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Mineral Resource Governance in the 21st Century: Gearing extractive industries towards sustainable development

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EXECUTIVE SUMMARY

Mineral Resource Governance Today: The Imperative for Change

There is a growing recognition that the extractive sector, if well managed, can play a positive role in promoting broad-based development and structural transformation of economies. In the context of the current global development agenda, the sector has direct links to a large number of the 17 Sustainable Development Goals (SDGs); specifically, those relating to poverty eradication, decent work and economic growth, clean water and sanitation, life on land, sustainable and affordable energy, climate action, industry and infrastructure, as well as peace and justice. Mining generates significant revenue streams through taxes, royalties and dividends for governments to invest in economic and social development (Goal 1). Mining can help drive economic development and diversification through direct and indirect economic benefits, the development of new technologies and by spurring the construction of new infrastructure for transport, communications, water and energy (Goal 9). It can alter the lives of local communities, offering opportunities for jobs and training, while contributing to economic and social inequities if not appropriately managed (Goal 8). Moreover, mining requires access to land and water, presenting significant and broad landscape impacts that must be responsibly managed (Goals 6 and 15). Mining activities are also energy and emissions-intensive in both the production and downstream uses of mining products (Goals 7 and 13). Finally, mining can contribute to peaceful societies by avoiding and remedying company-community conflict, respecting human rights and rights of indigenous peoples, and by supporting the representative decision-making of citizens and communities in extractives development (Goal 16) (ibid).

Many of today's wealthiest and most powerful countries were built on the back of significant natural resource endowments and in some cases, they have economies based largely on the exploitation of extractive resources still today. Even among developing countries this path to prosperity is being repeated as evidenced by countries such as Botswana that have judiciously used diamond resources to promote broad-based development. Indeed, if managed prudently, mineral wealth presents enormous opportunities for advancing sustainable development, particularly in low-income countries.

In addition to generating vast sums of government revenues through taxes, royalties and other levies, extractive projects can also yield benefits by, to name a few, fostering the emergence of competitive small and medium-scale enterprises which supply goods and services to the industry; opening-up access to modern infrastructure and leveraging it to support a wider range of development objectives and boost productivity in other sectors of the economy; and facilitating the transfer of technologies and know-how, thus strengthening local human capital formation, the key to structural transformation.

However, mineral resources have attributes that make them difficult to manage and for a majority of resource-rich developing countries, mining, oil or gas exploitation has not translated into economic, human and social development. The extractive industry in most of the developing world is an enclave with few linkages to the local economy thus missing the opportunities to explore multiplier effects and deliver sustainable development especially through stimulating the larger economy and thus driving economic transformation. Moreover, the extractive industry is disruptive and can generate long-lasting and negative environmental, social, economic, cultural and political impacts, some leading to severe environmental degradation and disruption of social fabric, and others unleashing political dynamics which result in the deterioration of governance and serious conflicts.

The realization of the full potential of the mining sector to act as a catalyst for growth and development in mineral-rich developing countries is therefore fraught with many challenges. These include: the unevenly distributed and finite nature of mineral deposits; the volatility of commodity prices which have exposed developing countries to external shocks triggering macro-economic instability; the difficulties of managing large and volatile inflows of foreign capital; information asymmetries and technical complexities of large-scale projects which render ill-equipped national administrations vulnerable to large multinational companies; conflicting stakeholder interests and lack of consensus between different stakeholders on what constitutes mineral-derived value and benefits, all potentially leading to social conflict; lack of accountability, transparency and risk of corruption; and geopolitics and global power asymmetries.

Further, much of the mineral's resources are traded in commodity exchanges dominated by a few locations in the developed world and a few trading houses essentially creating a monopoly of sorts. These trading hubs, to a large extent, coordinate and govern the value chain. They mediate between mineral production and manufacturing processes and consequently have a significant leverage in determining commodity pricing and how the value-created is shared between the various actors. As a result of their role, they tend to capture significant rents.

It has long been recognized that governance is key for mitigating the adverse impacts and enhancing the positive economic, social and environmental outcomes of mining. There is already a plethora of domestic, regional and international legal and regulatory frameworks as well as formal and informal initiatives and instruments including at company level, all aimed at better governing the extractive industry for increased economic prosperity and environmental protection. These include many commendable examples such as the Africa Mining Vision, the UN Guiding Principles on Business and Human Rights, the Extractive Industry Transparency Initiative (EITI), the Dodd-Frank Act, the Global Reporting Initiative (GRI), the Model Mining Development Agreement, the Initiative for Responsible Mining Assurance, the Natural Resource Charter, the development of indicators to measure resource governance, and the broader work of the International Council on Mining and Metals (ICMM).

More specifically, and in order to manage the challenges in the sector and mitigate conflicts at project level, many mining companies have traditionally sought to obtain a "Social License to Operate (SLO)", in other words, the acceptance or approval of extractive operations by those local community stakeholders who are affected by them and those stakeholders who can affect their profitability. In essence, the SLO came about as a process aimed at managing risk of conflict at the local level and reputational damage at the national and international levels. Today, mining companies consider community acceptance to be as crucial as the formal licenses and permits granted by governments.

The fundamental critique of the SLO framework is that it was developed as industry's pragmatic response to business risk. Its agenda is limited to accommodating community demands to the minimum extent necessary to avoid public opposition and social conflict, and the associated costs of reputational damage and operations delays or disruptions. It has been opportunistically used to serve the particular objectives and goals of companies, activists and governments. In essence, SLO defines the minimum of what a mining project can get away with in a particular location.

In general, most of the existing policy frameworks and instruments for governing the mining sector tend to present piecemeal efforts and, importantly, often fail to be implemented at the national level. This means that existing governance approaches and instruments have not succeeded in bringing about a transition away from the 'extractivist' and anthropocentric model widely prevalent in the developing world, whereby the extractive sector is an enclave with few linkages to the local economy.

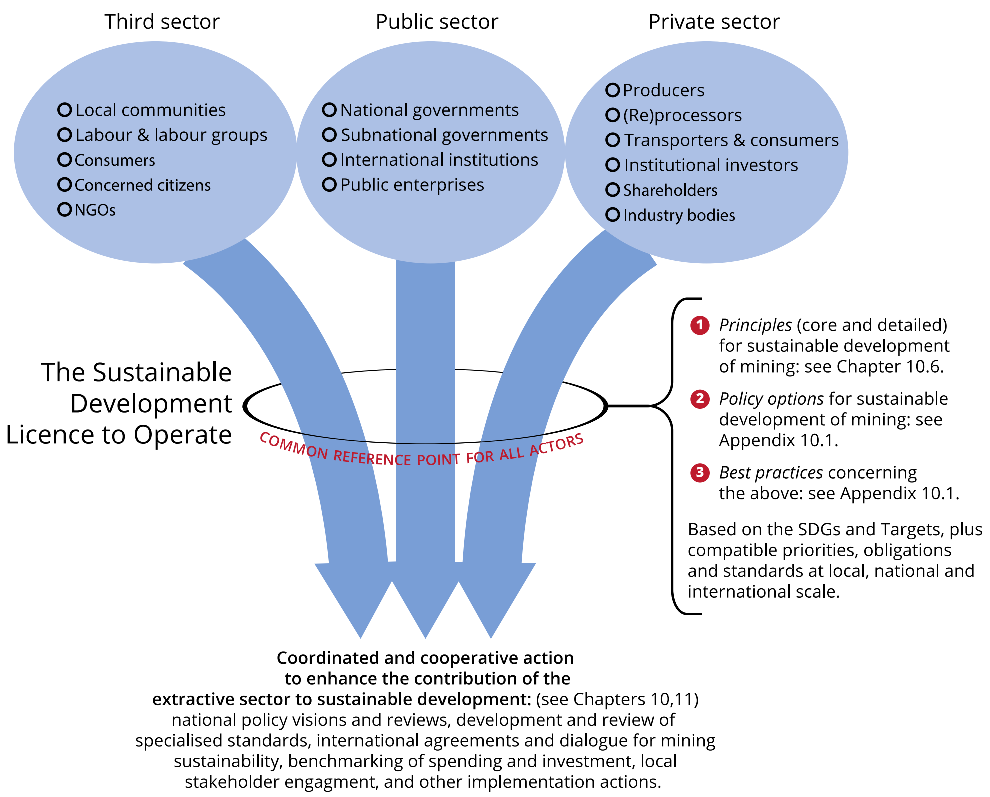
The adoption of the SDGs signalled the need to move beyond the concept of the 'social license to operate', which dominated the development discourse in the extractive industry throughout the end of 1990s and mid-2000s. The imperative for a new governance reference point arises from the limitations, inadequacy or even obsolescence of existing governance instruments given their sectorial and one-dimensional nature and from the need to translate the complex array of post-2015 global commitments into a manageable set of requirements that can be used by decision-makers involved in extractive sector governance.

In response to these new imperatives set by the 2030 Agenda for Sustainable Development there is need for a shift towards a new multi-level, holistic, integrated and multi-stakeholder governance framework composed of formal and informal arrangements. The framework should encompass governance institutions and mechanisms that act at the international, regional, national, local and project levels, and performed by a multitude of actors. A framework that would contribute to better understanding on how mining activities should be regulated and how resource rents should be used to improve economic and human development, at the same time as safeguarding the availability of resources and protecting the natural environment for current and future generations. In doing so, the new framework adopts a systemic integrated approach that attempts to account for complex inter-linkages and trade-offs between different natural resources, economic sectors, eco-systems, and development priorities and outcomes.

Such new global governance architecture needs to serve the continuous economic development, the structural transformation and economic diversification in resource-exporting countries. It should address not only resource security, but also resource efficiency and decoupling of resource use as well as the environmental impacts from economic growth. To achieve this, sustainable development approaches would need to be adopted, based on new metrics where success is measured against a quadruple bottom-line: on the strength of *economic* outcomes, sound *environmental* management, the respect of *social* values and aspirations, and the observance of the highest *governance* and transparency standards.

The new framework is the 'Sustainable Development License to Operate' (SDLO). The SDLO builds on the Social License to Operate (SLO). It is equally designed to improve the societal net benefits of mining, and is not meant necessarily to function as a licence in the compulsory or regulatory sense. However, the proposed SDLO extends the SLO concept in several important ways. It addresses a broader subject matter covering the nexus of all environmental social and economic concerns that fall within the subject matter ambit of the SDGs and Targets; it is relevant to all actors in the extractive sector across the public, private and civil society sectors; its implementation is a shared responsibility across nations and different actors along the minerals value chain; and it sets out not only minimum standards of practice, but also a set of internally consistent principles, policy options, and good practices for enhancing the extractive sector's contribution to achieving the SDGs. The figure below illustrates the key components of the SDLO and associated possible implementation actions.

Key components of the SDLO and illustrative implementation actions



Complex Issues, Intricate Dynamics and Many Opportunities for Action

Security of Supply

Extractive resources are going to continue playing a central role in driving the global economy despite moves to decouple economies and towards greater recycling. Demand is largely going to be driven by emerging economies as population grow in number and income into a global middle class living more and more in cities. These trends are going to drive demand for infrastructure and durable goods, the key drivers of demand for minerals. So as much as the recent commodity boom has waned, demand for minerals remains solid and indeed securing supply is a major concern going forward.

New supply challenges are emerging. The global transition towards carbon-clean energy production technologies will also be an important driver of the demand for minerals and metals. Energy production from renewable energy sources requires much greater amounts of metals, both of the common and rare types, than energy production from fossil fuels. As the 4th industrial revolution unfolds underpinned by information and communication technologies demand for new materials is rising creating new challenges of securing supply.

Artisanal and Small-Scale Mining

Export minerals and large-scale mining are given greater attention due to more direct macroeconomic benefits they bring and the concerns for security of supply. However, other extractive activities especially the artisanal and small-scale mining (ASM) and development minerals sectors are an important source of livelihoods for many marginalized poor. ASM has increasingly become a source of livelihood for many poor households. More so in recent years which has seen unprecedented and widespread shift from agrarian to informal mineral extractive economies. In 2016, the IIED estimated the number of people supported by ASM-related activities to be 100-150 million and growing.

The equating of the expansion of large-scale mining with 'development' by policy-makers has established an extractive model that favors large corporatized operators over the ASM sector. Indeed, ASMs are seen as illegal or operate in the margins of legality having little security of tenure. Attention is increasingly focused on the environmental degradation caused by ASM. ASM needs to be recognized as a distinct sector that requires a totally different approach from a policy and governance perspective. Many of the approaches used with ASM in the past treated it as a subset of large-scale formal mining and did not consider its very specific problems.

Moreover, ASM context-specific legal and policy frameworks are required and the importance of ASM must be reflected in international, regional, national and local agenda, policies and plans. The private sector and other stakeholders are urged to enact transparent practices across the supply chains and support ASM integration into local, national, regional and international supply chains. Governments are called to create the necessary business operating environment to accelerate these transitions. The introduction of appropriate technologies, as well as, the use of gender-focused instruments is considered important elements of a better ASM.

Development Minerals

Development minerals are minerals that are mined, processed, manufactured and used domestically in industries such as construction, manufacturing and agriculture. They are generally low value (compared to export minerals), however these minerals are crucial for the domestic economy. They also employ many people and especially women. However, since they are not usually traded and largely undertaken by informal miners and consumes locally (where they are produced), they are usually not given attention by policy makers.

Development mineral issues tend to be subsumed under export minerals. However, there are several factors that make development minerals different from export minerals. While export mineral value chains are highly globalized, development mineral value chains are generally local. Export minerals are traded in global commodity markets that tend to be very volatile. Industrial minerals and construction materials are typically not subject to price volatility and are less exposed to external shocks. Development minerals are well integrated into local economy as they supply key raw materials for construction and other local industries. Export minerals are very unevenly distributed and thus produced by a few countries. In contrast, development minerals are much more abundant and widely distributed.

These differences mean that a distinct governance framework is needed for development minerals. However, the lack of attention to this sector has seen unsustainable mining practices**.** For example, the uncontrolled sand extraction is already having both environmental and economic consequences. Some of the strategic policy directions needed in this sector include: (i) recognition in policy and law (it is excluded from many mining acts) of the sector's unique contribution to local, domestic and regional economies and potential for structural transformation of developing nations; (ii) need for concerted action from all stakeholders to overcome the environmental, social, labour and other challenges confronting the sector; (iii) formalization; (iv) extension services (by government and by mining associations); (v) geological data inventories; (vi) access to finance (especially micro-finance), trade fairs, and technology exhibitions, and (vii) simple occupational health and safety (OHS) and environmental standards as part of licensing.

Impacts of mineral extraction on environment and livelihoods

Minerals extraction involves disturbing the environment which can lead to disruptions of important biodiversity services and with livelihoods. The often severe and enduring impacts on the natural environment from mining activities are widely reported. For instance, surface mining often cuts back forest and other vegetation cover, removes topsoil and introduces heavy machinery, which can be particularly damaging in fragile environments. Habitat removal can lead to population declines of a number of species. This can lead to alterations in the structure and function of ecosystems affecting the provision of a range of ecosystem services for people (especially, female users), including water regulation, pest control, pollination, food provision and protection from storms, floods, and coastal erosion. Chemicals and other harmful substances used to process ores can enter waterways and the natural environment when not managed appropriately. There is often an extensive amount of mine waste that can be toxic in nature, posing a significant risk through failures of storage facilities to contain the waste.

The trend towards mining lower grade ores raises the potential for impacts of extractive activities. Mining lower grade ore will lead to larger amounts of waste, higher energy and water demand. The demand for these increases exponentially with declining ore grades. Equally as easily accessible reserves become depleted, exploration is moving into more remote and often fragile areas. Deep sea mining is one example of a new and challenging frontier for mineral extraction, especially with respect to its impacts.

Making sense in a crowded space

Efforts to improve governance have seen a plethora of instruments being launched. However, these have not been able to meet the challenges. The failure in generating sustainable growth through the use of the resource wealth in several countries can be seen as the central challenge to the governance systems in place. This is being amplified by new challenges. Centralized power at the level of the national government is being dissipated upwards, downwards and horizontally. New information and communication technologies are seeing increased pressures from an informed citizenry for a greater say in decisions. The importance of extractive corporations from emerging countries in the global marketplace is growing. As global power has shifted from G8 to G20, the diversity of G20 nations implies a less homogenous approach to issues of natural resources governance.

Some of the challenges with existing instruments include:

- As instrument tend to response to a particular challenge many tend to be sectorial and narrow;
- Risk management and security of supply still predominantly inform many of the instruments.
- Compliance is expensive. Many instruments tend to be voluntary which results in low compliance;
- The piecemeal and narrow focus and lack of coordination with other stakeholders can also lead to unintended consequences; and
- They undermine the role of governments to regulate by building a false argument that voluntary self-regulation is more effective.

The Case for a New Governance Framework

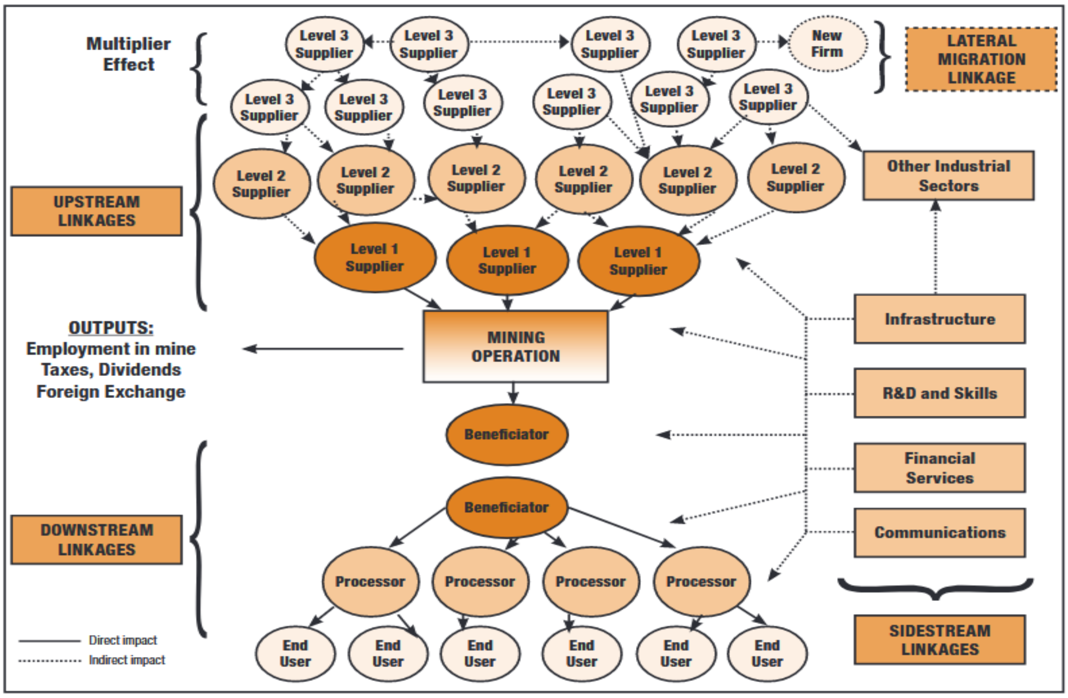
Towards greater and shared value and benefits

The foundations of the SDLO lie in the unequivocal recognition of planetary boundaries and on the need to secure a lasting alignment of what constitutes value and benefits to stakeholders in host and home countries and deliver a fair share of the benefits to all. This should support broad development objectives including poverty reduction, economic diversification and structural transformation without harming the environment and disrupting the social fabric of impacted communities.

A holistic and integrated governance framework for the extractive industry should cover the entire value chain of the extractive sector, that is, from licensing of mineral terrains, geological mapping, mineral exploration, mine development, mining, mineral processing and refining, ore transportation, manufacturing of end-use products, to recycling and mine closure.

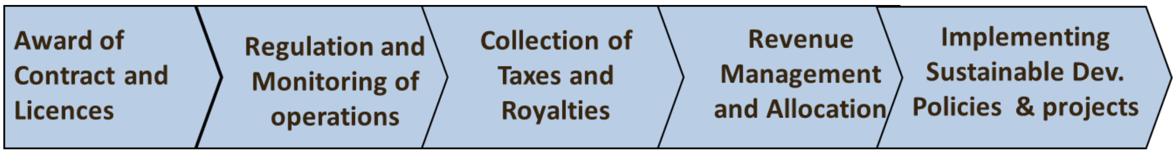
Translating mineral wealth into lasting economic and social gains requires a broad span of policies that convert mineral resources extraction from an enclave industry and link it to the broader economy through local content and value addition, among other routes (see below).

Linkages in the minerals industry and the relationship between firms



Source: Lydall, 2010.

How a country benefits from resource extraction depends crucially on the policies adopted throughout the entire *policy value chain* for extractive resources and on the decisions taken by several key actors in the sector. This is shown in the figure below. For governments, the key challenge here is having the right institutions and capacity to manage the extractive sectors well and invest the resource rents wisely to generate equitable and lasting benefits for all.



Source: World Bank (2009)

However, decision-making in the extractive sector is a complex global, national, regional and local architecture of relationships between individuals and institutions. There is therefore no perfect system of governance at all, but the convergence of different interests must be sought while respecting the objective limits imposed by the physical world and the need for justice and equity that guarantee the continuation of consensus.

An important feature of the extractive sector is the influential role played by transnational corporations (TNCs), including state-owned enterprises from other countries. Each of these actors pursues different sets of interests. The divergence in expectations between stakeholders has been a key driver of conflict in the extractive industry. Thus, the operationalization of the SDLO framework requires careful consideration of the views and expectations of all the key actors, recognition of spatial boundaries, power relationships and normative frameworks. These all play out in the mineral value-chain. The increasing demand by consumers for sustainable products are moving the governance challenge to the customer level and to the full product life cycle (disposal/recycling level). Therefore, what happens after a resource is extracted, processed and transformed to a product, used and finally disposed, are legitimate governance concerns now.

In establishing a new governance framework for the mining sector, it is essential to understand the sector within the broader context of a national economy, and its development objectives and strategies. This means both managing the potential impacts of mineral resource extraction on other parts of the economy (such as on the artisanal and small-scale mining sector), as well as maximising linkages between the mining sector and other parts of the economy (including through job creation, local procurement of goods and services, the downstream use of mined goods, and shared infrastructure). This will require a long-term comprehensive, holistic strategy, going beyond industry regulation to also include investment in education and training, and other policies for creating an enabling environment.

In the case of low-income resource-rich countries, governance strategies need to focus on breaking away from the enclave nature and extractivist model of the mining sector. Countries need to build forward and backward linkages with other socio-economic sectors, build infrastructure and capacity for greater value addition along the value chain, and promote regional partnerships and integration. A range of structural reforms and industrial policies need to be implemented to help achieve structural transformation and economic diversification. Developed countries and the global community need to afford developing countries sufficient policy space to do so, include through reform of the international trade and investment regime that constrains the use of the full range of policy instruments to achieve resource-based industrialisation at the local level.

Steps to Operationalizing the SDLO

Principles and policy options

The SDLO provides guidance on how to enhance the contribution of the extractive sector towards sustainable development through a set of principles and policy options, anchored on a clear and explicit recognition of planetary boundaries and on the need to decouple natural resource use, environmental and social impacts from economic growth, in a projected scenario of increased resource intensity till 2050. An important element of the SDLO is the recognition that mining activities can impact men and women in a different manner. Special attention should be paid to the role of women in artisanal and small-scale mining, their growing portion of employment in large-scale mining, and the adverse environmental and social impacts of mining that can disproportionately affect women. A gender-lens therefore needs to be adopted in governing the mining sector in order to maximise its development contribution, whilst also promoting female empowerment and gender equality that are central to the achievement of the Sustainable Development Goals. A similar need for differentiated analysis and policies may also arise with respect to other marginalised groups, such as indigenous people.

Overall, the essential principles for the operationalization of the SDLO are:

- SDLO is not a substitute for laws and regulations but makes a strong case for ensuring that the policies, laws and regulations in the extractive sector respond to shared visions and are fully aligned with national development plans and aspirations in a coherent manner. It seeks to standardize contracting laws through a generalized legislative framework that includes standardized forms. It argues for the use of competitive bidding processes in licensing mineral terrains, where relevant.

- As extractive industries place large demands on natural resources such as land and water and lead to pollution and environmental destruction, there is a need for a systems-thinking approach that accounts for the nexus between resources so as to steer policy efforts towards integrated natural resource management along the extractive value chain. Government policies need to incorporate environmental protection from the outset, with strategic environmental impact assessments, integrated spatial planning or landscape planning, and natural capital accounting being crucial elements.
- The SDLO framework seeks to integrate *local*, *national* and *international* governance issues. At the *local level*, there is a need to move away from charity-driven corporate social responsibility activities to implement inclusive business models whereby local communities participate in decision-making, their rights are protected, and they benefit from extractive activities. At the *national level*, host governments have a critical role to play including awarding exploration and ownership rights; fashioning concession agreements that ensure companies operate responsibly; mainstreaming strategic environmental assessments; domesticating natural capital accounting; adequately incorporating social and environmental assessments in national and local development plans; designing effective fiscal regimes; ensuring transparency and accountability; and channeling extractive rents into national and local public investment. Home countries also have a key role to play by better regulating the activities of trans-national corporations (TNCs); making international investment laws fairer; and tackling illicit financial flows, combating commodity price volatility, and ensuring a fair deal for host countries through, amongst others, international transparency and accountability initiatives, and regulation of tax havens. At the *international level*, policy action is needed to set global standards for the extractive sector – in the form of rules and regulations, voluntary instruments and reporting obligations – in a number of areas. These include coordination of policies and instruments and agreement on international standards (for example, on transparency and global codes of conduct); influencing incentives and behavior; technology transfer; and financial regulation (including to regulate the financialization of commodities and to curtail illicit financial flows).
- All groups of stakeholders should participate in decision-making through, amongst others, information exchange, media campaigns, and collaboration with institutions such as those with oversight roles. Industry should engage in a collaborative social dialogue regarding each extractive project, by articulating an agenda which balances its own commercial needs with societal expectations.
- In order to implement laws and policies governing the extractive sector, transparency is an essential, even if not a sufficient, prerequisite. Information on contracts and licenses, social and environmental impacts assessments, royalties and tax payments, revenues and expenditures should be easily accessible. Civil society organizations, labor unions, researchers and other stakeholders can also play an important role in analyzing data, reporting on findings and thus demanding accountability across all levels.

Operationalizing the SDLO

The SDLO should not be considered as a new instrument but rather a framework that articulates governance issues across the whole extractive value-chain, provides a means of organizing existing governance instruments, and assigns responsibilities to various parties. The SDLO framework seeks to create a more coherent governance landscape, by advocating for a concerted consolidation of existing instruments pertaining to the sector, ensuring sustainable development is the overriding objective, as well as pointing to areas where new instruments might be needed and to how a particular instrument will interact with others instruments.

The SDLO is a partnership of the key stakeholders in the extractive value chain to ensure mining is done sustainably while meeting the twin goals of sustainable development for exporting countries and also security of supply for importing countries. Importantly, it is essential to recognize that 'no one-solution-fits-all' and very different policy solutions may apply to countries with dissimilar industry characteristics, facing particular challenges, or at different stages of economic development. Differentiated governance approaches are needed for, instance, for countries where standards and guidelines can be easily implemented, compared to others with a large artisanal and small-scale mining sector, or with high levels of corruption, or that are affected by conflict and war. Governance strategies thus need to be tailored to a particular country's socioeconomic, geopolitical, historical and cultural background.

The operationalization of the SDLO can be pursued through three not mutually exclusive pathways, namely, (i) a global international agreement that commits countries to a governance framework much like SDGs commit countries to sustainable development; (ii) a global platform for continued dialogue and advocacy on cross cutting issues; and (iii) regional platforms to engage host and home regions so that issues of sustainable development and security of supply are reconciled through regional PACTs such as the Africa Mining Vision and the EU Raw Materials Initiative.

GLOSSARY

Brownfield exploration	In mineral exploitation, "brownfield exploration" designates exploration in areas near already known mineral deposits and/or exploration for lateral/ in-depth extensions of known deposits.
Construction minerals	Typical construction minerals are aggregates (sand, gravel, and crushed natural stone), various brick clays, gypsum, and natural ornamental or dimension stone
Dutch Disease	The expression "Dutch disease" describes the various negative impacts on the Dutch economy, such as inflation, rising value of the local currency (hampering exports) and rising labour costs that arose as a consequence of the discovery and the rapid development of the Dutch Groningen gas fields in the early 60's. The expression was coined by the UK journal "The Economist".
Extractivism	Activities which remove large quantities of natural resources that are not processed in the countries where they are extracts (or where they are processed only to a limited degree), especially for export. The extractivist mode of accumulation refers to the exploitation of raw materials needed primarily to fuel the development and growth of industrialised and emerging nations. It typically generates few benefits for the countries where the extraction takes place, due to the resulting limited demand for domestic labour, goods and services; lack of value addition and linkages to the rest of the economy; depletion of finite resources; environmental destruction; and incentives for 'rent-seeking' behaviour which undermine effective and democratic governance.
Exploration	All the activities related to the search for new mineral deposits and the related development activities up to the completed feasibility study.
Feasibility study	A Feasibility Study is a comprehensive technical and economic study of the selected development option for a mineral project that includes appropriately detailed assessments of applicable Modifying Factors together with any other relevant operational factors and detailed financial analysis that are necessary to demonstrate, at the time of reporting, that extraction is reasonably justified (economically mineable). The results of the study may reasonably serve as the basis for a final decision by a proponent or financial institution to proceed with, or finance, the development of the project. The confidence level of the study will be higher than that of a Pre-Feasibility Study.
Geological stocks	Potential, so far undiscovered, mineral concentrations contained in the upper part (Between the surface and +/- 3 km depth) that, pending successful exploration, will supply future needs, especially for metals. Tentative evaluations of the geological stocks have been performed for some metals, for instance copper.
Greenfield exploration	In mineral exploitation, "greenfield exploration" designates exploration in areas with no so far known mineral deposits
Home country	This is used to refer to the country wherein the mining company is registered. It is important to note that with the emergence of the global value chain for minerals and metals, the distinction between home and host country can be blurry.
Host Country	This is used to designate the country where the minerals and metals are exploited. The caveat noted above for home country also applies here.
Metallurgy	The science and art of separating metals and metallic minerals from their ores by mechanical and chemical processes; the preparation of metalliferous materials from raw ore. (US Bureau of Mines). Note: biological processes may also be used, such as bacterial leaching, to recover metals present in certain ores. In this report the use of the term includes closely related refining activities needed to purify the raw metal

	obtained from the metallurgical process, in order to meet required metal purity standards.
Metals	In most cases, an opaque, lustrous, elemental substance that is a good conductor of heat and electricity. It is also malleable and ductile, possesses high melting and boiling points, and tends to form positive ions in chemical compounds. (US Bureau of Mines). For the sake of simplicity, in this report, the expression “metals” includes the metalloids, as these mostly occur as by-products of metals and are recovered during the metallurgy or the refining processing of metallic ores.
Mineral deposits	A geological concentration of minerals of proven economic value.
Mineral reserve	A Mineral Reserve is the economically mineable part of a Mineral Resource. It includes diluting materials and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at Pre-Feasibility or Feasibility level as appropriate that include application of Modifying Factors. Such studies demonstrate that, at the time of reporting, extraction could reasonably be justified. The public disclosure of a Mineral Reserve must be demonstrated by a Pre-Feasibility Study or Feasibility Study.
Mining	The science, technique, and business of mineral discovery and exploitation. Strictly, the word connotes underground work directed to severance and treatment of ore or associated rock. Practically, it includes opencast work, quarrying, alluvial dredging, and combined operations, including surface and underground attack and ore treatment. (US Bureau of Mines).
Ore	An assemblage of minerals from which at least one economically valuable substance, most frequently a metal (e.g.: copper, gallium, gold, iron, zinc), can be extracted further to chemical and/or physical processing of the ore (see the terms “ore processing” and “metallurgy”. Typically, an ore comprises several minerals (“ore minerals”) of which only one, or a few, have an economic value. All other minerals have no economic value.
Ore processing (equivalent to “ore beneficiation” or “ore dressing” also frequently found in the literature)	Generally, especially for the production of metals, ore processing is a specific combination of biological and/or chemical and/or physical processes needed to separate the economically valuable ore minerals from the other, valueless, minerals present in the ore. This separation results in the production of a concentrate of economic minerals and in ore processing waste that will have to be disposed under the name of tailings, in specifically engineered reservoirs named tailing ponds. In the case of construction materials, such as sand and gravel, processing is frequently limited to some crushing, sorting and washing operations.
Pre-Feasibility study	A Pre-Feasibility Study is a comprehensive study of a range of options for the technical and economic viability of a mineral project that has advanced to a stage where a preferred mining method, in the case of underground mining, or the pit configuration, in the case of an open pit, is established and an effective method of mineral processing is determined. It includes a financial analysis based on reasonable assumptions on the Modifying Factors and the evaluation of any other relevant factors which are sufficient for a Qualified Person, acting reasonably, to determine if all or part of the Mineral Resource may be converted to a Mineral Reserve at the time of reporting. A Pre-Feasibility Study is at a lower confidence level than a Feasibility Study.
Refining	The purification of crude metallic products (US Bureau of Mines). This activity is closely related to metallurgy, in order to remove residual impurities contained in metallic melts and to meet market specifications on maximum allowed impurities.

Resource curse	Negative relationship described by several authors between resource abundance and poor economic and/or environmental and/or social performance.
Resource nationalism	Resource nationalism can take multiple forms. Resource nationalism can be defined as anti-competitive behaviour by individual nations, designed to restrict the international supply of a natural resource, for instance to maximise the value-added generated on their territories. It can also be driven by the political to exert control over the supply chains depending on specific minerals and metals through financial control of key producing countries, generally in order to develop a competitive advantage or geopolitical leverage. Resources nationalism is frequently expressed by tariff and non-tariff barriers restricting the free trade of minerals or metals. Resource nationalism is likely to have a greater effect on global terms of trade when a natural resource is only produced in few countries. In these markets, countries can affect global prices for raw materials and have most to gain from resource nationalism. In these cases, there is potential for the main producers (companies or countries) to act together to manipulate global prices.
Sovereign wealth fund	Resource revenue that is sequestered in a special fund by mineral-rich countries. These special-purpose financial vehicles aim to help ensure proper management of resource revenues. SWFs can have a number of components that may include: a stabilization fund, which captures in excess a pre-determined commodity price (used to project flows for budget purposes) and release these funds to support the budget when price falls below the predetermined price; a development fund that captures a portion of the resources flows and puts them in a fund to focus on long term projects e.g. infrastructure, and a heritage fund, which captures the resources and saves them for future generations. These funds are long term investments to be drawn by future generations.
Third sector	Civil society, research institutions, local communities, NGOs, concerned citizens, consumers, labour and labour groups.

CHAPTER 1- INTRODUCTION

1.0 Introduction[1]

Natural resources[2] are an important foundation for economic development as economies rely on raw materials and ecosystems services. Therefore, the sustainable development of any nation and of the world as a whole depends on the sustainable exploitation of natural resources[3]. Minerals are particularly crucial natural resources as they form the basis for industrialisation, the epitome of economic development.

The fact that minerals and metals provide raw materials that underpin economic activity[4] means that there will be a sustained demand for minerals and metals in the foreseeable future, although progress towards a circular economy could reduce the pressure on primary production, with some limitations, for instance, in relation to recycling of some metals and minerals (Reuter *et al*., 2013). Even though demand will follow economic cycles, thus exhibiting booms and slow-downs, the long-term picture is one of increased demand as economies grow, and particularly as developing economies catch up concomitantly with developed countries in their resource use patterns.

As resource exploitation involves disturbing and damaging the natural environment, people may lose services obtained from it. Exploitation may also generate huge revenues and profits which may accrue to those unaffected by the adverse impacts of resource exploitation. Thus, resource extraction has winners and losers, setting the stage for contestation[5]. This situation is further worsened by the lack of transparency of some companies and a widespread asymmetry of knowledge among mining project stakeholders, which may lead to wealth not being equally shared among them. Figure 1.1 depicts the array of stakeholders involved.

Natural resources abundance has costs and benefits to the country. Which side of the equation prevails is not a given. On one hand, the wealth generated can be parlayed to mitigate impacts of exploitation and also to transform national economies leading to sustained well-being. This is the story of some of the most advanced countries such as Australia, Canada, many member states of the European Union, Norway or the United States of America. This story of mineral extraction-driven transformation has more recently been repeated in Brazil, Chile and South Africa. On the other hand, some of the countries that have the lowest levels of development are also countries with abundant resources. This reflects the well documented "natural resource curse" phenomenon[6].

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[1] The terms 'extractive' and 'mining' are used interchangeably. The focus of this report is on minerals and metals.

[2] Natural resources refer to substances and materials (renewable and non-renewable) that occur in nature and can be exploited for economic well-being such as sun, plants, animal, soil, wind, air and water, metals, coal, oil and gas and minerals.

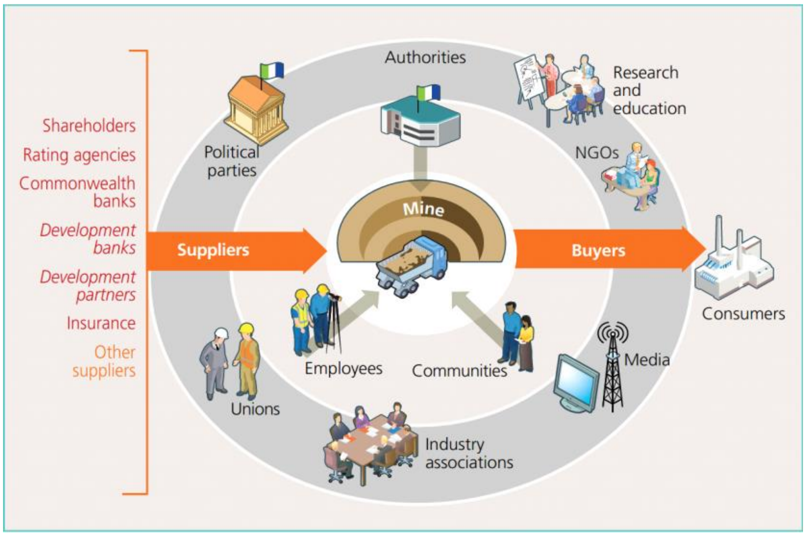
[3] The concept of sustainability can be traced to the Brundtland Report, "Our Common Future",' which defined the concept as: "…to ensure that [development] meets the needs of the present without compromising the ability of future generations to meet their own needs..' (World Commission on Environment and Development, 1987).

[4] The value of a particular resource is inherently economic, social and technological in nature. Metals are used in urban infrastructure, electronics, military hardware, transport, energy production, transmission and storage; minerals are used in cement, ceramics, bricks, aggregates, and so on.

[5] From a human right's perspective trade-offs 'must never result in a deprivation of the ability of people to enjoy the essential content of their human rights' (De Schutter, 2011)

[6] See Sachs & Warner, 1997; Auty, 2001; and Van der Ploeg, 2011

Figure 1.1 Generalised representation of mining projects stakeholders



Source: Christmann (2017).

Resource- rich countries have tended to perform much worse than non-resource rich countries on many development metrics (Sachs & Warner, 1997; Karl, 1997; Ross, 1999)[7]. The Democratic Republic of Congo (DRC) is the poster child of this scenario. A crucial challenge is the fact that extractive resource wealth unleashes new political dynamics as various actors seek to control the resource, which largely explains the prevalence of conflicts[8] in resource-rich countries. Even under the aegis of well-meaning governments, economies can become overwhelmed by sudden windfalls from extractive resources flows causing serious macroeconomic challenges, especially when there are capacity deficits in the administration.

Another common challenge is the so-called "Dutch Disease", whereby inflows of resource revenues cause high inflation and the appreciation of the domestic currency, leading to reallocation of resources from such sectors as agriculture and manufacturing to the resource sector and a rise in input costs, which consequently harm the competitiveness of the country's tradable sectors. The 'resource curse' concept has been critiqued by other authors (Davis, 2011; Stevens *et al*., 2015). Davis, for instance, argues that slower growth observed in resource-rich countries 'may simply reflect a resource drag'. This is a situation whereby a drag on measured growth of per capita economic output is introduced by an 'optimally managed per capita resource production that does not grow substantially over time'. Stevens *et al* argue that the phenomenon has been over-simplified and that the conclusions are driven by many factors beyond the control of exporting countries (e.g., investment cycles, colonial perspectives and so on).

[7] Indeed, using data from the Natural Resource Governance Index, NRGI finds that less than 20 percent of the countries studied have satisfactory standards of transparency and accountability. In the rest, the public lacks fundamental information about the oil, gas and mining sector. Even countries with generally satisfactory standards exhibit weaknesses in some dimensions.

[8] The conflict over the Panguna Copper mine, one of the world's richest copper mines, led to a civil war that killed as many as 20,000 people. The conflict escalated after land owners protested about environmental damage of the mine and the lack of economic benefit to the local people (Adamo, 2018).

Extractive resource wealth can thus engender dynamics that can create a virtuous cycle of growth or a vicious cycle of misery and poverty at the other extreme. Governance is the crucial factor that determines which cycle dominates. Good governance (Box 1.1) means that natural capital can be converted into human, social and physical capital, without undermining other forms of natural capital such as that provided by biodiversity. Equally it can engender positive spill-overs and multiplier effects that can guarantee high and sustained living standards. Poor governance manifests itself by the fact that natural resource revenues can be looted for personal benefit and/or wasted in poorly executed projects and resource allocation with severe environmental consequences.

Box 1.1 Governance Defined
A broad understanding of governance is *"the sum of laws, norms, policies and institutions that define, constitute, and mediate trans-border relations between states, cultures, citizens, intergovernmental and non-governmental organizations, and the market. It embraces the totality of institutions, policies, rules, practices, norms, procedures and initiatives by which states and their citizens (indeed humanity as a whole) try to bring more predictability, stability, and order to their responses to transnational challenges – such as climate change and environmental degradation, nuclear proliferation, and terrorism – which go beyond the capacity of a single nation state to solve."* (UN Intellectual History Project, 2009).

The above situation is, however, more nuanced. Of particular concern is the fact that extractive resources are finite and therefore once exploited, they will cease to be available again. Thus, countries only have a limited window of opportunity to convert extractive resource wealth into sustainable development. This is particularly important for people that bear the brunt of resource exploitation and also for future generations for whom the resources will no longer be available.

For countries that depend on importing extractive resources, the "resource curse" can translate into supply uncertainties. Supply uncertainties also arise from the fact that endowments of mineral resources are distributed unevenly geographically, with sometimes only a few countries controlling some specific resources. This concern is addressed through markets and geopolitics (in the form of free trade, economic diplomacy and power relations new discoveries and through resource efficiency to reduce overall dependency (UNEP, 2016). Beyond security of supply, companies from importing countries also have to worry about reputational risks that arise from dealing with exporting countries that are perceived as corrupt and where their activities may be associated with negative environmental and social impacts. In the case of resource-rich countries, the key concern is whether they can convert natural capital into high and sustained living standards and development. These two concerns are two sides of the same coin since unfettered supply of mineral resources is crucial for both pathways.

Gender inequality also poses a fundamental challenge in mining communities. Globally, women play very little leadership role in the formal mining sector and in most mining countries, women are still in the minority in the mining industry. However, their number as a proportion of the overall mining workforce continues to rise and it is envisaged that it will rise even further as the global mining industry continues to fight a growing shortage of skills. In the past, mining was entirely male-dominated work because hard labour-intensive work, and physical stamina and endurance were key job requirements. Currently, technology is greatly facilitating the entry of women into the mining industry; and this is because in the present day, mines are at the cutting edge of modern technology, and there is much less emphasis on physical muscles and far more on numeracy, literacy and specialist skills. Mining technology is thus an access opportunity paving the way for women in mining countries to increasingly play important roles in the mining industry, occupying positions of power and authority at all levels even in some African mining countries such as Zambia where women are found working as directors, managers, lawyers, engineers, laboratory technicians, truck drivers, control-room operatives and blast-supervisors (WIM, nd). Global feminist activist organization such as International Women in Mining (IWIN) continue to encourage the formation of women's mining cooperatives, associations and networks to motivate women's participation, stimulate bargaining power, work conditions and economic independence in mining countries.

With the informal ASM (see Chapter 3), however, gender inequities still emerge as a deepening socioeconomic challenge in mining countries and differences in equality of opportunity between men and women prevail. Africa continues to have the highest proportion of women artisanal miners and make up about 50 percent of the artisanal mining workforce, compared to the world average of 30 percent (IGF, 2018:1). Very few women are represented in the ASM management or technical mining operations. Indeed, for many women, involvement in informal mining are still traditional include "digging, rock crushing, grinding, panning, washing, and sieving" and for other women, artisanal mining "is mostly clustered in support services—water haulers for mine sites, laborers, and suppliers of goods and services around the mining sites, including the sex trade" (Eshun, 2016:1). There are also mining associated challenges in countries, such as Ghana, where agriculture production is highly gendered. This is the decreasing productivity of a mainly female subsistence farming with the environmental degradation that come with artisanal mining.

Addressing these challenges requires effective governance of the whole mineral value chain (upstream and downstream). Indeed, as shown in a recent report by UNU-WIDER, the 'resource curse' is not a destiny but mineral wealth can be a blessing (Ericsson & Olöf, 2017). Using data for 1996-2014 (a period that saw a significant rise in demand for natural resources – the so-called super-cycle), the authors show that mineral-rich countries experienced a 70% improvement in Human Development Index (HDI) over non-mining countries. They also show that mining countries exhibited relative improvements in governance indicators. This is evidence of the centrality of good governance in unlocking the benefit of mineral wealth. It underscores the need to strengthen governance of natural resources, which is the main premise for developing this assessment report.

The search for effective natural resources governance models has seen a plethora of initiatives launched at national and international levels. A mapping of the various governance instruments pertaining to the mining sector has identified in excess of 80 such (mainly international and regional) initiatives. These range from comprehensive policy frameworks to platforms for dialogue; from legally binding initiatives backed by UN sanctions and national laws to voluntary initiatives; and from a single stakeholder-led to multi-stakeholder platforms that bring together many types of stakeholders. Initiatives span from very site-specific to those that are global in coverage.

Many initiatives tend to cover a specific set of issues like the Kimberly Process Certification Scheme (KPCS), which is narrowly focused on conflict diamonds. Also, several initiatives are motivated by risk management concerns mainly relating to securing supply or managing reputational risks. Only 13 % of the initiatives mapped addressed broad sustainable development issues.

The review of the various initiatives paints a mixed picture. Some of the challenges faced by ongoing initiatives include unintended consequences such as conflict prevention initiatives increasing poverty, job loss and incidence of violence; lack of buy-in; lack of compliance (due to lack of sanctioning mechanisms); self-serving interpretation of the initiative's scope of application, which is prevalent with corporate social responsibility initiatives; uneven focus on critical issues; lack of a theory of change; and a proliferation of standards creating fatigue across stakeholders.

Even though useful lessons have been learnt and progress made, the "resource curse" is still a reality for some people living in extractive resource-rich countries. Unlocking the potential of extractive resource wealth to contribute towards inclusive and sustainable development will require addressing significant gaps at all levels of natural resource governance. This will necessitate attention being directed to core elements of an effective natural resource governance framework which include strong public institutions, fair redistribution of revenues, a shared notion of value, transparency measures, information and knowledge sharing, and a stable security environment.

The new global agenda for development, the Sustainable Development Goals (SDGs), has given a new impetus for leveraging extractive resource wealth to deliver improved livelihoods. A report (UNSDSN, CCSI, UNDP and WEF, 2015) mapping mining to the SDGs makes a strong case for linkages between the sector and the SDGs. It argues that since mining is a global industry and is often located in remote and less-developed areas including many indigenous lands and territories, when managed appropriately, it can create jobs, develop skills usable in other sectors of the economy, spur innovation and bring investment and infrastructure at a game-changing scale over long time horizons. The desire for mining to contribute to sustainable development has seen different regions adopting different approaches. In Africa, a continental strategy has been developed under the Africa Mining Vision (AU, 2009)). In Latin America, countries are pursuing different strategies (Box 1.2).

Box 1.2 Leveraging Mining for Industrialization: Africa and Latin America Approaches

Africa Mining Vision (AMV)

The vision calls for:

- A knowledge-driven African mining sector that catalyses and contributes to the broad-based growth and development of, and is fully integrated into, a single African market through:
  - Down-stream linkages into mineral beneficiation and manufacturing;
  - Up-stream linkages into mining capital goods, consumables and services industries;
  - Side-stream linkages into infrastructure (power, logistics; communications, water) and skills and technology development (HRD and R&D);
  - Mutually beneficial partnerships between the state, the private sector, civil society, local communities and other stakeholders; and
  - A comprehensive knowledge of its mineral endowment.
- A sustainable and well-governed mining sector that effectively garners and deploys resource rents and that is safe, healthy, gender & ethnically inclusive, environmentally friendly, socially responsible and appreciated by surrounding communities;
- A mining sector that has become a key component of a diversified, vibrant and globally competitive industrialising African economy;
- A mining sector that has helped establish a competitive African infrastructure platform, through the maximisation of its propulsive local & regional economic linkages;
- A mining sector that optimises and husbands Africa's finite mineral resource endowments and that is diversified, incorporating both high value metals and lower value industrial minerals at both commercial and small-scale levels;

- A mining sector that harnesses the potential of artisanal and small-scale mining to stimulate local/national entrepreneurship, improve livelihoods and advance integrated rural social and economic development; and
- A mining sector that is a major player in vibrant and competitive national, continental and international capital and commodity markets.

The implementation of the AMV has received mixed results. Twenty-four out of the 54 countries in Africa are at various stages of the implementation of the AMV (Oxfam, 2017). Notable progress has been observed in Chad, Ghana, Guinea, Kenya, Lesotho, Malawi and Sierra Leone. In Ghana, for example, a new mining policy has been promulgated as part of the implementation of the country's mining vision. This has also seen the enactment of laws on local content and local participation. The slow pace of AMV implementation has been attributed to the lack of political will, its top-down approach and the lack of centrality of the marginalized people; and lack of awareness (ActionAid, 2017; Compaoré, 2017).

Latin America

Bastida (2018) points that there is no regional initiative analogous to the Africa Mining Vision though the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) called upon countries to develop a common vision towards natural resources[9]. The different countries are pursuing strategies similar to those being promoted by AMV. Some examples include:

- In Chile, the Commission for Mining and Development, a multi-stakeholder group set up within the National Innovation and Competitiveness Council, issued in 2014 the report 'Mining: A Platform for the Future in Chile', which sets the Strategic Agenda for the sector towards 2035. The report draws a vision for the development of a 'virtuous, inclusive and sustainable' sector, which aims at placing mining at the core of developmental efforts.
- In Colombia, in February 2014, the Mining and Energy Planning Unit released the report 'Mining Scenarios for Colombia 2032', which identified a set of long-term strategies for the mining sector based on scenario planning. The report has informed the preparation of the ambitious 'National Development Plan 2018-2025',
- In Peru, a report 'Towards a Vision for Mining in Peru in 2030' was developed in 2016. The Vision emphasizes the need to adopt actions to enhance the economic contribution of mining and to ensure alignment with the SDGs and territorial development priorities.
- Argentina: The province of Jujuy, home to large reserves of lithium, has established guidelines on mining promotion and towards industrialization and added-value policies in its provincial constitution. Further, in 2011, the province established *Jujuy Energía y Minería Sociedad del Estado* (JEMSE), a provincial state-owned company. In 2017, JEMSE and the Italian FIB (Seri Group), installed an assembly plant and then produced lithium-ion cells for public transportation. Also, Jujuy National University has entered into a partnership with the national oil company) and the National Research Council to install the first lithium-ion cell factory in the country.
- Bolivia: The 2009 constitution mandates adding value and industrialising minerals. To implement the constitutional mandate, the government has invested in four pilot plants to produce lithium carbonate and assembly batteries in Potosi. To start-up production at an industrial scale, the government commissioned the design of an industrial plant for potassium chlorate

Conventional natural resource-related challenges are being exacerbated by new developments. These include a changing governance landscape where centralized power by national governments is being devolved downwards to local levels, upwards to the international levels and horizontally to regional levels[10]. At the same time, the rise of new powers (BRICS[11], in particular) is shifting global geopolitics.

[9] This was a key recommendation of the 2014 document 'Equality Covenants: Towards a Sustainable. Further in May 2016, ECLAC published the report 'Towards a New Governance of Natural Resources in Latin America and the Caribbean

[10] The fact that mineral value chains are global means that governance is further complicated by many actors involved including host states, home states, multinational corporations, civil society organizations and other stakeholders. This is further discussed in Chapter 9.

[11] BRICS stands a grouping of five emerging economies: Brazil, Russia, India, China and South Africa.

Another challenge relates to the increased financialization of natural resources so that commodity prices are no longer solely determined by fundamentals of demand and supply but by risk appetite of investors. Moreover, international investment laws have been criticised for being tilted towards favouring investors rather than the public interest, while illicit financial flows (IFFs) including taxation base erosion are draining revenues derived from the extraction of resources (Pun, 2017). Consumers and institutional investors are also increasingly concerned with the impact of their purchasing decisions and the quality of their portfolios, respectively. A further challenge relates to the impacts of climate change on extractive operations as well as on supply and demand dynamics. Other challenges relate to technological innovations that are changing the face of the extractive sector; as well as the need to rethink the role of artisanal and small-scale mining as bona fide (legitimate) players.

In addressing these governance challenges, devising innovative ways to effectively govern mineral resources is crucial. As we embark on the SDG path, it is important that we revisit the issue of crafting effective governance systems. This will be a monumental task if history is to guide us. Indeed, Lockwood *et al*. (2010) maintain that the natural resource governance problem belongs to a class of complex policy problems, the so-called “Wicked Problem”, which are characterized by complexity and contestation originating from multiple problem causes, divergent problem perspectives and solution strategies, and fragmented institutional settings that, to be remedied, necessitate institutional adaptation and innovation.

The development of a new governance framework is crucial. Pedro *et al.* (2017) calls for a new multi-level, holistic and integrated governance framework applicable to governments, companies and the broader range stakeholders in the extractive industry. This framework will be anchored in the quadruple bottom-line where development is measured on economic grounds, environmental and social imperatives as well as observance of highest governance and transparency standards. A central guiding principle is that these resources should be available for all generations (current and future) or in other words ‘it is not your world alone’.

1.1 Chapter synopsis

This report seeks to point the way towards a new governance landscape. It consists of three parts. Part one (Chapters 2 – 5) summarises the current state of the mining industry. Chapters 6 – 9 constitute the second part, which explores the present mineral resource governance architecture. The final part (Chapters 10-12) articulates the pathway to improved mineral resource governance for sustainable development.

Chapter 2 explores the role of the minerals and metals industry in the global economy with a focus on the evolution of the industry and the role of the emerging circular economy. It will profile the mining and metals industry throughout its value chain.

Chapter 3 looks at the evolution of artisanal and small- scale mining (ASM) and implications for resource governance. It illustrates how this sector differs from large-scale mining, particularly by looking at the distinctive issues affecting ASM. It also highlights the evolving thinking on ASM, including a review of specific legal and regulatory programmes to better manage the sector, and steps taken to increase collaboration between ASM and large-scale operators.

Chapter 4 examines the future trends in the extractive sector using 2050 as the time horizon. It explores drivers of both demand and supply, and implications for commodity price formation. Of particular significance is the assessment of the impact on global resource use of an increasing population, and the rapid pace of urbanization and expanding middle class, especially in developing countries. The Chapter features a review of scenario projections of future needs for mineral resources, and analysis of how they could be extracted and used. It also explores emerging governance issues that need to be anticipated.

Chapter 5 examines the potential social and environmental impacts of mining. It analyses environmental impacts and concerns arising, for example, from pollution, water depletion, land degradation, climate change, and biodiversity loss. The focus of the social impacts analysis includes, at the macro-level, tensions and other disruptions brought about by the scramble for resources and over-dependency on resource rents.

Chapter 6 focuses on the challenges of governing the sector. It includes a review of the political factors that tend to weaken resource governance. It shows how the sector can increase inequalities and potential capture by different interest groups, which is an important factor underpinning these challenges. Importantly, the Chapter makes a case for the criticality of strengthened mining governance. It seeks to improve the understanding of how the mining sector can aid the achievement of the Sustainable Development Goals, and of the need for a governance architecture that will facilitate the transition towards sustainable development.

Chapter 7 reviews the current governance architecture. The Chapter undertakes a mapping of the key governance instruments and stakeholders in the extractive industry.

Chapter 8 provides an assessment of the level of effectiveness and impact of existing initiatives and other instruments governing the extractive industry. This chapter identifies governance gaps and limitations and points to some building blocks for a more robust governance framework.

Chapter 9 explores the pre-requisites of an effective governance framework. It highlights the key elements and actors of a holistic framework. The chapter elaborates seven pre-requisites (need for a holistic framework, need to decouple economic growth from environmental and social impacts, need for respect of human rights, need for greater home country engagement, need for responsible business practices, need for a balance between security of supply (global north) and sustainable development aspirations (global south) and the need for data, information and knowledge) that are crucial for an effective governance framework.

Chapter 10 develops the proposal for a Sustainable Development Licence to Operate (SDLO) framework. The Chapter places at the centre-stage the SDLO both from an aspirational angle, but also with practical illustrations of what should be done to secure such a licence, which is not intended to function as a licence in the regulatory sense. The illustrations include realistic, clear and specific policy options to improve the governance of the extractive industry, as opposed to merely generic recommendations. The elements of the new governance framework are articulated. These are intended to help set global standards for what is acceptable; for instance, on rent extraction, getting a fair deal and share of profits, profit repatriation, transparency, accountability, expenditure issues, local content and value addition, and investing in the future and in support of sustainable development objectives.

Chapter 11 examines the implications of the SDLO framework developed in Chapter 10 for policy-making at the local, national, regional and international levels. It is hoped that the framework would serve as a guide for policy makers at these levels in crafting a new generation of mining policies and development strategies that can help deliver on the Sustainable Development Goals. The Chapter gives particular consideration to examining opportunities for greater consolidation of policy instruments, expansion of their coverage and scope in line with the adoption of the SDGs, and for enhancements in their application through greater synergies and coordination among key actors and practitioners.

Chapter 12 summarises the findings of the report and concludes.

PART 1: MINING TODAY

CHAPTER 2 –MINING IN A GLOBAL ECONOMY

2.0 Introduction

Minerals and metals underpin national economies and provide crucial raw materials for industrial activities. Minerals and metals are inputs required by almost every imaginable sector of the global economy. Without minerals and metals there would be no modern agriculture, means of transportation in the form of aircrafts, cars, ships and trains, energy production and distribution (including from renewable energy sources), information and communication technologies, military defence, roads and other infrastructure, satellites, and even modern medicine. Minerals and metals are essential to human life. They are the starting point of many industrial supply chains and as such are assets of strategic importance to many downstream industries that simply would not exist without them. This chapter describes the global minerals and metals industry, providing an introduction to the structure of the industry and its role in economies.

The minerals and metals industry encompasses a myriad of very diverse operations, from very small and informal, frequently illegal, artisanal mines producing small quantities of mostly low-volume and high-value minerals (such as gold, precious and semi-precious minerals or columbo-tantalite) to very large, highly mechanised and optimised operations where hundreds of thousands metric tonnes of ore are extracted every day. All have in common the extraction of a mineral raw material and its transformation into one or several marketable products, thanks to the application of a physical and/or chemical and/or biological process. This marketable product can be a mineral, which is directly used for its intrinsic physical or chemical properties such as colour, hardness (or softness), the capacity to adsorb certain liquids, resistance to heat and/or corrosion and conductivity of electric current. It can also be a metal that will need to be extracted from its carrier mineral, named "ore mineral" through a metallurgical process of diverse degrees of complexity.

Large companies, with billions of dollars' market value, operating very large-scale mines play the leading role in minerals and metals production, except in the production of some construction minerals (sand and gravel, dimension stone, clay) where SMEs play the major role. In 2012, the International Council on Mines and Metals, (ICMM) estimated that there were about 50 such global companies each with an asset base of over 109 billion $US (ICMM, 2012). Table 2.1 provides an insight of the role of large companies in the production of iron ore, copper ore and refined nickel. It is impossible to provide detailed statistics on the world production of minerals and metals by company, as production data related to some major companies, especially from China and Russia – two major mining countries - is unavailable from free-of-charge sources. The dominance of large companies, mostly transnational companies, can be explained by:

- the capital insensitivity of mining or metallurgical/operations (it may take over 10 billion $US to commission a new very large-scale mining operation with its annex facilities such as a processing plant, a smelter/ refining facility, railroads, a deep-sea harbour to export the production,

- the technological, technical and managerial complexity of such large-scale operations,

- the risk management capacities (see Box 2.2 for a short overview of the multiple risk factors mining activities are exposed to), part of the managerial capacities, needed to prevent and/or mitigate the multiple risks mining ventures are exposed to. On the other end of the range of the asset value of individual companies were over 2 000 junior companies, with an average asset value of 5 million $US each, or less listed either on the Toronto (TSX) or the Sidney (ASX) stock markets. Of these about 1 200 were listed on the Toronto Stock Exchange at the end of 2018[12]. They play an essential role in high-risk grassroots exploration, many of them selling their assets to larger companies in case of success. But only a few exploration projects will ever lead to the discovery of a deposit that can be mined at a profit, and even less discoveries are made of top-tier deposits (giant deposits with in the case of copper 5 Mt or more copper in the indicated or measured resource). According to Schodde (2017), about 40 to 120 deposits of any size were discovered every year between 1955 and 2010 but only 20 to 50 per year belong to the "major" or "giant" classes (the two top tier categories) that have a real impact on the supplies needed by the global economy. More recent discoveries are not yet fully documented as it may take years between an initial discovery and the formal publication of a resource calculation.

Table 2.1 Top producers of iron and copper ore, of refined nickel metal, compiled from various sources

	Iron ore production (Mt bulk iron ore)		Copper ore production (kt copper contained)		Refined Nickel production (kt Ni)	
Year			2016		2014	
Producer 1	Vale	349	Codelco	1 827	Vale	275
Producer 2	RioTinto	271	Freeport McMoran	1 696	Norils Nickel	274
Producer 3	BHP Billiton	227	Glencore	1 288	BHP Billiton	243
Producer 4	Fortescue Metals Group	181	BHP Billiton	1 113	Jinchuan Group	128
Producer 5	Anglo American	58	Southern Copper	900	Glencore	101
Producer 6	Arcelor Mittal	55	KGHM	677	Sumitomo Metals & Mining	75
Producer 7	National Mineral Development Corporation	35	RioTinto	523	Anglo American	65
Producer 8	Cliff Natural Resources	28	First Quantum	494	Eramet	55
Producer 9	Evraz	20	Antofagasta	477	Queensland Nickel	34
Producer 10	Atlas Iron	15	Vale	453	Sherritt International	31
Total 10 listed producers		1 239		9 448		1 281
World mine production (USGS)		2350		20 100		2 000
Share of the world mine production		53%		47%		64%
Source:	Company reports		http://www.mining.com/top-10-copper-mining-companies-2016/		https://www.thebalance.com/the-10-biggest-nickel-producers-2014-2339732	
Note	**These lists are only indicative as production data of some important companies is not available from free-of-charge sources.**					

2.1. Minerals and metals value chain[13]

There are several stages in the process between finding minerals in the ground and finding minerals in a product. For example, the production of metals meeting the purity requirements demanded by the market is a process involving several stages as follows[14] (Figure. 2.1):

- The creation of framework conditions that enable investment in the development of sustainable minerals and metals production as well as in the development of activities that foster resources efficiency and the development of the circular economy. These framework conditions include:

[12] https://www.tsx.com/resource/en/101, accessed on Dec. 31, 2018

[13] The mineral value chain refers to the processes by which value is added from exploration to consumption.

[14] The processes are well-known and fairly standard, especially for base metals. For more details, see Kesler & Simon (2015).

… formal minerals and metals related strategies and policies (see, as examples of such national policies and strategies the comparative analysis of the raw materials strategies of the G-20 countries by Hilpert *et al.* (2013),
… the mining and environmental laws as well as other related legal conditions, such as the labour or the tax law;
… the issuing of permits and licensing procedures applied under these laws to mineral exploration and, separately, to mining activities;
… commitment to the SDGs and its translation into policies, law and practice.

- Governance, based on adherence to the SDGs and to the principles of transparency and accountability, as detailed in this report, is an essential component to the framework conditions.
- The public acquisition and dissemination, as a common good, of data and knowledge documenting the existence of geological resources that may be of economic interest. This and the framework conditions imply the existence and [15]proper functioning of dedicated public institutions such as an environmental agency, a minerals and metals directorate and a geological survey with adequate experience, staff and material resources. These institutions are a must to adequately enforce the above-mentioned policy and legal frameworks.
- Mineral exploration, that can be partly public (early stage exploration, to attract investment in later stage exploration) and partly private. This stage aims at identifying mineral concentrations sufficiently attractive to justify the effort needed to characterise them up to the point where a first resource estimate, based on at least an indicated resource level[16], is ascertained.
- Mining project planning and development: this stage may comprise several steps, resulting in a definitive feasibility study. Each step will assess, with reduced uncertainty at each step:

… the resources and reserves,
… the best processes to mine the resource and turn into one or several products,
… the environmental and social impacts and detail the necessary prevention/ remediation strategies; calculate the production rate and the expect mine life;
… the capital expenditure needed to launch actual mining operations, the related operating costs and develop a cash-flow analysis over the expected mine life in order to calculate the Net Present Value of the project and its Internal Rate of Return, two key parameters needed to evaluate the economic viability of the project.
…

More details on the contents of these assessments can be found, for instance, on Canada's Queen's University MineWiki and in the published reports produced by mining projects that publicly report their activities under regulatory obligations[17] or on a voluntary basis. The latter are accessible for free via an online webportal with a geographic navigation interface: http://intel.rscmme.com/#. Figure 2.2 provides a synthetic overview of the main stages of mining projects, from early acquisition of geological data to mine closure.

- Mining is the extraction of the ore from open-pit or underground mines mostly by means of drilling and blasting, and loading of the ore onto trucks and hauling it to the processing plant which in many cases is located in close vicinity to the mine.
- Processing of the ore to recover the economically valuable ore minerals as a concentrate. Ore processing commonly involves several stages starting with crushing and comminution, to

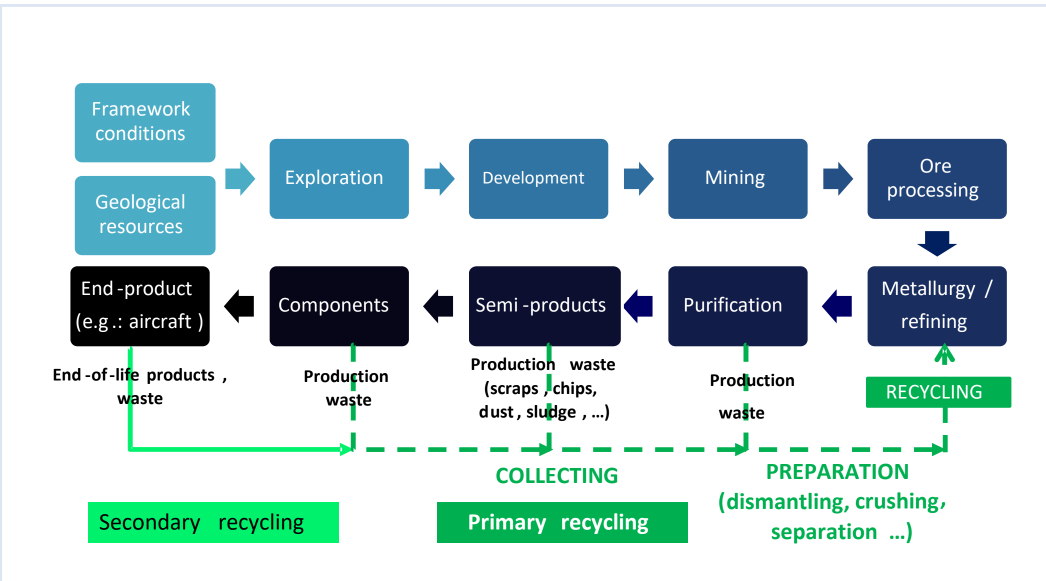
[15] http://minewiki.engineering.queensu.ca/mediawiki/index.php/Design_Topics
[16] "Indicated resource" is used here according to the meaning defined by the Committee for Mineral Reserves International Reporting Standards (CRIRSCO):
[17] As detailed by the Committee for Mineral Reserves International Reporting Standards (CRIRSCO), see http://www.crirsco.com/national.asp

grinding the ore to a grain size smaller than the grain size of the metal bearing mineral(s) to be recovered. These are then separated from the other, economically non-recoverable, minerals forming the ore. This separation may involve more or less complex physical and chemical operations. Economically non-recoverable minerals form a large share of the total waste generated by the minerals and metals industry.

- Extraction of the metal(s) from the ore concentrate, frequently followed by a stage of refining (needed to remove from the metal produced most of the remaining impurities) in order to meet the specific purity requirements imposed by the different markets of the metals.
- Metals are then used as raw materials for the manufacture of various products. An important observation to make is that these products are now increasingly being recycled at the end-of-life stage.

The stages of a minerals and metals industry dependent value chain[18] are shown in Figure 2.1. Green lines at the bottom represent recycling; the dotted line representing primary recycling from production waste, and the continuous line depicting secondary recycling from end-of-life products. These activities take place at a global scale and therefore, they are intermediated by trade (See Box 2.1) and Figure 2.6 for the copper example.

Figure 2.1 Schematic representation of a minerals or metals-dependent value chain



Source: Christmann, unpublished.

Figure 2.1 is simplified, to make it readable and understandable. It needs to be emphasised that each of the depicted stages may involve very different actors, as the know-how and competitiveness factors differ at each stage. Examples of vertical integration where a same company would do everything from exploration to the production of an end product are extremely rare and limited to cases where the end-product rather has the characteristics of a semi-product (for instance a rail made from a specific steel) than of a highly complex system such as a car, an airplane or a smartphone. It also cannot reflect

[18] Only exploration, mine development, mining, ore processing, metallurgical/ refining and metal purification activities lie within the core activities of the minerals and metals industry. In some cases, the production of some semi-products such as bars, coils, plates, rails, rods, and wire lies within the activities of the industry.

the diversity of the geographies related at each stage, which also depend on the mineral or metal concerned.

The case of copper, presented earlier and Figure 2.6 show the geographic complexity of copper flows. It also makes clear the crucial role of trade. Trading houses and specialised metals exchanges, such as the London or Shanghai Metal Exchanges, play a key role in linking the minerals and metals industry and the industrial users that will transform them into goods that either may be end-use products or be further integrated into sub-systems and systems, further downstream of the myriad of existing industrial value chains. Exchanges are specialised in trading a limited number of metals (Aluminium, Cobalt, Copper, Gold, Molybdenum, Lead, Nickel, Tin and Zinc plus some categories of steel). Trading houses are active in the trade of metals that are not managed by the specialised exchanges, especially in the trade of minor metals. These mostly rare metals do not have generally acknowledged prices. Therefore, trading houses, through speculative moves, can have a strong impact on the pricing of the minerals and metals they are trading and reap high benefits from their activities.

Box 2.1 Trading hubs in the minerals or metals value chain

Traders play key roles in the minerals value chain that include sourcing the commodities from producers, transporting and storing. Many trading firms also enter into supply contracts with producing countries and may even make a pre-payment for future supply, an arrangement that is popular in some poor developing countries as pre-payments can be seen as loans. This underscores the power traders can have in certain value chains, especially in relation with rarer metals.

Though commodity traders provide crucial services, research shows that the trade of commodities is also associated with risks including illicit financial flows, environmental damage, human rights violations, and lost opportunities for poor countries in which the (often finite) commodities are extracted (Burcher *et al*., 2015). Further, the fact that much of extractive resources governance challenges arise from lack of transparency (and thus significant efforts continue to be directed at increasing transparency e.g. EITI instruments), traders can do much to increase transparency of resource flows. This highlights the crucial role of traders in improving the governance of minerals or metals-dependent value chains.

<u>Commodity Hubs</u>

Trading houses tend to be located in certain geographic regions mainly due to geography, historical legacies, communication infrastructure and also proximity to financial centers. The key global commodity centers for extractive resources are in UK (London), US (New York), Switzerland (Bürgi Bonanomi *et al*., 2015). Switzerland is by far the most important center for commodity trading. One-third of the total volume of globally traded oil products and two- thirds of the international trade in base metals takes place in Switzerland (Bürgi Bonanomi *et al*., 2015). Much of this trading involves traders buying commodities from abroad and selling to clients who are also abroad meaning that much of the physical product never touches Swiss soil. Switzerland is also a prominent trading hub for precious metals. However, unlike oil and the other metals, they often physically trade in them. Indeed, it is estimated that 70 % of worldwide gold is refined in Switzerland (Bürgi Bonanomi *et al*., 2015). Due to this unique position, the Swiss government can play a significant role in creating greater transparency through rules on disclosure. Lannen *et al*. (2016a, 2016b) argues that the Swiss government could facilitate the collection and release of much better disaggregated data on the commodities trade. This would enable improved oversight (see chapter 9 for more discussion on home countries' responsibility).

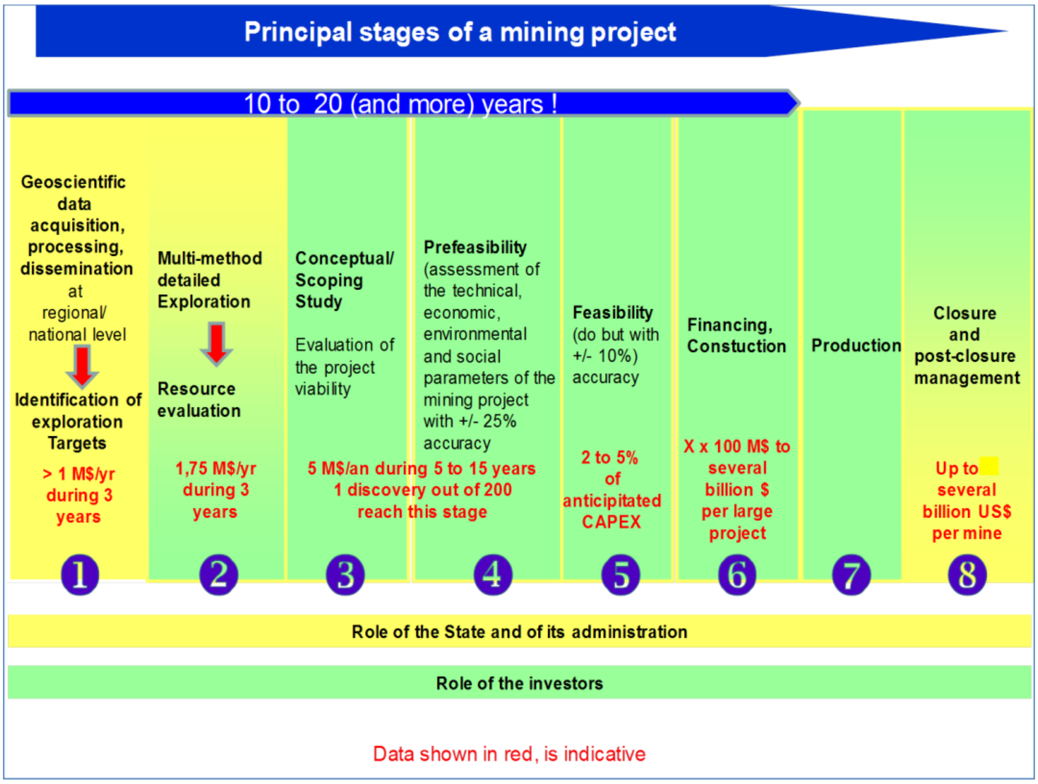
2.2 Mineral economics[19]

The minerals and metals industry value chain has special characteristics that make this industry unique compared to other sectors of the economy. These features include:

- The finite nature of minerals.
- With the possible exception of the production of sand and gravel or of dimension stone, the production of minerals and metals frequently implies technically complex operations that require significant expertise and particular equipment. Due to the highly specialized nature of each stage there tend to be many highly specialized players involved in the mining and/or metallurgical/ refining parts of minerals or metals dependent value chain. Such players work mostly in one or two stages of the supply chain and need to better understand the complete supply chain and its controlling factors, especially the likely future supply and demand trends in order to make their investment decisions.
- The location of mining and related ore processing activities is strictly controlled by geology. A mine can only be developed where there are mineral concentrations of economic value. The location of these concentrations is defined by geology and these locations are limited to specific areas where the appropriate geology exists. These areas are sometimes in very remote locations. The implication is that capital and expertise have to be exported to the locations to facilitate the exploitation of the reserves. As a result, Foreign Direct Investment (FDI) often plays a crucial role in the sector.
- With the exception of ASM (the subject of Chapter 3), it involves significant capital investment. This is particularly important for the mining, processing and metallurgical activities. The development of mines[20] is costly and lengthy (see Figure 2.2). The capital intensity is compounded by the fact that much risky investment is required to start a new industrial-scale mine. So, raising risk capital is extremely important (see next section)
- The global nature of most supply chains, except in the case of construction minerals such as sand and gravel that are mostly produced and used at national levels. In the case of other minerals and in the cases of mines and their related processing plants, smelters and refineries and the various manufacturing steps that may be required to build complex systems can all be located in different countries, depending on their respective comparative advantages. The copper example (Figure 2.6) is an illustration of the geographic complexity of global supply chains.

[19] This section is largely a summary of material available from Canada's Queen University's Mine Design Project Wiki. (http://minewiki.engineering.queensu.ca/mediawiki/index.php/Design_topics_available#The_stages_of_mine_design).
[6]A mine development project may include a smelter and a refinery, the development of railway lines and ports.

Figure 2.2 Main stages of industrial-scale mining project



Source: Constructed using information at Canada's Queen University's Mine Design Project Wiki.

Figure 2.2 shows the main stages of a mining project. Stages where public authorities have the leading role are shown with a yellow background; stages where industrial operators (either public or private) have a leading role are shown with a green background. The transition between the two types of leadership is intently blurred as it depends on national/regional policies and the availability of the required capabilities for implementation. The figures in red represent the order of magnitude estimates of the possible investment required at each stage of the development of an industrial-scale mining project.

The capital intensive and risky nature of the development of mines means that the underlying economics of a mining project constitute a critical factor. In the 2017 annual survey of the Mining Industry, PWC (PWC, 2017) shows that the average annual return on capital employed of the world 40 top mining companies varied between 2 and 14% per year during the 2012-2016 period, making it one of the worst performances among all industrial sectors, the returns being very weak in view of the risks incurred by the investors (see Box 2.2). This section highlights some of the critical elements that mining companies consider in deciding whether to go ahead and make needed capital investments at the various stages of a mine development.

Capital investment begins with investment into mineral exploration, to identify the existence of one or several minerals in concentrations that may be of economic interest. Large-scale mineral exploration requires investment of millions of dollars to perform complementary field investigations including satellite imagery interpretations, geological mapping, geochemical and rock sampling, geophysical surveying (air- and or heliborne as well on the ground and down in drill-holes methods), drilling, trenching, multi-element analyses of the samples, and mineralogical and petrographic studies. If successful, this early stage of exploration will lead to a first calculation of the measure and inferred resources of the deposits.

The mineral exploration phase of a mine project ends with the preparation of a feasibility study, assuming the project was not halted earlier, if deemed unprofitable. It might take 10 years or more, and tens of millions $US to reach the stage of a completed feasibility study. This investment may be completely lost if the conclusions of that feasibility study are negative.

If the conclusions are positive, the next step would be to secure the initial capital (CAPEX) needed to build the mine and its related facilities. This can involve huge investments, running, in some instances, into billions $US in the case of very large-scale industrial mines, including facilities such as processing plants, a smelter and/or a refinery, a railway line and even a port. Large-scale iron ore or copper ore mines are among the costliest projects. CAPEX also has to include the costs of any mine closure performance bonds or of other environmental performance bonds that are required by the authorities of some countries as an (imperfect) insurance against environmental externalities that may arise as a consequence of the mine's operation or following its closure.

Project financing is sourced through borrowing or equity; a mix of both being the most common. Buyers who have a strategic interest in the future production of the mine are playing an increasingly important role in project financing as they may enter into take-off agreements, providing capital against the guarantee of the exclusive delivery of a certain amount of the production over a given number of years.

Many projects never go beyond the stage 2 shown in Figure 2.2 (resource evaluation). Out of the 3821 public reports on ongoing exploration and mine development projects worldwide reported in 2017 by RSC Mining and Mineral Exploration (http://intel.rscmme.com/)[22], 3310 related to early exploration results (stage 2 in Figure 2.2) but only 63 were feasibility studies.

Box 2.2 – A summary overview of risk factors specific to the minerals and metals industry

In investing in the sector, investors have to cope with multiple risks that are typical of mining projects and minerals and metals markets. These, for instance, include, in no specific order:

- inadequate evaluation of mineable reserves;
- insufficient assessment of risk factors in the preparation of feasibility studies;
- political and regulatory/ fiscal uncertainty;
- imposition of export restrictions on minerals by government for conservation or for promoting local processing;
- corruption;
- lack of sufficient capacities/skills to effectively and efficiently manage minerals and metals related activities;
- opposition by local populations and other stakeholder groups such as the NIMBY ("Not in my backyard") or BANANA ("Build absolutely nothing anywhere near anything") movements;
- technological shifts rapidly changing the demand for certain minerals and metals;
- mineral and metal price volatility;

[21] These are only projects that published information related to their projects according one of the existing national reporting standards (see p. 4 and section 8.1.2)

[22] These are only projects that published information related to their projects according one of the existing national reporting standards (see p. 4 and section 8.1.2)

- geotechnical (ground stability) and environmental hazards (such as landslides, earthquakes, mechanic activity, extreme climate events, accidental or chronical pollution);
- resource nationalism restricting access to minerals (Korinek & Kim, 2013);
- negative market sentiment and risk aversion;
- consumer boycotts;
- global economic meltdown;
- supply-chain manipulation as a tool to ensure market and/or geopolitical dominance; and
- reputational issues related to potential environmental degradation, biodiversity loss, and negative social impacts.

Proactive risk management is, therefore, essential in managing modern industrial-scale minerals and metals activities. The topic of mining risks and their management has been the subject of much attention in the literature (for instance, Henberger, 2005; Chinbat, 2011; Vanek *et al*., 2013; Willis Towers Watson, 2017; EY, 2017; Stedman & Green, 2018; Mining Journal, 2018). While metal and mineral pricing risks can be covered to a certain extent through hedging techniques (Adam *et al.*, 2014; Carter *et al.,* 2017), most of the other risks may only be addressed by other insurance systems, at an extra cost. Given the risky nature of developing mines, it is hard to motivate investors if a potential 20 to 30 % Return on Investment (ROI) is not well demonstrated by a solid feasibility study.

2.3 Industry players

Although there are many medium-sized mining companies, most of the global production is from large and highly capitalized Multinational Corporations (MNCs) or State-Owned/ Controlled enterprises (SOE), many of them having operations spanning several countries. The MNCs and SOEs have the capacity to mobilize the scale of investments and attract the level of skills needed to develop large and complex mines. For this reason, the industry tends to also be highly concentrated with a few MNCs and SOEs controlling a large portion of global production and trade (Table 2.1). Various internet-based sources publish annual rankings of the world mining companies on the basis of their market value.[23]

Further, due to the need to raise significant capital, many mining companies tend to be listed in the major stock exchanges[24] in developed countries or are State Owned Enterprise (SOEs) in other parts of the world[25]. Due to the different ownership structure, the two types of companies exhibit very different risk appetite and tend to operate in very different environments with SOEs likely to operate in what might be perceived as more risky environments. SOEs that may not be solely driven by profit motives may invest in environments that could be perceived as risky by public-listed companies (that are largely driven by profit), for instance, in developing countries. Chinese SOEs, for example, play an important role in Africa's mining industry (Chintu & Williamson, 2013; World Bank Group's Oil, Gas, and Mining Unit, 2011), including in countries where governance issues may deter many other investors.

The industry has been consolidating such that a few large MNCs have almost a monopoly power. The result is that they are able to dictate terms of engagement with governments, especially in developing countries, which may not have the needed negotiating capacity and even in the developed countries.

[23] see for instance http://www.mining.com/top-50-biggest-mining-companies/

[24] Metals (aluminum, cobalt, copper, molybdenum, nickel and zinc) for instance are listed on the London and Shanghai Metals Exchange.

[25] The data on the relative shares between private and SOE is hard to determine because private companies listed on stock exchanges have disclosure requirements while SOE do not have and tend not to share this information. For this reason, most of the ranking of top mining companies tend to only include publicly-listed companies. See www.mining.com.

2.4 Mineral production

As pointed out earlier, minerals are crucial to economies and thus production data is critical for planning. To facilitate analysis of data, it is common to segment data according to the nature of the minerals that are extracted. There is no international consensus on this segmentation. One approach is to group minerals into three groups: metals, non-metallic and mineral fuels. This is the approach used in the 2016 report by the International Resource Panel on global material flows (UNEP, 2016). The classification of the World Mining Data, an annual statistical compendium on the global minerals and metals industry (Reichl *et al*., 2017), distinguishes between four groups (Table 2.2).

Construction minerals: construction minerals are all the mineral raw materials used in construction or infrastructure development. Although cement is not a naturally occurring mineral raw material, but the result of a chemical reaction generally involving limestone and clay, it is included in the list shown in Table 2.2, owing to its particularly important role as a construction material. With the exception of cement production, the processing of construction minerals is limited to crushing, grinding, sorting and washing operations.

Industrial minerals: these are all the minerals that are not used as a source of metals but rather for their intrinsic physical and/or chemical properties. Industrial minerals are extracted and processed to meet specific client specifications, such as granulometry, purity, whiteness, hardness, and melting temperature requirements. Processing of industrial minerals generally requires a bit more complex operations than construction materials as it is necessary to separate the valuable minerals from other minerals present in the deposit. Phosphate rock needs to be processed through more complex operations involving physical and chemical processing by sulphuric acid leaching, to turn the phosphate rock into phosphoric acid, which is a key input in the production of fertilisers. The same industrial mineral can have different markets, each with its own specifications to be met by the producer. Quality requirements can be stringent as, for instance, industrial sand purity requirements for the production of float glass, or the purity of talcum used in cosmetics, or of pure micronized limestone used as a filler for the production of white paper.

Table 2.2 Minerals and metals industry segmentation

Industry segment	Sub- segment	Minerals and metals part of the segment / sub-segment
Construction minerals		Sand, Gravel, Crushed rock, dimension stone (such as limestone, granite, syenite, marble), slate, lime, gypsum, clay (undifferentiated), cement
Industrial minerals		Asbestos, Baryte, Bentonite, Boron minerals, Bromine, Diamond (Industrial), Diatomite, Dolomite, Feldspar, Fluorspar, Garnet, Graphite, Gypsum and Anhydrite, Helium, Ilmenite, Iodine, Kaolin (China-Clay), Kyanite, Lime, Limestone, Magnesia, Magnesite, Mica, Nepheline syenite, Olivine, Perlite, Phosphates (incl. Guano), Potash, Quartz, Salt, special clays, Silica sand, Sillimanite, Soda Ash, Sodium sulfate, Spinel, Spodumene, Sulfur, Talc (incl.

		Steatite and Pyrophyllite), Titanium oxydes (rutile, anatase), Vermiculite, Wollastonite, Zeolites, Zircon
Metals	Iron and Ferro-Alloy Metals	Iron, Chromium, Cobalt, Manganese, Molybdenum, Nickel, Niobium, Tantalum, Titanium, Tungsten, Vanadium
	Non-Ferrous Metals	Aluminium (and bauxite, its ore), Antimony, Arsenic, Bismuth, Cadmium, Copper, Gallium, Germanium, Lead, Lithium, Mercury, Rare Earth metals, Rhenium, Selenium, Tellurium, Tin, Zinc
	Precious Metals and minerals	Gold, Platinum-Group Metals (Iridium, Osmium, Palladium, Platinum, Rhodium, Ruthenium), Silver, Gemstone diamonds, other precious and semi-precious minerals
Mineral fuels		Steam Coal (incl. Anthracite and Sub-Bituminous Coal), Coking Coal, Lignite, Natural Gas, Crude Petroleum, Oil Sands, Oil Shales, Thorium, Uranium

Source: adapted from Reichl et al. (2017).

Metal bearing minerals (frequently named ore minerals): they contain one or several metals, mostly contained in sulphides, oxides, carbonates and silicates. These minerals are part of an assemblage of minerals named "ore", comprising one or several valueless minerals in addition to the metal bearing mineral(s). In the case where several metals are present in the ore, only some may be recovered, either for economic or technical reasons.

Quite frequently, the ore comprises one main economically recoverable metal-bearing mineral, such as chalcopyrite (copper ore), galena (lead ore) or sphalerite (zinc ore), which can contain several other metalliferous components as minute impurities or as partial replacements of the main metal in the crystal lattice. In such a case, the main metal, whose recovery determines the economic viability of the mining and related processing and metallurgical/ refining operations, is frequently referred to as a carrier metal (Reuter *et al*., 2013), while the other recovered metals are known as by-products. Some examples of by-product metals are indium, silver, gold, cadmium, germanium, and gallium, to name a few. In some cases, the economic value of a by-product is such that its recovery could generate sufficient income to ensure the operation's viability. In this case, it becomes a co-product. Cobalt, due to its high current value, is a typical co-product of copper mining in the Democratic Republic of Congo. Ore minerals can be subdivided into sub-segments, characterised by different downstream markets:

- Ferrous metals – Iron, chromium, vanadium, manganese;
- Base metals – copper, nickel, lead, zinc, tin, cobalt, molybdenum;
- Specialty metals – niobium, tantalum, titanium, tungsten, aluminium, magnesium, antimony, arsenic, bismuth, cadmium, gallium, germanium, lithium, mercury, rare earths (or lanthnide) elements, rhenium, selenium, tellurium, zirconium; and
- Precious metals (gold, silver, and platinum group metals, diamonds[26]).

[26] Diamonds are a mineral but similar in value and appreciation to gold due to use in jewellery although on a volume basis the majority of mined diamonds are used in industrial applications.

Mineral fuels: These are mainly used for supply of energy. They include petroleum, coal, natural gas, oil shales and tar sand. Metals used to develop nuclear energy are also classified as mineral fuels. They include uranium and thorium.

The main uses of all these minerals are detailed in several reports such as the annual Mineral Commodity Summaries published by USGS[27], the European Commission's reports on raw materials critical to the EU economy (latest edition: European Commission, 2017a and 2017b), or in Schulz *et al.* (2017).

2.5 Production statistics

In 2014, the various segments of the industry, extracted at least 63 billion tonnes of minerals and metals contained in ores, including mineral fuels. Table 2.3 shows the values of the various minerals produced, in million nominal $US. It shows the individual production of the top 10 producing countries, their total production (row "Sub-total") and compares the latter (row "Cumulated share of the world total") to the total global production shown in the row "World total" (derived from Reichl *et al*., 2017). The total value of the minerals and metals produced in 2014 was estimated to be 5.6 billion nominal $US, not including the value of some construction minerals, such as sand, gravel, dimension stone or clay as no data is available.

Not every mineral or metal production is statistically recorded, or sometimes existing statistics may be inaccurate as reporting standards, capacities to report and transparency vary from country to country. The main statistical problems are related to construction materials and some of the rarer metals, especially when they are by-products.

In the case of construction materials, this is likely to be due to the existence of numerous small- to medium-size companies in many countries, with very loosely regulated operations. In the case of rarer metals that can only be recovered as by-products during the metallurgical processing of a concentrate of ore of a "main" or "carrier" metal such as copper, gold, lead or zinc, the recorded world production is frequently tiny (less than 200,000 tons per year) and their trade is largely in the hands of traders with related confidentiality agreements. As rare metals are highly strategic inputs for many high-technology industries, including the defence sector, there is a risk that published data can be manipulated as part of broader market manipulation strategies. Black markets of rare metals and minerals have been reported (see for instance United Nations Security Council, 2001; Sutherland, 2011; Fitzpatrick *et al*., 2015; Global Witness, 2015; and Amnesty International, 2016).

Construction minerals

The production of construction minerals is the only segment of the minerals and metals industry that is present in every country to feed local construction and infrastructure projects. The operators are mainly small-scale but there are also very large multinational groups, especially in cement production. With the exception of cement, much of the production in this segment – for instance, of dimension stone, and common clays (used for brickmaking) – is not recorded and therefore data on value of total production is not available. A rough estimate is that 45 billion tonnes of construction materials are

[27] Available here: https://minerals.usgs.gov/minerals/pubs/mcs/

produced annually. The global cement production is valued at about 320 billion nominal $US. The key construction materials (by value) are aggregate, cement and lime.

Table 2.3 2014 minerals, metals and mineral fuels production (in millions $US)

Country name	Total with mineral fuels	Total without mineral fuels	Cement	Iron, Ferro-alloys	Non-Ferrous Metals	Precious Metals	Industrial Minerais	Minerai-Fuels	Diamonds (gem)
China	956 662	372 241	183 111	63 627	85 681	20 582	19 240	584 421	-
United States	627 117	45 153	6 754	5 316	15 199	9 768	8 116	581 964	
Russian Federatio	572 610	55 138	5 065	12 313	12 453	14 143	7 431	517 472	3 733
Saudi Arabia	416 185	5 305	4 305	198	604	198		410 880	
Canada	207 991	37 414	1 249	7 748	10 892	7 411	8 111	170 577	2 003
Australia	165 741	83 814	834	53 065	15 120	12 309	2 182	81 927	304
Iran, Islamic Rep.	163 513	13 751	6 131	3 788	2 418	93	1 321	149 762	-
India	151 160	51 733	22 110	19 572	6 004	259	3 781	99 427	7
United Arab Emira	136 565	6 288	1 809	-	4 287	-	192	130 277	
Brazil	135 802	43 316	5 941	27 230	4 553	3 271	2 318	92 486	3
Sub-total >>>	3 533 346	714 153	237 309	192 857	157 211	68 034	52 692	2 819 193	6 050
World total	**5 606 369**	**1 224 106**	**328 420**	**367 755**	**277 488**	**151 375**	**84 810**	**4 382 263**	**14 258**
Cumulated share of the world total	63%	58%	72%	52%	57%	45%	62%	64%	42%
China's share of the world total	17%	30%	56%	17%	31%	14%	23%	13%	0%

Source: derived from Reichl et al. (2017), Kelly and Matos (2018). Bauxite (aluminium) is included as well as aluminium. Construction minerals, with the exception of cement, are not included.

Industrial minerals

On the basis of the data published by Reichl *et al.* (2017), the value of the global 2014 production of industrial minerals was estimated at around 85 billion nominal $US. However, Table 2.2 includes data on additional production available from the United States Geological Survey (USGS), to bring the total estimated value for 2014 to 132 billion $US. Of note is that the 2014 mineral production database shows that industrial mineral production was recorded in 116 countries (out of the 155 countries covered), showing that industrial mineral production is geographically widespread. The key industrial materials by value are bauxite, gypsum and salt.

Metals

In 2014, the total global value of mine production of metals was about US$ 796 billion, calculated on the basis of the metals value contained in mined ores. This segment is the second largest of the global mining and metals industry, well behind mineral fuels. The key metals (by value) are iron, copper, gold, manganese and chromium.

Mineral fuels

The production of mineral fuels is by far the most important segment of the global minerals and metals industry. The value of its products represents about 4 400 billion $US, that is about 79% of the total value of all minerals, metals and fossil fuels extracted worldwide in 2014. The 2014 production values are indicative, as the values shown in the table are compiled on the basis of some widely used spot prices, not the real transaction prices. Prices used in long-term contracts between suppliers and clients are mostly kept confidential.

2.6 Production distribution

The production of minerals and metals is highly concentrated with 10 countries accounting for almost two thirds (63 %) of global mineral, metals and mineral fuels production. In terms of individual countries, China is by far the world's largest producer of minerals, metals and mineral fuels. It produced about 30 % of total minerals (without fuel) and about 56 % of cement. The dominance is more apparent when looked at a more granular level. In 2014, it produced 48 % of aluminium, 42 % of cobalt, 27% of primary copper, 71% of primary lead, 50 % of raw steel and 44 % of primary and secondary zinc produced worldwide (Reichl *et al*., 2017).

The global distribution of mines is shown in Figure 2.3, based on the number of mines located in each 50km x 50km grid according to data provided by SNL[28]. It is estimated that there are in excess of 30,000 mines located around the world, of which over a third are categorised as 'active'[29]. 'Hotspots' of activity can be seen along the west coast of the Americas, Eastern Canada, Western and South-eastern Africa, Australia and South-east Asia.

While mining activities are geographically widespread, the amount of land used up by mining activities, current and past, is rather small when compared to other human footprints, such as agriculture. In the USA, a National Research Council study (1996) quotes an estimate stating that between 1930 and 1980 only 0.25 percent of the total land area of the United States was used for surface mining and the disposal of wastes from surface mines, underground mines, and beneficiation facilities. In comparison, in 2007, 51% of the US land was used for agriculture. In the European Union, current and past mining sites are part of the "Artificial land" category of the land cover census published by Eurostat. In 2015, artificial land, of which mining is only a small part, represented 4.4% of the EU land cover, as compared to 21.5% for croplands.

[28] Global Mining Data from SNL Metals and Mining's Metals Economics Group. Data extracted 24th April 2018.
[29] Defined as currently being explored, developed, or mined.

Figure 2.3 Density of mines globally (per 50km x 50km square at the equator)

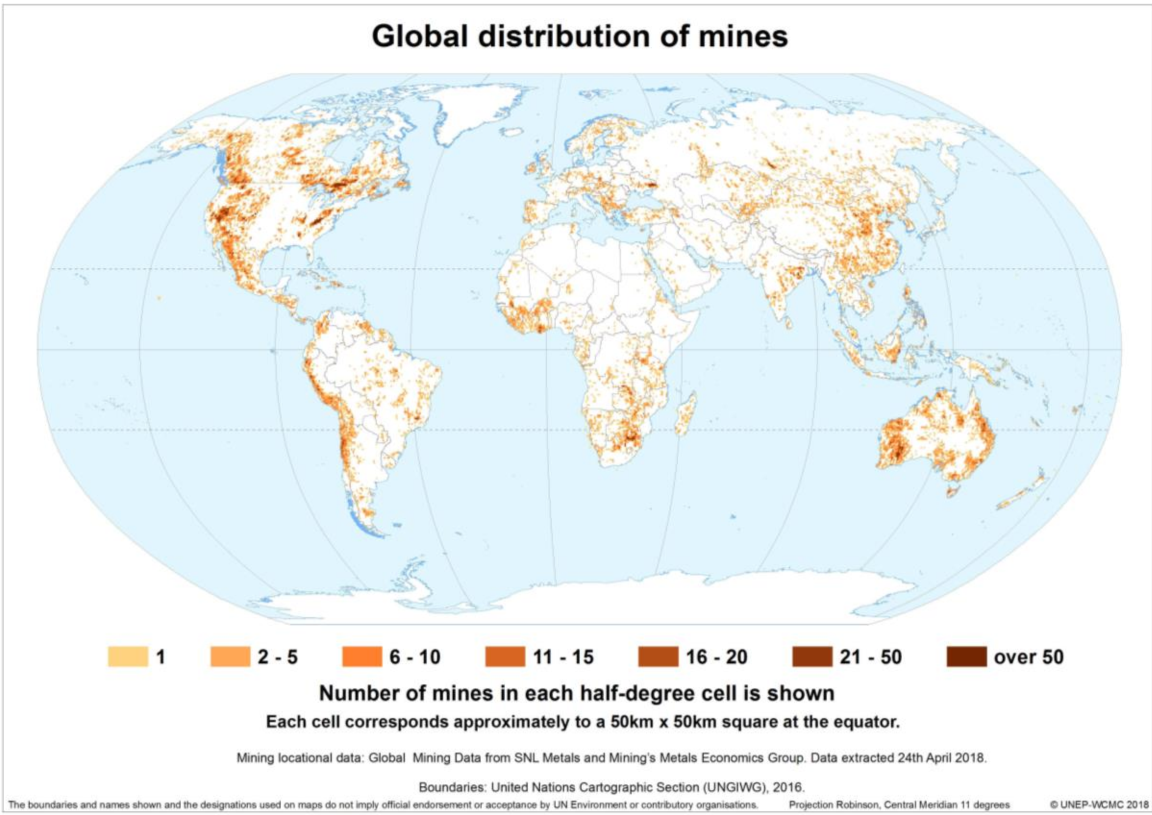
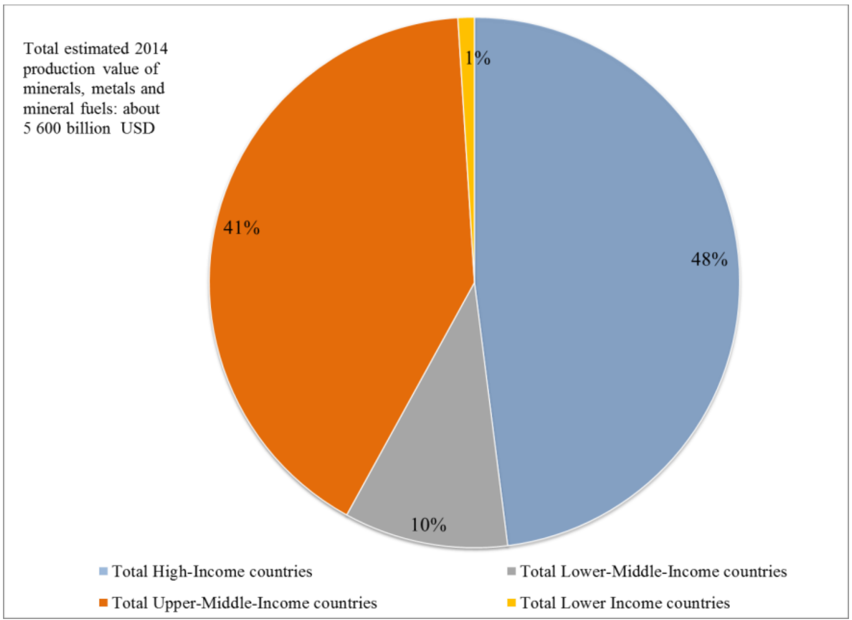


Figure 2.4 shows that most of the production is derived from upper or upper middle-income countries (90% of the total). In 2014, only about 10 % of the total estimated produced value of minerals, metals and mineral fuels originated from lower middle-income countries, especially India, Indonesia and Nigeria due to their relatively high mineral fuel production. Low-income countries produced only about 2% of this global value. The role of low-income and lower medium-income countries would slightly increase, up to about 8%, if mineral fuels were not counted.

Figure 2.4 Breakdown of the value of 2014 global production, by income group of the producing countries



The bigger picture reveals the modest current role of low income and lower-medium income countries as sources of minerals, metals and mineral fuels for the global economy. However, the total figures mask the strategic importance of the supplies of some minerals from these lesser developed countries. This is particularly the case for cobalt, an essential resource for the production of lithium ion batteries. In 2016, the Democratic Republic of Congo (DRC), a low-income country, produced 65% of the world cobalt mine production (Darton Commodities, 2017). The same year, the DRC and Rwanda were the main sources (68% of the global mine production) of tantalum (USGS, 2017). Tantalum is a very rare metal, which is essential in modern electronics, for the production of high-performance micro capacitors found in smartphones, or for the production of superalloys, essential to the manufacturing of modern fuel-efficient jet engines (MSP-REFRAM, 2017). The large high-grade copper resources of DRC and Zambia could become of major significance for the global economy.

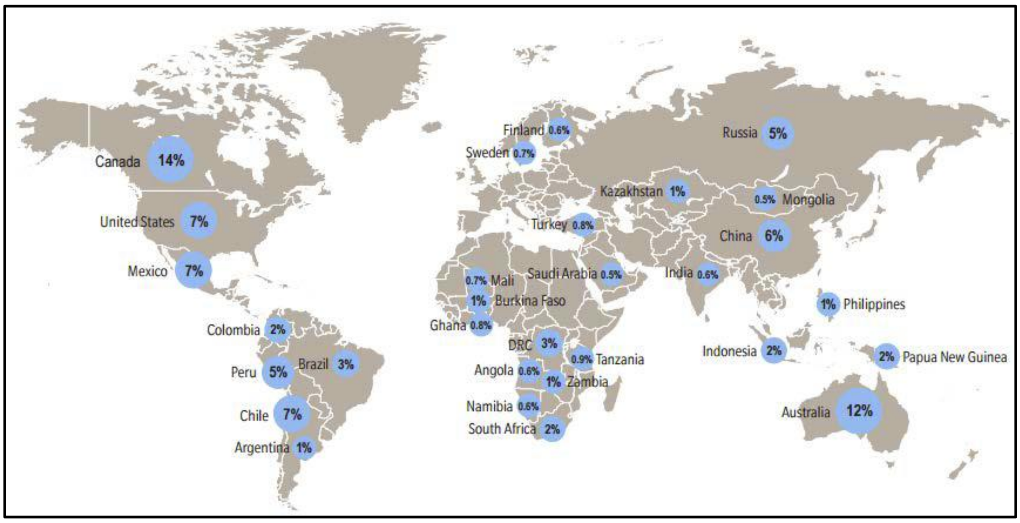
The low contribution of lower income countries does not reflect a lack of geological potential. To the contrary, it is a combination of several factors, including political instability, political and legal uncertainty, lack of transparency, corruption, lack of geological data, poor transport and/or energy infrastructure that deter investments in mineral exploration and mine development.

The probability of discovering more minerals is significant as large parts of the earth's crust have not been explored. In general, there is a good correlation between land area and mineral endowments[30]. Therefore, the regional differences in the value of global mineral exploration expenditures are more a reflection of exploration efforts as opposed to endowment. For example, Ericsson & Olöf (2017) show in Figure 2.5 that exploration expenditure in Canada and USA, which together account for 21 per cent of total global exploration expenditure, is far more than could be expected from their shares of production (12 per cent) and land mass (12%). Indeed, Australia, Canada and USA together account for one third of the total global exploration expenditure. Africa with about 20% of the global land mass

[30] https://pubs.usgs.gov/circ/2007/1294/reports/paper9.pdf accessed on 30 March 2018

area only attracted about 14% of total global mineral exploration expenditure. Latin America accounts for 12% of land mass attracted more than 20% of global exploration expenditure.

Figure 2.5 Share of exploration expenditures



Source: Ericsson & Olöf (2017).

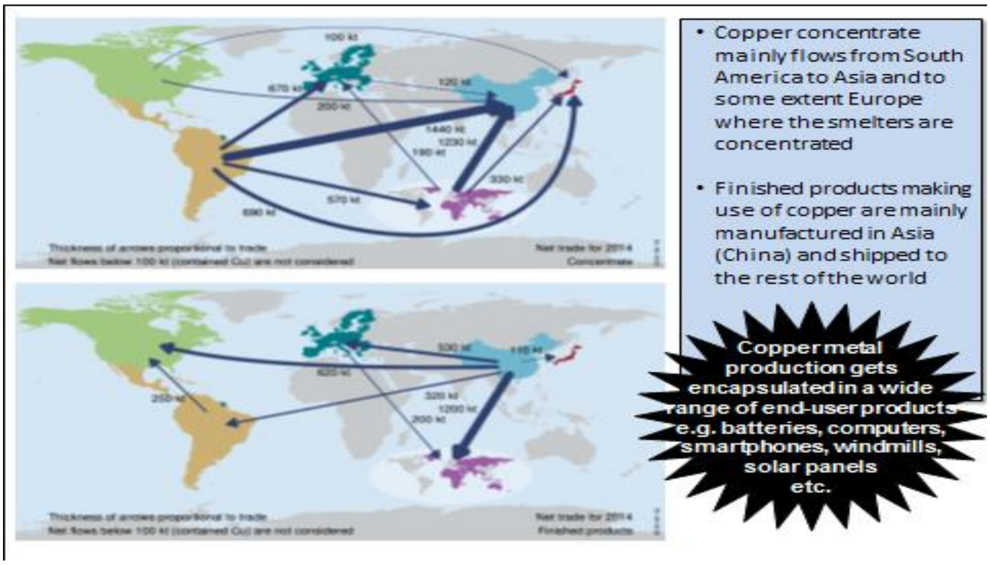
2.7 Global trade on minerals

As pointed out above, the location of the initial stages of the mineral and metals related supply chains up to mining and ore processing (where applicable) is generally not the same as the location where minerals and metals are used in manufacturing processes. Metallurgy may also have its distinct geography, as it depends very much on available infrastructure, skills and energy prices. Mining can only take place where geological conditions make it possible for economically recoverable mineral concentrations to exist. Not every country is geologically well endowed, and none can economically produce all the diversity of minerals and metals required by current manufacturing processes. For this reason, minerals and metals are widely traded, especially thanks to the development, since the middle of the 20th century, of efficient seaborne bulk transport connecting mineral producing countries to countries where metallurgy/ refining is done, then to where downstream manufacturing processes take place and finally to the consumer (see the copper flows example (Figure 2.6)).

Due to their frequently low per ton value, construction materials are rarely traded globally, but regional trade appears well developed, as not every country has some of the geological resources needed by its economy. For instance, in Europe, the Netherlands and parts of Belgium have very limited resources of the kind of coarse aggregate needed for concrete production. As a consequence, important quantities of crushed rocks are imported from Norway, where geological and topographical conditions make their production very competitive and loading of ships easy (Van der Meulen *et al.*, 2003). Cement is also traded regionally as not every country has the geological resources (especially limestone) and/or the energy resources necessary for its production.

The complexity of minerals and metals-related supply chains is demonstrated by the case of copper, as it is one of the relatively few metals for which data is sufficiently available and reliable to allow a global trade flow analysis. Figure 2.6 illustrates the complexity of supply chains due to the different geographies of mining, smelting/ refining and manufacturing. Documenting such trade flows is of major importance to understand, from an end-user perspective, where environmental footprints related to mineral and metal consumption actually take place and what could be the related governance and/or geopolitical issues. In a globalised economy, environmental and social footprints very frequently take place far away from the places were consumer goods are actually marketed, and consumer goods end-users remain poorly informed about the environmental and social impacts of their purchasing decisions – although this is increasingly changing.

Figure 2.6 Global copper trade



Source: adapted from Tercero Espinoza et al. (2016).

2.8 The importance of mining to economies

The data in Figure 2.5 shows that lower middle-income and low-income countries play only a relatively minor role, with some exceptions, in supplying minerals, metals and mineral fuels to the global economy. But mining and related activities are crucial to the economies of these countries. Some are highly dependent on the resources derived from mineral wealth. To calculate the contribution of mining to economy, Ericsson & Olöf (2017) have used the following indicators to develop a mining contribution to economy index:

- exports of minerals including coal as a share of total merchandise exports;
- total production value at mine stage of metallic minerals, industrial minerals, and coal, expressed as a percentage of GDP;
- mineral rents as a percentage of GDP; and
- exploration expenditures.

It should be noted that since their index uses exploration expenditure, it is somewhat forward looking as it also captures the prospect of continued dominance of minerals in the economy. Using the above criteria, an index was developed and countries were ranked on the score in the index. Of the top 50 mining dependent countries, there are only four high-income economies (HIE), but 16 upper-middle-income economies (UMIE), 18 lower-middle-income economies (LMIE), and 12 low-income economies (LIE). Table 2.4 shows 25 of the countries mapped.

Ericsson & Olöf's (2017) index does not include oil and gas so countries like Saudi Arabia and Nigeria that are heavily dependent on oil do not feature. If these were included, many lower income countries would feature in the top 50. The index thus serves as useful confirmation that for many poor countries, minerals are indeed critical.

Table 2. 4 Mineral contribution for top 25 mining countries

Rank	Country	Income Group	Export Value (% of total exports)	Production value (% of GDP)
1	DRC	LIE	80.9	14.7
2	Chile	HIE	57.0	9.5
3	Australia	HIE	56.7	11.9
4	Mongolia	UMIE	80.4	16.7
5	Papua New Guinea	LMIE	37.9	14
6	Zambia	LMIE	75.1	7.6
7	Peru	UMIE	53.8	5.8
8	Burkina Faso	LIE	49.6	6.0
9	Mali	LIE	65.7	5.3
10	Guyana	LMIE	61.2	10.5
11	South Africa	UMIE	38.2	7.1
12	Botswana	UMIE	91.3	12.8
13	Guinea	LIE	52.1	**8.8**
14	Mauritania	LMIE	58.1	10.2
15	Eritrea	LIE	38.6	9.0
16	Namibia	UMIE	50.3	6.9
17	Ghana	LMIE	23.0	4.1
18	Lao PDR	LMIE	36.5	3.3
19	Sierra Leone	LIE	93.6	14.9
20	Uzbekistan	LMIE	30.5	3.1
21	Uzbekistan	LMIE	30.5	3.1
22	Suriname	UMIE	33.8	6.0
23	Tanzania	LIE	38.1	1.5
24	Kazakhstan	UMIE	10.0	4.2
25	Liberia	LIE	39.3	11.3

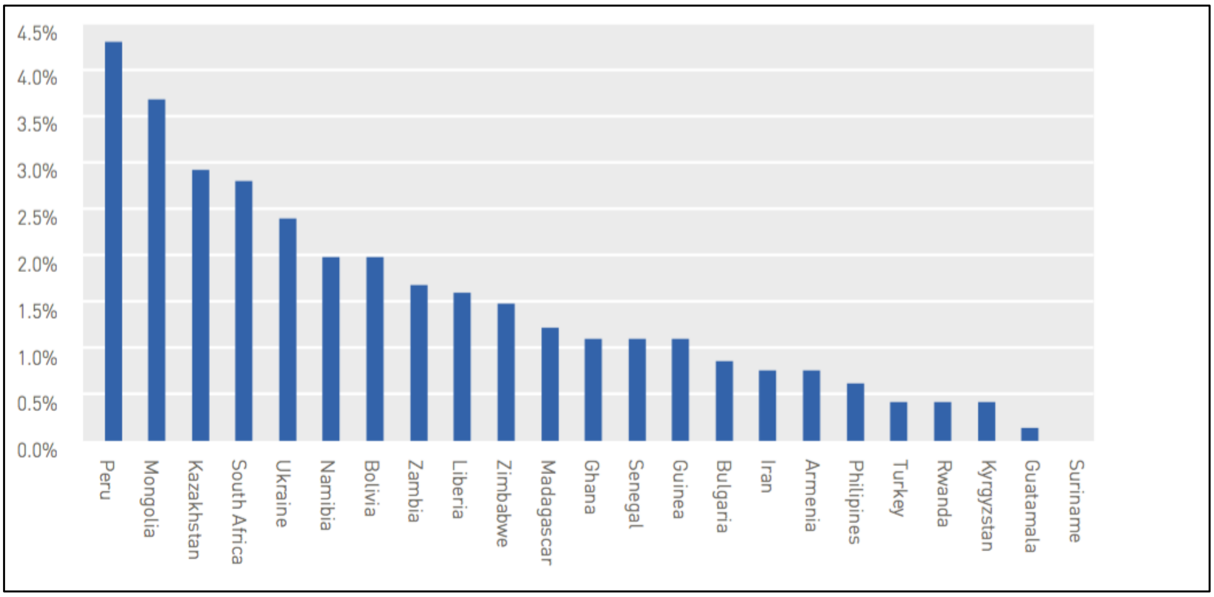
Source: Ericsson & Olöf (2017).
(HI = High Income, UMI: Upper Middle-Income, LMI: Lower Middle-Income, LI: Low-Income groups as defined by the World Bank).

However, many of the important exporters belonging to the low income and lower middle-income bracket suffer from poor governance that constrains an optimal contribution of minerals and metals production to their sustainable development. However, as pointed out in Chapter 1, governance reforms are taking place, which can help convert the resource curse into a blessing. With appropriate governance and an enabling policy and business environment, mining could play a transformational role for low-income mineral rich countries, as it played for high-income resource rich countries in the past. Improving governance along the mineral or metals dependent value chain is thus a key element in ensuring that the minerals and metals industry can contribute towards meeting countries' sustainable development objectives.

Even with good governance, one key challenge of the minerals and metals industry in developing countries is the frequent enclave nature of mining activities, conditioned by the geology-controlled location of mineral concentrations. Another challenge in these countries is, with some exceptions, the insufficient role of the mines and metals industry in their broad- based development. While mining or metallurgical operations are not large-scale employers, their development creates indirect jobs in other sectors of the economy, for instance in the services, transport and maintenance sectors. It also provides development nuclei in remote regions, where economic alternatives can be little.

As Figure 2.7 shows, mining's contribution to direct employment ranges from 0.1 to 4.5 % of total employment for the 25 top mineral dependent countries. For example, mining contributes 8.8% of Guinea's GDP (Table 2.4) but about 1.1 % of the total employment, counting direct employment only. Studies show that an average of three jobs are created in other sectors of the economy, such as equipment or service providers, for each job created in the mines and metals industry (Maxwell Stamp and The World Gold Council, 2015, Table A1.2). The potential for indirect job creation much depends on local conditions, such as the existence of a well-trained, diversified, workforce and of local suppliers of goods and services of relevance to the mines and metals industry.

Figure 2.7 Mining contribution (direct jobs only) as a percentage of total employment



Source: ILOSTAT data. http: www.ilo.org/ilostat (Countries in top 25 for which data is available).

The World Gold Council (2015) provides an assessment of the economic value created and distributed in gold mining. The survey is based on 2013 data from 16 companies, all members of the World Gold Council, representing a production of 732 t. gold, that is 24% of the 2013 world gold production (3 039 t). The total operational expenditure of the reporting companies was 47.3 billion nominal $US, 79% of which was, on average spent in the 16 countries hosting the mining activities covered by the survey

(Figure 2.8). The report provides data on the economic value created and distributed in gold mining in each of the 16 countries, several of them being low income countries.

Figure 2.9 provides a detailed breakdown of the average total in-country payments, showing that about 2/3 of the in-country payments go to suppliers of goods and services to the mines and their related facilities. On a country basis, the in-country payments vary between 47% (Mauritania) and 100% (Finland). This can be explained by the variable capacities in individual countries to supply the mining industries with the wide spectrum of skilled human resources, services and goods required by the mining industry. The same can be said about capital expenditure; equipment needed for mining, ore processing and/or metallurgical plants are mostly provided by a limited number of suppliers from developed countries. Modern equipment needed to ensure resource efficient and economically competitive operations is generally technologically complex. There are only few suppliers providing specific equipment such as haulage trucks, loaders or drilling rigs and machines. These companies have the capacity to provide very rapid worldwide assistance to their clients.

Figure 2.8 – Breakdown of the economic value created and distributed by gold mining

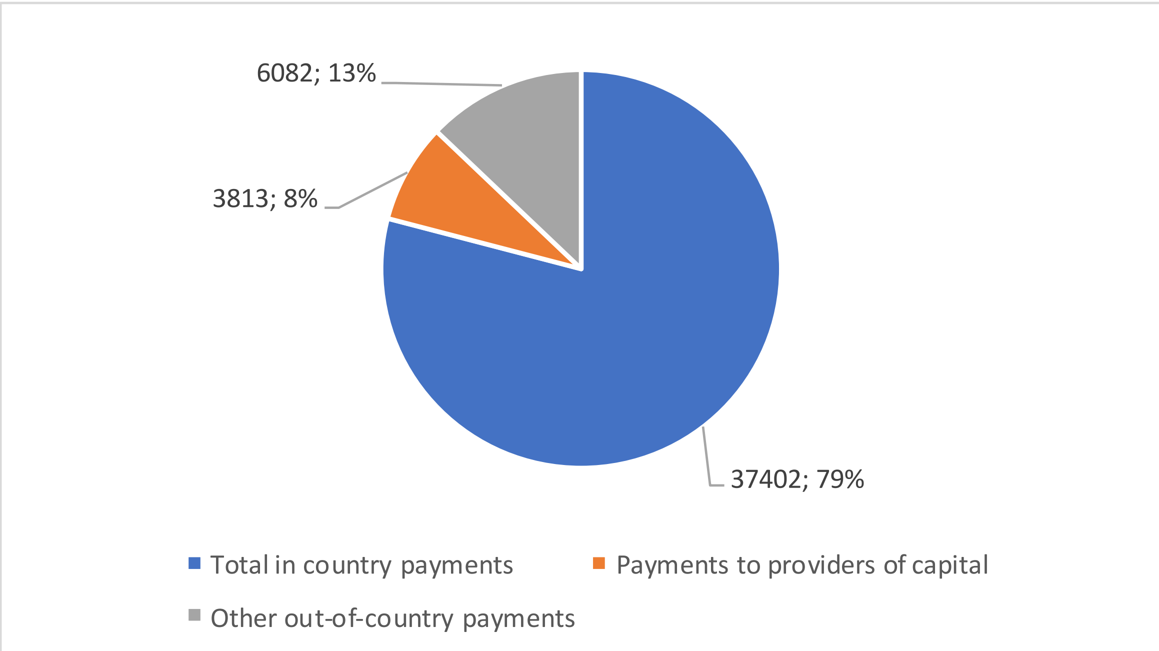
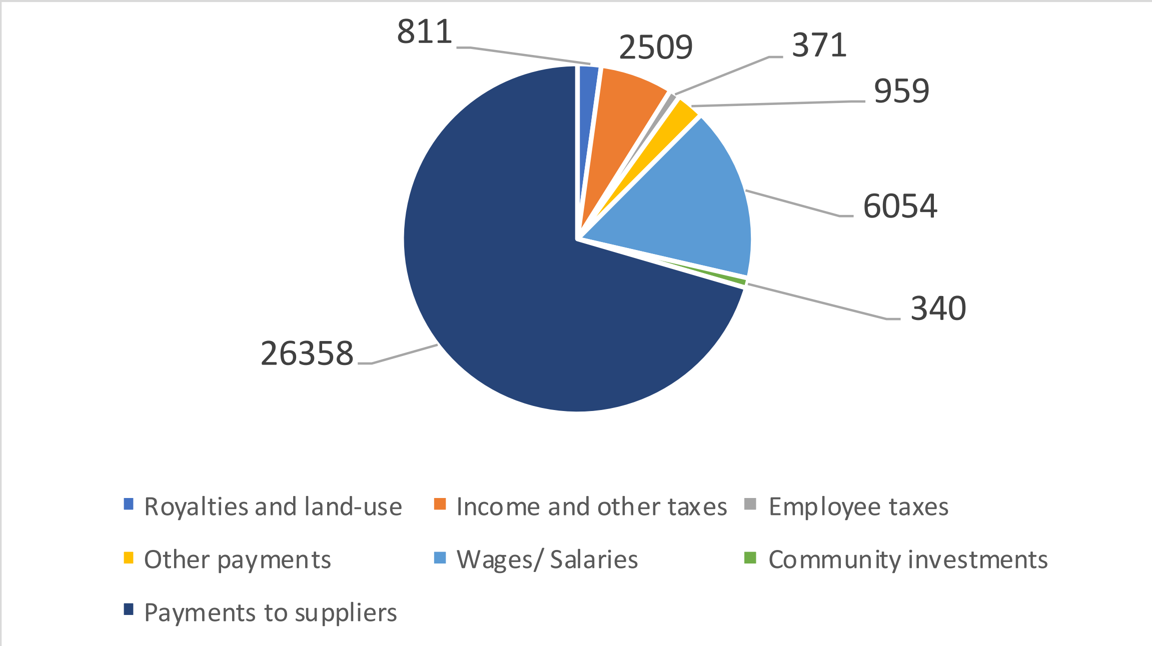


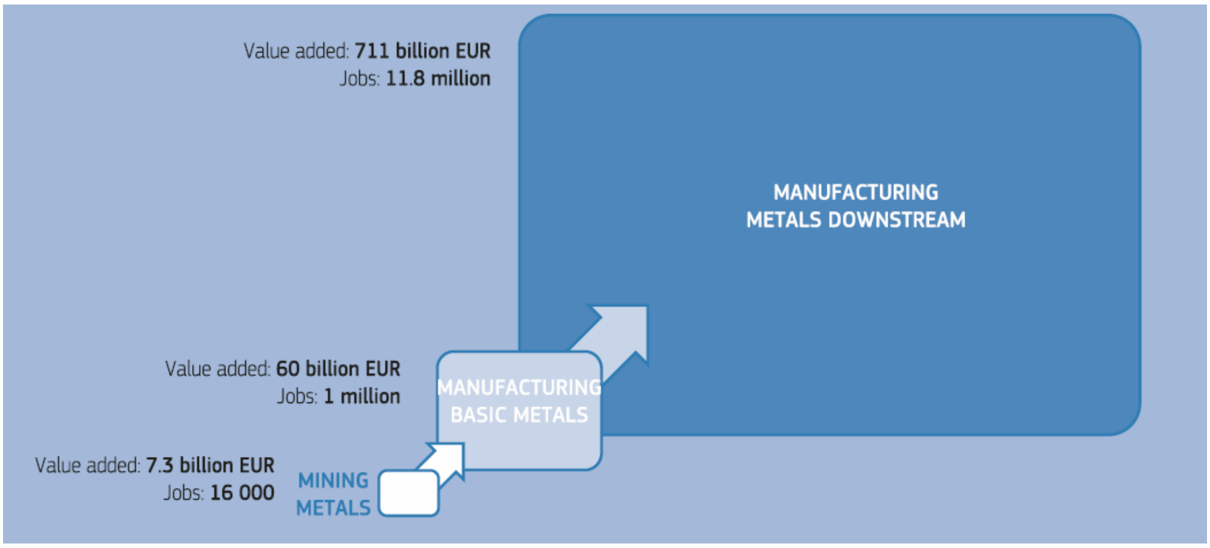
Figure 2.9– Detailed breakdown of the in-country payments made by the gold mining companies



Therefore, one way to make the minerals and metals industry contribute more to broad-based development is through creating opportunities for increased local content and local participation, especially in the provision of goods and services since in many mining operations, procurement in the form of operating and capital expenditures constitutes between 50 and 65% of the production value of mining (ICMM, 2015). Having more local companies provide services to mining companies not only creates jobs but also helps develop new skills such as machinery and electrical maintenance, welding and plumbing, for example, that can also be transferred to other sectors of the economy. To be effective, this requires the scaling up of domestic suppliers' capacity, capabilities and competitiveness through national suppliers' development programmes (ACET, 2017). Broad-based development also much depends on mastering the conditions necessary to the development of competitive industries that will turn minerals and metals in a wider range of added value goods and services. These are issues that should be key considerations in thinking about a more inclusive governance framework.

Figure 2.10 shows, for the year 2012, the value added and the direct employment in the EU mining industry and the downstream manufacturing of basic metals and even further downstream the whole industries depending on minerals and metals, with huge multiplier effects (Vidal-Legaz *et al*., 2016). These reflect the current outcome of the over 250 years of industrial history on the European continent. The rapid development of several Asian countries shows that modern management and efficient technologies can shorten the time necessary to reach comparable multiplier effects, but nevertheless some decades are necessary to such development levels, that may nevertheless prove environmentally unsustainable.

Figure 2.10 – Value added and number of jobs associated with metals (mining, basic manufacture and downstream sectors) in the European Union in 2012



Source : Vidal-Legaz et al. (2016).

2.9. Development minerals

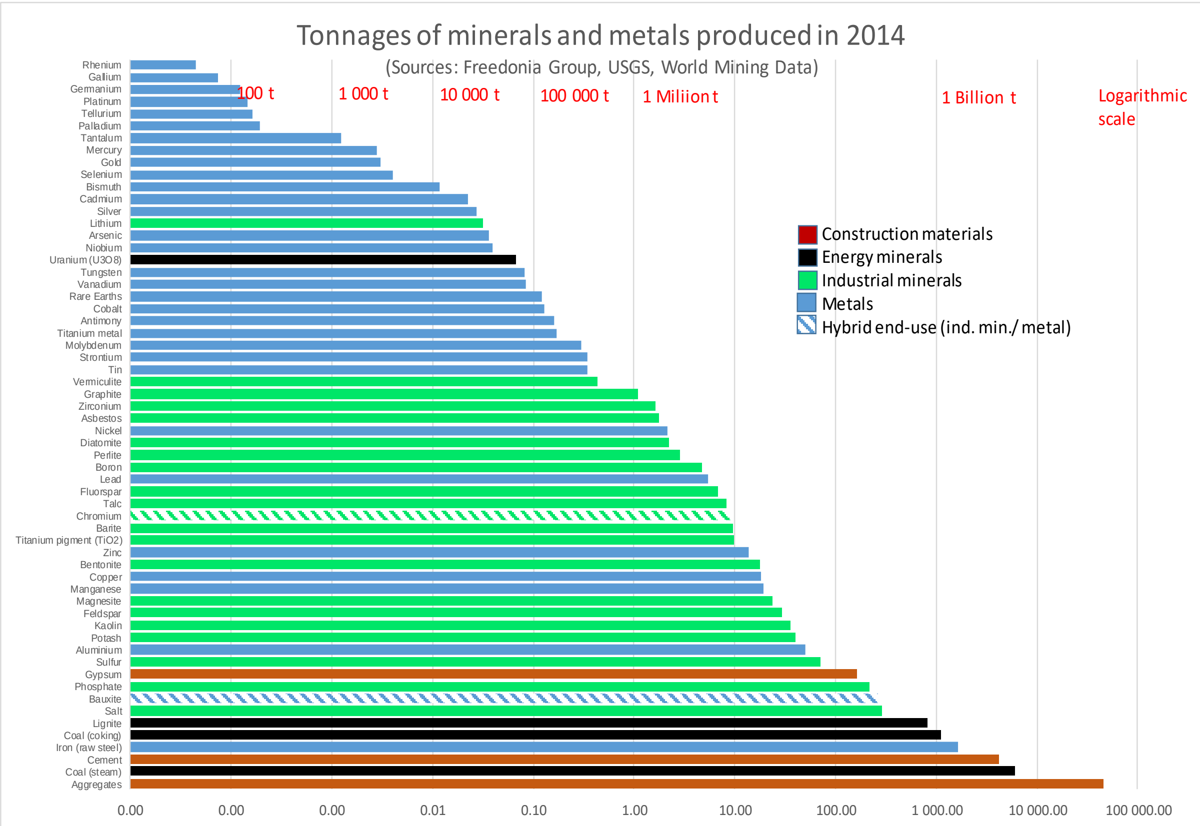
There is a classification that groups construction and industrial minerals as development minerals. These minerals are usually not traded but are crucial for the domestic economy. Franks *et al.* (2016) define development minerals as minerals that are mined, processed, manufactured and used domestically in industries such as construction, manufacturing and agriculture (Figure 2.9). The Development minerals sector is comprised of four branches:

- <u>Construction materials:</u> These are minerals 'used by the construction industry, for example in road making, in concrete in house construction and as railway ballast', the largest component being 'aggregates' used on their own or in concrete, mortar, roadstone or asphalt.
- <u>Dimension stones:</u> These are natural rock quarried for the purpose of cutting and (or) shaping to a specific size. The main rock types used to fabricate dimension stone are granite, limestone and marble.
- <u>Industrial minerals</u>: These are commodities, single or group, whose 'physical or chemical properties, and not their metallic, energetic or gem properties are the main basis for industrial purposes'. Examples of these minerals were given in Table 2.2.
- <u>Semi-precious stones:</u> These are mineral crystals or rock that are generally cut and polished to make jewelry. Examples include quartz, amethyst, garnet, aqua-marine, opal and pearl. Semi-precious stones range in value. Some stones may not be of high enough value to export or facet and instead may service local markets, especially in the vicinity of the tourist industry.

Though the export or traded minerals receive much more attention, development minerals (industrial and construction minerals) are a far larger sector. In terms of the importance of the development minerals sector, six country-level studies to generate data and three country-wide censuses commissioned by ACP-EU Development Minerals Programme[31] provide interesting insights. For example, the Uganda study revealed that of the 534,394 people employed in the Development Minerals workforce, 38% are women.

However, outside of the male dominated clay-brick sector, women make up 70% of the workforce for all other commodities. The study also found that if the ASM segment of development minerals were integrated within official statistics, Uganda's GDP would increase by 1.4%[32].

Figure 2.11 Tonnages of minerals and metals produced in 2014



The study for Jamaica found that the level of wages in the sector is 20-25% higher than the minimum wage. Development minerals are also vital for construction of housing, road building, agriculture (fertilizers) and a range of processing industries on the island (e.g. paint manufacture, cement, plasters, fertilizer).

However, this sector, which straddles both the formal and informal sector, is neglected. It does not create the huge challenges such as pollution and conflicts that traditional ASM, which is focused on high value minerals does. It neither generates huge export revenues, nor is it critical for the function of global manufacturing supply chains. Its importance is not well documented. Studies on minerals or metals tend to be focused either on ASM involving high value minerals or metals (such as gold, diamonds, and tin, tantalum and tungsten (3Ts) or on the formal sector with a focus on globally traded

[31] http://www.developmentminerals.org/index.php/en/
[32] Personal Communication with Daniel Franks, coordinator of ECP-EU Development Minerals programme

minerals or metals. Development mineral issues tend to be subsumed under export minerals. There are several factors that make development minerals different from export minerals. These include:

- While export mineral value chains are highly globalized, development mineral value chains are highly localized though sometimes they are also regional value chains
- Export minerals are traded in global commodity markets that tend to be very volatile with episodes of booms and busts and thus can create macroeconomic challenges in countries that trade in them. Industrial minerals and construction materials are typically not subject to price volatility and are less exposed to external shocks.
- Export mineral value chains tend be enclaves with weak linkages to other economic sectors. Development minerals are well integrated into local economy as barriers to entry are lower and they supply key raw materials for construction and other local industries.
- The highly specialized and capitalized nature of export minerals means that this sector lends itself to technological advances especially automation, which can have disruptive impacts on job creation and local procurement of goods and services. This does not apply to development minerals, which are unlikely to be disrupted by automation due to their low value.
- Export minerals are very unevenly distributed and thus produced by a few countries. They are also much more finite. In contrast, development minerals are much more abundant and widely distributed.
- Due to uneven distribution and thus the need for them to be traded, export minerals raise issues of supply security as disruption at either the supply source or the trading can disrupt economic activities at a global level. So, they can raise geopolitical considerations. The high dependence of many countries on exports revenues and also domestic resources also means that they are key issues that may arise in the context of local politics. Therefore, export minerals are likely to raise political issues, while development minerals are not.

These differences mean that a distinct governance framework is needed for development minerals. Lack of attention to this sector has seen unsustainable mining practices with uncontrolled sand extraction already having both environmental and economic consequences (see Box 2.3). The ACP-EU programme[33] on development minerals is seeking to provide much needed support to this sector, which is frequently neglected in national development strategies and policies. Some of the strategic policy directions the programme is advocating include: (i) recognition of the sector in policy and law (it is excluded from many mining acts); (ii) formalization; (iii) extension services (by government and by mining associations); (iv) geological data inventories; (v) access to finance (especially micro-finance), trade fairs, and technology exhibitions, and (vi) simple occupational health and safety (OHS) and environmental standards as part of licensing.

Box 2.3 Towards sustainable sand extraction

Sand and gravel are mined world-wide and account for the largest volume of solid materials extracted globally, mainly for construction. Rising demand has seen a huge extraction increase in recent years. Sands are now being extracted at a rate far greater than their renewal. For example, building and land reclamation projects exhausted marine sand resources in Dubai, which now imports sand.
This extraction is having a major impact on rivers, deltas and coastal areas and has affected the provision, protection and regulation of ecosystem services. Dredging and extraction of aggregates destroys organisms, habitats and ecosystems and deeply affects the composition of biodiversity. The extraction of aggregates in rivers has led to severe damage to river basins, in particular, lowering of the river bed and thus water tables. This has exacerbated drought occurrence and severity as tributaries of major rivers dry up when sand

[33] Programme website: http://www.developmentminerals.org/index.php/en/

extraction reaches certain thresholds. Sand extraction has also increased river pollution. Marine mining has seen erosion of beaches. For example, in Morocco, sand extraction has transformed a large beach into a rocky landscape between Safi and Essouira; yet beaches are crucial in protecting land, especially given rising sea levels. Environmental impacts of sand extraction have economic consequences. Tourism may be affected through beach erosion while fishing is impacted through destruction of benthic fauna. Agriculture could be affected through loss of agricultural land from river erosion and, as mentioned above, the lowering of the water table.

Actions

A two-pronged approach has been proposed (UNEP, 2014) to reduce sand extraction. These are strengthening governance and regulation and reducing sand consumption:

- Strengthen governance and regulation of sand extraction. Large-scale mining, quarrying and reclamation activities should be authorized only after sound scientific assessment shows there would be limited impact on the environment. Extraction should reflect the true cost of mining. Sand extraction should be properly taxed so that other options become economically viable.
- Reducing consumption of sand. One way is to optimise the use of existing buildings and infrastructure. Recycled building and quarry dust material can be a substitute for sand. Concrete rubble should be recycled to avoid using aggregates, at least for low-quality uses. Another way is the replacement of sand by up to 40% of incinerator ash exhibits higher compressive strength than regular cement mortars. Some desert sand can be used, if mixed with other material. There are also alternatives for building houses, including wood, straw and recycled material. However, the current building industry is geared toward concrete know-how and equipment. Training of architects and engineers, new laws and regulations, and positive incentives are needed to initiate a shift for lowering our dependency on sand. Renewable and recycled materials need to be targeted for building houses and roads.

In a context of demographic growth coupled with rapid urbanisation, many developing countries will find it hard to reduce their construction minerals consumption, with limited alternatives as the use of wood or other biomaterials can only provide a limited alternative, to avoid aggravating deforestation, already an important issue in a number of developing countries.

2.10 Conclusion

Minerals and metals are important for the more advanced developed countries as inputs to industry and manufacturing, as well as for many resource-rich developing countries as key sources of revenue to fund their development. Every country needs minerals and metals for a number of purposes, even if these are more often than not hidden in imported goods. Therefore, the unfeterred supply of minerals and metals is a key concern for all.

In addition, finding and exploiting minerals and metals is very risky, capital intensive and requires highly specialized skills. Multinational companies and large state-owned enterprises tend to be the dominant players. For many countries, exploitation of mineral resources is dependent on FDI from these players. At the same time, protecting their investments is a crucial consideration for investors. For this reason, international investment treaties designed to protect investors from expropriation have been developed, that countries sign up to. Given the stakes involved – that is, the need for unfettered trade in minerals and metals, and the need for protecting FDI – governments are invariably concerned with and involved in the governance of minerals and metals dependent value chains, with geopolitics playing an important role.

For mineral rich developing countries aligning mining investment decisions of companies with their long-term development aspirations is a key step to creating shared value through the extractive sector. At country level, greater linkages between the minerals and metals industries and other sectors of the economy should be systematically developed, adding local content and local participation. This offers a credible path to achieving development goals. In this context, governance is essential to achieve SDGs, providing long-term benefits to society without harming the environment the same society depends on. The development of governance will also help to improve the business environment needed to attract investment in downstream added- value manufacturing, while a number of additional conditions such as access to know how, intellectual property, competitively priced energy, to water, to transport infrastructure as well as the availability of a skilled workforce need to be fulfilled to achieve broad-based development.

The development minerals sector is the forgotten middle of the minerals and metals industry landscape. These minerals are widely distributed and generally require modest investment. They are largely mined by small and medium-scale (SMEs) local producers. Consequently, they do not give rise to geopolitics of the export minerals or generate the conflict dynamics of ASM (the subject of the next chapter). Data on production is patchy and hence their role in the economy tends to be overlooked. The result is that development minerals do not get the needed attention of policy makers and development partners. In countries with no significant metallic ore deposits, it is the biggest sector in the minerals industry, in terms of economic contribution. Special attention is needed to fully harness this sector underscoring the need for a specialized governance framework for the sector. The focus of this report is on export minerals and therefore this specialised framework will not be addressed here.

In the next Chapter, we will discuss the artisanal and small-scale (ASM) mining sector, the other end of the mining landscape, where entry and exit is open to almost anyone as the capital required is minimal (in some instances, only a pick axe may be required). As a result, ASM is characterised by very different dynamics, and thus merits some dedicated analysis.

CHAPTER 3 – ARTISANAL AND SMALL-SCALE MINING

3.0 Introduction

Chapter 2 referred to formal, industrial or large-scale mining (and also touched on the development mineral sector (see section 2.6), which is defined as primarily medium-scale mining). This chapter focuses on the other end of the spectrum of extractive industries, characterized by low technology, informality, and carried out largely by individuals and small groups. We call it the informal, artisanal and small-scale mining. The acronym ASM is used widely to mean this type of mining practices, and will be used henceforth in this chapter.

Historically, before the advent of industrial mining, all extractive practices were artisanal in nature. In some locations, the history of artisanal mining goes back to pre-colonial times; several areas of Africa, for example, were the sources of gold that were traded by the Arabs (Dondeyne & Ndunguru, 2014; Werthmann, 2007) and diamond mining was exclusively carried out in India (Lahiri-Dutt & Roy Chowdhury, 2018). In resource-rich developing countries, some communities still carry on their traditional mining practices. The kind of mining that flourished during the ’gold rushes’ that took place in the New World during the nineteenth century, was artisanal in nature. The gold rushes involved individualised, highly mobile artisanal gold miners, and created what is known as ‘frontier democracy’ (Bryceson, 2018). Although some aspects of production and labour arrangements in ASM sometimes resemble the gold-rush mining, it will be incorrect to equate contemporary mineral rushes with those of the past because today’s miners operate in different political, economic and juridicial contexts. The frontier democracy (self-regulation) model might have worked in the past but such governance is unlikely to be effective in the more complex socio-political environment today. ASM therefore demands a governance structure that will protect both the environment and the communities involved in it, and that is bottom up rather than top-down.

Today’s ASM is driven by a complex set of factors closely related to local, national and global contexts. Experts have shown that throughout the mineralised tracts of the global south, thousands of peasants are moving out of agriculture-related livelihoods to take up extractive industries to make a living out of mineral resource extraction (Lahiri-Dutt, 2018a). The reasons of this mass exodus from agriculture are complex and the process has far-reaching implications for the governance of extractive industries. Amongst the several compelling factors forcing this unprecedented and widespread shift from agrarian to informal mineral extractive economies, Lahiri-Dutt (2018b) identifies six overlapping drivers. The first is the unsustainability and poor productivity of the agricultural sector caused by a number of forces. This is the ‘agricultural poverty’ thesis that focuses on the ‘push’ factor. Secondly, economic reforms carried out in developing countries have primarily meant to liberalise land markets and to help Foreign Direct Investment (or FDI). This is ‘the structural reform’ factor that has led to a mushrooming of foreign investments in extractive industries, drawing the attention of the poor to extraction as a viable and attractive livelihood option. Third, and not unrelated to second, are the initiatives the states undertake to earn revenue incomes from mineral extraction. This is the ‘rentier state’ factor in which the state primarily attempts to earn incomes through rent and incentivizes informal mining to avoid taxation. Fourth, again, not unrelated, is the equation of the expansion of extractive industries with ‘development’ by policy-makers has established an extractive model that favours large corporatised operators leaving out local communities to claim part of the minerals. This is the ‘mining for development’ factor. Fifth, environmental degradation at the local level and uncertainties of precipitation and temperatures have enhanced the vulnerabilities of people and encouraged them to take up extractive livelihoods. This is the ‘environmental refugees’ factor. Lastly, globally the rising commodity prices have incentivised not only the large-scale corporations but also the rural poor to earn additional cash incomes or to supplement their existing incomes through seasonal mining. This is the ‘pull’ factor that has also been responsible for the mushrooming of informal, artisanal and small-scale mining in recent decades.

3.1. Nomenclature

The acronym ASM is widely used to collectively describe a wide range of mining practices, processes and activities. These extractive practices can vary from individuals panning for gold or digging for precious stones along riverbanks or in the tailings of large-scale operations, to relatively large and organised operations using heavy machinery such as excavators and drilling machines (Buxton, 2013; Collins & Lawson, 2014; Hinton, 2006; Veiga, Maxson & Hylander, 2006; ECA, 2002). ASM can involve the extraction of high-value gemstones, minerals and fuels to low-value construction materials including various stones, gravel and even sand. ASM is generally distinguished from large-scale or industrial mining in the literature by its relatively low levels of capital investment, mechanisation/technology and production/recovery of minerals; high degree of labour intensity; exploitation of marginal deposits; informality and haphazard nature; and poor occupational health, safety and environmental safeguards (Adler Miserendino *et al*., 2013; Buxton, 2013; Chaparro Ávila, 2003; Collins & Lawson, 2014; Hentschel, Hruschka, & M., 2002; Hinton, 2006; Mutemeri, Walker, Coulson & Watson, 2016, ECA, 2002).

ASM can be loosely classified into the following categories (ECA, 2002; ICMM, 2009; Villegas, Weinberg, Levin & Hund, 2012), based on drivers that tend to overlap on the ground:

- *Traditional or Permanent:* ASM that occurs year round and is frequently the primary economic activity of a community. This type of ASM may have occurred for generations in an area and forms part of traditional livelihoods.
- *Seasonal:* ASM that complements or alternates with other seasonal livelihoods, such as agriculture or the rearing of livestock, or results from seasonal migration. Seasonal ASM may overlap with permanent ASM (e.g. students may join permanent ASM sites during holidays).
- *Rush/Influx:* ASM that involves opportunistic in-migration or an influx of miners to a recently discovered deposit. This type of mining has been seen in Brazil and is common in Madagascar.
- *Shock/push:* ASM resulting from unexpected events, such as drought, economic collapse, commodity price fluctuations, conflict or retrenchment from other industries or sectors (such as large-scale mining).
- *Permanent co-habitation:* ASM that takes place in areas connected with large- or medium-scale mining, such as miners working in abandoned areas, in tailings dams, or downstream of the larger operations.

3.1.1 ASM regulation

Each country seems to understand ASM and to define it in their legislation according to different criteria. These criteria can include the volume of production, the amount of capital invested, the number of individuals employed, the size of the concession or depth of the mine, and/or the level of sophistication of the equipment or degree of mechanisation used (ECA, 2002; Andrew, 2003, p. 122; ILO, 1999, p. 3). While most countries distinguish between large-scale mining and ASM in legislation, fewer draw a distinction between 'artisanal' and 'small-scale' mining (Bugnosen, 2003). In India, minerals on land belong to the States who are entitled to the royalties on their extraction. Minerals are classified into 'major' and 'minor', based on their economic importance. Most minor minerals, including marble and granite are mined or quarried in the ASM sector, and the rules for minor mineral concessions are issued by the individual State Governments. The current law as such does not provide for any separate dispensation for minerals or small deposits generally mined in the ASM sector, though the National Mineral Policy 2008[34] does recognise the need for a separate approach for managing small deposits.

Many countries have provisions in their legislation to allow ASM only for nationals and limit the trading of minerals produced by ASM to national boundaries (ECA, 2002; Mutemeri *et al.*, 2016), although foreign partnership or investment is frequently allowed (ILO, 1999, p. 3). Permits and licences for ASM are provided for mining in smaller areas than for large-scale mining (or in specifically designated areas) and are of shorter duration. They may be (provisionally) renewable but tend not to be transferrable. Permits/licences for ASM generally have some restrictions on the use of heavy machinery and explosives, but have less stringent environmental, health and safety requirements than for large-scale mines (Mutemeri *et al.*, 2016).

However, legislation often lags behind reality. Most of these definitions are changing on the ground because of difficulties in their application. For example, there have recently been discussions in Ghana about amending legislation to create a 'medium-scale' category of mining to represent the increasing mechanisation of ASM (Hilson & Hilson, 2015). Similarly, Verbrugge and Besmanos (2016, p. 137) argue that the definition of ASM in legislation in the Philippines no longer represents practice on the ground, where many ASM operations "boast a significant degree of capitalization and mechanization".

3.1.2 Material extracted by ASM

A wide range of materials is extracted by ASM. Generally, these are divided into high-value or low-value minerals, and as a matter of convenience, can be further classified into the following categories (Chaparro Ávila, 2003, p. 22; ECA 2002; Economic Commission for Africa, 2011; Hinton, 2006, pp. 11-12; Villegas *et al.*, 2012):

- Precious metals (such as gold, silver and platinum);
- Base metals (ferrous such as iron, and non-ferrous such as copper, lead, nickel and zinc, but also there are a range of others such as bauxite (for aluminium), tin, molybdenum, cobalt and manganese among others);

[34] https://mines.gov.in/writereaddata/Content/88753b05_NMP2008[1].pdf:

"Efforts will be made to promote small scale mining of small deposits in a scientific and efficient manner while safeguarding vital environmental and ecological imperatives. …
where small deposits are not susceptible to viable mining a cluster approach will be adopted by granting the deposits together as a single lease within a geographically defined boundary. Efforts would be made to grant such mineral concessions to consortia of small scale miners so that such clusters of small deposits will enable them to reap the benefits of economies of scale."

- High-value minerals (such as cassiterite/tin, coltan/tantalum, and wolframite/tungsten also known as 3Ts);
- Precious gemstones (such as diamonds, sapphires and rubies);
- Semi-precious stones (such as aquamarine, tourmaline and amethyst); and
- Low value, industrial and construction minerals (such as clay, coal, feldspar, fluorspar, granite-like rock[35], gravel, gypsum, kaolin, limestone, sandstone, marble, quartz, sand and talc)

3.2 ASM and the economy

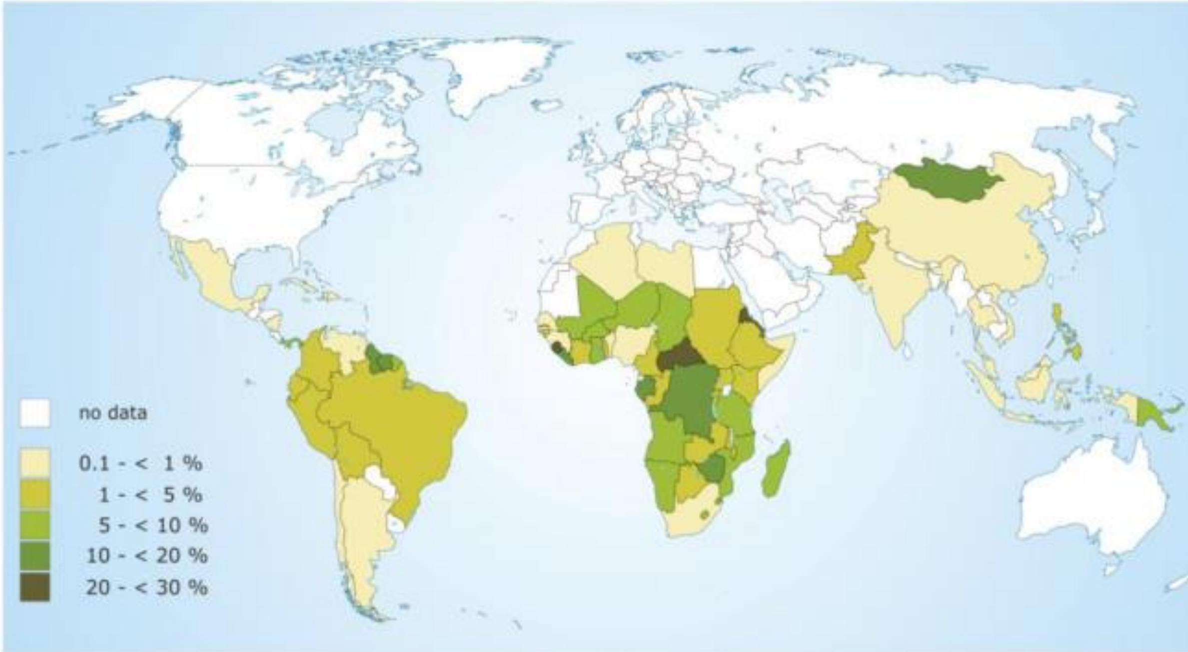
The Artisanal and Small-scale Mining in Protected Areas and Critical Ecosystems (ASM-PACE) project[36] estimates that ASM produces approximately 10 percent of the word's gold, 15-20 percent of its diamonds, 20 to 25 percent of its tin and tantalum, and 80 percent of coloured gemstones (Villegas *et al*., 2012; World Bank, 2012). Other estimates provide higher figures for the amount of gold produced globally by ASM to 20- 30 percent (Seccatore, Veiga, Origliasso, Marin, & De Tomi, 2014; Sippl & Selin, 2012). ASM thus makes a significant contribution to economies to some economies, for example, in 2014 ASM contributed about 12% of Ghana's merchandise exports (McQuilken & Hilson, 2016).

Perhaps where ASM has a bigger impact on the economy is in the provision of non-farm livelihood. No accurate estimate can ever be given for such a disparate, diverse and widely scattered activity. Figures vary dramatically depending on definition and minerals considered. Many estimates primarily focus on precious metals and minerals, leaving aside industrial commodities including coal, stones and sand. An estimated 40.5 million people were directly engaged in ASM in 2017, up from 30 million in 2014, 13 million in 1999 and 6 million in 1993. That compares with only 7 million people working in industrial mining in 2013 (IGF, 2017). ASM activities occur across most regions in the world as shown in Figure 3.1.

[35] 'granite' is used as reference to hard stone which may be crushed for aggregate, used for armouring, as dimension stone and so on. Most rock used in this way is not granite, which has a precise petrographic definition (a medium to coarse grained, silica-rich igneous rock). But basalt, syenite or other types of igneous rock are used more commonly as the key feature is rock which hard wearing as, for example, in roadstone, and available locally.

[36] A joint initiative by the international conservation organization WWF and specialist development consultancy firm Levin Sources, ASM-PACE seeks to identify workable, sustainable solutions that constructively navigate the conservation and development trade-off presented by ASM in protected areas and critical ecosystems.

Figure 3.1: Distribution of ASM activities by % of population involved



Source: *Dorner et al. (2012) cited in* IGF (2017)

Many academics and international donors agree that ASM is a poverty-driven activity, even if developing country policy-makers are not fully convinced (Gamu, Le Billon, & Spiegel, 2015; Hilson & Banchirigah, 2009; Hilson & Garforth, 2012; Maclin *et al*., 2017). In many countries, ASM "is predominantly a highly important and deeply rooted livelihood improvement activity" and "not a mere survival strategy to which people turn to, in times of distress or conflict" (Geenen, 2013, pp. 208–209, cited in Maclin et al. 2017). ASM is also increasingly being described as an activity with the potential for "wealth creation" (ECA, 2002; Fisher, Mwaipopo, Mutagwaba, Nyange & Yaron, 2009; Hilson & Hilson, 2015, p. 6; Verbrugge, 2016, p. 113).

According to Hilson & McQuilken (2014), it was not until the late 1990s that donor support for ASM in sub-Saharan Africa had a livelihood dimension. With this recognition came several programmes focusing on "alternative livelihoods". It is acknowledged that incomes earned through ASM can be difficult to quantify, as they cannot be isolated from the household's other income generating activities (Heemskerk, 2005, pp. 84-85). A number of authors discuss the poverty traps that exist in ASM (Childs, 2008; Hilson, 2012).

Hilson has been a strong advocate of understanding the links between ASM and smallholder farming going as far as to say the two activities are "inseparable" (Hilson, 2016a). His works (e.g. Hilson, 2011, 2016a; Hilson, 2016b; Hilson & Garforth, 2012; Hilson & Van Bockstael, 2012; Okoh & Hilson, 2011) and that of other authors (for example, Cartier & Bürge, 2011; Maconachie & Binns, 2007; Maconachie *et al*., 2006 examining Sierra Leone) have has consistently argued that ASM complements and supports agriculture by providing income in the off-season for the purchase of fertilisers and other agricultural inputs. However, this complementarity is being broken (see Box 3.1). This box shows that the dynamics in ASM is changing as itinerant entrepreneurs are displacing farmer-miners.

Box 3.1 Agriculture and ASM

Agriculture and ASM are key means of rural livelihood improvement. They tend to coexist in the same space competing at times and complementing at other times. To understand how this complex relationship is evolving, ACET conducted a study of three countries, Burkina Faso, Ghana and Sierra Leone. The study found that after smallholder agriculture, ASM provides the second highest employment. About one million people are directly engaged in ASM in Ghana, 300,000 in Sierra Leone and about 200,000 in Burkina Faso.

The ACET study (ACET, 2017) found overwhelmingly negative impact of ASM activities on smallholder agriculture. These include:

- growing imbalance in the power relations between the itinerant ASM entrepreneurs and workers on the one hand and sedentary smallholder farmers on the other;
- growing overvaluation of assets in resource rich rural communities that is increasing the vulnerability of rural households and undermining efforts to reduce poverty;
- growing threat to food security, reduction in available arable land and consequent reduction in food- and cash-crop production; and
- environmental and health risks associated with unregulated ASM activities.

Can ASM be a sustainable tool for poverty reduction in resource-rich communities?

The non-renewable characteristic of minerals inherently defines the itinerant nature of ASM livelihoods. The shifts from one location to another, once the reserves are exhausted, can potentially damage the environment and destroy farmlands, ultimately undermining food security and cash incomes. The ACET study again shows that post-mining communities virtually become ghost towns and devastated farmlands feature huge, mosquito-infested and chemically-polluted pools, with dried-up streams.

This study offers three key strategies for to mitigating the negative impact of ASM on the livelihoods of rural communities:

- strengthening institutional capacity to plug the loopholes in regulatory responses;
- strict enforcement of the already well-articulated policies and regulations; and
- addressing the longstanding challenges confronting smallholder agriculture (such as low productivity and inadequate financial, logistical and technical support).

<u>Land Use</u>

The study also revealed that the lack of an effective regulatory response to land use is partly responsible for the indiscriminate incursions into cash-crop farmlands by ASM operators. None of the countries under study has a comprehensive geological mapping and land use plan to identify areas of mineral reserve potentials and guide the utilization of land resources for other purposes. This is critical for the mutual coexistence of the two sectors and the promotion of sustainable growth and development of the rural communities. Already ASM is wreaking significant damage on agricultural lands and the only way to reverse this sad trend is through rigorous land use management interventions, and proper demarcation of areas for cash and food crops and those reserved for ASM activities.

<u>Employment</u>

With regard to employment, if ASM is seen as a major pathway to rural job creation and thus improvement in the livelihood of mineral-rich communities, then this emerging trend can be regarded as a manifestation of market failure, requiring state intervention. For example, the regulations will have to focus on restricting the use of heavy earth-moving and dredging equipment in artisanal mining sites. In this regard, Ghana has to learn from both Sierra Leone and Burkina Faso, which have a clear regulatory distinction between artisanal mining and small-scale mining.

<u>Regulations</u>

New regulations will be extremely difficult to enforce and unlikely to achieve intended outcomes in the study countries and particularly in Ghana where regulatory capture seems to be evident. More traction could be gained by focusing on enforcing existing regulations than introducing new ones. Thus, effective regulatory responses would be to support artisanal miners (the workers) with resources and training to engage in their trade effectively, and strict enforcement of licensing. The current institutional arrangements that empower regional and district leadership structures need to be strengthened along with coordination among key stakeholders. In particular, the capacity of the Environmental Protection Agency (EPA) needs to be built up at regional and district levels. Overcoming regulatory capture requires political will to dismantle the patronage structures that prevent effective implementation of rules and regulations. In Ghana, the change is beginning to occur with the moratorium that was imposed on ASM in order to address the root cause.

3.3 The Drivers of ASM

3.3.1 Rural distress and agrarian crisis driver

The rural economy in most countries is suffering; smallholder agriculture throughout these countries has stagnated, pushing large numbers of previously rural, farm-based communities into non-farm jobs (Lahiri-Dutt, 2014). This process can be traced to the structural adjustment programs of the 1980's. Several authors have argued that structural adjustment programs (SAPs) implemented across sub-Saharan Africa in the late 1970s, 1980s and 1990s fuelled the expansion of ASM (ECA, 2002; Banchirigah, 2006; Hayes, 2008; Hilson, 2010; Hilson & McQuilken, 2014; Hilson & Potter, 2005; Spiegel, 2009, 2012b). Scholars argue that ASM absorbed people who were retrenched through the privatisation of state-owned enterprises – including large-scale mines and crop parastatals. ASM also engaged people as a result of the reduction of the public sector workforce (ECA, 2002; Banchirigah, 2006; Hayes, 2008, pp. 37-38; Hilson & McQuilken, 2014; Spiegel, 2009). Finally, ASM provided an alternative or supplemental source of income for farmers struggling due to agricultural reforms – including the "reductions in export crop taxes, the devaluation of local currencies, and the removal of subsidies on vital crop inputs" – that made smallholder farming unfeasible (Banchirigah & Hilson, 2010, p. 160; Hilson, 2010, p. 297).

More recent challenges have further compounded the rural distress driver. For example, Kamete (2008, 2012) finds that the shock of the post-2000 economic crisis in Zimbabwe, which resulted in complete devaluation of the local currency, hyperinflation, and extremely high levels of unemployment and poverty, led to a new artisanal gold rush and the growth of informal mining settlements. Teschner (2014, p. 140) finds that the March 2012 *coup d'etat* in Mali, which led to the State's withdrawal of financial support from the commune government and social services, resulted in ASM becoming "a critical rural industry not only supplying much needed income to rural people, but also informally funding social institutions from the bottom up during a time of national crisis". These are just two of many examples of 'shock' or 'push' ASM. One can see that both forces operate, explaining the reason why Verbrugge (2016) argues that ASM is both a product and catalyst of rural transformation.

3.3.2 Mining sector reform driver

According to Hilson *et al*. (2016, p. 233), between 1988-2012, the World Bank contributed US$1.4 billion to mining sector reforms, which included a series of technical support loans focused on legislative and fiscal reforms and institutional strengthening. Through this support, by 1995, 35 of sub-Saharan Africa's countries had revised their mining codes, which resulted in increased large-scale private investment in mineral exploration and extraction. However, this reform resulted in large tracts of mineralised land in many countries (Ghana and Tanzania being prime examples) being granted as exploration/mining concessions to foreign multinationals, which has resulted in lack of availability of viable land for legal ASM activities and encouraged informality in the sector (Fold, Jønsson, & Yankson, 2014; Hilson *et al.,* 2016). For instance, in Mongolia, Lahiri-Dutt & Dondov (2016) have described the links between the liberalisation of the Mongolian economy, expansion of the informal sector in the urban context and mushrooming of ASM in rural areas.

3.3.3 Commodity prices driver

Participation in ASM tends to fluctuate with commodity prices (Eftimie *et al*., 2012). China's unprecedented economic growth has helped raise commodity prices, creating incentives for many rural peoples to diversify their livelihood activities into extractive activities. The rapid rise of gold prices since 2000[37] has seen a marked increase in artisanal mining in Ghana (ACET, 2017). It has been suggested that ASM can be viable at a smaller production level than large-scale mining for certain kinds of minerals (Marin *et al*., 2016; Hayes, 2008, p. 37).

3.4. Characteristics and issues

3.4.1 Data

Lack of reliable data about the scale and scope of ASM production is a key challenge for government authorities and other key stakeholders seeking to develop effective policies and management programmes (Banchirigah, 2008; Collins & Lawson, 2014; Cook & Healy, 2012). Figures on the number of artisanal miners and their production vary dramatically, as most governments do not have reliable data on ASM. There are a range of obstacles to collecting data on ASM, including the fact that few miners are willing to honestly disclose figures on their production levels/earnings/investments to researchers or government officials, and only few maintain adequate records (Heemskerk, 2005; Marin, Seccatore, De Tomi, & Veiga, 2016). In addition, ASM populations are often mobile and transient and may be linked to illegal activities, problematizing access for researchers (Heemskerk, 2005). Production levels are also hugely variable and dependent on context, making it difficult for generalisation (Heemskerk, 2005)[38].

3.4.2. Environmental degradation and safety

Many ASM activities coincide with the global commons of forested lands in critical ecosystems that were not used before (Duřan *et al.,* 2013). Attention is now focused on the environmental degradation caused by ASM. These impacts range from deforestation (Hirons, 2011), biodiversity loss (Butler, 2006), soil and water pollution, to extreme dust and air pollution. Other impacts include changes in river regimes, surface or underground fires (in the case of coal mining) and frequent landslides in areas of steep gradient. Noise pollution is also a problem. For example, in areas of bulky industrial or construction material mining, the crushers create extreme levels of noise and dust. These

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[37] The price of gold rose from US$ 255.95 per ounce in 2001 to 1,746 per ounce in 2012, a 582% rise. See trend in gold price at World Gold Council website, https://www.gold.org/data/gold-price

[38] Three useful guides for collecting baseline data and conducting research on ASM communities include: Estimating Mercury Use And Documenting Practices In Artisanal And Small-Scale Gold Mining (ASGM) (O'Neil & Telmer, 2017) produced by UN Environment; the rapid assessment toolkit "*Gender Dimensions of Artisanal and Small-Scale Mining"* (Eftimie et al., 2012) produced by the World Bank, and the "*Methodological Toolkit for Baseline Assessments and Response Strategies to Artisanal and Small-Scale Mining in Protected Areas and Critical Ecosystems"* (Hinton & Hollestelle, 2012) produced by the World Wide Fund for Nature (WWF) and Estelle Levin Limited.

environmental impacts can be short- or long-term in nature. A number of non-governmental organisations are now working in this area, although their scope varies. For instance, Global Environment Facility (GEF) has focus on mercury in gold mining prevention (see Box 3.2), whereas the Artisanal and Small-Scale Mining in Protected Areas and Critical Ecosystems (ASM-PACE) Programme has the primary objective of characterising the protected areas and sensitive ecosystems. However, since ASM-based livelihoods are risky, health and safety issues are now being more closely linked to the environmental issues surrounding ASM (Smith *et al*., 2016). In the near future, closer attention will be paid to the longer-term and wider impacts of ASM, perhaps contributing to climate change, especially the impact of ASM on forest degradation.

Box 3.2 Minamata Convention & ASGM

In 2017, a new multilateral environmental agreement entered into force with provisions specifically targeted to the artisanal and small-scale gold mining (ASGM) sector. The Minamata Convention on Mercury aims to protect human health and the environment from mercury pollution. ASGM is the largest global source of such pollution and reducing and eliminating mercury is an important part of the treaty (O'neil & Telmer, 2017). It is worthwhile to mention that lessons learnt from the Sustainable Artisanal Mining (SAM) Project (http://sam.mn/) and the Better Gold Initiative provided crucial input in the negotiation process that led the Minimata Convention.

The Convention states that each party that determines that ASGM using mercury is "more than insignificant" in its territory must develop and implement a national action plan. The national action plan approach was chosen because negotiators recognized that the particular characteristics of ASGM – its informality, local and regional variability, and importance for development – make a "one size fits all" approach unlikely to succeed. Furthermore, although the Convention is focused on mercury pollution, the provisions on ASGM are designed to promote a multidimensional strategy that takes into account social, economic, governance, and public health factors. The Convention stipulates required actions and components of each national action plan, which include:

- National objectives and reduction targets;
- Actions to eliminate the worst ASGM practices (such as whole ore amalgamation);
- Steps to facilitate formalization or regulation of ASM;
- Baseline estimates of mercury use and practices employed;
- Strategies for promoting reduction of mercury releases;
- Strategies for managing trade in mercury;
- Strategies to involve stakeholders in the development and implementation of the plan;
- A public health strategy;
- Strategies to protect vulnerable populations; and
- Strategies for providing information to miners and their communities.

The development of ASGM national action plans is a significant undertaking that will bring together ministries and other stakeholders and shape country policy on ASM for years to come. As of mid-2018, 32 countries have started work on national action plans with financial support from the Global Environment Facility. The UN Environment Global Mercury Partnership is supporting many of these countries by developing tools and methodologies (e.g. the ASGM Baseline Estimates toolkit), and providing technical assistance and opportunities to share information and lessons learned.

3.4.3 Use of technologies

ASM remains low-technology irrespective of efforts to introduce the use of appropriate technologies. This is partly due to laws that define similar forms of mining (such as the 'People's mining' of Indonesia) as low technology and family-oriented affairs. So far, interventions such as capacity building and technology transfer programs implemented by intergovernmental organizations and multilateral lending agencies have focused on environmentally-friendly mining processing methods, particularly reducing mercury use and pollution for gold mining (ECA, 2002; Aryee *et al*., 2003; Collins & Lawson, 2014; Hinton, Veiga, & Veiga, 2003; Sippl & Selin, 2012).

Some examples include:

- The Artisanal Gold Council has been training and introducing mercury-free processing methods in a number of countries in Asia, Africa and Latin America.
- The IGoli process, developed by Mintek is has been piloted in number of countries (ECA, 2002; Mintek, 2011).
- The use of metal detectors has proven to be difficult in alleviating drudgery of miners' labour due to the restrictions imposed by individual countries with regard to the use of technology in ASM.

IGF (2017) points out that while technical alternatives exist, they are not always applicable due to geological, socioeconomic, cultural and other site-specific factors. One barrier to adopting cleaner technologies for ASM mining communities is cost effectiveness. ASM operators are also usually risk-averse and will not change their practices until the benefits have been clearly demonstrated to them. Indeed, some researchers have argued that poor understanding of the make-up and dynamics of ASM communities has led to the design of many inappropriate technologies and support services (Hilson & Potter, 2003; Banchirigah, 2008). Setting up technical advisory services in existing state institutions (such as Geological Surveys, national universities and vocational training institutions) is seen as the optimal way to provide support (Fold *et al*., 2014).

3.4.4 Criminality and illegality

Hruschka (2013) explains that the distinction between "illegal ASM" and "informal ASM" is nebulous and the two are often erroneously conflated. ASM cannot be deemed "illegal" if legislation does not exist to regulate ASM or to specifically prohibit it either outright or in specific areas, such as in proximity to waterways or in biodiversity hotspots. It is also problematic to refer to ASM as "illegal" if the regulatory and administrative procedures supporting the legislation are not effectively implemented to enable formalization. For this reason, some authors prefer to use the term "extralegal" to refer to ASM activities (Labonne, 2014; Siegel & Veiga, 2009).

All the same, illegality is a serious challenge in ASM. In Ghana, estimates of foreign miners are in the range of 50,000 who are all illegal miners as the law restricts ASM to nationals. Ghana is currently grappling with the challenge of illegal mining as ASM which has also attracted international criminal networks from all over the world (Aido, 2016; Crawford *et al*., 2015; Hirons, 2013).

3.4.5 Migration

Literature shows that migration into ASM areas can be seasonal and temporary in nature, as well as more permanent, leading to the quick growth of semi-urban or even urban settlements that lack basic amenities. ASM settlements are characterised by lack of access to essential facilities such as healthcare, water and sanitation. Unemployment and alcoholism compound these problems. A tradition of heavy migrant female labour exists in all mining communities yet labour focuses on male waged workers rather than women. This is due to the impact of migrant labour which builds on male worker exploitation while obscuring the role of women and children (Parpart, 1986). Artisanal mining often leads to conflicts with the local population (in case of Mongolia, for example, conflicts between herders and the miners are not uncommon). These conflicts can flare into armed confrontation (Endicott, 2012: 144; Maconachie *et al*., 2006; Nyame & Grant, 2014). Moreover, issues like drug use and prostitution are often found in ASM hotspots (Huggins, Buss, & Rutherford, 2017; Fold *et al*., 2014; Banchirigah, 2008; Maclin, Kelly, Perks, Vinck, & Pham, 2017). Less often discussed is gender-based violence, typically sexual and physical harassment from the male dominated labour-force, and problems of residence for female migrant workforce providing support service to male migrant miners.

3.4.6 Access rights/Land tenure

ASM often involves elaborate informal or customary property systems, which are often not taken into account in policy making (Spiegel & Veiga, 2010). Verbrugge *et al*. (2015) analyse the complex relationships between ASM and surface land tenure arrangements in the southern Philippines, the eastern DRC and Liberia. They argue that the interactions between ASM (largely informal) and surface land claimants are not underscored by antagonism but rather negotiations for mutually beneficial arrangements. This point is echoed by O'Faircheallaigh & Corbett (2016, p. 966) in the case of the Philippines, whereby local governments tend to be in favour of ASM. The reason is because "local politicians and business people are often involved in the sector and value its employment and other economic benefits".

In Ghana and many other countries in Africa, traditional authorities (such as chiefs) still assert authority and control over rural lands, however customary land tenure practices frequently conflict with formal land rights and licensing procedures (Banchirigah, 2008; Dube *et al*., 2016; Hilson & Yakovleva, 2007; Nyame & Blocher, 2010). Conflict often results from one of these two scenarios: either traditional authorities give permission for ASM operators to work on lands without legal/official permits or licences, or the government provides licences for miners to work on tracts of lands without the permission of traditional authorities (Dube *et al.,* 2016). Hirons (2013) argues that integrating traditional sources of authority into decentralisation reforms is imperative if they are to have any substantive impact on ASM governance in Ghana.

Mitchell (2016) examines the consequences of overlapping land tenure in sub-Saharan Africa and found that lack of secure land tenure offers little incentive to miners to formalise their activities, build their businesses and infrastructure or undertake environmentally responsible practices. He also revealed that ASM licences are typically of short duration, and renewal is not guaranteed. This provides a disincentive for ASM operators to invest in their operations or responsibly manage the land. The USAID Property Rights and Artisanal Diamond Development (PRADD) project in Liberia aimed at addressing weak property rights that lead to conflicts, and at creating positive incentives for ASM operators for good stewardship of land (USAID, 2013). Similarly, Verbrugge & Besmanos (2016) evaluate a policy program in the southern Philippines (Minahang Bayanihan) geared towards the recognition of mineral property rights and labour rights.

Women face different participation challenges as a result of the lack of access to, use of and control over resourceful land and other productive resources, licences, finance, and geological data. Due to the traditional patriarchal influenced legal constraints to owning or inheriting land and mineral rights, many women end up operating unregistered, increases their vulnerability in the current global efforts at formalization, which, in itself, is characterized by arduous requirements many women are unable to fulfil (IGF, 2018). The lack of access and control over land restricts women from accessing an important determinant of mining business success; finance (IGF, 2018). And where a woman is actually the family head and owner of land, in some cultures such as in Sierra Leone, Botswana and Lesotho, the formal laws of the nation constrain the woman from accessing loans by requiring consent/approval from a spouse or father (ibid.). This typically encourages vulnerable women into undesired relationships with male miners purely to survive. In Madagascar, for instance, temporary marriages typically known as "gold marriages" or "vadin saffira" (sapphire marriages) are common (Bryceson, Jønsson, & Verbrugge 2014; Lawson, 2016). Since such sexual relationship in return for material goods have no legal status in relation to land or property rights, it further deepens the vulnerability of women, making them more susceptible to exploitation. Also related to lack of property rights, are lack of access to mineralised lands and lack of geological information and analysis, which represent other key barriers for ASM operators (observed by O'Faircheallaigh & Corbett, 2016).

3.4.7 Conflicts with large-scale mining

Conflict between ASM and large-scale mining is an area of increasing concern and attention. ASM often occurs on large-scale mining leases; in fact, the presence of ASM frequently provides a geological indicator or "target selection criteria" for large-scale exploration activities (Aubynn, 2009; ICMM, 2009, p. 16). In some countries, government policies promoting large-scale mining have created a situation whereby very large tracts of land are under concession of large-scale mining companies. Often, ASM existed prior to the arrival of the large-scale company. Cases have been reported where large-scale companies have been offered land once the ASM licence (which is typically of short duration) expires. Other times, the presence of the large-scale company instigates an influx of miners either to work on the outskirts of the concession or in the tailings of large-scale mines. In Mozambique, the government's inability to control artisanal miners is said to be a factor that has discouraged foreign mining investment (Dondeyne & Ndunguru, 2014).

From the perspective of large-scale mining companies, ASM poses potential financial liabilities and reputational risks, given its "illegal" nature, poor health and safety practices, use of child labour, and environmental impacts that may be mistakenly attributed to the large-scale company's activities (ICMM, 2009). In addition, ASM can cause damage to a large-scale company's assets, either directly through vandalism and other acts of resistance by miners, high-grading and other forms of encroaching on large-scale activities. Military-type tactics of eviction of artisanal and small-scale miners are frequently used. Around the world, security forces employed by either companies or governments to protect large-scale mining assets have been accused of human rights abuses against artisanal and small-scale miners, including gender-based violence and sexual assault.

There are a number of papers investigating the relationship between ASM and large-scale mining (see, for instance, Aubynn, 2009; CASM, 2009; Hilson & Yakovleva, 2007; ICMM, 2009; IIED, 2015; Smith, Smith, John, & Teschner, 2017; Teschner, 2013). Almost all of these papers emphasise trust as a key factor (and barrier) in managing this relationship. Legacy issues and the role of the government are also vital. For example, Smith *et al.* (2017) discuss a case in the Guyanas where a company relinquished a section of their concession to the national government, to be set aside for ASM (but reserved for miners belonging to traditional landowners of the concession and surrounding land). In this case, the researchers found a number of barriers to this move, including lack of communication between the company and small-scale miners; lack of trust on the part of small-scale miners towards both the company and the government (based in large part on previous evictions and treatment); and disagreement on the roles to be played by the different actors.

In addition, Teschner (2013) compared the experiences of two large-scale mines in Ghana (Tarkwa and Damang) owned by the same company (Gold Fields) in dealing with ASM, and found that "early mining decisions established legacies which have persisted to this day; one relationship based on trust and the other shadowed by broken promises and resentment". The government's involvement (or lack thereof) was also a key factor in each mine's relationship with artisanal and small-scale miners. The authors recommend that large-scale companies plan their relationship with artisanal and small-scale miners early on in the project development phase and establish agreements that are adhered to throughout the life of the mine. They also argue that consultation with ASM leaders is crucial.

It is obvious that there is a potential for large-scale mining companies to provide capacity building or mentorship to artisanal and small-scale operators, particularly in the areas of environment, health and safety, and marketing. However, "illegality" and the risk of encouraging influxes of miners, present risk factors (Verbrugge, 2017).

3.4.8 ASM and conflict

The fact that ASM largely focusses on high value minerals, which are also easy to extract, means that control of ASM sites is attractive to criminal networks that seek to capture and control these resources. This could occur in two ways. First, it might involve capturing state power and by extension controlling the sites. Second, it could entail capturing the site directly and engaging the state for control. High value minerals are able to finance this kind of conflict and are known as conflict minerals. Diamonds have also fuelled deadly conflicts, which was the reason for the establishment of the Kimberley Process to ensure that diamonds in the market are not fuelling conflict[39]. In recent years tin, tantalum, tungsten and gold (3TG) have been the key focus due to conflict they have been fuelling in the Great Lakes region. Cobalt is also becoming a source of concern as demand rises (Faber *et al*., 2017). Consumer pressure to guarantee that products are free of conflict minerals has seen the establishment of a number of due diligence and certification schemes (See chapter 7).

3.4.9 Child labour

One of the major challenges of ASM is child labour. Poverty is the main reason why the children work in the mining sector (Faber *et al*., 2017). The International Labour Organization (ILO) estimates that there are more than one million children working in ASM. However, Schipper *et al*. (2015) argue that the actual number is likely higher, as ASM has been growing steadily since 2006, the time of this estimation. Child labour can constitute a significant part of the labour force. For instance, 20% of all miners in Mali and 30-50% of gold miners in Burkina Faso are children (Schipper *et al*. 2015). This is physically dangerous because of the heavy and awkward loads, the strenuous work, the unstable underground structures, heavy tools and equipment, the toxic and often explosive chemicals, and the exposure to extremes of heat and cold. ILO (undated) also points that mining often takes place in remote areas where law, schools, and social services are inexistent; where family and community support may not exist; and where conditions foster alcohol abuse, drugs, and prostitution. These conditions expose children to psychological and other harms.

Donors and environmental agencies consider child labour in the mining sector as the worst form of child labour that should be outlawed (O'Driscoll, 2017). However, this remains a contentious issue as

[39] Kimberley Process Certification Scheme (KPCS) is the process established in 2000 to prevent "conflict diamonds" from entering the mainstream rough diamond market by United Nations General Assembly Resolution 55/56. Diamonds were fueling conflicts in Sierra Leone, Liberia and Angola

there are those who argue that not working will drive these already poor families into further poverty. These proponents actually argue that it is the participation in these activities that enables some children to go to school (O'Driscoll, 2017) and that a ban may actually harm the children (Faber *et al*., 2017). Nevertheless, there have been efforts to interdict child labour in ASM mainly through using certification schemes that guarantee that supply chains are free of child labour. Some of these responsible mining initiatives include Fairtrade, Fairmined, OECD, and the Responsible Jewellery Council (O 'Driscoll, 2017).

3.5 Supporting ASM

ASM has not traditionally been on the radar of development partners. Hilson (2016b, p. 551) argues that while donors in sub-Saharan Africa in the 1970s had rural development programmes focused on 'Integrated Rural Development', improving prospects for smallholder farmers, these programmes were largely rhetorical, as the main focus was on "large-scale, export-led growth" and "big projects such as dams, oil pipelines, mines and forestry". They also overlooked the role of ASM in rural development. While there was a shift in the 1980s towards livelihoods diversification, ASM was considered "independent of agriculture and other rural development concerns" (Hilson, 2016b, p. 551).

The United Nations' report entitled "*Small-Scale Mining in the Developing Countries"* (UN, 1972), marks the beginning of a series of concerted efforts by development partners focused on capacity building and technology transfer programmes encouraging efficient and environmentally friendly mining and processing methods (including mercury reduction) (Aryee, Ntibery, & Atorkui, 2003; Collins & Lawson, 2014; Sippl & Selin, 2012). However, these initial efforts were not very successful.

According to Sippl & Selin (2012, p. 21), in the 1970s and 1980s, international capacity-building and technology-transfer programs had a tendency to be "characterized by experts from northern industrialized countries spending short periods of time in southern developing country communities to conduct training and introduce new ideas and systems, then going back home again with few continuing connections or commitments". Many of these activities failed to have real impacts because they were short-term in nature and failed to take into account local contexts (ECA, 2002). Further, in the mid-1990s, funds from the World Bank and other international sources were used to purchase equipment that was either not suitable for small-scale miners or that small-scale miners did not know how to use, because this equipment was not accompanied by appropriate sensitisation and training programs. Other equipment provided more recently has been received positively, but it is unlikely to be affordable for miners to retain and maintain (Aryee *et al.,* 2003).

Another focus of support has been alternative livelihood schemes that sought to discourage ASM. Large-scale mining projects also frequently invest in alternative livelihood programmes in efforts to curb illegal mining on or near their concessions (Aryee *et al*., 2003). According to Hilson and Banchirigah (2009), in sub-Saharan Africa, alternative livelihoods programmes have mainly been agrarian-based. However, they question the viability of such programmes and whether they actually slowed the growth of ASM, arguing that ASM itself is in fact, the alternative livelihood for farming, which has become unviable due to structural adjustment and the global economy. Tschakert's (2009) study of ASM miners in Ghana corroborates these observations on alternative livelihoods.

According to Hentschel *et al*. (2002, p. 9, cited in Collins & Lawson, 2014), the approaches used by the international development community to deal with ASM have evolved along with increased understanding of the issues involved. These approaches can be summarised as follows (Table 3.1):

Table 3.1 Approaches for dealing with ASM

Period	Approaches for dealing with ASM
1970's	Definitional issues
1980's	Technical issues
Early 1990's	Towards integration of technical, environmental, legal, social and economic issues
1990's	Special attention on legalisation of ASM sectors
Mid to late 1990's	Relation between large mining companies and ASM Gender and child labour issues
2010's	Community related issues and sustainable livelihoods
Post 2010	Ethnographic details on life world and formalisation

Source: Adapted from (Hentschel et al. (2002), p. 9)

Collins & Lawson (2014) provide a compendium of approaches to working with ASM based on a comprehensive review of literature documenting how international donors, national and sub-national governments, civil society, universities, ASM associations and other stakeholders have tried to support and regulate ASM. This compendium provides the following categories of approaches to working with ASM:

- Knowledge-based strategies
    - National and local data on ASM
    - Knowledge sharing
    - Local-level community consultation, dialogue and participation
- Regularization and formalisation of ASM
    - Putting legislation in place
    - Enforcement
    - Incentives and strategies to overcome obstacles to formalisation
    - Cooperatives and associations
- Training/capacity building programmes
    - Technical support and assistance
    - Assistance Centres
- Strategies focused on mercury
    - Minamata Convention on Mercury
    - Centralised processing centres
    - Mercury retorts
    - Clean/No-mercury technologies
- Financial assistance
- Fair Trade, Standards & Certification Initiatives
- Beneficiation of resources
- Intersection of ASM with large-scale mining

  - Geological information and demarcating areas for ASM
  - Relocation to demarcated areas
  - Technology transfer
- Land rights/Securing tenure for miners
- Reclamation of lands mined by small-scale miners
- Gender-focused strategies
  - Research into women miners
  - Gender sensitive access to microcredit
- Alternative livelihoods approaches/Livelihood diversification

Hilson & McQuilken (2014) provide an analysis of the support provided to ASM by the international community over the last four decades in sub-Saharan Africa, reflecting on why ASM still occupies a “peripheral position” (p. 104). However, there have been some encouraging outcomes from more recent support programs indicating some of the lessons are being learnt. Some examples of these include:

- From 2000-2011, the World Bank housed CASM (Communities and Small-Scale Mining), intended to serve as a global initiative/dialogue on ASM to coordinate knowledge-sharing. CASM was sponsored by a number of international organisations including the International Labour Organization (ILO), the United Nations Department of Economic and Social Affairs (UN-DESA), Conservation International, and the British Department for International Development (DFID) (World Bank, 2003, p. 10). More recently, various projects focused on ASM have been run through the World Bank’s Sustainable Management of Mineral Resources Project (SMMRP).
- The UN Seminar on Artisanal & Small-scale Mining in Africa: Identifying Best Practices & Building the Sustainable Livelihoods of Communities held on in 2002 adopted the “Yaoundé Vision on ASM", which recognised both the poverty-driven nature of the activity as well as its poverty reduction potential (ECA, 2002: 92-101). It called for greater alignment to and integration of ASM in rural development plans. This vision document detailed a series of policy objectives to deliver sustainable reductions in poverty and to help improve livelihoods in African ASM communities by 2015. Though the “Yaoundé Vision on ASM" was acknowledged as a policy document that has mobilised practitioners and politicians globally, the degree to which its implementation has led to improvements for miners and communities remains contested.
- In July 2015, the ACP-EU Development Minerals Programme was launched. The programme largely aims to develop the capacity of mineral institutions and the small-scale private sector, operating in low-value minerals in ACP countries.
- Similarly, in October 2016, the Global Environment Facility approved the development of a programme entitled Global Opportunities for the Long-term Development of the Artisanal and Small-Scale Gold Mining Sector (GEF-GOLD) – See Box 3.3. The programme, led by UN Environment and jointly implemented with Conservation International, UNDP and UNIDO, built on the experience of the participating agencies, and is composed of *four* main components: 1) formalisation of the sector, 2) access to finance and to global gold markets for ASM communities, 3) reduction of mercury use and 4) maintain a knowledge management and information exchange mechanism (See Box 3.3).

Box 3.3 GEF GOLD

The GEF -GOLD programme is a 45million $ investment from the Global Environment Facility which was approved in 2016 and constitute the first large intervention under the Minamata Convention on mercury to address artisanal and small-scale gold mining sector, which is the largest user and emitter of mercury to the environment. The programme is composed of a suite of 8 projects which will address:

- Formalisation of the sector. The Convention recognize that formalization is the first step towards implementing sustainable solutions and it requires each party in which the use of mercury in ASGM is "more than insignificant" to, *inter alia*, develop a strategy for formalization of the sector.
- Improving access to finance and international gold market. The programme will educate the investor sector on the potential of the sector and capacitate miners to apply for funding to procure the necessary equipment, which will ensure a more efficient and cleaner gold extraction (mercury-free). At the same time, the project will work on the gold value chain to ensure a more direct access (i.e. more income) to international gold markets where the appetite for responsible ASM gold is growing.
- Technology transfer to demonstrate the applicability of non-mercury gold extraction methods which are both more efficient and which lead to a lesser impact on the environment.

Knowledge creation and management. The Programme will collect and curate existing information on the sector and assist participating countries in identifying the best options corresponding to their particular conditions. This component will also collect information and lessons learned from the implementation in the 8 countries and build up the database of experience. Finally, this component will produce and disseminate information material to educate the public at large including gold consumers. Use of new communication tools will provide interactive material.

The United Nations Economic Commission for Africa (ECA) produced in 2002 a Compendium on Best Practices in Small-scale Mining in Africa, which was one of the first attempts to document across several jurisdictions on the continent, good practices in mining policy and legislation; promotion of clean and efficient technology; minerals marketing and access to credit and finance; environmental management, health and safety; capacity building and technical assistance programmes as well as addressing gender and child labour in the ASM sector (ECA, 2002).

3.6. Upgrading ASM to better deliver on the SDGs

Much has been – and is being – done to improve governance of ASM and enhance its contribution towards achieving the Sustainable Developoment Goals (SDGs). A number of initiatives have been proposed. These include broader processes and approaches (such as formalisation), as well as individual initiatives (Weldegiorgis, 2016). Some of these are discussed below.

3.6.1 Increased focus on innovation

ECA argued for adequate allocation of funding to local centres of innovation and adaptation of technology as well as the dissemination of tested models of equipment hiring, pay-back or hire-to-pay schemes. It further noted that the success of any programme to develop the ASM depended on the quality of baseline studies aimed at identifying user needs and profiling it at a disaggregated level (ECA, 2011).

3.6.2 Bottom-up approach

Experts are increasingly advocating for bottom-up approaches that directly engage miners themselves (Salo *et al*., 2016). The need for a better understanding of the context specific and nuanced characteristics of the practices and the people involved (including organisational structures and labour hierarchies) is also frequently highlighted (see, for example, ECA, 2011: 80-84; Hilson, 2009).

According to Childs (2008, p. 204, citing ILO 1999), many of the approaches used with ASM in the past treated it as a subset of large-scale formal mining and did not take into account its very specific problems (Verbrugge & Besmanos, 2016). Some of the more promising approaches are briefly discussed below.

3.6.3 Formalisation

While formalisation is not a silver bullet, there is generally consensus that it forms the cornerstone of effective management of the sector. Much of the literature on ASM points to formalisation as a key strategy for regulation, increasing the sustainability of activities, creating benefits for communities and minimising negative impacts (ECA, 2002; Banchirigah, 2008; Collins & Lawson, 2014; Dube *et al*., 2016; Lowe, 2005; Maconachie & Hilson, 2011; Salo *et al*., 2016; Siegel & Veiga, 2009; Smith *et al.,* 2017; Spiegel, 2015b; Verbrugge & Besmanos, 2016). Formalisation refers not only to the presence of legislation, but also to “the activation and enforcement of it by authorities and the extent of their success” (Hilson, Hilson, & Pardie, 2007, pp. 276-277). A recent program (Passport to Markets) supported by the European Partnership for Responsible Minerals (EPRM) has enabled a partnership between the Alliance for Responsible Mining (ARM) and RESOLVE to produce a Code of Risk-mitigation for ASM engaging in Formal Trade (CRAFT). The CRAFT seeks to assist buyers to apply due diligence in the sector and create a gateway into the formal market for artisanal and small-scale miners (see www.craftmines.org).

The UN Environment Global Mercury Partnership analyses several formalisation efforts in its report entitled: *Analysis of formalization approaches in the artisanal and small-scale gold mining sector* (UN Environment, 2012). Many countries formalised their ASM sector in the last few years (See Box 3.4 below). More recently, there has been a re-focus on formalisation through organisations such as the International Institute of Environment and Development (IIED) and the Minamata Convention on Mercury which requires that countries where ASM is “more than insignificant” develop a National Action Plan, containing, inter-alia, steps to facilitate the formalisation or regulation of the sector (see Box 3.2).

Box 3.4. Formalisation of ASM - *The Sustainable Artisanal Mining (SAM) Project*

Though Mongolia is traditionally a pastoralist society, artisanal mining (SAM) is now one of the key sectors of the economy. Unofficial estimates suggest that the number people involved in ASM is close to 100,000 (1/3 women, 2/3 men), equivalent to about 25% of the rural workforce of about 400,000 people who depend indirectly on this activity. The shift towards ASM was triggered by three disasters hitting herders between 1999 and 2002, in which about 11 million animals were lost. Artisanal and small-scale mining (ASM) suddenly became the only alternative source of livelihoods. Many people were lured into ASM when gold prices entered an upward trend in 2003.

As ASM grew in size and impact, and developed outside the control of the government, it increasingly became a political issue. ASM was considered to be responsible for serious environmental impacts, tax evasion, illicit minerals trade, dire safety conditions, and paltry social welfare. These were legitimate concerns and vested interests created a popular narrative in which ASM was considered an undesirable aspect of Mongolia’s mining scene and artisanal miners were frequently being subjected to discrimination and human rights violations.

The Sustainable Artisanal Mining Project sought to rectify this and make Artisanal mining a motor for sustainable rural development under an integrated sustainable resource management by the

Government of Mongolia. It aimed to achieve this goal by supporting the establishment of transparent and straightforward legal system; formalization of institutional structures and organization within ASM; enhancing skills development and transfer of know-how; and establishment of knowledge base for integrated natural resource management and rural development.

SAM has had significant impact. Thousands of miners are working formally via local ASM organizations and are registered for social and health insurance. Best practice examples of environmental reclamation, occupational safety, and increased local development contributions emerged. The ASM Federation increasingly became a strong and effective advocate for miners' rights. An ASM Unit is now established within the Ministry of Mining's (MoM), and ASM commitments from ministries responsible for labour, social protection, and health are strong. Crucially, the public and political perception of ASM has improved considerably.

Ultimately the SAM Project seeks to transform Mongolia into an international knowledge hub for ASM best practices. And it has already had impact in improving governance of the sector. The Better Gold Initiative, a global certification standard for artisanal gold (see chapter 7) was built on the expertise gained from the SAM Project. The knowledge from both the SAM project and the Better Gold Initiative were a crucial input into the negotiation process which led to the Minamata Convention (a Multilateral Environment Agreement (MEA) of UN Environment.

Source : http://sam.mn/sustainable-artisanal-mining-project/

An analysis of the institutional frameworks governing ASM in Zimbabwe undertaken by Dube *et al*. (2016) identified some common barriers to miners' formalisation including "high registration and compliance fees; limited knowledge of the formal institutional frameworks; limited access to the formal market and opaque nature of a registration process that often breeds corruption" (Dube *et al.*, 2016, p. 1091). These barriers are common in many countries.

This study also highlights a key point raised by Spiegel (2015b, p. 544) about formalisation policies being potentially misused by elites to "consolidate power rather than to distribute "development" opportunities" (Verbrugge & Besmanos, 2016; Banchirigah, 2008; Maconachie & Hilson, 2011; Salo *et al*., 2016; Siegel & Veiga, 2009; Smith *et al*., 2017). Collins and Lawson's (2014) compendium of approaches to working with ASM provides the following table (Table 3.2), outlining key obstacles to formalisation and potential strategies or incentives to encourage formalisation.

Table 3.2 Obstacles and incentives (strategies) to formalisation

Obstacles	Incentives/strategies to encourage formalisation
Miners feel there is little difference between being legal and illegal	• Linking technical support and capacity building activities to formalization. • Linking access to credit to formalization. • Government purchasing commodities at a higher price than informal markets.
Miners' lack of knowledge of legal requirements	• Capacity building/awareness programmes.

	• Communicating more regularly and effectively with miners.
Traditional and cultural practices, e.g. operating individually without seeking permits; or chieftaincy systems	• Baseline information to understand target community. • Increasing local participation, including traditional authorities, in initiatives linked to formalization. • Working closely with local organisations and communities.
Licensing fees are too high for miners	• Reducing costs in licensing, royalties, taxes and fees – see, for example, the comparative study undertaken by USAID (2010), which assessed how legalization of artisanal diamond miners can be promoted through reduced costs of licensing, royalties, taxes, and fees.
Miners fear of having to pay taxes, royalties and fees, if legalised	• Tax incentives. • Incentives which provide direct access to markets which pay higher prices for commodities than the informal market. • Capacity building and training programs linked to formalization.
Complex and bureaucratic process to formalize	• Simplifying licensing procedures. • Providing decentralised support to miners in the formalisation process.
Miners have to travel to large centres to apply for licence	• Decentralising licensing procedures to regions where mining is taking place.
Miners have to re-apply for licences every two to three years, making it difficult and costly for miners to maintain legal status	• Increasing licence expiration period. • Reducing bureaucratic procedures for reapplication of licence.
Free access to most convenient buying agents (including non-licenced) as informal enterprises	• Government purchasing commodities at a higher price than informal markets. • Access to markets which pay higher prices for commodities than the informal market, e.g. Oro Verde and Fairtrade initiatives.
Mobility of small-scale and artisanal miners- informality helps to maintain flexibility in shifting from one site to another	• Geospatial data. • Geological mapping.
Limited access to mining concessions for small-scale and artisanal miners	• Demarcation of areas for ASM.
Rare visits and inspections of ASM mines	• Decentralisation of offices to mining areas. • Decentralising monitoring responsibilities. • Up-skilling miners to monitor health, safety and environmental practices.
Limited danger of sanctions in combination with the possibilities to evade the imposition of the law	• Transparency measures for ASM.
Providing incentives requires a level of capacity from government that might not exist	• Capacity building for government. • Public-private partnerships.

	• Increased advocacy to encourage resources and attention to be directed at ASM.

Source: Adapted mainly from Hentschel et al. (2002), Spiegel (2012a) and Veiga et al. (2006), and also citing Andrew (2003); Hilson and Maponga (2004); Maconachie and Hilson (2011); Peru Support Group (2012); Spiegel (2012a), USAID (2010) and Veiga et al. (2006).

3.6.4. Formation of associations and cooperatives (self-regulation)

Mutemeri *et al*. (2016, p. 657) argue that ASM policy must emphasise on ''*building the capacity* of existing forms of association, organisations, co-operatives and governance, thus by building on existing forms of self-regulation". They point to ASM associations and cooperatives as structures that "lend themselves to self-regulation" and cited Tanzania as an example where regional miners associations have managed to exert influence over small-scale miners to operate responsibly (Mutemeri *et al*., 2016, citing Mwaipopo *et al*., 2004).

In some countries, such as Ghana, the formation of cooperatives has been useful for organising miners so that they can self-govern and advocate for their interests, particularly in terms of negotiating with large-scale mining companies.

3.6.5 Decentralisation

While many donor projects focus on different aspects of formalisation for ASM, they often prioritise national-level governance structures and by-pass local governance structures (Spiegel, 2012a; Spiegel & Veiga, 2010). For example, many conferences on ASM focus on the role of national governments in relation to ASM and do not include local government actors (Spiegel, 2012a). Spiegel (2015a) has argued that the policy shift disempowering local government officials from regulating artisanal mining in their districts resulted in an alienation of the authorities from the miners and a free-for-all approach from individuals and corporations who have permits from national mining headquarters. As such, artisanal miners continue to be blamed for economic and environmental problems and face coercive control tactics without any measures to facilitate compliance. This institutional failure has been the major factor exacerbating economic and environmental problems, and ironically, legitimising further coercive control tactics (Mabhena, 2012; Spiegel, 2015a; Spiegel, 2015b).

Decentralisation of licensing processes and regulation of ASM to local levels of government is seen as a (theoretically) effective way of facilitating formalisation of ASM and managing its impacts. However, decentralisation policies have failed on the ground in a number of jurisdictions (examples include Ghana and Zimbabwe), due to their ineffective implementation (Hirons, 2013; Spiegel, 2015b).

O'Faircheallaigh & Corbett (2016) map the key features of policy and regulatory responses to ASM around the world using a heuristic model with two key variables: geographical scope (that is, national or regional/local) and the extent to which policy and regulation is coerced or incentive-based (for example, military crackdowns versus encouraging the formation of associations/cooperatives through training and finance). The authors propose that "regulation must be heavily focused at the local or regional level if it is to be effective, because it is at these levels that knowledge exist on the realities that ASM miners face on the ground, and where capacity may exist to actually apply policy and regulation in remote areas where ASM often occurs" (O'Faircheallaigh & Corbett, 2016, p. 967). At the same time, they acknolwedge that some central coordination is important. They discuss new legislation introduced by the Autonomous Bougainville Government in Papua New Guinea in 2015 as a potentially effective model, as this model combines local regulation (including recognition of the right of customary landowners to negotiate terms with ASM operators) and capacity building with central coordination.

3.6.6 Certification and Fair Trade

A number of certification and fair-trade schemes have been developed for ASM. Hilson *et al*. (2016) describe 14 ethical mineral schemes and standards, of which at least five target ASM. These are: the Better Gold Initiative (BGI), Fairtrade Gold, Fairmined Gold, Tin Supply Chain Initiative (iTSCi), and Diamond Development Standards (DDS). McQuilken (2016) also reviews four ethical gold schemes: the Conflict-Free Gold Standard (CFGS); the Better Gold Initiative (BGI); Fairtrade Gold; and the Fairmined Gold Standard. He provides an overview of these standards and analysis on their strengths and weaknesses. He found that these schemes face enforcement challenges and are reliant on inputs from 'Western' organisations (McQuilken, 2016). The schemes also tend to be top-down initiatives that do not encourage the agency of miners but rather depend on Western consumers.

According to Hilson *et al*. (2016, p. 241), many ethical and fair-trade schemes have been "shaped by discourses on security, conflict minerals and civil war" and the "main priority for most is to supply commodities that can be traced to the source". Schemes and interventions specifically aimed at 'conflict minerals' and cutting their links to armed groups include (Cuvelier, Vlassenroot, & Olin, 2014; Hilson *et al*., 2016; Spiegel, 2015a):

- the *Kimberly Process Certification Scheme* (KPCS) – established in 2002 by the United Nations General Assembly;
- the 2010 United States Dodd-Frank Act – legislation focused on the 'conflict minerals' cassiterite (tin), columbite-tantalite (tantalum), gold and wolframite (tungsten);
- the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas (adopted in 2011); and
- the Regional Initiative Against the Illegal Exploitation of Natural Resources of the International Conference on the Great Lakes Region (ICGLR).

The KPCS is said to have influenced many ethical and fair-trade schemes (Hilson *et al*., 2016). According to Cuvelier *et al*. (2014, p. 341), "these interventions often tend to rely on unsupported assumptions regarding how natural resources are linked to the motivations of combatants and the dynamics of conflict, and rarely consider the populations in conflict-affected regions, who play an integral role in these dynamics".

Spiegel (2015a, p. 266) analyses the discourse around the KPCS in the context of Zimbabwe's Marange fields, and concludes that "attention to conflict-free diamonds which are of great use to corporate interests in protecting the image of a global commodity chain, provided no benefit to populations in Zimbabwe who were marginalized and oppressed in the process". Similarly, the Dodd-Frank Act has been criticised for inducing hardship on informal Congolese miners and for causing the collapse of local economies (Hilson *et al*., 2016; Radley & Vogel, 2015; Raghavan, 2014; Vogel & Radley, 2014; Wolfe, 2015) to "ease the consciences of Western consumers" (Ben Radley, cited in Wolfe, 2015).

Hilson *et al.* (2016) argue that many ethical mineral schemes and standards claim to target poor and marginalised miners, but tend to work with already established and well-networked miners because they are the ones capable of meeting the stringent requirements required to supply minerals that can be tracked along the supply chain. Because they work within the same institutional structures that tend to marginalise ASM operators, rather than working to challenge them, such schemes are prone to "elite capture" (McQuilken, 2016, p. 194). They tend to target those miners "regarded as being 'low hanging fruit' or easy to access" (McQuilken, 2016, p. 190), leaving the majority of operators incapable of accessing certification schemes for the same reasons they cannot formalise their operations (such as long, costly and bureaucratic licensing procedures and the lack of availability of mineralised lands). In a review of ASM conflict free mineral certification schemes targeted for EU market access, Eslava (2018) notes that most often ASM and the certification of its activities is considered solely from an economic perspective and does not consider the local social and cultural dynamics that underpin the activity, leading to the design of sub-optimal incentives for certification. Eslava (2018) argues that ASM sector should be supported to comply with conflict-free and responsible mining and sourcing schemes and that EU upstream actors, especially SMEs, should be supported in their attempts to engage with and improve the situation in the ASM sector.

Hilson (2008) also argues that because gold derived from ASM in sub-Saharan Africa is an important source of foreign exchange for national governments, fair trade for ASM cannot follow the same model, as it does for other commodities such as coffee, tea and cocoa, which focuses on connecting ASM producers with Western retailers. It should be adapted, he argues, to focus on national governments as the end consumer. Similarly, Adler Miserendino *et al.* (2013) question the ability of consumer-based pressure to address the impacts of ASM due to its tendency to be driven by the need for immediate profits.[40] See also Chapter 7 for an assessment of governance instruments.

3.6.7 Capital and finance (including microfinance)

Spiegel (2012b) examines the roles of microfinance services to engage economically vulnerable mining groups and assess its constraints. He found that like fair trade schemes, microfinance programmes risk being elite captured and limited, if they do not tackle the "structural inequities" and "institutional ambiguities" that limit "mineral marketing, resource ownership rights and licensing opportunities for the poor" (Spiegel, 2012b, p. 507).

Additional risks include non-repayment of loans and improper use of credit (that may exacerbate rather than reduce safety and environmental risks). Donors could look beyond the standard model of microfinance that treats it as "merely a commercial loan product" (Spiegel, 2012b, p. 488) to address broader concerns in rural communities, such as lack of literacy and business development skills, and health issues, by working alongside other social development programmes. This requires targeted local needs assessment and consideration of alternative models, support to labour groups to develop lending and savings programmes (including micro-savings), public subsidies for credit, and government-supported equipment loans as an alternative to cash.

Small grants and equipment leasing schemes have been set up in countries such as Tanzania (Fold *et al*., 2014; World Bank, 2009), through the World Bank's Sustainable Management of Mineral Resources Project (SMMRP). Commenting on this, Spiegel (2015b) notes that: "the government's ASM-sector microfinance program became profiled at a UNIDO conference in 2005 as one of the most proactive examples of how acquisition of a small-scale miners' licence could lead to benefits such as credit access." The actions highlighted above with respect to upgrading or improving the governance

[40]Other relevant research on the theme include Childs (2014a), Childs (2008), Childs (2014b) and Imparato (2010).

of ASM will have to be done within a country-specific context. The implication is that political economy issues will need to be addressed. Box 3.5 briefly addresses some key considerations.

Box 3.5 The Political economy of ASM

While ASM supports the livelihoods of many poor rural people, the story is more complex. As pointed out earlier supply chains of ASM are global with many actors including local traders, city-based financiers, government elites (including military) and even global criminal networks. Mawowa (2013) argues that associating ASM only with informality and casting it as a survival strategy for the poor is clearly inadequate in the Zimbabwean context, as senior civil servants, politicians and military figures play a critical role in ASM. The fact that there are many actors, some with significant influence, means that actions to upgrade and 'clean' artisanal supply chains must take into consideration the political economy driving decisions by miners, buyers, traders and other key stakeholders. IGFM (nd) points that understanding the financial flows is critical to capture who the winners and losers are within existing systems, and who is most likely to oppose reform efforts. Mapping ASM's complex relationships and interactions is vital for effective policy formulation, which balances the interests of governments; economic actors involved in ASM and affected communities.

3.7 Gender in ASM

Artisanal, informal and small-scale mining is a highly gendered activity, both in terms of growing numbers of women joining this work, and in the deepening gendered nature of the tasks involved. Discussions fail to adequately highlight women's productive roles or specify the gendered impacts of the mining industry (IGF, 2018). Women's contributions to the mining sector remain invisible mainly because the literature on mining has historically focused, to a large extent, on digging practices, putting emphasis on the miner and excluding women who are mostly engaged in such non-digging activities as crashing, sluicing, washing, panning, sieving, sorting, transporting, mercury-gold amalgamation, amalgam decomposition, cleaning and food vending (IGF, 2018). Women in ASM perform some of these processing activities at home while attending to domestic chores, thus their involvement in mining sites is limited, contributing to their invisibility (Eftimie *et al*., 2012). Yet, crucial to a gender perspective is an appreciation and understanding of ASM-based livelihoods that support women's primary reproductive roles: ensuring household food security, care for the children and nurturing of the children (Lahiri-Dutt, 2012).

Compared to formal, industrial and larger-scale mining, many more women are involved in ASM. Moreover, in ASM communities throughout the world, women and men have different social roles, rights, and opportunities and will be affected in different ways by any major change in the environment. They also play different roles in production and labour organisations. Women and men are also at different levels, when it comes to having access to land and non-land inputs such as extension services (Lahiri-Dutt, 2008). Lahiri-Dutt (2015) notes that, compared to large-scale formal extractive industries, women's labour contributions to ASM are larger and increasing. A recent survey conducted by SDC (2013) found that on the average, about 71 percent of artisanal miners were male and the average age of the miners was around 37 years. The proportion of women involved varies across continents and for the type of minerals. For instance, 10-50% in Asia; 10 -30% in Latin America; and 40 - 100% in Africa (Hinton, 2003; Eftimie *et al*., 2012). In some countries, women make up the majority of the ASM labour force (for example, up to 74% in Guinea, and 50% in Madagascar, Mali, and Zimbabwe (Yakovleva, 2007). However, because women do not own the land, they are generally not the owners of ASM operations. This means women's labour is used in ASM for surplus accumulation. In the range of tasks in ASM such as digging, panning, processing, transportation and related chores, the percentage of women involved can vary from as low as 10% to as high as 50%.

Women are more heavily represented in lower value industrial mineral sectors, the proportion rising to over 75 % in salt mining (Lahiri-Dutt, 2007). Women tend to have different work from men (such as hauling or washing ore) and are generally paid less; even where women perform similar tasks, they tend to have lower salaries (Eftimie *et al*., 2012). In a country like Mongolia, women's participation in ASM is generally higher than in the large-scale mining sector. Mongolia is also no exception to the gender segregation of tasks in ASM; for activities such as digging, panning, processing, transportation and related chores, the percentage of women can vary from 10 % to 30 % depending on the context (Purevjav, 2011). In general, studies of women's involvement in ASM reinforce the conclusion that a globalised gender inequality exists in ASM (see also Tallichet *et al*., 2003, Bashwira *et al*., 2014, Huesca, 2013, Rustad, Østby, & Nordås, 2016).

Hinton *et al.* (2003: 13) suggest that the key factors in determining gender roles and the status of women in ASM include women's and men's access to and control of resources; their ability to attain knowledge of resources, their decision-making capacity or political power; and beliefs or attitudes that support or impede the transformation of gender roles. In attempting to address gender inequalities in ASM, for instance, Kenya's draft Mining Policy's commitment to gender mainstreaming aimed at ensuring that women were represented, including within associations and cooperatives (Huggins *et al*., 2017).

The World Bank (2015, drawing on Collins & Lawson, 2014; Hinton *et al*., 2003; Tallichet *et al*., 2003) has identified the following "best practice examples of gendered ASM assistance strategies":

- Developing systems to formalize and regulate ASM activities, particularly those involving women.
- Developing incentives to increase participation in the formal sector (such as financial assistance and capacity building programmes).
- Encouraging the formation of women's mining cooperatives, associations and networks to encouraging women's participation, bargaining power, work conditions and economic independence.
- Gender-sensitive financial support, such as microcredit.
- Gender-sensitive training and capacity building in technical areas (such as minerals processing); health and safety; financial literacy; legal capacity; bookkeeping/accounting; marketing and managerial skills.
- Beneficiation (value-adding) strategies targeting women (such as lapidary and jewelery making).
- Mining site support services (such as childcare services).
- Alternative livelihoods programmes.

Additional potential positive gender-focused governance instruments include initiatives that integrate women and gender considerations in the development of ASM legislation; policies and support for women to acquire mineral titles/licences and understanding of the legislative environment of ASM; and further studies and programmes focusing on gendered health and safety issues in ASM (Collins & Lawson, 2014; Hinton *et al*., 2003; Tallichet *et al*., 2003).

3.8 Conclusion

Artisanal, informal and small-scale mining is located at the other end of the spectrum of extractive practices, yet by itself presents a diversity that makes it difficult to offer one-size-fits-all 'solution' (Lahiri-Dutt, 2016). As compared to larger-scale, formal and industrialised mining, the diverse extractive practices, processes and regimes, many more people are involved in ASM deriving livelihoods from it. Yet, ASM also poses serious environmental, social and regulatory challenges. These include serious environmental damages, exploitative labour relations and conflicts. In some countries, such externalities can threaten other livelihoods such as agriculture, forestry or grazing. As ASM minerals tend to be traded and some are crucial to some globally important sectors, especially electronics, and where consumers are demanding that minerals do not fuel conflicts, their governance has also become a major global concern. In some regions, the criminalisation of ASM has compounded the governance problem. There are examples of initiatives adopted by some governments to innovatively deal with these challenges.

Globally, attention is now focused on finding ways to formalize ASM for better regulation and governance. However, the fact is that much of ASM is a part of the informal economies of the countries where they occur (Lahiri-Dutt, 2004). The independent exercise of agency may reflect a typical principal-agent problem given the myriad of actors involved (for example, governments with offices located far away from mining operations; powerful well-placed ASM entrepreneurs; savvy middlemen; and a poverty-driven workforce) all driven by different interests and motivations. Given the sheer size of ASM in terms of commodities produced (and traded), and numbers of people involved, more investment needs to be made to improve ASM profiling and the targeting of support programmes. Governance of ASM will therefore need to be embedded in extractive policy instruments.

Macro level initiatives aim to link ASM to global supply chains through the implementation of systems that can guarantee responsible sourcing (such as the OECD Due Diligence Guidance system). The development of certification systems (see Chapter 7 for more on this topic) that can guarantee sustainable practices in return for a premium in prices received by the ASM miners might also become popular in future. However, the conceptualisation and design of the certification schemes may require a review to reduce unintended impacts on poverty and gender, which can render such schemes ineffective as tools in breaking up the links between mineral resources dependence, poverty, environmental degradation and conflict.

CHAPTER 4 – TRENDS IN THE EXTRACTIVE SECTOR TOWARDS 2050

4.0 Introduction

Minerals and metals are the fundamental building blocks of civilization. Along with energy, they form an essential foundation upon which modern economies and living standards rest[41] (USGS, 2015). It follows that population growth and affluence inevitably translate into higher demand for minerals and metals. In addition to a growing global population and rising incomes that will fuel demand, technological progress is rapidly changing the demand patterns for raw materials. So, metals that were hardly in demand a few years ago, like indium, are now critical as they are used in smart phones with touch screens, which have become ubiquitous. Therefore, new technologies are creating new vulnerabilities in economic systems (EU, 2014).

Minerals and metals markets have always been marked by supply and demand imbalances as it takes many years for industry to react to sudden demand increases, or supply disruptions. The continuous interactions between demand and supply are governed by complex feedback mechanisms (Wellmer & Dalheimer, 2012; Wellmer & Hagelücken, 2015). External shocks such as geopolitical tensions (oil shocks of the 1970's, rare earth crisis of 2010-11), social tensions (for instance strikes in major mines and/or smelters) or natural catastrophes (droughts, floods, landslides, earthquakes impacting major production facilities) can have major impacts on the supply of minerals and metals. On the demand side, the rapid economic emergence of highly populated countries and the development of the global middle-class have major impacts as well. The rapid economic development of China, a phenomenon unprecedented in recorded history by its magnitude (due to the size of its population) and speed led to significant price hikes of many minerals since 2002.

Technology shifts can impact both sides of the demand and supply balance. Some rarer metals can have only one of very few specific industrial uses and demand for them can rapidly dwindle due to a technology shift. An example of this are europium and terbium, two very scarce rare earth metals that were in high demand in the first part of the 2010 decade, due to their use for the production of phosphor powder needed for the production of compact fluorescent lamps (CFLs), then a very successful energy-efficient lighting technology. Now (2018), some years later, even more energy efficient LEDs have widely replaced CFLs. LEDs require no, or little, europium and terbium.

The relative inelasticity of minerals and metals production can also lead to the development of overcapacities. In periods of high demand, investors invest in new mines and smelters which may lead to the development of important overcapacities when, years later their production starts. At that time the demand may have reduced, for instance due to an economic slowdown. The overcapacity issues is one of the nagging problems of several global minerals and metals industries, such as the aluminium (The Aluminium Association, European Aluminium, Aluminium Association of Canada, Japan Aluminium Association, 2018) and the steel industries (McKinsey & Company, 2018). Overcapacities depress the minerals and metals.

[41] Minerals used in common applications include iron to produce steel, copper used in electrical wiring and plumbing, and titanium used for the structural frames of airplanes and in paint pigments.

Metal prices reflect changes in the supply and demand balance, and also reflect market anticipations. Rapid changes in the factors impacting on demand or supply lead to price volatilities, which can be exacerbated by speculation. Speculation on many minerals and metals is much facilitated by the existence of unregulated financial instruments, many internet-based, making it possible to speculate on the future pricing of many minerals and metals. At the same time, some of these instruments, such as future markets are extremely useful to industrial players to hedge their production, ensuring their value against future price hikes or decreases. Hedging techniques in this case contribute to better price stability.

As the complexity and sophistication of products is growing, leading to a corresponding increase in the number of materials used in their production, the material supply chains needed to deliver these are also becoming increasingly complex. For instance, the supply chain of the CdTe solar cell has 617 nodes and 999 links (Nuss *et al*., 2016). This is making economic systems highly vulnerable to supply chain challenges and disruptions.

The fact that mineral resources are finite and that growth can eventually outstrip supply[42] has been an issue of concern for some time. The well-known Limits to Growth study by the Club of Rome (Meadows, 1972) forecasted a global crisis by around 2000 for several metals (for instance, copper reserves were to be exhausted in 2008). Mudd (2010), after a thorough analysis of the Australian industry, points to environmental factors (energy and water use, waste generation) and costs as potentially important issues for the future of mining in Australia. A comparable observation has been made for the Chilean copper industry by the Chilean Copper Commission (COCHILCO, 2017), whereby in 2027 the copper production of Chile may only be about 2% above its 2016 level, due to environmental constraints. Chile is the world's largest producer of copper ore (28% of the 2016 world production). However, the debate on what constitutes finite resources is more nuanced. Some have argued that economic mineral resources are not a stationary, solitary figure, but rather a function of prevailing economic, technological, social and environmental constraints. Indeed, this debate is best exemplified by the famous bet between the biologist, Paul Ehrlich, who predicted the running out of materials in face of projected population explosion[43] and the economist, Julian Simon, who argued that growing population was not a catastrophic problem as higher demand will lead to higher prices and there will be an incentive to find more materials, or find alternatives and thus prices would remain low. The economist won the bet.[44] This example illustrates the challenges of framing the debate of the future availability of natural resources where people take extreme positions, one side warning of a certain catastrophe, and the other having undue faith in economics and technology (Kestenbaum, 2014). A more appropriate way of looking at this is offered by Mudd (2010) who argues that although

[42] For example, if demand of indium continues at its current pace, according to some estimates, supply may run out in around 10 years. China, which produces around 90% of the world's rare earth metals, estimates that its mines might run dry in just 15-20 years (Nuwer, 2014).

[43] He wrote this in a best-selling book in 1968 titled *The Population Bomb.*

[44] They bet on what would happen to the price of five metals — copper, chromium, nickel, tin and tungsten — over a decade. These were metals essential for all kinds of everyday things such as electronics, cars and buildings, and thus likely to become scarcer as a growing population would increase demand. This would be reflected in rising prices. But if the economist was right, the markets and human ingenuity would mean that the prices would stay the same or even go down. It turned out that between 1980 and 1990, the world population grew by 800 million people. However, prices for the five metals went down by an average of 50 percent. Therefore, Julian Simon won the bet.

it may be possible to find new mineral deposits in the future, with improved technology or favourable economics facilitating the processing of higher cost resources, it is the environmental cost which will, in the medium to longer term, determine the real availability of metals and minerals. On this basis, it is possible to claim that the 'Limits to Growth' approach is both right and wrong – wrong in the sense that economic mineral resources commonly continue to increase over time, but right in the fact that the production of minerals and metals is becoming increasingly costly from an environmental perspective.

This chapter will explore the key drivers shaping the future supply and demand of minerals and metals. It will examine some of the initiatives aimed at securing future supply so as to gain insight into how various stakeholders are looking at the issue. The chapter will also explore the key megatrends that will impact on demand and supply of minerals and metals.

4.1 Review of supply/demand and critically assessments

Given the crucial role of minerals and metals in underpinning economies, security of supply has always been a major concern for many governments especially of industrialized countries whose industries rely heavily on minerals and/or metals sourced elsewhere. Minerals and metals are of strategic importance to any economy and since 2008 several countries and research institutions have engaged in the assessment of criticality factors that, from their particular perspective, may impact on supplies and/or on prices of minerals and metals.

For instance, the EU can only satisfy a very limited part, sometimes equal to nil, of its needs for 27 critical minerals and metals from within its borders (EC, 2017). For 14 of them, its dependence on imports from beyond its borders is higher than 90%. The US Geological Survey (USGS) also observes that the changing patterns in net import reliance of nonfuel mineral commodities over the past 60 years are a clear indication that the US has become increasingly dependent on other countries to supply non-fuel mineral commodities that are important for ensuring its economic well-being and national security (USGS, 2015). The result has been numerous calls in recent years to better assess elemental resources and to determine which of them are "critical," the aim being to minimize further disruptions to global and national technologies and economies (Graedel *et al*., 2015a and 2015b). A similar drive exists in other countries and regions, for instance, in the European Union (European Commission 2017a and 2017b; Vidal- Legaz, 2016).

Therefore, analysing security of supply by assessing the risk (or "criticality") factors that could impact supply, is a regular exercise conducted by national agencies and other stakeholders of minerals and/or metals imports dependent countries and regions. Researchers recognise that criticality depends not only on geological abundance. Other important factors include the potential for substitution, the degree to which ore deposits are geopolitically concentrated, the state of the mining technology, regulatory oversight, geopolitical initiatives, regional instabilities, and economic policies.

The intimate link between minerals and metals extraction (and use) and the health of the environment as well as social needs has also created an impetus for better understanding of future minerals and metals demand and thus to devise better strategies to mitigate the environmental impact of resource extraction and use. A key global concern is to ensure appropriate levels of supply, while reducing the negative environmental footprints of mineral extraction and use (UNEP, 2013).

While much progress has been made in developing criticality assessment methodologies (Graedel & Reck, 2016), there is a need to develop more foresight in criticality assessments. This requires analysis, for instance, of the various trends identified in this Chapter, such as demography, the development of the global middle-class, urbanisation, geopolitical risks, possible evolutions of minerals and/or metals dependent technologies, possible evolution of minerals and metals recycling rates, the possible substitutions of rare minerals and metals in their main uses (Graedel *et al.,* 2013).

The following section discusses a number of initiatives related to determining the future availability of resources.

4.1.1 World Economic Forum: Future Availability of Resources (WEF, 2014)

The World Economic Forum has conducted a number of studies to understand the future availability of resources. The aim is mainly to inform the development of strategies by mining companies and relevant policies by policy-makers, with the aim of ensuring future global security of supply of minerals and metals.

WEF states that both public and private sectors tend to have incomplete and sometimes conflicting perceptions of natural resource availability. The four key paradigms that seem to dominate are: (i) threats of material exhaustion; (ii) concern about rising costs; (iii) long-term abundance; and (iv) social injustice focused on distributional challenges. They maintain that while all four paradigms are valid, they are only true at specific scales or for specific resources, hence creating the potential for miscommunication. They suggest that responding effectively to concerns about resource availability requires global, national and local decision-makers to have a more complete, nuanced and common understanding of resource availability, as well as its implications for economies and political systems at multiple levels. The key insights from the WEF study are:

- The role of technology, preferences, policies and prices is underestimated when forecasting supply and demand for natural resources.
- Contrary to popular perceptions, population growth is and will be far less significant in spurring resource demand than economic growth and development in the period up to 2035.
- Physical, economic, political and social interconnections between resources are growing, and will increasingly influence resource availability, in both positive and negative ways.
- Defining natural resource availability often fails to consider how resources are distributed, both between countries and between individuals within countries.
- Environmental factors create local and global risks to resource availability, while resource production and use are the primary factors causing environmental risks.

In thinking about supply, WEF (2014) highlights the risk challenge. While the world has sufficient global stocks of natural resources to meet most of society's demands, the flow of resource distribution is increasingly threatened by highly uncertain "above ground" factors, namely:

- high levels of interconnectedness mean that local crises can have global repercussions, underscoring the need to focus on addressing social and environmental considerations in securing supply;
- natural resources are distributed and consumed in intricate value chains, a significant portion of which are global. The value chains all suffer from distortions at different points due to, among others, monopolistic structures, constrained supply routes and government intervention (including subsidies and taxation);

- pricing on global markets is sensitive to the actions of traders and investors uninterested in physical delivery, and is thus exposed to the prevailing views on global economic growth; and
- technological breakthroughs and new discoveries can quickly cause a shift from scarcity to abundance.

4.1.2. The European Union (EU) Supply Risk Assessment (EU, 2017c)

As indicated above, in 2013, the EU imported about 91% of the minerals and metals its economy needs (Ad-hoc working group on defining critical raw materials, 2014). The 2017 edition of this assessment of the raw materials critical to the EU (European Commission – 2017a, 2017b, 2017 c) identified 26 minerals and metals critical to the EU, with import reliance rates varying between 0 and 100%. Therefore, security of supply is of crucial importance especially in line with the EU's aspiration of raising industry's contribution to GDP to as much as 20 % by 2020.

The resulting analysis based on the above drivers identified twenty-seven critical raw materials from a list of fifty-four candidate materials. They include: antimony, beryllium, borates, chromium, cobalt, coking, coal, fluorspar, gallium, germanium, indium, magnesite, magnesium, natural graphite, niobium, PGMs, phosphate rock, Heavy Rare Earth Elements (HREEs) (Heavy), Light Rare Earth Elements (LREEs), silicon metal, and tungsten.

4.1.3. Yale Study on Materials Criticality (Graedel & Beck, 2015)

Researchers at Yale have conducted a five-year assessment of the criticality of the planet's metal resources in response to rising global demand and the increasing complexity of modern products (Graedel & Beck, 2015). This research builds on an earlier assessment of the National Research Council (NRC, 2008). The NRC study developed a two-dimensions "criticality matrix" to aid in assessing a mineral's or metal's degree of criticality. The matrix is based on the finding that a mineral or metal is critical if it is both important in use and if it is subject to potential supply restrictions (similar to the criteria used by the EU study). The Yale study adds an extra dimension of environmental implications to the critically.

Using this assessment framework, the study maps the criticality of all elements. Some observations include:

- The metals that are crucial for high-tech applications, such as electronics and thin film solar cell technology, are most critical from a supply risk perspective. These include indium, arsenic, thallium, antimony, silver, and selenium.
- With respect to vulnerability to supply restrictions, the most critical include thallium, lead, arsenic, rhodium, and manganese. With regards to vulnerability to the extent to which suitable substitutes are unavailable, magnesium, chromium, manganese, rhodium, yttrium and several rare earths are critical.
- From an environmental implications' perspective, of most concern are precious metals, particularly gold and the platinum metal group – because of the adverse environmental impacts related to their extraction and processing.

Some important conclusions from the interpretation of the findings include:

- An assessment of the criticality of metals should not be regarded as static, but as a result that will evolve over time as new ore deposits are located, political circumstances change, and technologies are transformed. Thus, determining metal criticality requires evaluations to be periodically updated. Taking into account that data revisions are infrequent and major technological and

societal transformations tend to occur slowly, the authors consider the undertaking of criticality reassessments at five-year intervals as reasonable.
- Criticality is too complex, and the users of the information too diverse, for metals to simply be designated as “critical” or “not critical.” Corporations, national governments, and resource sustainability experts have different goals, different perspectives, and different time scales. Therefore, while universal criticality designations can be informative and useful, they can never be prescriptive.

Nuss *et al.* (2016) caution that although criticality of one mineral or metal might be low, this does not necessarily convey positive news. For instance, chromium and manganese, which are both essential in steel making, display the highest vulnerability to supply restriction, largely because substitution or substitution at equal performance is not possible for all end-uses. Yet much of the demand for iron is for use as steel. For this reason, a framework that considers the criticality of the actual product rather than the elements would be more useful for policy makers and businesses in making strategic choices.

4.1.4. British Geological Survey Risk List (BGS, 2015)

The British Geological Survey regularly assesses the supply risk of elements that are crucial for maintaining economic activities and lifestyles. For the 2015 risk list, the ranking system was based on seven criteria: production concentration; reserve distribution; recycling rate; substitutability; governance (in top producing nations); governance (in top reserve-hosting nations); and companion metal fraction[45]. Key highlights of the 2015 risk list include:

- The on-going concern about rare earth elements (REEs) supply that has received significant attention over the past five years must not be ignored. This element group remains at the top of the list in terms of supply-side risk.
- Other economically important metals with similarly high levels of risk to supply disruption include antimony (with application as a fire retardant), bismuth (used in numerous medical applications), platinum group metals (active components in autocatalysts), and tungsten (a key hard metal used in most cutting tools).
- Some of these elements, particularly the rare earth elements and antimony, have low recycling rates and a limited number of substitutes. They are also almost exclusively mined as by-product metals.
- China continues to dominate production of many metals and minerals. China is the leading global producer of 23 of the 41 elements and element groups on the list.
- The list also provides an indication of which elements might be subject to supply disruption, most likely resulting from non-geological factors such as geopolitics or resource nationalism (for example, state intervention in production and trade), along with other factors such as labour strikes, accidents and infrastructure availability.

The report also underlines that the minerals and metals market is not static, as new reserves are continually added in response to drivers such as increased demand and advances in technology (BGS, 2015). In the future, recycling is likely to contribute an increasing share to the global market and substitutability may also increase as new technologies are developed.

[45] Some metals only occur as a by-product of a host metal, for example indium is a by-product of zinc. . Companion metal fraction reflects the relative weight of the by-product in the host metal.

4.1.5. Critical Metals for Future Sustainable Technologies and their Recycling Potential: United Nations Environment Programme (UNEP, 2009)

UN Environment has also looked at future minerals and metals supply risk with a particular focus on metals that have seen a rapid uptake as a result of the emergence of innovative green technologies (UNEP, 2009). The specific objectives of the report were to: identify and analyse the global availability, geographical spread and prices of critical metals; analyse the recycling potential including a feasibility assessment for potential innovative technologies for the recycling; and identify framework conditions that could help foster technologies which enable the implementation of closed-loop recycling systems for critical metals.

The analytical framework used included criteria to assess demand and supply and its criticality as follows:

- demand growth
- supply risks
- concentration of mining
- physical scarcity (reserves compared to annual demand)
- temporary scarcity (time lag between production and demand)
- structural or technical scarcity (metal is just a minor product in a coupled production and inefficiencies occur in the mining process, production and manufacturing)
- recycling restrictions
- high scale of dissipative applications
- physical/chemical limitations for recycling
- lack of suitable recycling technologies and/or recycling infrastructures
- lack of price incentives for recycling

This framework was then used to perform a comprehensive analysis of eleven 'green minor metals', considered key to future sustainable technologies (FST)[46.] The study found that in the short run (next 5 years) tellurium, indium and gallium will become critical due to rapid demand growth as well as serious supply risks combined with moderate recycling restrictions. In the mid-term, rare earths, lithium, tantalum, palladium, platinum and ruthenium will become critical. In the long-term (till 2050) only germanium and cobalt are likely to become critical. The report also identifies three activities to promote the recycling of critical metals in the future to insure supply. These are enlargement of recycling capacities; development and realization of new recycling technologies; and accelerated improvement of international recycling infrastructures.

4.1.6. German Fraunhofer Institute for Systems and Innovation Research and the German Mineral Resources Agency

The German Fraunhofer Institute for Systems and Innovation Research and the German Mineral Resources Agency, have assessed the potential mineral raw materials requirements of 42 innovative technologies with a particularly high presumed market potential by 2035 (Marscheider-Weidemann *et al*., 2016; Table 4.1). It presents a scenario for the demand of metals up to 2035. It shows the share of the 2013 world production of a range of rare metals (with the exception of copper) that may be

[46] The term 'sustainable technologies' has no official definition; it rather describes technologies which result in positive environmental impacts. Examples include future sustainable technologies that replace an obsolete technology and hereby reduce environmental impacts; that lead to emission reductions (such as automotive catalysts); or that provide power efficiency during the production or consumption phase (such as energy efficient LED lamps).

required in 2035 by 42 innovative technologies, many of them related to energy production (windmills, thermoelectric generators, thin-film and dye-sensitised photovoltaic cells, solar thermal power plants, solid oxide fuel cells, and micro-energy harvesting), storage (lithium batteries, and vanadium redox batteries), transmission (inductive electricity transmission), or energy saving (lightweight tailored blanks for the automotive industry, lightweight alloys for the aircraft industry, LEDs, super capacitors for motor vehicles, and super alloys for energy efficient jet engines).

Table 4.1 Estimates of the share of the 2013 world production of mostly rare metals

Metal	Demand2013 / Production2013	Demand2035 / Production2013	Related innovative technologies
	2013	2035	
Lithium	2%	385%	Lithium-ion batteries, lightweight airframes
HREE (Dy/Tb)	85%	313%	Magnets, e-cars, wind power
Rhenium	98%	250%	Super alloys
LREE (Nd/Pr)	79%	174%	Permanent Magnets (especially for e-cars and wind power)
Tantalum	38%	159%	Micro-capacitors, medical technology
Scandium	17%	138%	SOFC fuel cells
Cobalt	4%	94%	Lithium-ion batteries, XTL
Germanium	39%	81%	Fibre optic, IR technology
Platinum	0%	60%	Fuel cells, catalysts
Tin	50%	42%	Lead-free solders, windmills
Palladium	8%	47%	Catalysts, seawater desalination
Indium	29%	45%	Displays, thin layer photovoltaics
Gallium	25%	37%	Thin layer photovoltaics, IC, WLED
Silver	22%	32%	Lead-free solder, nanosilver, RFID, microcapacitors, high-temperature supraconductors, concentrating solar panels
Copper	1%	29%	Electric motors, RFID
Titanium	4%	18%	Seawater desalination, medical implants

Source : Marscheider-Weidemann et al. (2016). HREE = heavy rare earth elements (primarily y dysprosium and terbium). LREE = light rare earth sediments (essentially neodymium and praseodymium)

The findings show that solely for the emerging innovative technologies studied in the report, demand in 2035 could exceed the total global primary production in 2013 of six metals: lithium, dysprosium/terbium, rhenium, neodymium/praseodymium, tantalum, and scandium. For these metals, technological change plays a more important role than global economic growth in driving the increase in demand. The results are particularly striking in the case of demand for lithium for use in lithium-ion batteries and lightweight airframes, as demand in 2013 was estimated as only 2% of the 2013 primary production, while it is expected to rise to 385% of 2013 production in 2035.

4.1.7. Forecasting demand and supply of key minerals (Christmann, 2017)

The six studies reviewed above had a focus on what are considered as strategic minerals and metals mainly driven by emerging technologies in the wake of the fourth industrial revolution[47]. They also largely reflect security of supply concerns of the more industrialized countries, which rely on raw materials imports for their industries. For many countries and especially the emerging economies, the

[47] The 4th industrial revolution is characterized by the intensified use of information and communication technologies and shift towards renewables.

supply of commonly used minerals and metals will continue to be important and for these countries the security of supply is a major concern.

Christmann (2017) constructed a baseline scenario for the demand up to 2050. The baseline model is based on the following assumptions:

(i) Demography

The projections are based on UN Population Division estimates (population and urbanization) and Kaufman *et al*. (2012) estimates for middle class growth.

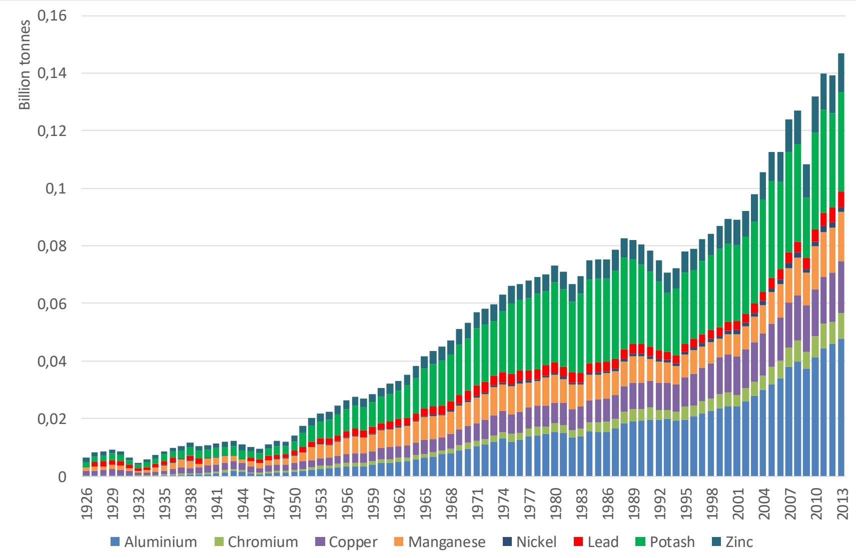
- Population: The world population, estimated to be 7.3 billion people in 2015, may reach 9.7 billion by 2050 and 11.2 billion by 2100 (United Nations Population Division, 2015, median scenario). This would mean 2.4 billion new natural resources users (an increase of 33%) by 2050, and 3.9 billion by 2100 (an increase of 53%).
- Urbanisation: In 2000 nearly 2.9 billion people lived in urban areas (United Nations, 2014). By 2050, 6.3 billion people, or 66% of the word population may live in cities.
- Middle class[48]: Kaufman *et al*. (2012) developed country-level scenarios up to 2030. Their estimate is that in 2000 the global middle class counted 1.33 billion people, while in 2030, the global middle-class may comprise 4.7 billion people;

(ii) Demand growth

The primary production (through mining, as compared to secondary production, from recycling) of minerals and metals will remain a necessity, at least as long as the world population continues to grow and there is no saturation of the per capita minerals and metals' needs, a perspective that appears very remote due to the existing disparities between the developed and the developing countries (UNEP, 2010a). We are likely to see the continuation of the exponential demand growth (Figure 4.1) observed during the 20th century for common minerals and metals that are widely used in construction, infrastructure, mass produced goods and agriculture (phosphate and potash being two of the key ingredients used for the production of fertilisers).

[48] The definition of "middle-class" used here is the one proposed by Brandi & Büge (2014) as well as by Kaufman *et al*. (2012), whereby a member of the global middle class is a person that pertains to a household earning or spending between 10 and 100 $US per day, on the 2005 purchasing power parity corrected basis

Figure 4.1 Production of selected common minerals and metals (1926-2013)



Source: Christmann (2017), using data from Kelly & Matos (2017).

To model future growth in demand, three growth trends are considered. These are:

- 1926-2013: This fully reflects the available data set;
- 1951-2000: This reflects post-World War II reconstruction in OECD countries and the economic development of OECD countries; and
- 2001-2013: This reflect the rapid development of China.

The lowest growth rate over the three periods is used to project metal demand forward to 2050[49]. Table 4.2 shows the average annual growth rates of selected metals for the three periods. The lowest growth rates are highlighted for each metal. As the table shows, demand growth will range from 1.8 % for lead to 6.0% for aluminium. The average of the lowest growth rates is 3.9 % for all selected minerals and metals, and 3.8% for metals only. The growth rate for metals is a conservative estimate compared to the OECD's 5% up to 2030 (APR, 2013).

Table 4.2 Average annual growth rates of selected metals

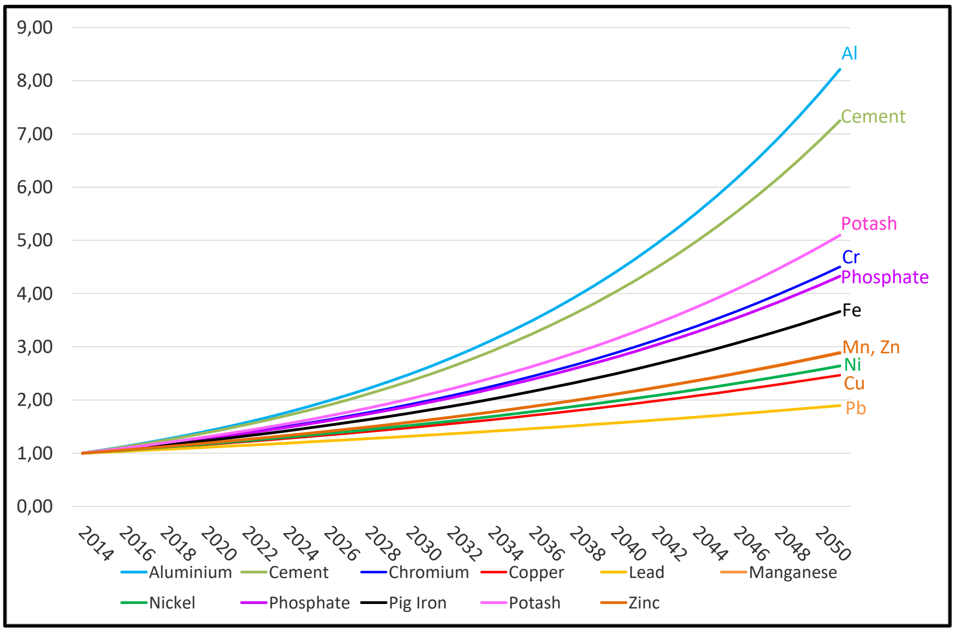
	Period (growth in %)		
Metal	**1926 – 2013**	**1951 - 2000**	**2001 - 2013**
Aluminium	7.8	6.0	6.0
Chromium	6.4	4.8	5.8
Copper	3.5	3.4	2.6
Lead	1.8	2.1	4.4
Manganese	5.0	3.5	7.5
Nickel	6.5	5.3	6.4
Phosphate	4.3	4.0	4.0
Iron	3.7	3.6	5.6
Potash	4.5	4.7	4.0
Zinc	2.9	3.0	3.2

Source: Christmann (2017), using data from Kelly & Matos (2016).

[49] This is a conservative approach that assumes past trends are replicated in the future. The future is likely to experience higher demand since a much bigger part of the world is now rapidly developing. Since the forecast use the lowest growth rate of previous spurts this is a very conservative projection.

Using the demographic and demand growth assumptions above as a baseline, the demand for these minerals and metals by 2050 was estimated. This was simulated using the lowest of the average annual growth rates observed over the three periods (Figure 4.2). The scenario shows that a significant increase in production by 2050 would be needed if historical growth trends are observed going forward. If this scenario materialises, the production of the various key commodities rises significantly, ranging from 750 % for bauxite to 114 % for lead between 2013 and 2050. An important question is whether the resources available can meet this demand. Using data from the US Geological Survey on known reserves, Christmann (2017) calculates the share of this demand that can be met with current reserves (see Figure 4.3). He finds that under this scenario, the anticipated needs for only two of the minerals (potash and phosphate) can be met with current known reserves. For chromium, reserves can only meet 19 % of the anticipated needs.

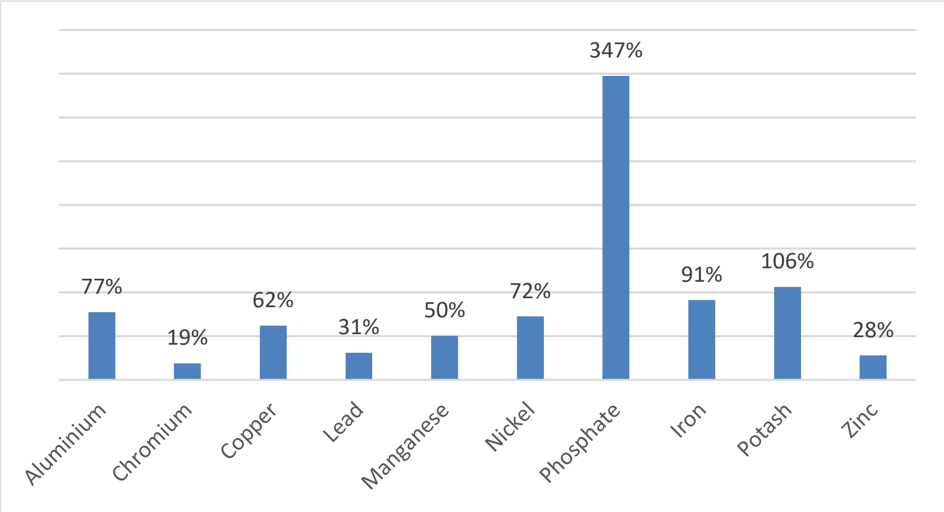
Figure 4.2 Growth scenario for the most widely used minerals and metals



Source: Christmann (2017), using data from Kelly & Matos (2016).

Fig. 4.3 does not mean that the world is running out of any of these minerals and metals, as yet undiscovered resources are huge (see for instance the copper example in Johnson *et al.*, 2014 and Kessler & Wilkinson, 2008). But it means that a major exploration effort is needed to find yet undiscovered resources and turn them into mineable reserves.

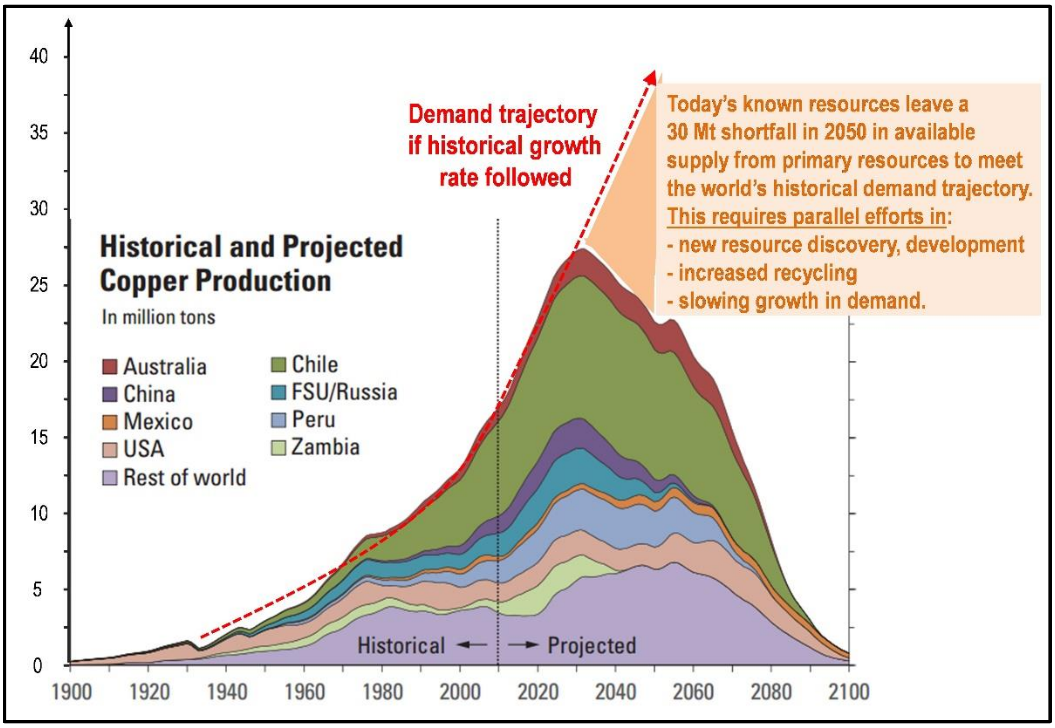
Figure 4.3 Share of projected 2050 demand that can be met by current reserves



Source: Calculated from Christmann (2017) results.

A similar analysis, for copper, shows that demand could outstrip supply by 2020 (Figure 4.4) in the absence of new major discoveries and commissioning of new mines, and if the copper consumption continues to grow exponentially. It underlines the need for a massive exploration effort, to both reduce copper use, something unlikely to happen in view of the current copper demand drivers, and to explore for deep seated, hidden, large scale deposits or in areas so far considered unattractive by investors. This momentum could unfold further to the copper price hike that would logically result if this scenario materialises.

Figure 4.4 Historical and projected primary demand of copper



Source: Northey et al. (2014)

However, the baseline analysis is still a useful starting point. As discussed previously, the demand for infrastructure and durable goods will grow rapidly, largely driven by demographics, though other drivers may also modify this demand. It is most likely that cement, copper, steel and stainless steel will continue to be needed to build houses and infrastructure, energy production and distribution systems. Demand for lead may follow a very different – likely much reduced – pattern as vehicles shift from internal combustion engines to electrical vehicles that use non-lead batteries (batteries for cars with combustion engines are the current main use of lead).

Using this baseline forecast, it is clear that more mineral deposits will need to be found. There is a high likelihood that there are still substantial quantities to be found as much of the earth crust is yet to be explored. As mentioned earlier, exploration is skewed towards a few countries with Canada and Australia capturing close to about one third of the global exploration budget. Estimates of potential resources in undiscovered deposits range widely but the consensus is that mineral resources are unlikely to become scarce in the near future (Christmann, 2017). As to the investment in actual mining, it should be noted that over the last two decades China, widely through SOEs or companies with close connections to the State, became an investor of global importance, partly substituting TNCs belonging to the OECD group of countries.

Notwithstanding the fact that there is much yet to be discovered, this does not guarantee supply in the future. Beyond low expenditure on exploration, it takes an average of 15.3 years between discovery of commercial mineral deposits and mine commissioning (Schodde, 2016) , and this duration is likely to further grow as projects have to consider environmental and social issues, something that was widely ignored in the past. With ongoing concern for environmental sustainability, the sector is likely to attract more activism and more regulations, which will mean even longer periods to commission a mine. Another factor that may limit supply is availability of water and energy. The demand for these increases exponentially with declining ore grades. For example, Chile forecasts a 2 % increase in copper production in 2025 (from 2015 levels). However, the demand for water and energy will rise by 22 %[50] and 34 %, respectively (Norgate & Jahanshahi ,2010; Northey, Haque & Mudd,2013). As ore grades decline worldwide and impacts of climate change become more severe, the competition for water will increase and even lead to conflicts between mining companies and other users of water. This might limit what can be produced even when resources are available.

A comprehensive assessment of possible future demand for minerals and metals is not the focus of this report. Nonetheless, a good understanding of the drivers of supply and demand of minerals and metals is crucial to informing new governance structures as these drivers can indicate new points of leverage.

4.2 Drivers of demand and supply of minerals and metals

The seven studies summarized above focus on security of supply of minerals and metals. They, thus, serve as a good starting point for identifying drivers of future supply and demand, as security of supply is essentially aimed at meeting given demand. The key drivers emerging from a review of these studies are shown in Table 4.3.

[50] Chile plans to overcome this challenge through using seawater; it foresees the share of desalinated water in its mining operations rising from 21% to 46% (Chilco, 2016, cited in Christmann, 2017).

Table 4.3 Summary of drivers of supply and demand assessments

Study	Drivers assumed as key
WEF Study	Prices (markets), technology preferences, policies, population, economic growth Interconnectedness (politics, economics and society), geopolitics perceptions.
EU Study	Governance/ stability, recycling rate, substitutability
Yale study	Geology, substitutability, geopolitics, state of mining technology, regulatory oversight, political stability, economic policies, environmental implications (human and ecosystems), supply chains complexity, final product structure
British Geological Survey	Product concentration, reserves distribution, recycling rate, substitutability, governance, companion metal fraction (in ore).
UNEP	Concentration of mining, reserves, temporary scarcity (lag in supply response. structural scarcity) (companion metal and inefficiencies), recycling restrictions
German Study	Technology innovation; market demand (renewable energy)
Christmann Study	Population, urbanisation and middle class

Source: Compiled by authors from selected reports

The literature also provides other insights into drivers of supply and demand. A summary is provided below:

- The US National Research Council (NRC, 2008) maintains that over the long term (more than ten years), availability of mineral resources[51] is a function of five factors: geologic (does the mineral resource exist?); technical (can we extract and process it?); environmental and social (can we produce it in environmentally and socially accepted ways?); political (how do governments influence availability through their policies and actions?); and economic (can we produce it at a cost users are willing and able to pay?).
- The Global Agenda Council on Responsible Mineral Resource Management clusters drivers of change in the minerals and metals industry under five pillars: environmental (growing concern for biodiversity, climate and water), technological (intensified rate of change), societal (concern for fairness, generational change), geopolitical (potential for resource nationalism) and geographical (declining ores and movement to more remote frontiers) (WEF, 2015a).
- According to USGS (2015), types of commodities, as well as their sources, are important factors used to evaluate supply risk. Domestic reserves and resources, governance risk, and trade restrictions, among others, are additional factors that should be considered when calculating supply risk and developing mitigation strategies.
- Macpherson & Ulrich (2017) identify key trends that will shape demand as the long-term shift to a low-carbon economy and physical natural capital risks; technological change of unprecedented depth and speed; a new global economic and geopolitical balance and the associated risk of division and polarization; the emergence of the Sustainable Development Goals (SDGs) agenda, alongside a new generation of (individual) market participants that is

[51] "Mineral resources" used in this study encompass minerals as well as metals.

increasingly focused on social issues; and a stronger institutional focus on long-term risks and opportunities that can affect economic, political and societal development and growth.

- The *Metals* magazine argues that the megatrends of the next decades include the relentless growth of the global population, climate change, shortage of raw materials, increasing demand for energy, the shift of economic gravity, the ongoing urbanization trend and the accelerated creation of information networks (FOM, 2016).

A synthesis of the emerging drivers, points to a number of megatrends that will shape the future demand for and availability of minerals and metals. These megatrends are explored next.

4.2.1. Demographics

Population growth has a significant impact on demand for minerals and metals due to increased consumption. Thus, as the global population moves towards the 9 billion mark in 2050, and with a growing middle class, it will drive a sustained demand for minerals. However, urbanization rather than population growth represents a more important demographic trend that is likely to have a larger impact on the demand and consumption of minerals and metals. The UN estimates that by 2050, 70 per cent of the world's population will live in cities. This rise of cities and urban living is predicated on the use of materials and metals. The strength of metal alloys, particularly steels, has led to a revolution in how cities are built. Without them, there would be no buildings higher than three or four floors. Metals, as well as development minerals, are also critical in underpinning the infrastructure needed for road, rail and air transport networks.

4.2.1.1 Society- Changing Values

More than anything, the perceptions of society in developed countries will shape the evolution of consumption, while populations in developing countries are more likely to seek development first. As mentioned, there is a growing emphasis on sustainable consumption and responsible sourcing. Consumers are increasingly expecting organizations to demonstrate responsible sourcing in their supply chain, and as a result many certification standards are emerging to provide this guarantee. Despite the voluntary nature of many of these standards, a large number of companies are nonetheless seeking to obtain such certification. As WEF (2015) states, social pressure to act more sustainably is growing and has the potential to disrupt the sector.

Companies are increasingly expected to operate more sustainably and to define and implement actions reflecting this priority. The industry is responding; shifting its mind-set, strategies and activities. WEF (2015) reports that 80% of senior mining executives believe that sustainability-oriented strategies are essential for current and future competitive advantage, while 63% of chief executives expect sustainability to transform their industry within five years.

Consumers, OEMs and recyclers are also exerting significant influence on national materials' strategies. Schüler *et al*. (2016b) note that the 2015 EU trade strategy, *'Trade for All,'* reflects the European consumers' concerns with respect to the social and environmental conditions in global production sites. It increasingly scrutinizes the effects of Free Trade Agreements (FTAs) on other – especially developing – countries.

In developed countries, the rise of internet and social media is supporting the emergence of new business models that will have a profound impact on demand for materials. There is in particular a strong movement towards alternate ownership models, or the rise of the '*sharing economy'*. This model is based on sharing underutilized assets – spanning from spaces (homes) to things. One product is owned and shared by many users. Higher utilization means less demand. An example is several tenants sharing one vacuum cleaner. The use of social media is also creating global movements that can influence policy consumption as well as corporate behaviour globally.

4.2.2. Economic growth

Economic growth is intrinsically linked to increased use of natural resources given the central role they play in supplying the raw materials needed to produce goods and services. Unless economic growth is accompanied by significant decoupling, then continuous growth will mean greater demand for resources as this growth will be faster in emerging and developing economies which are experiencing a rising middle class. The future demand for durable goods will thus be significant. For example, in Africa, Mckinsey predicts that at least four groups of industries – consumer-facing industries, agriculture, extractive resources, and infrastructure – together could generate as much as $2.6 trillion in revenue annually by 2020, or $1 trillion more than today[52].

However, future demand may be different from past patterns. Studies on the resource intensity of the economic process point to a gradual de-linking of natural resources use and economic growth (Dittrich, 2012). Technological progress has seen the efficient use of material resources, the production process re-engineered, goods and services redesigned, and substitutions with lighter materials. This has resulted in the production of lighter goods. Continued technological advances, coupled with a shift in developed countries towards the service sector, raise prospects for further dematerialization of the economic process. However, using a measure of resources used to one unit of GDP per Capita (Income)', as an alternative indicator for evaluating the resource requirements of the economy, Bithas & Kalimeris (2017) reject the vision of a dematerialized growth and the de-linkage of the economy from natural resources. They argue that resource requirements evaluated at the level of income approximate the human scale of production. The pattern observed in the past, and likely to persist, is that demand for metals is strongly linked to general economic development.

4.2.3. Regulations/Policy

The regulatory regimes adopted by countries have a significant impact on demand and supply of minerals and metals. For instance, the EU has many uncharacterized and unexplored deposits; however, the existing economic and regulatory climate, the widespread NIMBY and BANANA syndromes and the resulting activism of certain groups, combined with growing land use competition limits their exploitation (EU, 2015). The result is that EU can only supply a small part of its needs for many minerals and metals. Similarly, some have suggested that the dominance of China on the crucial REEs may be partly attributed to less stringent environmental standards, as opposed to the US, which was the major supplier in the past and holds around 38% of the world's deposits but had to close many mines due to environmental standards (Nuwer, 2014).

Regulation is also fuelling demand of certain minerals and metals. Emission regulations have been the main driver of demand for the platinum group metals and regulations to reduce green-house gasses (GHGs) are driving new demand for many metals as green technologies emerge.

[52] http://www.mckinsey.com/global-themes/middle-east-and-africa/lions-on-the-move

Regulation can also produce unintended effects. For instance, the desire to improve fuel consumption, largely prompted by regulation, has seen car manufacturers switching from steel to aluminium bodies to reduce weight and thus reduce fuel consumption. This has seen a reduction in zinc demand, which is mainly used to galvanize steel. However, almost all the world's indium comes from zinc mines, as indium is a core product from zinc ore. There are no dedicated indium mines because it occurs in such small amounts such that mining for it is uneconomical. So, if demand for zinc declines, then the corresponding adjustment in the supply of zinc will also have an impact on the supply of indium (Nuwer, 2014). Yet indium is increasingly becoming a crucial element in high technology – mainly used in smart phones to make touch screens – and is now seen in some countries as a critical metal.

Incentives can also be used in place of regulation. In the US, the material with one of the highest rate of recovery is lead-acid batteries, used primarily in cars. Their recovery rate is 98 percent, compared to about 50 percent for aluminium cans. The reason is that the government, concerned about the use of lead, offers car companies a financial incentive to recycle the batteries themselves (Jones, 2013)[53].

4.2.4. Governance/Political stability

Changes in the quality of governance may impact reserves availability. Mineral reserves are usually a small percent of potential resources. Mineral discovery and exploitation depend on investment, which in turn depend on political stability and a favourable investment climate. There are still significant mineral deposits to be explored for and reserves to be identified. For example, Africa is considered rich in natural resources, with a geology as favourable to the existence of mineral deposits than Canada or Australia. But, while over the 1991-2015 period, Canada and Australia respectively attracted, in average, \$118 and \$125 per km^2 per year in exploration investment, Africa only attracted \$36 per km^2 per year (Christmann, 2017). It should be noted that even within Africa the bulk of this is spent in only a few countries, meaning that little exploration investment is made in some countries (see Chapter 2). The reasons behind the lack of exploration include poor infrastructure, poor governance, and lack of baseline geological data.

As reserves of any mineral and metals are a dynamic quantity that varies on the basis of the evolution over time of modifying factors such as minerals or metals prices, energy and labour costs, periods of apparent scarcity alternate with apparent abundance, while the geological stocks remain unchanged. It should be noted that the sharp reduction in exploration investment observed since 2012 together with the higher costs of finding (Schodde, 2017) and putting into production new deposits does not bode well for future minerals and metals supply to the global economy.

4.2.5. Geopolitics

A feature of Earth's ore forming processes is the creation of large spatial disparities in elemental abundance, with some locales hosting rich stores of mineable resources, and others almost none (Graedel *et al.*, 2015; also see Figure 2.4). For instance, Morocco currently holds 70 percent of the world's phosphorus reserves. South Africa, Zimbabwe and Russia control nearly all of the world's platinum reserves. The Democratic Republic of Congo (DRC) has 40 % of its cobalt, while China has a near monopoly of REEs.

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[53] A highly effective incentive is one which can make manufacturers recover and recycle their own products. This means that they will tend to make them easier to re-use or break apart in the first place. Products will be designed with recovery in mind

Given the critical role of minerals and metals in economies, their uneven distributions can cause challenges when trade is restricted. Mineral resources-rich countries, or countries that via their investments abroad control a significant share of the global production, can use their control, if they effectively control the producing companies, as leverage in international negotiations. Their dominance provides them the ability to distort the market by either dumping or restrictive measures. For instance, in September 2010, a maritime border dispute prompted the Chinese government to temporarily suspend all rare earth exports to Japan (Stone, 2016).

Geopolitics are also becoming more complicated by the rise of resources nationalism, itself fuelled by the higher minerals and metals prices observed since 2012. This rise is usually associated with restricting resource supply, and deterring foreign investment and consequently reducing future supply. Commodity booms can frequently cause a rise in sentiments of resource nationalism and occasionally the nationalization of mineral deposits.

As emerging countries grow and industrialize, the global supply may be disrupted as some countries may seek to limit exports as they develop their own industries. For example, Indonesia announced in 2012 the introduction of quotas and taxes on a range of metal exports, including nickel, tin and copper, to support its growing industries (APR, 2013).

Given the crucial role of minerals and metals in the economy and also in defence industries, for many countries securing supply of materials is a national security issue. This means significant funds will continue to be spent in securing supply chains and also in finding alternatives to reduce dependence. For instance, Japan stockpiles of minerals and metals, which it considers as strategic resources (ECA, 2011), while the fear of a future REE shortage has prompted the US to invest millions into basic research on reducing use of rare earth elements and recovering them from existing products. Some industries have cut back their reliance on rare earth elements; for instance, Tesla does not use these in its batteries or motors (Stone, 2016).

4.2.6. Globalization

On-going trade liberalization has seen huge rise in global trade. This has significant implications for the supply of minerals and materials. The fact that the rules of trade are not entirely under the control of a resource exporting country, limits somehow countries' ability to use their possession of critical mineral and metals as a strategic weapon for political negotiation or economic domination. In 2014, a ruling by the World Trade Organization (WTO) resulted in the Chinese government removing its rare earth export quotas (Stone, 2016). But numerous ways and means to distort free trade through tariff and non-tariff measures still exist, as detailed in the OECD Inventory of Restrictions on Exports of Industrial Raw Materials[54], that details at country level and for a wide range of traded minerals and metals the trade restrictions existing in 2014.

Liberalization of trade and rising FDI are also reshaping manufacturing. This has seen the emergence of complex manufacturing value chains spanning several locations and supported by global supply chains. An example is the supply chain of CdTe solar panels mentioned in the introduction of this Chapter. Such complex supply chains can be highly vulnerable to supply chain disruption.

54 https://qdd.oecd.org/subject.aspx?Subject=ExportRestrictions_IndustrialRawMaterials

While the liberalization of trade agenda has become entrenched in the global economics system, this arrangement is evolving (see Box 4.1).

Box 4.1 Globalization - retreat and rearrangement?

Global trade is undergoing some re-arrangements. On one hand, as the effects of globalization start impacting national politics, especially in the west, the very logic of the agenda is being questioned by former key proponents. For instance, the US has recently pulled out of the proposed Trans-Pacific Trade Partnership and has also questioned and called for revision of some trade agreements it had signed on. On the other hand, China is laying ground for accelerating global trade.

In terms of impact on national politics, the most significant development is the 'exit' from the UK from the European Union (BREXIT). While migration has been a major political issue, the loss of manufacturing jobs due the emergence of global production networks has also been a major issue, especially in the US. This has seen the US government dis-incentivize companies from off-shoring production and trying to lure companies to re-shore. In an attempt to protect local industry, there have been threats to raise tariffs on steel and aluminium. Manufacturing being a key user of minerals, these threats have a big impact on supply and demand patterns of minerals and metals.

At the same time, China is boldly pushing the globalizing agenda through its ambitious 'One Belt, One Road' initiative that seeks to create a vast and globally-spread infrastructure that includes roads, railways and ports that will facilitate global trade. This is likely to create significant demand in the short to medium-term to build this infrastructure. Ultimately, such an infrastructure is likely to boost aggregate demand, and demand for minerals and metals.

The retreat seen in the west could be temporary as they are driven by political cycles that are short-term. However, the continuous loss of jobs that is likely to be accelerated by the rise of automation and robotics, the so called fourth industrial revolution, the anxieties driving these political cycles are likely to persist and could well lead to a re-arrangement of global trade.

4.2.7. Mining and metals, research, innovation and evolution

4.2.7.2. Innovation in mining & metals industry

The mining and metals industry is facing challenges and opportunities, therefore research and innovation are important to address them. Research and innovation are critical to develop some of the solutions that are needed to address the challenges caused by the exponential demand increase expected for most minerals and metals in the coming decades while, at the same time, making the global economy as circular and sustainable as possible. This has led to the development of comprehensive research agendas such as the European ERA-MIN research agenda (Vidal *et al.,* 2013),the Research Agenda developed by European Technology Platform on Sustainable Mineral Resources (ETP-SMR)or the European Research and Innovation Roadmap 2050 (Reynolds *et al., 2018)*. The industry is innovating in both technologies used and in business models adopted and there are many developments worldwide such as the creation of US Critical Metals Institute[55], the German Federal Ministry of Education and Research (BMBF) R4 programme on raw materials of strategic importance to the German economy (Bundesministerium für Bildung und Forschung, 2013 or the

[55] Website: https://cmi.ameslab.gov

European Union Knowledge and Innovation Community on Raw Materials, possibly the world largest research and innovation network, with over 120 partners from industry, research and academia.

a) Greater recovery of Ores

As ore grades have deteriorated, the mining industry has innovated and found new ways to extract metal from low quality ores economically. Some innovations include:

- Technologies such as in-situ mining, autonomous haulage and drilling and rapid tunneling are changing the process of mining. In-situ leaching technologies can significantly extend amount of economically recoverable minerals by allowing the mining of previously uneconomic ore types and grades (Mudd, 2010).
- Various biological processes are also being optimized to extract metals from lower-grade ores with the help of bacteria. Bio-mining is already applied to extract copper and other metals from mine tailings and industrial wastes.
- The use of information technology is also important. The US Department of Energy (DoE) Critical Materials Institute is now using its supercomputers to search for molecules that might bind to rare earth elements and help them to float. Researchers hope that this approach can boost recovery of REEs from 65 percent to 75 percent (Jones, 2013).
- Big data and more sophisticated modelling are being used to enable more efficient planning and more accurate and less intrusive mining operations (WEF, 2015b).

b) R&D in mining exploration

Bloodworth and Gunn (undated) argue that R&D advances are likely to lead to a better understanding of ore forming processes and this can dramatically change the picture of reserves. For example, they mention that mineral deposits, for which there was no scientific model, and therefore no exploration guides, 50 years ago such as porphyry deposits, are now the principal source of copper. R&D in minerals exploration is very active internationally in sectors such as:

1. the development of the geological representation of the deeper crust, essential to understanding the location of possible deep-seated, concealed mineral deposits;
2. the development of geophysical investigation methods, as these are critical to progress on the first topic;
3. the development of cheaper, more efficient, drilling technologies; and
4. the development of data mining and predictive data modelling based on artificial intelligence technologies to identify signals that could relate to yet unidentified mineral deposits.

More information on research and innovation priorities in exploration and in all other research and innovation areas related to minerals and metals can be found in the ERA-MIN research agenda (Vidal *et al.,* 2013), to which about 200 experts from academia, industry and research contributed.

c) Extending frontiers of mining

Mining is extending to new frontiers. Sea-bed mining in the deep seas is also gaining traction, and in such areas a lack of data and information leads to a high level of uncertainty around environmental risks.

Commercial scale deep sea mining has yet to begin but, driven by markets and technology, corporations and governments have increased the pace of exploration for mineral deposits in the deep ocean seabed. Many of these deposits are found at depths between 1,000 and 6,000 metres below the surface and contain concentrations of metals of commercial interest such as copper, nickel, manganese, zinc, lead, gold, and molybdenum.

Exploration companies are interested in three types of mineral deposits, each from a different ocean location and requiring a different type of mining technology (Hien *et al*., 2013). Each of the three types would also have specific environmental impacts (see Chapter 5).

- Polymetallic nodules (or 'manganese nodules') that can be found on the abyssal plains (the deep ocean floor);
- Polymetallic sulphides from deep-sea hydrothermal vents (both active vents and areas where venting has occurred in the past) found along ocean ridge systems (underwater mountain chains); and
- Cobalt crusts from seamounts (underwater mountains) and other topographical features.

These areas all have distinct faunas across different regions of the world's oceans. Most habitat-forming bottom-dwelling species are extremely vulnerable to human disturbance. The United Nations General Assembly has recognised this as it has repeatedly committed nations to take action to ensure that deep-sea fishing on the high seas is managed to prevent destructive fishing activities and damage to habitats and vulnerable species.

Estimates of seafloor deposits targeted for mining range from 600 million to 1 billion tons of minerals, including 30 million tons of copper and zinc (AFP-JIJI, undated). Interest in seabed mining is rising, a first industrial production project of copper-zinc-gold ore may start in the coming years off the coast of Papuasia New Guinea and numerous contracts (with governments and companies) have been signed for exploration of the international seabed, governed by the International Seabed Authority[56.], the body charged with controlling exploration and exploitation of the areas beyond national jurisdiction (UN, 1982).

d) From mining and metal companies to material companies

Currently, mining metals and recycling tend to be separate businesses that are largely not integrated. This is changing as mining companies are also turning their attention to urban mining or recycling as part of their business and are rethinking their business models (FOM, 2016).

We are also witnessing the arrival of new entrants in the minerals value chain in the form of high-tech and big brand technology firms who acquire diversified mining portfolios with the view to securing access to vital inputs and taking full control of their supply chains. These include the electric car maker Tesla that acquired lithium assets, a key ingredient for their batteries (PWC, nd). However, more fundamental rethinking is likely. For example, the recycling of REEs is difficult. REEs are used in very small quantities making the economics of recovery unfavourable. But a product-centric approach can change the economics of recycling these. Binnemans & Jones (2014) point to the recovery of rare earth elements from end-of-life fluorescent lamps as an example of product-centric recycling. Rather

[56] https://www.isa.org.jm

than only targeting the rare-earth content of lamp phosphor powder, the recycling of all the different waste fractions (glass, metals, plastics, phosphor powders) can be economical. This then involves the rethinking of the business model from the metal supplier to the material supplier. This transition has the prospect of 100 % re-use and zero waste production through reorganization (the emerging circular economy paradigm).

e) Material innovation

Material science is advancing and is inventing new materials. Traditional metals are being substantially replaced by composites with higher performance. Lu (2010) states that aluminium use in Boeing 787 aircraft has dropped to 20 % compared to 50% in the previous model (Boeing 777). In contrast, carbon fiber–reinforced polymeric composites are 50% by weight in the Boeing 787, up from 12% in the Boeing 777.

Advances in material science are also creating new uses for metals. Metals may be mixed with other materials in a controlled way to form composite structures and increase their versatilities. For example, the pillar of the world longest bridge is made of steel tubes that are protected against corrosion in the harsh ocean environment by a coating of novel polymeric composites combined with cathode attachments (Lu, 2010). Advances in material engineering are consequently creating new substitutes and at the same time increasing versatility of traditional materials and thus creating new markets.

f) Additive manufacturing (3D Printing)

Additive Manufacturing or 3D printing is revolutionizing the way products are manufactured. As these technologies have progressed, engineers are now adopting a systematic approach to design. Performance parameters are defined, and then solutions that are suitable for the process are developed from them rather than the other way around. Designs therefore fit the solution available. The result is that parts can be, on average, up to 20-30 percent lighter than those produced in conventional ways (milled or cast parts). In some cases, the potential weight reduction can be as much as 60-80 percent (Herzog, 2016). The 3D printing technology also builds a final product through stacking layers of material. The advantage of this method is that there is almost no waste of the used material. Thus, 3D printing does not only save materials (this translates into a lighter environmental footprint), but depending on the use of the items (for example, as parts in a car), this reduction in weight translates into energy savings and further reduction in the ecological footprint (Lee, 2016).

Growth in 3D printing can see a reduction in demand for metals due to the savings it entails. However, the versatility of this new manufacturing process may see increased applications and thus higher demand for materials.

g) Blockchain technology

A growing number of consumers, institutional investors and other stakeholders have concerns with the quality and transparency of existing product certification schemes. Blockchain technology has the potential to allay those fears as it enables the geo-tagging of ores with cryptographic tokens allowing the identification, trading and management of ore as well as secure and monitorable maintenance of records from the moment of extraction all over the lifetime of minerals and metals. However, this will only be meaningful as long as material flows coming from separate sources will remain separate. For recycled materials, this technology could be very useful to identify the plant where the recycled material originates from, but it will be impossible to trace where all the original materials that entered a specific recycling plant came from. The records, called blocks, include information on ownership and authenticity, exact location of where the ore was extracted, as well as quality of production process from an ethical, social and environmental perspective.[57]

h) The digital mine and drones

Enabled by the internet of things (IoT), the digital mine is becoming a reality as planning, control and decision support systems are fully integrated and core physical processes are automated, including in remote locations. Moreover, mining companies are increasingly using unmanned drones for data collection (such as geophysical surveys in real time) and safety monitoring, especially to facilitate access to and inspection of difficult-to- reach or dangerous areas.[58]

These technology transformations and disruptions have necessitated organisational changes and a review of business models. Fully integrated real-time data visualisation and mapping, predictive modelling and cognitive analytics are contributing to efficiency gains, reduction of waste and better management of cost profiles. However, they also have serious impacts on jobs.

i) Innovation-driven uncertainty

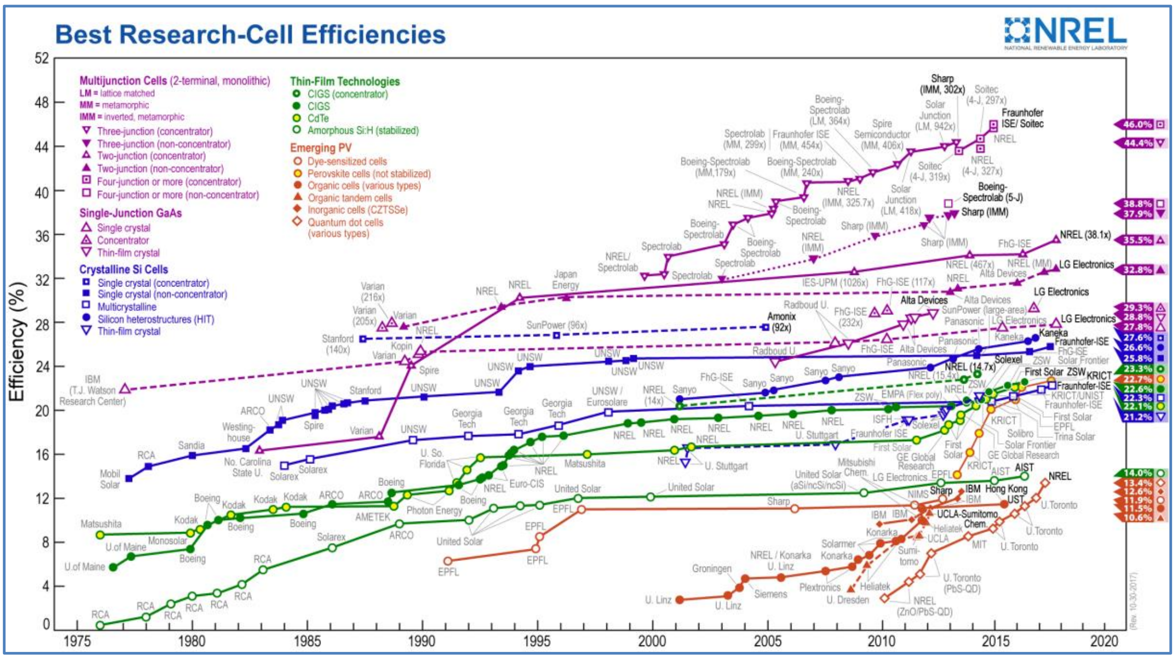
While technologies evolve at an ever-faster pace, it is difficult to forecast which technologies will be market leaders by 2050 and which ones will not have faded into oblivion. Christmann (2017) points to lighting technologies as an illustrative case. These technologies have evolved several times over the years, each time impacting mineral raw material demand. The gas mantle (which used cerium and thorium oxide), was invented in the late 19th century. It was later on substituted by LEDs (which use gallium).

Such rapid, sweeping, technology shifts make forecasting of demand fairly complex. While in 2013 only about 2 % percent of the 2013 lithium production was used for the production of lithium batteries, in 2035 the lithium demand for battery production may be as much as nearly 4 times the total 2013 world production. Although by then other battery technologies may have also been developed and industrialized.

Figure 4.5 produced by the US National Renewable Energy Laboratory (Department of Energy), provides insight into the many competing photovoltaic cell technologies currently being developed worldwide and the progress over time of their solar to electrical energy conversion factors. The upper left corner shows the material consumption and the solar to electric energy conversion factor on the right scale. Each technological family, shown with a specific colour, has specific material requirements. It is difficult to predict which of these technologies will be the market leader in 20 years and hence which raw materials may consequently be in high demand.

[57] https://www.pwc.com/gx/en/energy-utilities-mining/assets/pwc-mining-transformation-final.pdf
[58] https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Energy-and-Resources/gx-er-tracking-the-trends-2017.pdf

Figure 4.5 Photovoltaic cells in development (Oct. 30, 2017 update)



Source: US National Renewable Energy Laboratory (NREL). https://www.nrel.gov/pv/assets/images/efficiency-chart.png). This diagram is updated every three months.

4.2.8. Shift towards a circular economy[59]

WEF (2015) scenario analysis of circular use of commodities and metals, makes a number of conclusions. First, mining will not disappear. Primary extraction will continue but volumes are unlikely to grow in line with GDP growth. This means that pressure to realize scale effects and cost efficiency will remain in the foreseeable future. Demands for cost effectiveness will exist in parallel with demand for environmentally and socially responsible actions, leading to new partnership and operating models. Second, metals will not disappear. Metals companies will act as a liaison between commodity producers and end industries. Opportunities will exist to adapt business model transformations and reposition as materials providers. Third, technology will be key. Mining companies have an opportunity to focus on waste treatment optimization and metal companies on the improvement of low-grade processing capabilities. Fourth, it will become increasingly important to better understand supply chains and consumer preferences.

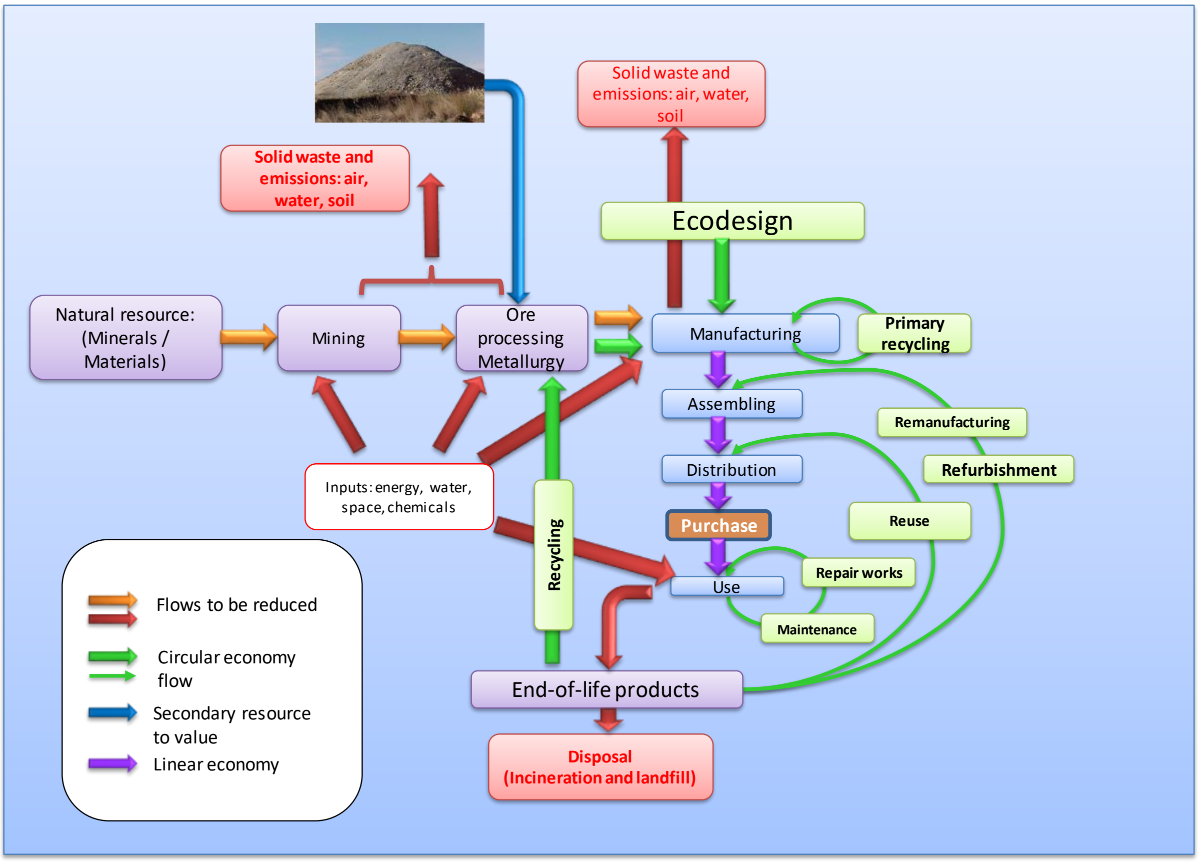
There is also a growing concern about the failure of the global ecosystem and alarm bells are ringing. The International Resource Panel has at the heart of its activities the recognition of the pressing need to decouple natural resource use and environmental impacts from economic growth (UNEP, 2011). In 2017, 15,364 scientists from all over the world issued a second warning of humanity. Several threats are putting humanity's future in question. These concerns have resulted in a strong push for a green,

[59] Material implications within a green economy include materials used in wind, solar, and energy storage batteries technologies. The key materials examined in World Bank (2017) scenarios were: Aluminium, Chromium Copper, Indium (Rare earth), Iron, Lithium, Lead, Manganese Molybdenum Silver, Steel, Zinc. However, other materials acknowledged as also important in for green economy include: Antimony, Boron, Cadmium Cerium, chromium Dysprosium Europium, Gallium, Germanium Gold, Lanthanum, neodymium nickel, Niobium platinum, Praseodymium, Selenium Silicon Tellurium Terbium, Tin Zinc, Vanadium.

circular economy. Consumers who want to see sustainable production and consumption, citizens and authorities aware of the challenges faced by the global and local ecosystems and the resulting threats to humankind itself are leading this push. Several international agreements have already been concluded to tackle specific issues. The most widely known is the Paris Agreement under the United Nations Framework Convention on Climate Change (United Nations, 2015) committing participating countries to curb their greenhouse gas emissions, to keep the average global temperature well below +2° C as compared to pre-industrial levels. Other important examples are the Minimata Convention on Mercury (United Nations, 2013) and the Montreal Protocol on Substances that Deplete the Ozone Layer.

Many possible actions can lead towards a more circular economy as shown in Figure 4.6.

Figure 4.6 – Schematic representation of the transition towards circular economy in relation with minerals and metals



Source: Christmann, unpublished work

Inputs[60] (such as energy, water and chemicals) as well as waste and emissions related to the production of minerals and metals can be reduced in several ways, for instance waste and some emissions can be reduced through industrial ecology designs (Graedel, 2015) or the development of more resource-efficient mining, ore processing or metallurgical process. A survey of the US mining

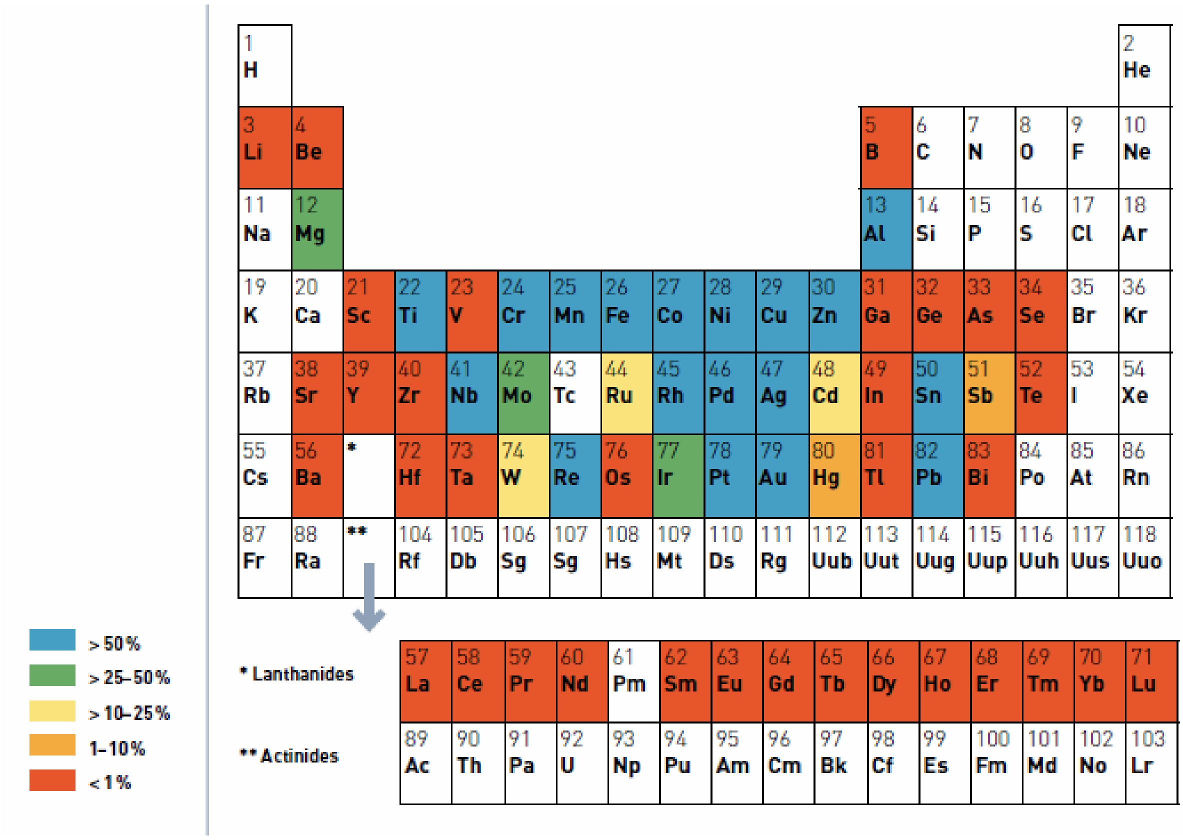
[60] Shown as red rectangles in figure 4.5

industry (US Department of Energy, 2007) showed that in the USA, more than 20% of the energy used in mining and ore processing could be saved if existing best practices were systematically used, and over half of the energy could be saved thanks to further research and innovation in developing more efficient equipment and processes.

The demand for primary minerals and metals (coming from a mine) could be significant if all the possibilities offered by the circular economy concept, shown as green arrows in figure 4.6 were used to the fullest. However, there are many obstacles on the way.

For instance, recycling of minerals and metals from end-of-life can be technically daunting and economically impossible as detailed in an earlier International Resource Panel report (Reuter et al., 2013). As a result, recycling rates of many metals from end-of-life product are verily low, sometimes less than 1% (UNEP, 2011 and Figure 4.7).

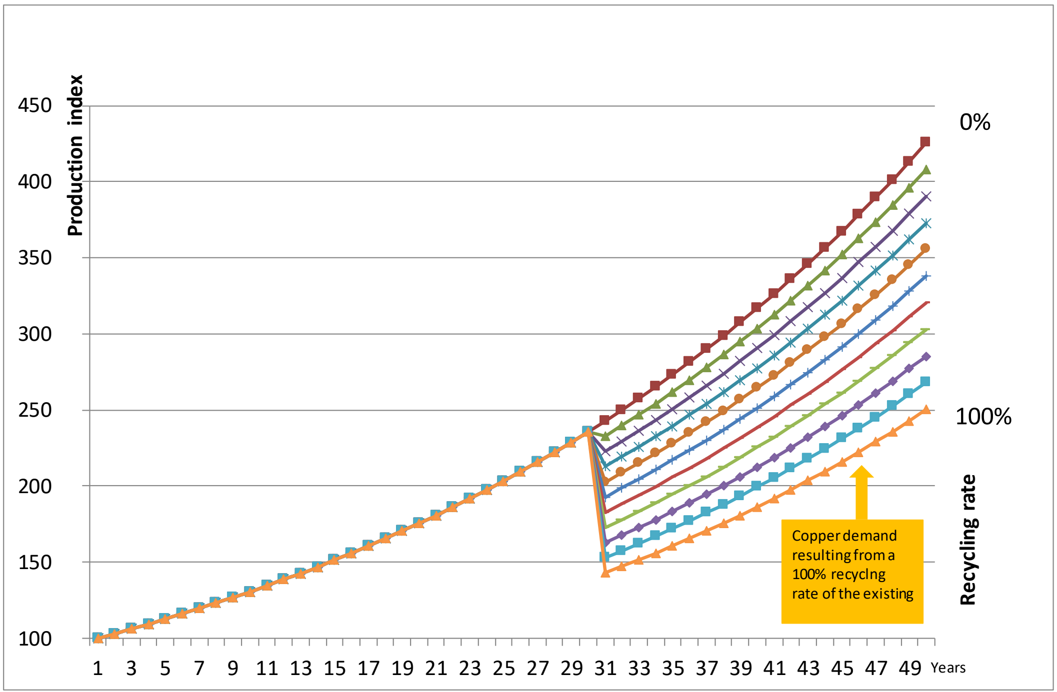
Figure 4.7 End-of-life recycling rates of 60 metals



Source: UNEP (2011). International Resource Panel Report.

Recycling of minerals and metals provides much benefits such a reduced primary demand as well as reduced energy and water demand for the production of recycled metals. But as long as the demand for minerals and metals grows year after year, the impact of recycling will remain limited and more primary minerals will continue to be produced. The duration of the use phase of metals in specific applications is of great importance to determine the size of the potentially recyclable minerals and metals available from end-of-use products. To illustrate this, figure 4.8 shows the abatement of the demand for a given mineral or metal that would result if the demand grows at a 3%/year rate and the use phase of that mineral or metal lasts 30 years. The diagram shows (yellow line) that a (very theoretical) 100% recycling rate would only partly reduce the demand for primary mineral and metal. This figure is close to the copper case, a metal that has a long use phase in many of its applications. This partly explains why in 2015 (Brininstool & Flanagan, 2018) the production of secondary (from recycling) copper was 4.03 Mt, which is 20% of the world copper metal production. As a consequence, a strictly circular economy will be impossible to achieve as long as the demand for minerals and metals continues to grow exponentially, a situation that is likely to last for most of the 21st century, due to the drivers mentioned above.

Figure 4.8 - Impact of recycling on primary metals demand - 3%/ year demand growth, 30 years use phase - Primary production, year 1 = 100



Source: Christmann, unpublished work

4.2.9.1. Reduction in consumption

The shift toward a more circular economy is seeing shifts in production processes to reduce waste and pay greater attention to recycling. Some of the key related trends include:

- Products are being designed to facilitate recovery of different metals. Design for disassembly facilitates separation of the proper fractions for further processing (Handwerker *et al*., 2016).
- Products are being designed with multiple uses or re-use in mind. For instance, it should be possible to design the steel rods and beams used in construction so that instead of being destroyed during demolition they can easily be disassembled, collected, reconditioned and certified for reuse in new buildings (WEF, 2015).
- Recycling is being automated. One of the hardest steps in e-waste recycling is simply getting the battery or other critical-metal-rich components out of the larger device or machine. This is a menial but intricate task, often handed over to low-paid workers. However, unsafe

practices can lead to contamination. Japan is at the forefront of efforts to automate these processes so they can be done economically and safely by machine .

- Greater attention is being paid to remanufacturing and refurbishing – the disassembly, cleaning, repair and reassembly of a product – restoring it to a like-new condition. Note that reusing a remanufactured/refurbished engine rather than producing a new one can, for example, consume up to 83 % less energy and save up to 87 % of emissions.
- More fundamental shifts include changes in the business model. For example, leasing of products or selling functions instead of products. It should be noted that leasing as opposed to outright sale provides a means to easily recycle as products are returned to the seller once the lease comes to an end (Wäger *et al*., 2012).

The shift to a more circular economy is also creating demand for new materials as shown in Table 4.1. Materials that were not previously in demand are now considered critical materials and significant efforts are being made to ensure their supply[61]. For instance, the demand for cobalt and lithium is soaring due to the rapid development of battery-operated electric cars, or the demand for gallium is sustained by the rapid development of LED lighting.

4.2.9.2. Substitution of rare minerals and metals

Substituting the use of scarce, generally expensive minerals or metals is one of the different ways to enhance resource efficiency and to transition towards the circular economy. Substitution can take place in multiple ways: one metal can be substituted by one other in some uses (for instance aluminium can substitute copper in high voltage overland electricity supply lines) or a technology using a different metal can substitute an older technology that used different minerals or metals (for example LEDs using gallium instead of CFLs using europium, terbium and mercury).

However, substitution remains a complex topic as the use of substitutes in certain applications may result in loss or performance and/or may involve very long qualification processes, for instance in aeronautics. Graedel *et al.,* 2013[62]; Halme *et al.,* 2012; Vidal *et al*., 2013; Tercero Espinoza *et al*., 2015; European Commission 2017a & b provide detailed insights into substitutionability of individual minerals and metals and related research topics.

The shift to a green economy is also creating demand for new materials. Materials that were not previously in demand are now considered critical materials and significant efforts are being made to ensure their supply[63].

4.2.9.3. Shift to renewable energy

[61] The green minor metals include indium (In), germanium, (Ge), tantalum (Ta), PGM [platinum group metals, such as ruthenium (Ru), platinum (Pt) and palladium (Pd)], tellurium (Te), cobalt (Co), lithium (Li), gallium (Ga) and REE (rare earth elements), which are needed for the development of cleaner technologies. Batteries, wind turbines, solar panels and electronics systems needed for all kinds of control use these critical metals.

[62] It comprises, in its supplementary information, a detailed database covering 62 elements, mostly metals, and their main uses

[63] The green minor metals include indium (In), germanium, (Ge), tantalum (Ta), PGM [platinum group metals, such as ruthenium (Ru), platinum (Pt) and palladium (Pd)], tellurium (Te), cobalt (Co), lithium (Li), gallium (Ga) and REE (rare earth elements), which are needed for the development of cleaner technologies. Batteries, wind turbines, solar panels and electronics systems needed for all kinds of control use these critical metals.

The global transition towards carbon-clean energy production technologies will also be an important driver of the demand for minerals and metals[64]. Energy production from renewable energy sources requires much greater amounts of metals, both of the common and rare types, than energy production from fossil fuels (Baldwin *et al*., 2015).

The International Resource Panel's Green Energy Choices report finds that some demand-side energy efficiency technologies, including present-day electric vehicles and a few building insulation technologies, may aggravate the pressure on natural resources, especially metallic resources (UNEP, 2016). Environmental damage and biodiversity loss associated with this will increase demand for mined products. Overall, the report concludes that the current structure of global resource use is likely to change substantially with the global energy transition that is necessary to mitigate climate change. Electricity production technologies that are mainly made of metal, or that use rare metals (with a low known reserve) have a substantial impact on metal depletion. The on-going assessment of metal criticality by the International Resource Panel will hopefully give rise to more robust and appropriate methods to assess the criticality of metals used in energy technologies. A recent report by World Bank also concludes that a low carbon future will be significantly more mineral and metal- intensive than is the case with current energy technologies (World Bank, 2017). The report assesses what it would take to materially supply a subset of new technologies and data systems required to reach the transition to a low carbon energy future. After identifying the relevant minerals and metals that are expected to play a crucial role and developing indicative scenarios on how the demand for those commodities might increase over the century, the study provides some initial implications for relevant resource-rich developing countries.

4.2.9.4. Rise of green investment

Investment is crucial for any industry and thus the investment community can shape industries by providing the capital they need to grow. Therefore, investment strategies adopted will have far reaching consequences on both demand and supply of minerals and metals.

Worldwide, sustainability is becoming an essential investment criterion. These types of investments accounted for $3.74 trillion in total assets under management at the end of 2011 (Macpherson & Ulrich, 2017). Many market players have started using sustainable, responsible and impact-based strategies for investing in assets. For example, PFZW, the Dutch giant healthcare pension fund, has announced that it intends to quadruple its sustainable investments to a value of $16 billion before 2020. The pension fund will also aim to halve the CO^2 footprint of its investments before 2020 by comparing companies in each sector and picking the best performers (WEF, 2015). Over the past decade, green bonds have also emerged.

Macpherson & Ulrich (2017) indicate that green finance will likely be supported across the investment value chain and bolstered by the 2016 Paris Agreement. Furthermore, investment for the achievement of the SDGs, which have become a framework for environmental and social investment themes, will

[64] Such as antimony, cobalt, gallium, germanium, gold, lithium, molybdenum, niobium, platinum group elements, rhenium, selenium, silver, tantalum, tellurium, tin, tungsten, vanadium or zirconium. Photovoltaic and thermal photovoltaic energy production, windmills and the related energy storage and distribution systems will require large amounts of aluminium, copper, iron and its main alloying metals (chrome, manganese, molybdenum, nickel, niobium and vanadium) as well as rare minor metals such as gallium, germanium, indium, platinum group elements, rare earth elements, selenium, silver, tantalum, tellurium, tin (U.S. Department of Energy, 2011; ; Vidal *et al*., 2013; Baldwin *et al*., 2015; UNEP, 2016; Arrobas *et al*., 2017).

gain momentum, especially among millennial, value, and impact investors. This is the case of the Church of England National Investment Bodies (NIBs) who have recently adopted a new investment policy for the extractive sector centred on business conduct, responsibility and corporate governance including in the management of risk, the side effects of extractive operations and the safeguard of operating standards. It covers ethical risks, human rights, social concerns, health and safety, corruption and taxation, as well as environment and ecology, with the possibility of divesting where risks are high.[65]

4.3 Conclusion

Ali *et al.* (2017) point that the successful delivery of the United Nations sustainable development goals and implementation of the Paris Agreement requires technologies that utilize a wide range of minerals and metals in vast quantities. Minerals and metals recycling and technological change will contribute to sustaining supply, but mining must continue and grow for the foreseeable future to ensure that minerals and metals remain available to industry. New links are needed between existing institutional frameworks to oversee their responsible sourcing, trajectories for mineral exploration, environmental practices, and consumer awareness of the effects of consumption. An international process is needed to mitigate the shocks of future supply crises, which could be undertaken through a covenant or even a treaty. Going forward, the authors propose 6 measures on how best to ensure ecologically viable continuity of global mineral supply over the coming decades and so, avert the crisis that is looming, namely, 1) reach consensus on international targets for global mineral production; 2) monitor impacts of mineral production and consumption; 3) improve coordination of mineral exploration; 4) support investment and research into new mineral extraction technologies; 5) harmonize global best practices for responsible mineral resource development; and 6) develop maps and inventories showing the availability of recyclable metals.

Nonetheless, painting the future picture of demand for and supply of minerals and metals is fairly complex, as demand and supply patterns can change dramatically over time due to numerous economic, technical, and geopolitical factors. For example, in 1954, Africa was the key supplier of non-fuel commodities of mineral origin to the United States, closely followed by the United Kingdom. By 2014, China was the main source of supply for 24 of these commodities, followed by Canada.
Drivers of supply and demand tend to interact and influence each other in ways that might be counterintuitive. For example, higher incomes can lead to increased demand for durable goods, but at the same time the middle class might be more sensitive to the message of responsible consumption and thus reduce demand. High demand and high prices can also lead to the development of new substitutes or new technologies to mine previously uneconomic resources (such as fracking technology to tap shale gas) that can result in abundance. A shift to a green economy and the new digital technologies are, on one hand, creating demand for minerals and metals that were previously in more limited demand and, on the other, reducing demand through greater emphasis on recycling and other circular economy related practices. The drivers of demand and supply are in constant flux and how they interact shapes the pattern of demand-supply.

[65] https://gallery.mailchimp.com/50eac70851c7245ce1ce00c45/files/3de6701c-8404-4429-88f0-a01776e6ba8f/Extractive_Industries_Policy_1_.pdf

How minerals are mined and processed and used may change dramatically. There is growing concern about the impact of mining and processing metals on the environment, especially with respect to biodiversity and climate change. These new concerns are coming in place as ore grades are deteriorating and thus creating higher demand for water and energy. At the same time, mainly in developing countries, consumers are demanding that products be produced sustainably. Mining companies will have to rethink their business models to cope with shifting consumer preferences and a tightening regulatory landscape. They will need to start seeing themselves as material providers so that they can internalize all the costs and develop models that can integrate mining, processing, product development and recycling. The manner in which mining companies are regulated may need to change to fit this new model.

Meanwhile, primary metal extraction will cover most of the world's material demand in the coming decades (Dolega, 2016). Meeting future materials demand will mean significant investment in exploration and in development of new mines. These are costly and risky ventures. It will require improving governance at the national level and reducing political risk so as to attract needed investments. This could lead to new areas being opened for exploration and development.

The complexity of the issues discussed above points to the need for a governance framework that can accommodate a supply and demand landscape, which will be in a flux going forward. As the value chain extends to include recycling and becomes more complex, mining companies will have to revisit their business models to accommodate a changing landscape. The prospect of increased exploration and mining to meet future demand means that a sharper focus will need to be placed on mitigating the impact of mining, especially as mining moves towards new frontiers where past experience in managing these externalities may not suffice.

There is the need for a coordinated international effort to develop foresight capabilities, needed to enlighten public and industrial strategies and to strengthen minerals and metals governance. There is a need for an international body that would have a similar role that the International Energy Agency has in the energy sector.

CHAPTER 5- ENVIRONMENTAL AND SOCIAL IMPACTS OF MINING

5.0. Introduction

The earlier chapters of this report show that mining is important for economic development (Chapter 2) and for sustainable livelihoods, as in the case of ASM (Chapter 3). Demand for minerals will continue to grow due to, amongst other factors, population growth, rising urbanization, and an expanding middle class especially in the developing countries (Chapter 4). This trend is expected to continue, even if at a slower pace, irrespective of the pursuit of a low carbon strategy and/or substantial progress towards a circular economy.

This chapter explores the environmental and social externalities of mining activities and the potential consequential impacts on the viability and future of other economic sectors. In particular, sectors that show a strong dependence on ecosystem services (such as agriculture, nature-based tourism and fisheries) may be negatively affected if the potential impacts of mining on ecosystem assets and their flows to beneficiaries are not addressed. Examples of this include deforestation-led erosion affecting hydropower dams; habitat loss and fragmentation affecting wildlife populations in tourist destinations and pollination services; coastal habitat destruction decreasing fish stocks; and water and soil contamination affecting agricultural production. Therefore, coupled with the need to invest resource wealth in sustainable development, is the need to manage resource development so as not to undermine other economic sectors.

There is potential for impacts of extractive activities to become more severe in the future as there is a trend towards mining lower grade ores. One common explanation is that most rich ore deposits would have already been exploited leaving only lower grades, while others argue that the cost effectiveness of mining lower ore grade in already developed mine sites distorts the grade ratings (Dolega *et al*., 2016). Whatever the case, mining lower grade ore will lead to larger amounts of waste, higher energy and water demand. Equally, as easily accessible reserves become depleted, exploration is moving into more remote and often fragile areas. Deep sea mining is one example of a new and challenging frontier for mineral extraction. These trends could potentially increase environmental and social impacts. The good news is that the social and environmental impacts of mining now receive far greater attention. Public scrutiny by national and international civil society has been one force for change. Governments are now held to a higher standard of accountability, as are donors and international financial institutions.

Environmental and social responsibility does not end with the mining operation itself. As an inherently obsolescent industry, the closure planning of a mine[66] must be undertaken as part of the development process. Managing environmental and social liability potential past closure has been among the most neglected areas of mineral governance. While laws such as the U.S. Comprehensive Environmental Responsibility Compensation and Liability Act (CERCLA) have helped to raise the issue of environmental liability, the social impacts of mine closure remain largely neglected. Planning for a post-mining economy that considers social development and community satisfaction with quality of life must remain an essential goal of improved governance in the sector.

[66] Mine closure is discussed in Chapter 6 (section 6.1.11).

This chapter outlines key environmental and social impacts associated within mining activities. Please note that a focus has been put on the negative impacts of mining as these often present the most pressing challenges both for environmental management and governance. However, it should be noted that steps are being taken to achieve neutral or positive impacts on biodiversity as a result of mining activities. Some examples of good practice and industry initiatives to address biodiversity and ecosystems service impacts are provided in later chapters of the report.

5.1 Extractive industry and the environment

The often severe and enduring impacts on the natural environment from mining activities are widely reported. For instance, surface mining often cuts back forest and other vegetation cover, removes topsoil[67] and introduces heavy machinery, which can be particularly damaging in fragile environments. Chemicals and other harmful substances used to process ores can enter waterways and the natural environment when not managed appropriately. There is often an extensive amount of mine waste that can be toxic in nature, posing a significant risk through failures of storage facilities to contain the waste. There have been a number of catastrophic events linked to failures of large facilities, such as the Samarco tailings dam disaster in Brazil in November 2015 (Hatje *et al.*, 2017) (see **Error! Reference source not found.**). Mining also does not happen in isolation. There are a range of ancillary activities to support operations that can include roads, railways, energy generation facilities and so on. Where mines are located in remote areas, the need for new infrastructure and energy generation can be particularly important to consider.

The extent and severity of mining impacts on the environment depends on both the type of operation and the sensitivity of the environment and these vary throughout the life cycle of the project. The impacts of mining can extend beyond the operations of the mine. Closed mines have potential of environmental damage as well as pose risk to safety. Therefore, the potential impacts throughout the whole lifecycle of a project, and for years beyond closure of the mine itself, need to be considered.
The environmental impacts of extractive activities are summarized below with an aim to delineating key parameters for environmental governance of the sector in later chapters. For a more detailed discussion, see Dolega *et al*. (2016).

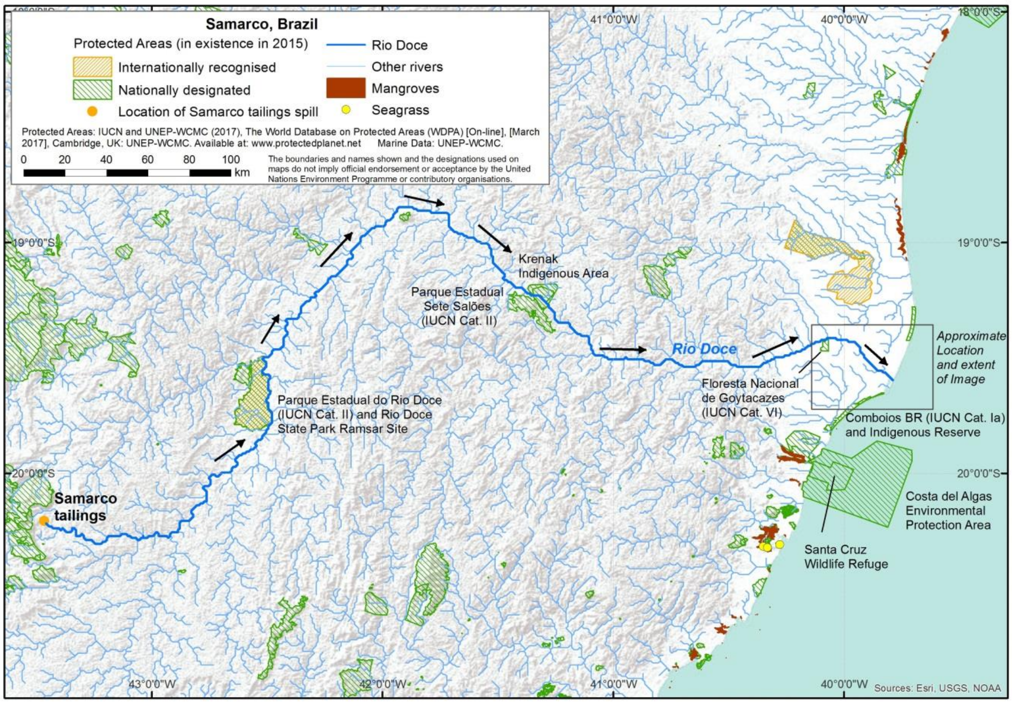
5.1.1 Freshwater competition and contamination

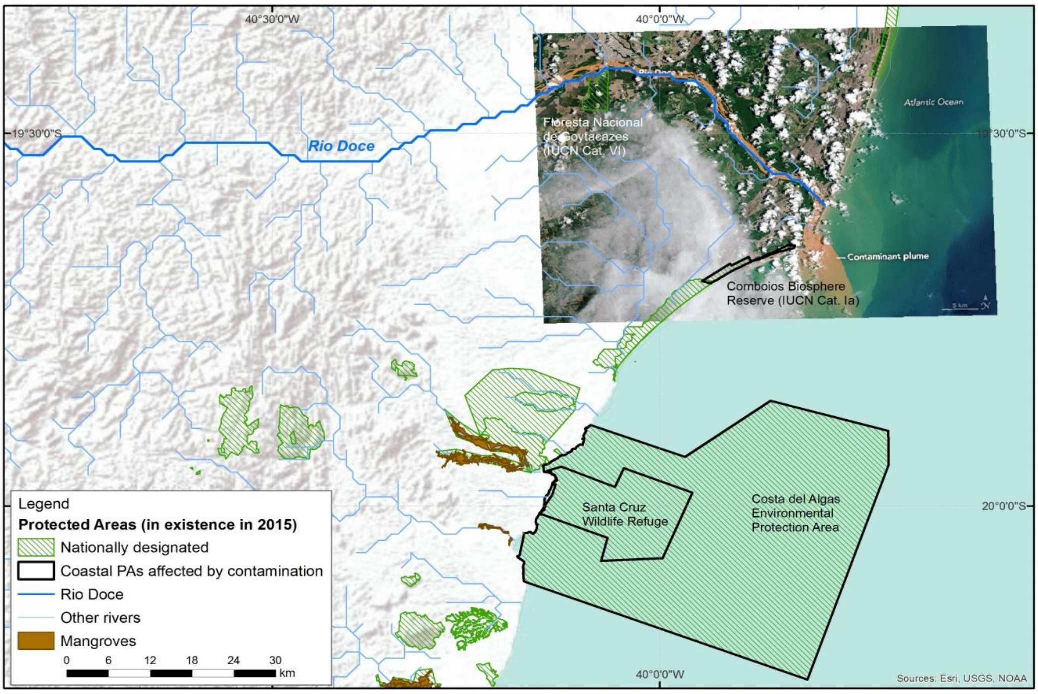
A number of environmental problems associated with mining stem from the contamination of, and competition for, surface and groundwater. The mining industry is a heavy user of water. It has been estimated that 1600 litres of water are used to obtain 19 kgs of copper (CSIRO, 2016). This demand creates competition for water between mining and other uses, especially agriculture. Groundwater lowering for mining further aggravates water stress. ICMM/IFC (2016) reports that water-stressed countries are host to 70 % of mining operations of the six largest mining companies.

Another challenge arises from the production of effluents. Toxic effluent waters from processing that are not properly treated or retained directly contaminate surface waters and affect ecosystems, biodiversity and human health. The impact of toxins can be compounded in the food chain through

[67] For instance, for each carat recovered from the Catoca mine in Angola, the fourth-largest diamond mine in the world, more than a tonne of material is removed (ECA 2011)

Figure 5. 1 The Samarco tailings dam failure in relation to protected areas and habitats.





Source: IUCN & UNEP-WCMC (2017).

bio-accumulation. The effluent waters contain toxic chemicals used in the processing of mineral ores such as cyanide, organic chemicals and leached heavy metal oxides (including lead and zinc oxides) and may also have high levels of acidity (UNEP, 2010b; ELAW, 2010 cited in Dolega *et al*., 2016). Water contamination has been shown to have a severe and far reaching impact on fish habitats and populations located downstream of mines, including aquaculture and fisheries (Daniel *et al.*, 2014).

Water contamination can result from a number of mining activities, including those listed below.

- Effluents discharge: Mining discharges many effluents that can seep into water bodies including Groundwater. There can also be excess water in the mineral deposit area as well.
- Excavation leading to water table intrusion: Mining often penetrates the earth to depths which reach the water table. This allows groundwater to flow into the mining pit, which may contaminate local groundwater. Contaminated groundwater may affect the clean water supply, surface water and, via irrigation, agricultural soils.
- Tailing Storage Facilities (TSF) leakages and collapse[68]: Leakages from TSFs, if the floor and sides are not properly sealed, can lead to high concentrations of toxic reagents and heavy metals in groundwater. Heavy rainfall, tectonic activity, and poor construction and management can cause a storage facility to collapse and release tailings to the environment. Tailings dam failures are one of the most devastating environmental accidents[69]. The risk factors for a failure, especially from heavy rainfall events and snowmelt have increased with climate change as it likely to lead to heavier precipitation events. **Error! Reference source not found.** gives an example of the large areas that can be potentially impacted by TSF failures.
- Acid Mine Drainage (AMD): AMD is one of the main problems related to mining. AMD occurs when sulphide minerals, which are part of waste rocks or mining tailings, are exposed to oxygen and water, leading to a chemical reaction in which sulfuric acid forms. The acid dissolves heavy metals, such as arsenic, cadmium, mercury or lead, and can contaminate groundwater and soil if no restraining systems are installed. AMD after mine closure poses a particular threat. Globally, many regions face ongoing environmental damage due to AMD at closed mining sites. Australia estimates that it has 50,000 abandoned mines (Unger *et al*., 2012 cited in Dolega *et al*., 2016). Exemplifying a common problem, drinking water was contaminated in 2010 by AMD from the abandoned Brookstead tin mine in Tasmania (White, 2013, cited in Dolega *et al*., 2016).

Mining activities adjacent to water courses can also cause impacts, such as increased siltation due to removal of nearby vegetation cover or changes to the temperature regime.

Water contamination can have a huge impact on biodiversity and ecosystem services. As well as the direct impacts of water contamination on aquatic life and the wildlife (such as mortality), there are a number of other potential impacts. Increased silt within watercourses can disrupt visibility and the migration patterns of aquatic species, whilst extraction of water for use can reduce the availability of water to animals and birds at crucial times and locations. At the extreme, long term changes in water table can fundamentally change the soil conditions in an area, leading to different habitat types becoming established.

Changes in sediment depth or water temperature within watercourses can also change both plant and animal assemblages over time. Factors such as changes in sedimentation or silt can also impact the way ecosystems function and disrupt the environmental, social and economic services they provide.

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[68] Tailings are the materials left over after wet processes used to separate the valuable fraction from the uneconomic fraction of an ore. The leftover slurry is referred to as tailings and consists of fine particles and chemical reagents. Sometimes, it has high concentrations of toxic substances. The tailings are usually stored in impoundments known as a Tailing Storage Facility (TSF)

[69] In Brazil in November 2015, a tailings dam failure discharged more than 50 million cubic meters of sludge into the surrounding areas. The resulting mudflow interrupted the drinking water supply of at least 260,000 people, more than 600 inhabitants lost their homes and several people died. The mudflow contaminated more than 600 km of the nearby river Rio Doce (Neves et al. 2016). Water samples from the river indicate concentrations of substances such as lead, aluminium, iron, barium, copper, boron and mercury by far exceed tolerable levels. The river's toxic water composition now renders it useless for irrigation or consumption.

For example, water contamination in important fishing or aquaculture areas can have particularly negative social and economic impacts.

5.1.2 Impacts to the marine environment

As indicated in **Error! Reference source not found.**, rivers contaminated as a result of mining activities can flow into coastal areas, causing impacts on the marine environment. Furthermore, extractive activities in the sea and disposal of waste into the sea also pose environmental problems, as outlined below.

- Seabed mining for diamonds in the Sperrgebiet region of southwestern Namibia has removed a strip of beach 300 metres wide and 110 kilometers long. This has taken the beach down to the bedrock and increased turbidity and sediment as a result of the disposal of the sand tailings directly into the ocean (ECA, 2011).
- Mining sites close to bodies of water such as in Indonesia, the Philippines, Papua New Guinea and Norway, often dispose of tailings directly into rivers or the sea. Currently, 16 mines in eight countries use deep-sea tailings disposal techniques (Groß, 2016 cited in Dolega *et al.*, 2016). Submarine disposal for mines close to the coast is relatively cheaper than on-land disposal, leading to distorted price competition with mining sites following best-practice waste treatment standards.

Not all risks associated with disposal of tailings in deep-sea locations are entirely known. However, initial studies already indicate deep sea disposal accompanies reduced abundance of aquatic life and there is a general consensus that this practice should be banned (Dolega *et al.*, 2016). Box 5.1 describes the impacts of seabed mining.

Box 5.1 Impacts of seabed mining

Recent research has shown that deep seabed mining is likely to cause many adverse impacts on deep-sea ecosystems (Figure 5.2), including a loss of habitat and biodiversity (van Dover et al., 2017). Although the direct seabed footprint may be relatively small in terms of habitat removal or damage, the noise, vibrations and changes in light levels can be hugely impactful for marine species. A key concern around this is the potential interference of noise and vibrations on marine mammals that use sonar for navigation and communication, particularly where this may cause disturbance or barriers along important migration routes, at breeding and feeding sites, or at critical times of the lifecycle. Migratory routes may be also be disrupted and pose long term impact on the migratory pattern. In a similar way to impacts on freshwater habitats, potential contamination from discharges, changes in sediment regimes and local microclimates have the potential to impact biodiversity and ecosystem services. Communities that rely on healthy fisheries can be particularly impacted by mismanagement of mining operations in the marine environment. However, where mining operations are conducted sensitively, the fishing exclusion zones around them can create refuges for some fish species.

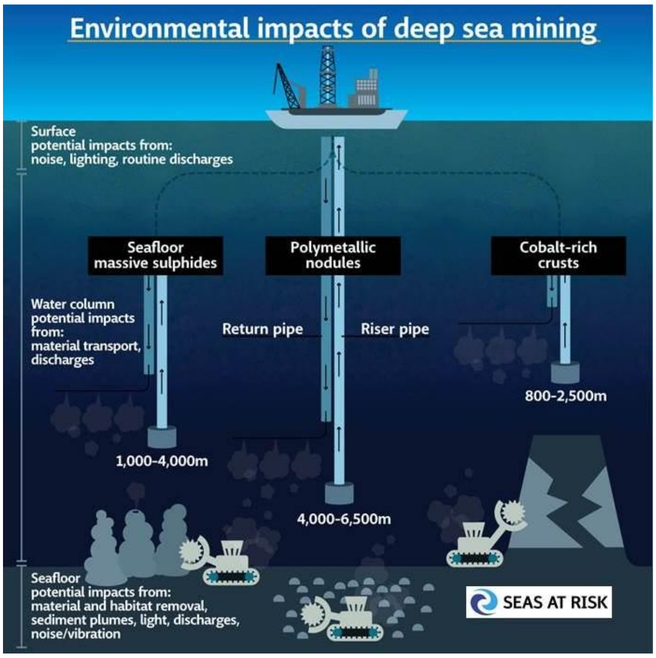
There is widespread concern that such impacts will be significant and even irreversible because: [70]

- Many deep-sea species reproduce slowly, live in slow-changing environments and are likely to be highly vulnerable to mining impacts;
- The deep sea helps regulate the planet's life systems, and little is known about the effects of seabed mining on that capacity;
- Many deep-sea habitats – hydrothermal vent zones in particular – are compact, localised and particularly vulnerable to external impacts;

[70] MIDAS Research Highlights: High-level summary of the key project outcomes, 2016, http://www.eu-midas.net/library

- There is insufficient scientific knowledge to adequately assess the likely effects of deep-sea mining on habitats, biodiversity and ecosystems; and
- The remoteness of the areas in which deep-sea mining will take place will make monitoring and emergency response difficult.

Figure 5.2 Environmental impacts of deep-sea mining



Source (Ali, 2017).

5.1.3 Solid waste production

Depending on the specific ore grades and the degree of overburden, the ratio of waste to metal mined is large. For example, to mine seven grams of gold, on average one tonne of waste material must be mined, not including the overburden Mineral extraction is the largest global waste producer, particularly from copper, zinc, bauxite and nickel mining (Roche *et al*., 2017; Dolega *et al*., 2016; Hudson-Edwards *et al*., 2010). The waste generated is usually stored as tailings, which as earlier noted, is a major hazard. Box 5.2 presents how UNECE is supporting member countries to address this concern.

Box 5.2 Tailings management

UNECE promotes responsible mining as part of a green economy agenda through a range of largely separate sectoral activities and instruments. Tailing management and management of methane gas are two areas that UNECE provides good lessons. Under the UNECE Convention on the Transboundary Effects of Industrial Accidents and the Convention on the Protection and Use of Transboundary Watercourse and International Lakes, safety guidelines and good practices for tailings management facilities were developed in 2008.

Tailings Management Facilities (TMFs) store large amounts of mining waste that is generated as a by-product when extracting minerals. As such, they can pose serious threats to humans and the environment, especially in case of their improper design, handling or management. Hence, a failure may result in uncontrolled spills of tailings, dangerous flow-slides or the release of hazardous substances, leading to major environmental catastrophes. Effluents from mining tailing, particularly from coal, iron and uranium ore mines, are also potential sources of groundwater and soil pollution with heavy metals and radionuclide.

Under the Convention on the Transboundary Effects on Industrial Accidents, UNECE promotes effective TMF management across the pan-European region. The *Safety Guidelines and Good Practices for Tailings Management Facilities* aim at supporting Governments and stakeholders' efforts with a view to limiting the number of accidents at tailings management facilities and the severity of their consequences for human health and the environment. Several projects on improving TMF safety have been or are being implemented in Eastern Europe (Ukraine) and the Caucasus (Armenia and Georgia) based on the UNECE Safety Guidelines. The convention has also taken special note of the need to improve tailings safety in Central Asia, where the risk of accidents caused by a natural disaster or infrastructure failure is very high.

UNECE has initiated and works through an inter-agency coordination group on industrial and chemical accidents to strengthen institutional and capacity development for industrial accident prevention, preparedness and response.

The footprint required to store or dispose of solid waste can be very large. This can create additional pressures on surrounding habitats, as areas are cleared to accommodate large spoil heaps. In addition, leachate and particulate matter from solid waste can impact surrounding terrestrial and aquatic habitats.

5.1.4 Air pollution

All mining stages can affect air quality since fine particles and dust are often produced and dispersed by the wind. This can lead to a range of environmental impacts and adverse human health effects, particularly if the dust contains heavy metals. Air pollutants also pose a risk to ecosystems which in turn can also impact human health and welfare through contaminated food, water and a loss of other ecosystem services. Air pollution can also impact biodiversity, through both direct and indirect impacts. For example, the ability of some plants (including a number of agricultural crops) to photosynthesise can be compromised by consistent coverings of dust, while large quantities of airborne material can reduce visibility or cause disruption to the movement of animals. Over longer periods, species fitness and survival may be compromised by air pollution, either through direct contact or bio-accumulation of heavy metals in the food chain.

5.1.5 Soil erosion and contamination

Land conversion due to mining and its infrastructure destroys or contaminates soil cover in many cases, which constitutes a long-term or even total loss of agricultural potential. Mining processes, such as crushing and milling, reduce soil particle sizes significantly, enhancing erosion by rainfall, runoff water or wind. This can have significant impact on the immediate and downstream ecosystems and human health. In addition, high sediment loads in surface waters, commonly lead to drastic changes in aquatic ecosystems, as described in more detail in the sections above. The overall impacts on soil health and biodiversity can be very high, damaging soil structure, reducing soil biota and disrupting hydrological processes. This can drastically reduce the number of plant species able to grow, modifying habitats (and thus the species they support) and leading to an increased risk of bio-accumulation for some contaminants.

5.1.6 Radioactive pollution

Producing one tonne of usable uranium oxide requires processing 3,000 tonnes of waste, which often contain elevated levels of radioactivity (ECA, 2011). Of note is that beyond uranium mining, the waste from extracting other metals is associated with radioactive by-elements that can also irradiate tailings sludge. Rare-earth element mining and processing often coincide with radioactivity leaks from thorium (Dold, 2014; Walz *et al.*, 2016 cited in Dolega *et al.,* 2016). Gold production in the Witwatersrand basin in South Africa has produced several billion tonnes of gold tailings with about 600,000 tonnes of contained uranium oxide in these tailings (Winde, 2013). Wind erosion can then transport the radioactive dust, and rainfall and oxygen may dissolve the radioactive particles and trigger mine drainage, contaminating streams, aquifers and groundwater. The radioactivity can enter the food chain and have severe and lasting impacts on biodiversity and human health.

5.1.7 Habitat clearance

During mine development, the clearance of natural habitats to gain access to mineral deposits, as well as to build facilities for storage, processing and waste can have a profound impact on the populations of a number of species, particularly if those sites are important for key functions such as breeding, feeding or migration (see Box 5.3).

Box 5.3: Biodiversity hotspot: Guinea Sangaredi mine

Bauxite mines and alumina refineries typically create serious ecological problems. Bauxite ore is mined in open pits, requiring the removal of vegetation and topsoil. The Alumina refining produces highly caustic "red mud" that negatively affects surface and groundwater quality. In addition to direct environmental impacts, there are more profound effects associated with the increased population and infrastructure development associated with the mine.

The Sangaredi Mine is Guinea's largest and most profitable mine. Sangaredi Mine is a vast open pit approximately 20 kilometres from one end to the other. The mine is located in the Upper Guinea Forest falls within one of the world's most biologically rich, yet seriously threatened, ecosystems. Biological assessments of the area surrounding the bauxite mine and proposed alumina processing facility identified 5 reptile species, 17 amphibian species, 140 species of birds, 16 species of mammals and 8 primate species, including the endangered West African chimpanzee and western red colobus. New developments will likely put immense pressure on this environmental "hotspot."

Source: UNEP (2008) cited in ECA (2011).

A study by Murguia (2015) showed that large-scale metal mining activities exert or may intensify pressures on bio-diversity by adversely changing habitats, directly and indirectly. The study examined the global spatial distribution of mines and deposits for five key metals across different biodiversity zones. The study found that mines and deposits (bauxite and silver, especially) are not randomly distributed, but are concentrated within intermediate and high diversity zones. In addition, increased demand for minerals and the depletion of easily accessible reserves is pushing exploration and mining into previously inaccessible and / or fragile areas such as the Arctic, and more remote areas of the world's tropical forests, where the impacts of direct and induced habitat loss associated with mining are particularly severe.

In Europe, a number of initiatives have been undertaken to address the loss of biodiversity from extractive activities (See Box 5.4). The International Finance Corporation's performance standard 6, specifically noting "biodiversity conservation," is also a key development in this regard. In 2012, the revised standards require that projects achieve a no net loss of biodiversity in areas of natural habitat and a net gain in areas of critical habitat through adoption of the mitigation hierarchy. They also include additional requirements for operations in protected areas (IFC, 2012). This standard has been adopted by the Equator Principle Finance Institutions and has become a blue print of best practice for a number of industries, including mining and oil and gas.

Box 5.4 Protecting biodiversity from extractive activities in Europe

Although Europe is not a big global player in mineral production, Europe has a significant and important extractive industry that generates close to EU 49 billion and employs close to 287,000 people. The potential impact of this industry on biodiversity has been acknowledged. In response, Europe has put in place actions to address the loss of biodiversity resulting from extractive activities (EC, 2010). Natura 2000 is the centrepiece of the EU nature and biodiversity policy. This is an EU-wide ecological network of nearly 26000 of Europe's most valuable and threatened species, habitats and ecosystems.

There is no automatic exclusion of non-energy extractive industry (NEEI) activities in and around Natura 2000. Instead, extractive activities shall follow the provisions outlined in Article 6 of the Habitats Directive to ensure that these activities do not adversely affect the integrity of Natura 2000 sites. The Commission Guidelines on 'Non-energy mineral extraction and Natura 2000' show how the needs of extractive industry can be met while avoiding adverse effects on wildlife and nature. They examine how the potential impacts of extraction activities on nature and biodiversity can be minimised or avoided altogether. They also highlight the importance of strategic planning, the appropriate assessment of new developments, and the need for adequate mitigation measures. The guidelines contain many examples of best practice and show how some extraction projects can ultimately be beneficial to biodiversity by providing highly quality ecological niches (EC, 2010).

Europe also regularly assesses the guidelines to determine if they are still relevant. The REFIT Fitness Check Tool is a comprehensive policy evaluation of the Birds and Habitats Directives. The evaluation assesses if the Directives are fit for purpose by examining their performance against five criteria: relevance, effectiveness, efficiency, coherence and EU added-value. This retrospective exercise considers what has worked well or poorly, and compares actual performance to earlier expectations. The results will be used by the Commission to inform future decisions relating to EU nature policy.

In a recent evaluation (EC, 2016) several industry stakeholders referred to the overly restrictive application of the provisions of the Nature Directives by permitting authorities, which has led to a de facto ban on activities in the Natura 2000 protected areas in some parts of the EU. Nevertheless, stakeholders have called for a more balanced, proportional and sustainable approach to licensing of potential new mining and quarrying developments.

The European Commission has also adopted the Action Plan for nature, people and the economy to improve their implementation and boost their contribution towards reaching the EU's biodiversity targets for 2020. The Action Plan calls for reconciling and building bridges between nature, people and the economy, focuses on four priority areas and comprises 15 actions to be carried out between now and 2019. Among others, they seek to identify with Member States and other stakeholders' best practices on investment for extractive operations and for land rehabilitation and restoration by non-energy mineral extractive industry, in order to complement the existing guidance on non-energy mineral extractive industry (EC, 2017d).

Finally, within the scope of the EU Raw Materials Weeks 2017 and 2018, conferences on extractive industry and biodiversity are organized. For more information see: https://ec.europa.eu/growth/content/raw-materials-week-2017_en and http://eurawmaterialsweek.eu/

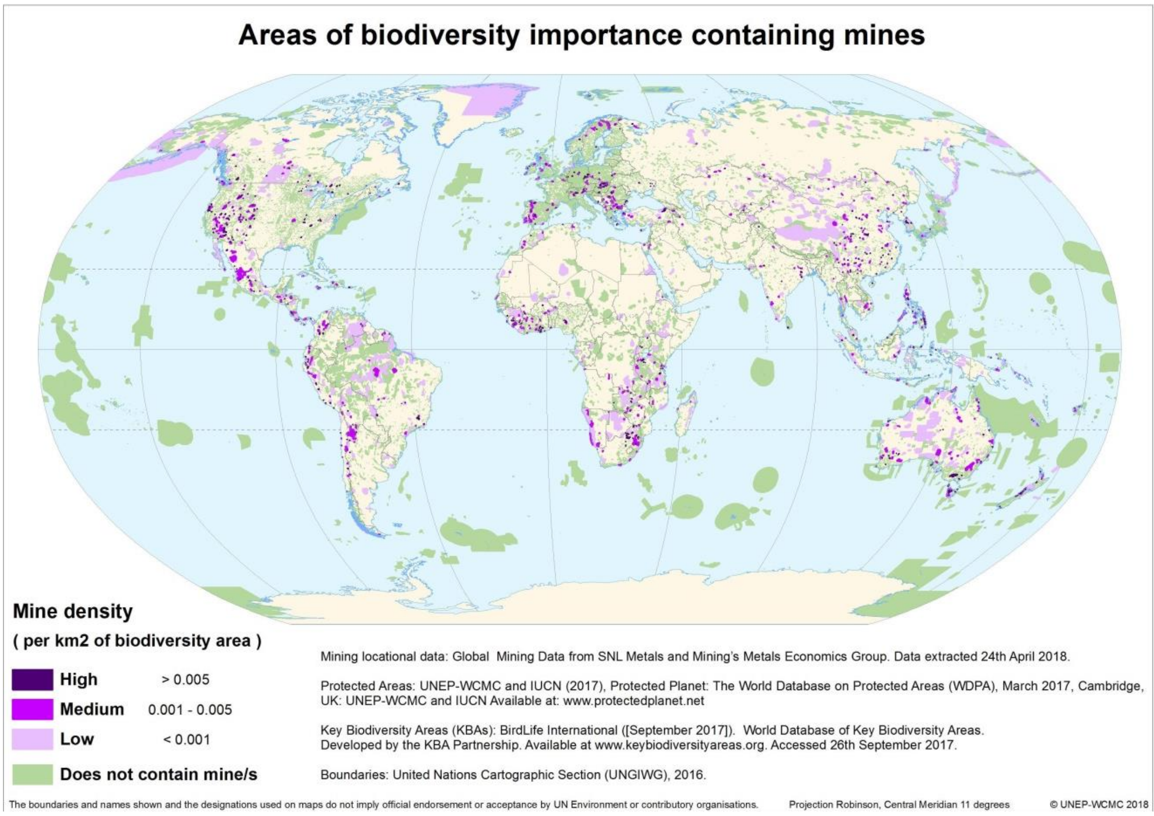
Habitat removal can lead to population declines of a number of species through direct mortality as well as reduced fitness and survival associated with a loss of foraging and breeding areas. This can lead to alterations in the structure and function of ecosystems affecting the provision of a range of ecosystem services for people, including water regulation, pest control, pollination, food provision and protection from storms, floods, and coastal erosion.

5.1.8. Impacts on important areas for Biodiversity

Impacts on biodiversity and ecosystems can be particularly high where mining activities are located in protected areas and other areas of high biodiversity value and sensitivity (such as Key Biodiversity Areas). Globally, it is estimated that there are 1,604 mining operations within Key Biodiversity Areas and 2,075 in Protected Areas. The countries with the greatest number of mining operations within areas of biodiversity importance are the USA, China, Australia, Brazil and Canada. These areas of biodiversity importance vary in their size and degree of vulnerability and irreplaceability of biodiversity. World Heritage sites are designated based on the values of outstanding universal value, and of the 241 sites that are based on natural and mixed natural and cultural values, 33 contain a total of 68 mines within their boundaries, with a single site containing 12 mines. Alliance for Zero Extinction sites represent the last refuge for Critically Endangered and Endangered species based on the IUCN Red List of Threatened species. Of the 588 sites globally identified, 60 contain one or more mines in 29 countries. AZE sites are typically small in size and therefore the impacts of mining can be particularly severe and if not managed could contribute to a global extinction of species.

Figure 5.3 shows areas of biodiversity importance (Key Biodiversity Areas and Protected Areas) globally, highlighting those that contain mines. These are categorised based on the number of mines per km^2 of biodiversity area.

Figure 5. 3 Areas of biodiversity importance containing mines



Source: UNEP-WCMC & IUCN (2017).

Areas of biodiversity importance with relatively higher numbers of mines proportional to the designated area are those where the potential for negative impacts from mining is greater. These higher risk areas are predominately found along the west coast of the Americas, Western and South-eastern Africa, Australia, South-east Asia, and across Europe.

In addition to pressures on areas of biodiversity importance as a result of mining activities within them, there have also been a number of instances of protected areas being downgraded, downsized, or degazetted to allow for mineral and oil and gas exploration (Mascia, 2014). This could lead to potentially large impacts on the conservation status of particular areas and species.

5.1.9 Climate Change

While mining impacts the environment, climate change also has impacts on the mining sector. Extractive industries contribute to climate change mostly due to environmental destruction of potential carbon sinks due to deforestation and degradation of ecosystems. Moreover, extraction and processing of natural resources can be very energy-intensive. Mining is one of the most intensive users of heavy fuel oil. Thus, the industry has a significant climate change footprint (See Box 5.5). The Box describes an action to mitigate GhG that is a by-product of coal production. The use of extractive natural resources, especially fossil fuels, is also the key source of greenhouse gases (GHG) that cause climate change. Northgate & Haque (2010) provide useful data on the contribution of mining to GhG.

Box 5.5 Methane management

Coal production, transportation, storage and use account for approximately 40% of global greenhouse gas emissions (UNECE, 2015). Methane, a by-product of coal production is a potent greenhouse gas with a 100-year global warming potential 25 times that of CO_2. For the top three world producers of coal, it is estimated that total coal mine methane ranged from 5.5 billion cubic metres to 19.3 billion cubic meters (289.8 Tg CO_{2e} or 289.8 Tg of carbon dioxide) (US EPA, 2009). The health, safety and environmental impacts of methane released during coal mining also need to be addressed. Methane creates unsafe working conditions in many underground coal mines that can result in human fatalities. At the same time, safe extraction of methane saves the lives of miners (even though methane extraction has its own risks), and efficient use and destruction of the valuable gas provides an affordable but cleaner burning fuel for the communities that surround mining complexes.

While technological advances have made it possible to significantly reduce methane emitted even from the gassiest mines, deployment of these technologies and movement towards zero methane-related fatalities and lowered methane emissions to the atmosphere is not universal, and may be impeded by a lack of awareness of the guiding principles for methane drainage and use in coal mines (UNECE, 2015). In this context, UNECE has developed *Best Practice Guidance on Effective Methane Drainage and Use in Coal Mines.* The document presents recommended principles and standards on coal mine methane capture and use in a clear and succinct way, providing decision-makers with a solid base of understanding from which to direct policy and commercial decisions.

The principles outlined therein are intended to complement existing legal and regulatory frameworks and to support development of safer and more effective practices where industry practice and regulation continue to evolve. While the *Best Practice Guidance* is envisioned primarily as a tool to support performance- and principle-based regulatory programmes, it can also complement more prescriptive regulation and support the transition to performance-based regulation.

It is also now widely recognized that available mineral deposits are increasingly deeper and of declining ore grade and this will lead to growing demand for water as well as greater mine waste, thereby raising energy consumption, and increasing the industry's climate footprint (Rüttinger & Sharma, 2016; Dolega *et al*., 2016). This close connection between extractive industries and climate change is being complicated by a number of factors, including those outlined below.

- Most mine infrastructure has been designed assuming that the climate is not changing. With respect to Canada, Pearce *et al.* (2010) note that the greater intensity and frequency of precipitation could damage mining facilities and infrastructure; for instance, walls of open-pit mines and contaminant structures may not safely withstand floods. The impacts of climate change are already being felt. For instance, production time lost as a result of closure of coalmines due to flooding impacted royalty revenues received by the Queensland state of Australia, thereby resulting in losses in excess of $5 billion to the State's gross state product (Sharma *et al*., 2013).
- Climate change-induced drought cycles can strain relationships between mining companies and communities as each party tries to adapt. In Australia, community concerns around mine water discharge during floods, and competition over water scarcity during droughts, have led to some negative reputational impacts for the mining industry (Sharma *et al.,* 2013). Indeed, communities expect the extractive sector to do more to help them adapt to climatic changes.
- Climate change polices will impact demand and supply of mineral resources. A shift to renewable sources of energy and recycling or moving from carbon economy to the "green economy" is seen as the key pathway for climate change mitigation. This would mean less intensive use of natural resources. At the same time, adaptation and mitigation actions that call for upgrading of infrastructure, building flood defenses, and development of renewable resources will increase demand for materials and thus extractives resources (Buorgouin, 2014). Global warming due to climate change is also opening new areas to mining.
- Climate change will intensify human migration and displacement with the potential to destabilize governance and property rights regimes, and open the door for powerful actors to expand their claims on natural resources and thus deepen the struggles for control and use of natural resources (Freudenberger & Miller, 2010).

Climate change is therefore recognised as being a serious risk to biodiversity (IPCC, 2002). It is likely to exacerbate many of the impacts discussed in the sections above, including increased water scarcity, contamination events due to the failure of mining infrastructure and pressures associated with indirect impacts (see section below for more information).

For the extractive economies, climate change is a pressing environmental threat and a significant business risk. Climate shocks threaten the larger global economy that relies on raw materials derived from mineral resources. Some of the world's largest mining operations currently operate in remote, climate-sensitive regions (Rüttinger & Sharma, 2016). Climate change will provoke adjustments in the value of mineral resources and more importantly, climate mitigation instruments may profoundly alter institutions of mineral resource governance in unpredictable ways as materials for renewable energy infrastructure and alternative construction materials are developed (Freudenberger & Miller, 2010).

5.1.10. Induced, indirect and cumulative impacts

In addition to the direct impacts of mining operations, there are a host of other indirect and induced effects that often take place within the landscape.

Mining, when properly managed, can have positive outcomes. It not only offers direct employment to a local workforce (sometimes at higher salaries) but also stimulates ancillary development to provide better infrastructure and services (e.g. health care) required by an operation. Particularly in areas of low employment and high poverty, in-migration of people to the area is a common effect. Additional positive impacts include increased revenues for local government, development of infrastructure, local contracts, benefit sharing, diversification of livelihoods. If not properly planned for and managed, mining can result in negative environmental consequences including land conversion, habitat fragmentation and degradation, increased levels of wildlife poaching, increased fishing pressure and so on. A recent assessment of chimpanzees in eastern DRC found that key populations had declined by 80-98%, principally due to poaching for bushmeat (Plumptre *et al.,* 2015). Hunting is particularly intense around artisanal mining and logging camps, where bushmeat is often the main source of protein (Ondoua Ondoua *et al*., 2017). These impacts can be particularly profound if mining takes place within previously undisturbed areas, and can far outweigh the direct impacts of mining that have been outlined above (Edwards *et al*., 2013Laurance *et al*., 2009).

Mining activities can also cause indirect yet profound impacts through the introduction of invasive species that lead to population declines of native species though predation and competition for resources, breeding sites and others. This can in turn lead to altered habitats and ecosystem functions with resulting impacts on the provision of ecosystem services. Furthermore, mining tends to occur in clusters around a region and the impacts need to be managed with cumulative development in mind. Thus, there may be synergies in waste management systems or other mitigation measures that can be more efficiently managed at a regional level if such a cumulative approach is built into environmental assessments.

5.2 The mining industry and society

Mining activities are embedded in communities and thus have profound impacts on the affected communities. Many activities require land and water and this will consequently have an impact on the livelihoods of the communities occupying the area where mineral extraction is to take place.

5.2.1 Social breakdown

Mining activities can have a significant impact on social structure (See Box 5.6) and social order due to unusual labour flows:

- Disruption of livelihoods due to displacement, dispossession and the impact of environmental challenges wrought by mining activities. This has direct implications as it disrupts complex land tenure systems of the people with informal and traditional rights.
- Social disharmony due to increased internal economic inequalities – for example, between men and women, between those with jobs at the mine and those without, and between communities receiving royalty payments and other benefits and resource rents and those who do not. The emergence of mechanized mining is also leading to a reduction of employment opportunities. Gender inequalities are particularly exacerbated due to unequal access to jobs in the mining sector, the loss of male support for household work and women expending more energy accessing safe water and food because of degraded environments. As men are more likely to migrate to work in the mines, this leads to a high share of female-headed households. For example, in Zimbabwe female-headed households made up to 40% of households in 2015 (World Bank, 2015). Migration of mine workers also leads to an increase prevalence of HIV due to prostitution around mining sites (Hargrove, 2008; Sagaon-Teyssier *et al*., 2017). HIV/AIDS has disproportionate adverse impact on women and girls. This is not simply due to higher infection rates among this group, but also because of women’s traditional role as care givers meaning that healthy women are forced to exit the labour force to care for sick household members.

- The local economic structure is altered as livelihoods are lost and local economic activity is reorganized to meet the needs of the mine. Local communities become dependent on the mine and thus vulnerable to economic cycles of commodities markets.
- A large influx of outsiders or immigrant miners, not integrated into the local community or subject to its social constraints means breakdown of norms that keep order and harmony, and creates tensions that can lead to violence.

The result of all these social changes can lead to collapse of social order and unleashing of vices including violence, prostitution, gambling, drug use, alcoholism and so on that accompany such breakdown. The use of child and forced labour is also common in mining, which constitutes a menace to the society.

Box 5.6 Displacement from the Thach Khe iron ore mine16

The Thach Khe Iron Ore Mine is an open pit iron ore mine in central Viet Nam. Its reserves have been estimated at 544 million tonnes, or 60 percent of Vietnam's total iron ore reserves.

Mining activities were expected to impact around 4,000 hectares of land in six communes with about 4,000 households (16,800 people). These households were required to relocate.

Under the resettlement plan, all households should have been resettled between 2009 and 2013, with 60 percent of the total relocated between 2010 and 2011. However, the mining company failed to contribute the promised capital. In 2009, the company had committed to contribute AU$65 million by 2010 but by 2012 had provided AU$11.05 million.

As a result, resettlements were significantly delayed and some not completed. The delay in the resettlement process has seriously affected the lives of the displaced people. In particular, the mining company commenced excavation operations before relocation had been finalized. The local people that had not been resettled on time were exposed to water shortage and contamination, air pollution, dust and noise.

Source : UNDP and UN Environment (2018).

5.2.2 Human rights

Serious human rights violations accompany the social breakdown that can occur in the wake of the onset of extractive activities. Forced eviction or re-location are common features of mining operations. This is a serious human right violation especially for indigenous people whose livelihoods are closely intertwined with the land. They derive much of their livelihoods from biodiversity services for which they have accumulated significant knowledge to use them sustainably. Many indigenous people are ill-equipped to participate in modern economies and the expropriation of the land usually leads them to destitution.

Another challenge relates to militarization of the society. The competition for resources (land, water and revenues derived from extractives activities) can lead to serious conflicts that can see arming of various peoples. Mining companies can arm themselves to protect their properties; local people can form militias to agitate for their rights; and governments can deploy security forces to forestall or quell violence. Militarization inevitably leads to human rights violations with women disproportionately impacted through increased sexual violence in these areas (Manning, 2016; Gilmore *et al*., 2016). Human rights defenders in mining areas also receive threats and attacks. Lakhani (2017) reports that 21 land rights defenders have been killed in Guatemala since 2010.

In addition, workers' rights constitute an important issue in the context of the extractive industry. ILO (undated) states that in many large-scale mining operations, freedom of association and collective bargaining have often been contested by mining companies, leading to severe clashes between labour and management. The denial of civil liberties; undue restrictions on the right to strike; interference by governments in the functioning of workers' organizations; and restrictive legislation are common challenges. The fatal shooting of 34 workers at the Marikana platinum mine in South Africa in August 2012 underscores some of the gross human right violations due to employment conditions in mines that frequently offer pay barely above the poverty threshold.

5.2.3 Conflict

Extractive industries often operate in complex social environments surrounded by communities living in extreme poverty. The perceptions of increased inequality that results from mining booms usually generate tensions between local governments and national governments due to resource nationalism, as well as local-level conflicts relating to property rights and mining impacts. Conflict can easily become a full-blown war and can be the most devastating social impact of extractive activities as was observed in the case of the Bougainville conflict in Papua New Guinea (Cochrane, 2017).

The very existence of extractive resources unleashes new political dynamics as various factions seek to control the resources, especially if the State is weak or corrupt. Extractive resources corrode governance structures and weaken the State, as they become the object of capture. In this context, local conflicts can easily take new dimensions. Local militias can easily morph to mafias. The potential monetary gains can lure foreign rebel groups and mercenaries into the fighting and broaden existing conflicts. Methods used by armed groups to exploit minerals include extorting or "taxing" mining companies and intermediaries, directly operating mineral extraction sites.

Conflict situations are more likely to attract extractive firms that have higher risk tolerance and lower reputation concerns to be involved. Such firms are much more likely to have poor industry practice in environmental, human rights and fiscal performance. Thus, conflicts worsen all other challenges and mining can become a "threat multiplier." Conflict driven by minerals is now a major item on the global agenda and this has seen the launch of many initiatives to curb the flow of resources to armed groups from the sale of minerals.

5.2.4 Health and safety

Extractive activities have potential to create serious health and safety challenges both in terms of occupational exposure as well as public health, in general. The health challenges due to mining activities are closely related to the environmental challenges. Contamination of water, air and soil eventually translates to human health challenges. For instance, an environmental assessment of the Democratic Republic of the Congo found extremely high concentrations of highly toxic cobalt salts in the Katanga province, illustrating the link between environmental damage and human health (ECA, 2011). Poor working conditions are also of concern. Issues include low or non-existent health standards, fatal accidents with heavy machinery, shaft and slope collapses and water invasions among other serious safety issues (Schuler *et al*., 2016a). Furthermore, underground mining has specific associated risks such as subsidence, slopes collapse and methane leaks. The extent of these impacts is recognized in some regulatory systems such as the United States through specialized agencies such as the Mining Safety

5.3 Application of S-LCA to assessing social and environmental impacts[71]

5.3.1 Social - Life Cycle Assessment (S-LCA)

There are a variety of approaches to assess the social and environmental impacts and benefits of mining and/or metallurgy. Tools taking into account a life-cycle perspective such as life-cycle assessment (LCA) are especially powerful in assessing material supply chains, as they allow consideration of the various life-cycle stages (from extraction of raw materials to end-of-life), identification of different burdens and possible 'hot-spots', and the identification of unintended consequences. Life-cycle approaches are indispensable in supporting decisions toward more sustainable consumption and production (Pennington *et al*., 2007) and are increasingly forming the backbone of European environmental policies. Examples of life-cycle thinking based environmental policies include the Communication on Sustainable Consumption and Production (EC, 2008) and the Communication on Circular Economy (EC, 2015).

Life-cycle assessment (LCA) in the metals and mining sector provides a tool for systematically evaluating the potential environmental and social impacts of products, services, and technologies. LCA examines inputs (resources and energy) and outputs (emissions, wastes, and desired products) from "cradle to grave," that is, across the entire product life cycle from resource extraction to material processing to manufacturing and fabrication to use and then to end-of-life (Cleveland and Morris 2014; ISO 2006a, 2006b). With this approach, LCA can help identify and avoid shifting of environmental burdens, such as from one life cycle stage to another or from one environmental threat to another. Recent work has focused on broadening the traditional LCA framework to integrate environmental, social, and economic aspects at varying spatial levels, also referred to as life cycle sustainability assessment (LCSA) (UNEP, 2011). Publicly available life-cycle inventory (LCI) data are collected for different world regions and countries such as the United States[72], Europe[73], and China[74].

Recent years have seen a tremendous increase in the literature related to environmental LCAs (E-LCA) of the mining and metals production sector.[75] The production of primary (virgin) metal typically includes ore mining and concentrating, smelting or separation, and refining to obtain the element in its metallic form, with a variety of processing routes available (Chapman & Roberts, 1983; Gupta ,2004).

Environmental impact categories frequently reported include, for example, cumulative energy requirement and global warming potential, as well as more local impacts related to the release of toxic substances (human- and eco-toxicity impacts) or air emissions (particulate matter, acidification, and eutrophication), and sometimes water use and land use related indicators. The metal and mining industry also routinely conducts LCA studies using industry data (Baitz, Bayliss, & Russell-Vaccari,

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[71] Other approaches exist such as environmental impact assessment, environmental and social impact assessment, environmental risk assessment (Manhart *et al*, 2018) and so on .The intention here is not to review all the approaches but to show the application of SLCA to assessing social and environmental impacts.

[72] https://www.nrel.gov/lci/

[73] http://ec.europa.eu/environment/ipp/lca.htm

[74] http://www.ike-global.com/products-2/chinese-lca-database-clcd

[75] See for example Baitz, Bayliss, and Russell-Vaccari, 2016; Lee & Wen, 2016; Norgate, Jahanshahi, & Rankin, 2007; Nuss & Eckelman, 2014; Rönnlund *et al*., 2016; Schreiber *et al*. ,2016; Vahidi, Navarro, & Zhao, 2016; van der Voet *et al.,* 2013; Weng *et al*., 2016; and Zaimes *et al*., 2015

2016). However, studies are often conducted independently leading to potential inconsistencies, for example in the system boundaries and background data sources used.

On the other hand, social LCA (S-LCA) integrates traditional LCA methodology with additional social and socio-economic aspects. Unlike traditional LCA focusing on environmental impacts, S-LCA aims at assessing both negative and positive impacts affecting different stakeholders throughout a product's life cycle. It represents one among several approaches to evaluate social implications in material supply chains. While data collection in E-LCA is based mostly on physical quantities related to a product or service life cycle, S-LCA requires information on organization-related aspects along the value chain, such as prices and working hours.

The S-LCA methodology was developed in accordance with the ISO 14040 and 14044 standards for E-LCA (ISO 14044, 2006). Methodological guidelines on S-LCA have been issued within the Life Cycle Initiative, a cooperation between UN Environment and the Society of Environmental Toxicology and Chemistry (SETAC) (UNEP/SETAC Life Cycle Initiative, 2009). The UNEP/SETAC Guidelines are the outcome of a broad, global, transparent and open process involving many relevant stakeholders from the public, academic and business sectors. They provide an important reference methodological framework for S-LCA, especially for the first two phases of S-LCA, which are goal and scope definition and life cycle inventory. As the social sustainability can encompass a variety of aspects, they recommend a set of stakeholder categories and impact subcategories. However, the S-LCA methodology is still under development, and a standardized set of indicators for assessing social performance is still missing. Several alternative methodological frameworks for social life-cycle assessment have been proposed in recent years (Kühnen & Hahn, 2017; Pelletier *et al*., 2016; Petti *et al*., 2016; Sureau *et al*., 2017). When modelling a supply chain in an S-LCA study, data gathering consists of both primary (site-specific) data, and secondary data on social aspects related to country-specific sector (CSS), available in S-LCA databases[76] (Sala *et al*., 2016).

Social risk in raw materials industries use of S-LCA database for preliminary screening

S-LCA databases are repositories of social indicator data, relevant to a set of impact categories. Data used to populate the databases are drawn from a broad range of reputable, publicly available sources such as the statistical agencies of the World Bank, the World Health Organization and the International Labour Organization. The data available for each indicator cover a set of country-specific sectors. When data are unavailable for some countries or sectors, extrapolation techniques are applied. In general, these databases include three main components (Figure 10.9):

- A global Input/Output model, representing the structure of the global economy
- A worker hour's model, that ranks CSS by labour intensity (disclosing, for each country and sector, the worker hours needed to produce 1 US$ of output)[77].
- A social risk assessment module (for each indicator, risk levels are assigned and converted in characterization factors).

By multiplying the level of social risk in country-specific sectors by the worker hours per dollar of output in each sector, the S-LCA database allows for quantifying (in an additive manner) the

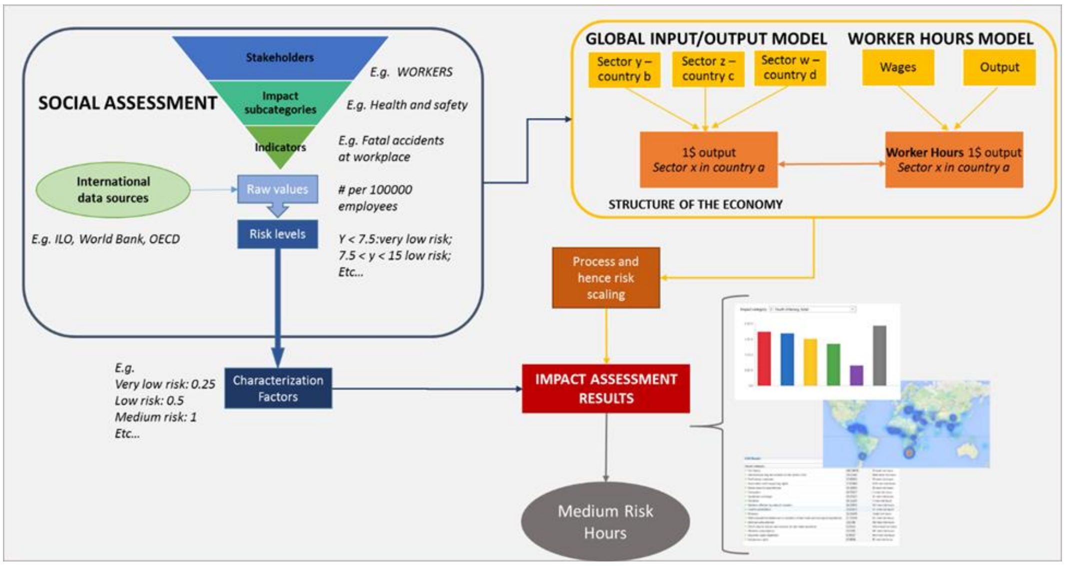
[76] Currently, two commercial databases for S-LCA are available: Social Hotspot Database (developed by New Earth, http://socialhotspot.org/) and Product Social Impact Life Cycle Assessment developed by GreenDelta (https://psilca.net/).

[77] The worker hours model is derived by dividing total wages paid out by country and sector per dollar of output based on the GTAP (Global Trade Analysis Project) I-O model, and country/sector-specific wage estimates to characterize worker hours per country, sector, and dollar of output.

distribution of potential social risk along product supply chains. Risks are quantified in "medium risk hours", which is the number of worker hours along the supply chain that are characterized by a certain social risk. The resulting data sets can be used, complementary to other social impact assessments, to highlight possible social risks in supply chains and carry out supply chain due diligence. An illustrative preliminary example of such an analysis is presented in the Annex (Annex 5.1).

Figure 5.4 is a schematic figure showing the general structure of social life-cycle assessment databases as one possible source of data for evaluating social implications in material supply chains.

Figure 5.4 General structure of social life-cycle assessment databases.



Uncertainty and data quality

Data quality is a critical issue in performing any LCA study. The database used for the analysis provides an assessment of the data quality for the results obtained, which is summarized in Figure 5.5 below. Data quality is particularly poor in the category of corruption and bribery for India, while fatal and non-fatal accidents categories have low temporal conformance in most of the countries (data available from the original data source was five years older than the database). We note that assessments such as the one above should be seen as a starting point for further analysis at a more detailed level, such as through supply chain due diligence implementation. Furthermore, other sources of uncertainty affecting the analysis include:

- the input/output model used to develop the database;
- the extrapolation techniques used in the social risk assessment (for instance, when data for a specific country is unavailable, regionally representative countries are used as proxies); and
- the different reporting schemes used in data collection by different countries (for instance, for the same indicator on labour accident data can come from insurance records, labour inspectorate records, and so on).

Figure 5.5 Data quality assessment for five criteria

	Australia					Brazil					Chile					India				
	R	C	T	G	F	R	C	T	G	F	R	C	T	G	F	R	C	T	G	F
Association and bargaining rights	2	3	4	1	4	2	3	4	1	4	2	3	4	1	4	2	3	4	1	4
Corruption and bribery	2	2	2	2	3	3	3	3	3	3	2	2	2	2	3	5	5	5	5	5
Discrimination - gender wage gap	3	2	4	2	3	4	2	3	2	3	4	2	4	2	3	3	1	3	1	1
Fair salary	2	2	3	1	2	2	2	4	1	2	2	2	3	1	2	2	1	4	1	2
Fatal accidents	3	4	4	3	4	3	4	5	3	3	2	3	5	1	3	2	3	5	1	2
Human trafficking	2	1	1	1	4	2	1	1	1	4	2	1	1	1	4	2	1	1	1	4
Indigenous rights	3	1	2	1	1	3	1	3	1	1	3	1	3	1	1	3	1	3	1	1
Non-fatal accidents	3	4	4	3	3	3	3	5	2	3	2	3	5	1	3	3	4	5	3	3
Safety measures	2	4	1	3	2	2	4	1	5	2	2	4	1	3	2	2	4	1	5	2
Working time	2	3	3	1	3	2	3	5	1	3	2	3	3	1	3	2	4	5	1	4

	France					Russian Federation					Sounth Africa					United States				
	R	C	T	G	F	R	C	T	G	F	R	C	T	G	F	R	C	T	G	F
Association and bargaining rights	2	3	4	1	4	2	3	4	1	4	4	4	5	3	4	2	3	4	1	2
Corruption and bribery	2	2	2	2	3	4	4	4	4	4	2	2	2	2	3	2	2	2	2	3
Discrimination - gender wage gap	3	1	4	1	2	3	1	3	1	1	3	1	3	1	2	3	1	5	1	1
Fair salary	2	2	4	1	1	2	2	3	1	2	2	1	4	1	2	2	2	2	1	2
Fatal accidents	2	3	4	1	2	3	3	5	2	3	2	3	5	1	3	2	3	3	1	2
Human trafficking	2	1	1	1	4	2	1	1	1	4	2	1	1	1	4	2	1	1	1	4
Indigenous rights	3	1	2	1	1	3	1	3	1	1	3	1	3	1	1	3	1	2	1	1
Non-fatal accidents	2	3	3	1	2	3	4	5	3	4	4	4	5	4	4	2	3	4	1	2
Safety measures	2	4	1	3	2	2	4	1	4	2	2	4	1	5	2	2	4	1	1	2
Working time	2	1	2	1	3	2	3	4	1	3	2	3	3	1	3	2	2	2	1	3

Source: PSILCA database.

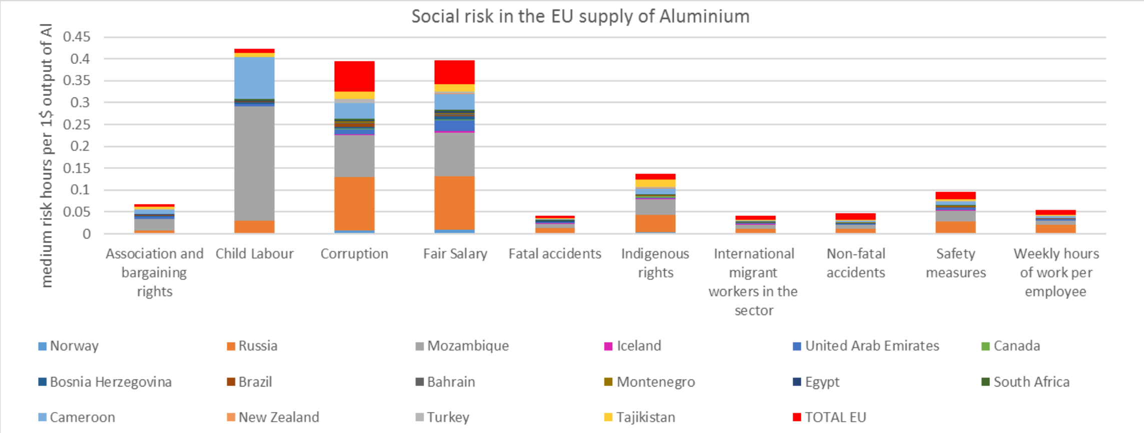
Notes: (Criteria: R: Reliability of the source(s); C: Completeness conformance; T: Temporal conformance; G: Geographical conformance; F: Further technical conformance. Scores are ranging from 1 (very good quality) to 5 (bad quality)).

Europe is reliant on imports for many metals. In some cases, when the extra-EU supply is concentrated in very few countries with poor governance and substitution possibilities are limited, materials are considered as critical for the EU economy[78]. The European Commission produces an assessment of materials criticality on a regular basis in order to tackle the risk of potential supply disruption. Besides security of supply considerations, the import of raw materials from other regions implies a shifting of environmental and social burdens linked to the production of these materials. As an example, the Report analyzes the EU supply of Aluminum and the social impacts related to the import of this material from different countries. The entire EU supply of Al is composed of 36 % of domestic production (mainly from Germany, France and Spain) and 64 % imports from extra-EU countries (Norway, Russian Federation, Mozambique, and Iceland being the main ones).

In this Report, we calculate the social risk of the metal production sectors in the producing countries using the PSILCA database and weigh them by the share to the EU supply. Figure 10.11 below shows the amount of medium risk hours per 1$ output of Al. The production from EU countries is grouped together in one category (Total EU) in order to match it against the extra EU supply. Child labour, fair salary and corruption are the most critical social impacts, with Mozambique and Russia mainly contributing to these impacts.

[78] https://ec.europa.eu/jrc/en/publication/assessment-methodology-establishing-eu-list-critical-raw-materials-background-report

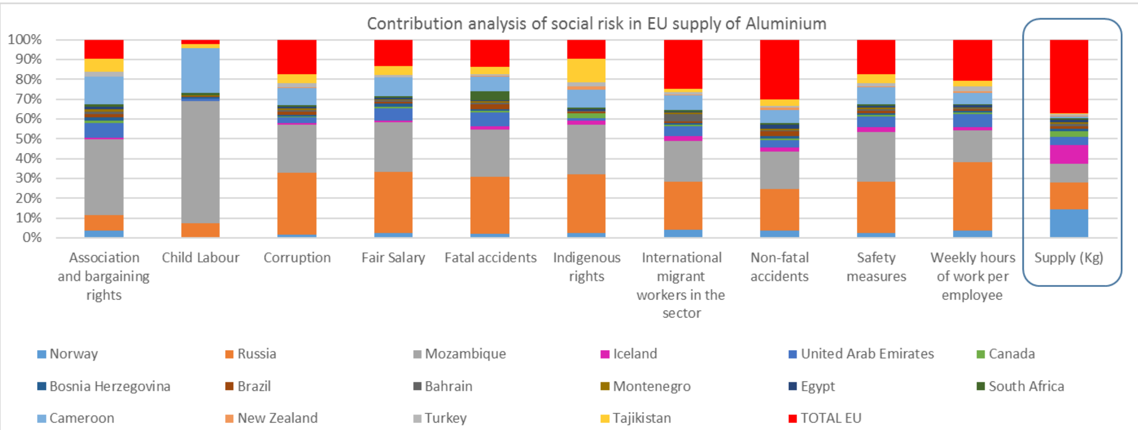
Figure 5.6 Illustration of possible social risk in the EU supply of raw materials.



Source: Preliminary assessment calculated using PSILCA database.

Figure 5.7 below shows the relative contribution of the supplying countries (and EU) to the different social risks, and compares it with the supply share in terms of mass. While EU supply is 34% of the total, its contribution to the social impacts is generally lower. Similarly, Norway's share of Aluminum supply to the EU is 14%, but the social impacts relating to this country are much lower in all the impact categories. From a policy perspective, these examples highlight that a sustainable supply of raw materials should take the shifting of burdens due to international trade and imports into account.

Figure 5.7 Illustration of possible relative contributions to the social risk of Aluminium EU supply and comparison with the production shares



Source: Preliminary assessment calculated using PSILCA database.

While the assessment of environmental impacts can benefit from more established techniques (E-LCA), the quantitative assessment of social impacts along the supply chain is still in its early stages. S-LCA databases offer a wide spectrum of information on global supply chain working conditions and human rights that could be used for better understanding of social risk in different world regions and sectors. For example, in this assessment, S-LCA was used to compare the mining sector in different countries based on the social risk for a selected set of impact categories. However, given that the analysis takes place at the level of country-sectors means that possible regional differences within the country or company behaviour might not be fully accounted for. Further refinement of these metrics can, however, be undertaken at the sub-national level as well, particularly with the assistance of the corporate sector (see also Appendix 5.1 for examples of applications of S-LCA.

5.3.2 Tracking impacts at the corporate level through improved governance

The American statistician, W. Edward Deming, studied Japan's tremendous business success in the aftermath of World War II and proposed a much-celebrated concept in business circles known as "Total Quality Management" (TQM). Japan's resource usage was particularly efficient and their environmental and social impact per unit of industrial output continues to be far lower than most developed countries. Deming proposed that Total Quality Management entails looking at all stakeholders involved in the process of production and consumption of a product. Expanding on this concept in the nineteen nineties, environmental managers suggested adding an 'E' to the acronym and expanding its scope to include all environmental flows in the production process. TQEM lays a lot of emphasis on the measurement of performance, continued change and innovation. Decision-making should be data-driven and there should be an emphasis on continuous improvement.

Design should be geared toward quality and must anticipate problems as opposed to reacting to mistakes. From an environmental standpoint, this may be achieved through management changes, technological improvements and the establishment of self-correction mechanisms. There is a need for corporations to institute this management mechanism and for governments to encourage its establishment, through institutional cooperation. TQEM programs require greater communication between various departments of a corporation so that environmental concerns can be tackled collectively. For example, the manufacturing and sourcing department needs to coordinate modular design for easy recyclability with the research and development (R&D) department of a company. Most large American corporations have developed TQEM programs that have also been embraced by the larger mining companies. Yet, change management within the mining sector has met with certain structural limitations around the way material flows are considered by the business environment. Although social and environmental performance of the sector has shown a remarkable shift from the two-decade period of 1995 to 2015 (Franks, 2015), the broader structural incentives for change need to be realigned with nonlinear material flows.

Industrial ecologists suggest that a product remains the responsibility of the producer until it is actually absorbed by the system in which it enters. Therefore, food products that are digested by organisms no longer remain the responsibility of the producers. However, products containing materials such as steel and plastics do indeed remain the responsibility of the producer since they are not permanently digested or "metabolized" by any entity and become a liability on the system after usage. This is particularly a problem with obsolescent technology items such as cars, computers and photocopiers. Increasingly there is a trend to have product-take back schemes, where the producer must take back the product after use and is responsible for either refurbishing it or disposing of it in an environmentally appropriate manner. Such schemes have been especially successful with photocopiers and laser printers in the United States.

A few attempts have been made in the management literature to examine various ways of implementing the principles of industrial ecology in the corporate world, most notably in the writings of Paul Shrivastava who notes that industrial societies have traditionally led managers to focus their efforts on the creation of wealth through technological expansion, whereas managers in post-industrial societies must shift their efforts towards managing risks which accrue from the creation and distribution of wealth (Shrivastava, 1995). His analysis emanates from a study of major industrial accidents, such as the methyl isocyanate leakage from a Union Carbide plant in Bhopal, India. Risk, he proposes, is thus the primary motivating force behind the adoption of industrial ecological principles by managers in the modern corporation.

While Shrivastava's model of "eco-centric management" is useful from a macroscopic perspective, he does not offer suggestions for how the business administration of a corporation or government institutions should change in tangible ways. What follows is a brief set of recommendations in nine significant sectors of a modern corporation that would follow the paradigm of industrial ecology. It is important to appreciate that 70% of our economy is now in the service sector and hence many of the changes, which are being recommended for the manufacturing sector, will inexorably need to be reinforced in the service sector.

1. Strategic Planning Division

- Plan to integrate vertically rather than horizontally in order to minimize transactional impact on mineral resources that are to be used in the production process.
- Avoid large transportation costs and resulting pollution by geographically locating facilities in closer proximity to each other.
- Look for synergies in energy and waste utilization with nearby industries through the establishment of eco-industrial parks. Share best practices with industries to achieve better cooperation.

2. Government and Community Relations Department

- Lobbying efforts of the industry should focus on long-term voluntary compliance initiatives, which could reduce the infrastructure required for compliance-centered government agencies. However, the voluntary compliance must be effectively enforced internally.
- Favour integrated environmental regulations rather than the conventional air, water and waste mode of incremental regulations.
- Dispute resolution and negotiation strategies should be favoured over legal action to reduce transaction costs of litigation, unless it is important to set an institutional precedent with a case.

3. Research and Development Division

- Utilize industrial ecology concepts of Design for Environment and Dematerialization to develop eco-friendlier products.

4. Manufacturing / Sourcing Division

- Coordinate activities with R&D sector to ensure manufacturing processes optimize energy usage for product manufacturing.
- Choose suppliers that are in close proximity to the manufacturing location to reduce transportation costs and risks of environmental accidents.

5. Environmental Health and Safety (EHS) Department

- Move from compliance-oriented EHS management to proactive pollution prevention.

- Work with R&D department to see if emissions can somehow be reused in the manufacturing process in your company or in other nearby companies.

6. Financial Management and Accounting Departments

- Use a low discount rate for evaluating the future benefits of environmental projects in order to ensure that the long-term benefits are accounted for. Consider reporting performance over longer time horizons as well.
- Include the cost of resource depletion or resource amelioration when calculating company's profitability.

7. Human Resources Department

- Provide training for all employees on environmental issues so that company initiatives are appreciated and taken in context (an ecoliteracy requirement across the company).
- Encourage employees to live near the company's location and provide incentives for use of collective or public transportation.

8. Marketing Department

- Reduce advertising through paper-based or other disposable media.
- Persuade industry competitors to produce and market items with ecological impact data and benchmarks on product labels to encourage positive competition on environmental performance.

9. Customer Service Department

- Encourage customers to participate in product-takeback by offering incentives for recycling and return of products.
- Provide services for product repair or telephonic guidance for home-repairs, with modest fees as a revenue stream rather than encouraging obsolescence.

The measures described above are by no means an exhaustive listing but provide a skeletal set of points to consider in the context of reconfiguring a corporation to account for material cycles. These measures also attempt to keep in view the fact that manufacturing does indeed provide many jobs, but that services associated with product repair and recycling can provide comparable impacts which can be evaluated through life cycle analysis.

It is also important to consider how corporate entities manage their data and the impact this can have on community conflicts. The demand for transparency in the extractive industries is partly driven by this concern. Lack of data on impacts – both positive and negative – can lead to conspiracy theories and exacerbate conflicts as shown in Box 5.7. However, it is important to recognize that many of these initiatives are currently focused on economic reporting rather than reporting of ecological and social impacts. The situation of monitoring and governing impacts is even more complex when dealing with artisanal and small-scale mining (ASM), which is also often linked to conflict and can prove to be less amenable to formal regulatory reform.

Box 5.7 Information deficits on impacts and conflict escalation[79]

In the extractive industries, a lack of access to reliable information about the distribution of benefits and the impacts of projects can be a key contributor to a breakdown of trust and misperceptions that can fuel social conflicts and spiral into violence. Social conflicts in the extractives sector threaten national cohesion and peace, and prevent the sector from making important development contributions. In Peru, over $ 8.5 billion of investment in the extractives sector have been blocked due to conflicts whilst 53 people were killed and more than 1500 injured over the past 15 years[80]. 80% of conflicts were related to the environmental impacts of mining operations, above all on the availability and quality of water resources. The International Finance Corporation and the International Council of Mining and Metals have found that 70% of operations of the world's biggest mining companies are located in water-stressed areas. The impacts of climate change, including increasing water scarcity, will only make matters worse. Getting it right is more important than ever before. Whereas a number of global initiatives are already promoting greater transparency in the sector, environmental transparency is often neglected. The Global Reporting Initiative is a voluntary mechanism that has been operational since 1997 and includes a series of standards for effective reporting of impacts that could be further strengthened through accountability mechanisms.

The importance of access to information has been recognized at the global level and initiatives promoting transparency are proliferating. Principle 10 of the Rio Declaration emphasizes the need for citizens to have appropriate access to information concerning the environment that is held by public authorities and the opportunity to participate in decision-making processes. Founded in 2003, the Extractive Industries Transparency Initiative (EITI) was the first global effort to bring greater transparency to the extractive sector. The 51 EITI implementing countries commit to publishing annual reports that disclose the revenues from the extraction of the countries' extractive resources. Companies report payments to government (taxes, royalties) and the government reports what it has received. The reports are reconciled by an independent auditor and also include information related to beneficial ownership disclosure, licence and contract information. In this way, over $1.9 billion worth of government revenues from oil, gas and minerals have been disclosed so far[81]

Whereas initiatives such as EITI represent an important first step in providing public access to financial information in the extractive sector, they stop short of increasing transparency related to the social and environmental performance of projects. Financial transparency is critically important but concerns of local communities in the vicinity of operations tend to focus on the more immediate impacts of a project. This includes the impact of operations on the availability and quality of local water supplies or the number of local jobs created for example. Excluding this data from public disclosure creates 'information asymmetries' where stakeholders have unequal access to information. So far, efforts of increasing transparency in the sector do not go far enough to address these information asymmetries and help citizens understand the distribution of benefits and risks across a project lifecycle.

There are also large risks for corruption during procurement, such as companies being forced to procure from businesses connected to political elites[82]. This needs to be addressed.

5.4 Conclusion

Environmental and social impacts are main factors leading to a lack of public acceptance in the extractive sector. The fact that even closed mines can have significant legacy impact long after operations ceased underscores the social and environmental challenge of extractives.

Indeed, many initiatives to attain social licences to operate are concerned with mitigating environmental and social externalities that come with mining activities. As will be seen in Chapter 7,

[79] Contributed by: David Jensen and Inga Petersen – UN Environment, Post-Conflict and Disaster Management Branch

[80] The Economist 'Mining in Latin America: From conflict to cooperation', February 6, 2016. http://www.economist.com/news/americas/21690100-big-miners-have-better-record-their-critics-claim-it-up-governments-balance

[81] Extractive Industries Transparency Initiative Factsheet (April 2017) https://eiti.org/sites/default/files/documents/eiti_factsheet_en.pdf

[82] The OECD Typology on Corruption Risks covers the issue of corruption in procurement well (http://www.oecd.org/publications/corruption-in-the-extractive-value-chain-9789264256569-en.htm).

many initiatives have been implemented to address these impacts of mining. Notwithstanding these initiatives, negative externalities remain a major concern. Mining is moving to new areas that are more fragile or into global commons (the sea), for which governance experience is limited.

Furthermore, the impacts of mining activities on the environment cannot be seen in isolation, as many have the potential to effect human health and livelihoods.

The project-based or standalone approach of dealing with impacts of mining needs rethinking. In large mining districts, strategic environmental assessments that include cumulative impacts and management need to be mainstreamed.

Moreover, an assessment should be made of the trade-offs of mining versus recycling to ascertain the optimal profile of recycled versus mined material sourcing. Then a holistic approach in managing impacts can be internalized across the whole value chain. This may also involve the advent of new companies and players that form a new kind of industrial ecosystem.

The analysis of the environmental and social impacts of mining presented in this chapter suggests a need for both national and international governance mechanisms to build more sustainable global supply chains that mitigate the environmental and social impacts of the sector as well as developing innovative tools to manage such impacts. The next chapter, which is the first chapter of the second part of this report, examines governance challenges of the extractive sector.

Appendix 5.1: Illustrative Example of Social Life-cycle Assessment

Using data from the S-LCA database PSILCA, the IRP Working Group calculated the possible social risk related to the mining sector in the following countries: Australia, Brazil, Chile, France, India, Russian Federation, South Africa and United States. It should be noted that the resulting assessment represents one possible approach for highlighting social issues and should be complemented by additional assessments; some of which are highlighted in later sections of this chapter. While S-LCA databases have a broad coverage of countries and sectors, data are not specific for sites, companies, specific technologies, and local issues. They rather underpin top-down approaches collecting data from international sources and input/output models. The main criteria applied for the country selection is the international coverage (at least one country for each region) and the relevance of the mining sector in the country economy. Based on the relevance for the mining sectors, the following set of impact subcategories was selected from the database: association and bargaining rights; corruption and bribery; discrimination - gender wage gap; fair salary; fatal accidents; human trafficking; goods produced by forced labour; indigenous rights; non-fatal accidents; safety measures; and working time. Each impact sub-category is characterized by one or more indicators calculated for the selected country and for the mining sector. The assessment, however, includes also the calculation of social risk for all the upstream sectors in the supply chain; that is, for all the CSS providing inputs to the mining sector in the country under investigation. Table A5.1 shows the set of stakeholders, impact subcategories, indicators, and data sources used for the assessment. This is drawn from the PSILCA database.

Table A5.1 An example of indicators and data sources used in social LCA

Stakeholder	Subcategory	Indicator	Unit of measurement	Data Source	Sector specific
WORKERS	Discrimination - gender wage gap	Gender wage gap	% (Difference between male and female median wages divided by the higher median wage*100)	ILOSTAT	Yes
	Fair salary	Minimum wage, per month	USD	Wageindicator.org	Yes
		Sector average wage, per month	USD		Yes
		Living wage, per month	USD		No
	Fatal accidents	Fatal accidents at workplace	Cases per 100,000 employees and year	ILOSTAT	No
	Non-fatal accidents	Accident rate at workplace	Cases per 100,000 employees and year	ILOSTAT	Yes
	Safety measures	Presence of sufficient safety measures	OSHA cases per 100,000 employees in the sector	Occupational Safety and Health Administration (OSHA), US Department of Labour	Yes
	Human trafficking	Tier placement referring to trafficking in persons	Tier placement	Trafficking in Persons Report 2014 (US Department of State)	No
	Right of association and bargaining	Right of Collective bargaining	Score of ordinal 0-3 scale	Database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social	No
		Right of Association	Score of ordinal 0-3 scale		Yes
	Working time	Hours of work per employee, per week	Hours	ILOSTAT	Yes
VALUE CHAIN ACTORS	Corruption and bribery	Active involvement of enterprises in corruption and bribery	% of sector-related cases out of all registered foreign bribery cases	OECD	Yes
LOCAL COMMUNITY	Respect of indigenous rights	Presence of indigenous population	Y/N	ILO Convention No 169 (ILO 1989)	No
		Human rights issues faced by indigenous people	Score		No

Figure A5.1 shows the preliminary social risk results as normalized values on a 0 to 1 scale, where 1 is assigned to the maximum value in the set (corresponding to the highest risk in a certain impact subcategory), and 0 is assigned to the minimum value (corresponding to the lowest risk). This is according to a preliminary elaboration of data from PSILCA database. Considerable uncertainties might exist and were discussed earlier.

Figure A5.1 Illustration of possible social risk in the mining sector- country comparison

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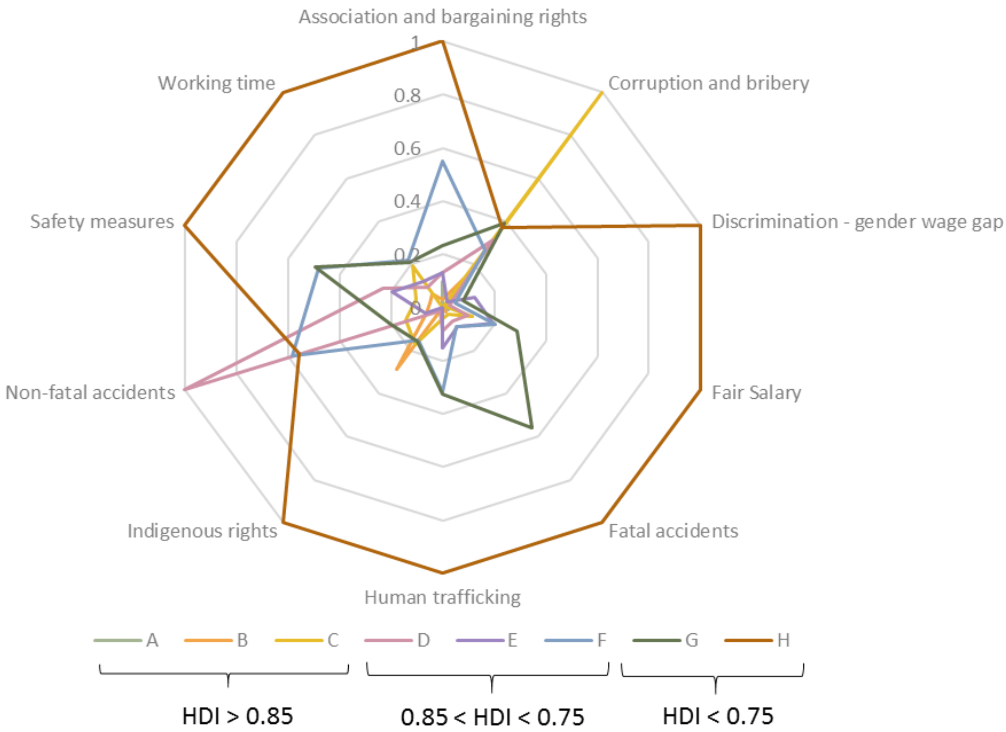
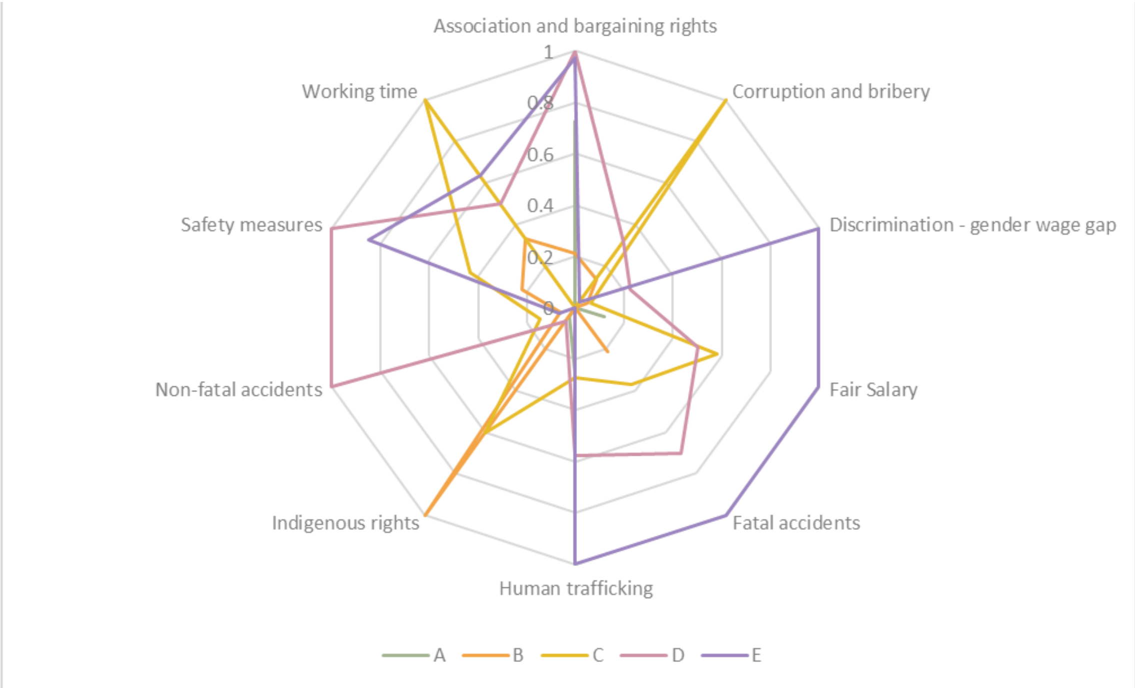


Given the preliminary nature of the analysis, the Report does not display country names, but rather letters corresponding to different development status: countries A, B, C have a Human Development Index[i] (HDI) higher than 0.85; D, E, F have an HDI between 0.75 and 0.85; G and H have a HDI lower than 0.75.

For most of the categories, country H has the highest social risk values, while A shows the best performance (red line). However, hotspots in social impacts are also found for other countries with regard to certain impact subcategories; for example, non-fatal accidents (D and F), fatal accidents (G), corruption and bribery (C, D, F, and G), indigenous rights (B), and association and bargaining rights (F). Results show that social risk in most developed countries is generally lower than in the emerging economies (with an exception for the corruption category). A stronger legislation on labour rights and better governance can be some of the underlying reasons for this difference in social risk results.

When comparing countries with similar development status, more nuances in social risks are visible. Figure A5.2 shows the relative social risk results of countries having a Human Development Index higher than 0.8, thus countries A, B, C, D, E from the original set shown in Figure A5.1. Some social risks peaks are visible here; for instance, for countries C and E that were hidden in the previous figure (especially for the impact categories gender wage gap, fair salary, fatal accidents, human trafficking, working time, association and bargaining rights).

Figure A5.2 Illustration of possible social risk in the mining sector- most developed countries.



PART 2: MINERAL RESOURCE GOVERNANCE TODAY

CHAPTER 6 - CHALLENGES OF EXTRACTIVE GOVERNANCE

6.0 Introduction

The previous chapters in the first part of this Report have provided a review of the status of mining today. As shown earlier, while mining can contribute towards sustainable development the contribution of mining to sustainable development also comes with externalities as discussed in Chapter 5. If not addressed, these externalities can undermine the viability of other economic sectors and sustainable development outcomes. Therefore, realising the true benefits of mineral resources hinges on a governance framework that fosters sustainable development while mitigating the externalities that come with mineral exploitation. This chapter focuses on the challenges of mineral resources governance and approaches to addressing these challenges.

6.1. Challenges

Various factors conspire to make natural resources difficult to manage. These emanate from: (i) complex policy environment; (ii) power asymmetry; and (iii) political economy dynamics.

6.1.1 Complex policy environment:

- Extractive resources tend to be owned by the state on behalf of the people; thus, they are arguably more difficult to govern given the competing claims. Also, stakeholders span international, national and local domains[83]. Governments are faced with a regulatory dilemma (Pedro, 2017:19-20) as they have to balance the various interests in a fair and equitable way and craft policies accordingly, which is hard and poor handling of this can lead to conflicts.
- Huge influxes of volatile revenue flows from extraction activities can lead to economic management challenges. Governments are faced with distributional and investment challenges to ensure that transient mineral revenues are translated in lasting benefits (Pedro, 2006)[84]. Doshi *et al.* (2015) makes the point that governments in many resource-rich countries face two important and related challenges or decisions with regard to the resource rents: How much of the resource rents should be spent or saved? How to spend the revenues? However, in doing these, they face macroeconomic management challenges of risks and also of absorptive capacity:
  i. Macroeconomic risks present themselves in two main ways. First, there is a potential deterioration of non-resource tradeable (exporting and import competing) sectors due to appreciation of the exchange rate as a result of excessive current domestic investment or consumption expenditure driven by huge influxes- the so-called Dutch Disease. Second, there are also potential adverse consequences due to the impact of volatility on government revenues. Both these challenges can complicate fiscal planning, often resulting in inefficient pro-cyclical “stop-go” government expenditures.
  ii. Absorptive capacity: capacity of government to spend effectively and efficiently depends on technical and institutional capacities. Constraints on human and institutional capacities can reduce the effectiveness of sudden and large increases in public investment. An optimal

[83] It is obvious that there are situations where the government could be the owner and the extractor of the resources.

[84] Two underlying principles here are the ‘common good’ nature of extractive resources and the desire for ‘intergenerational equity’.(See Chapter 9).

policy, therefore would scale up public investments only in line with the growing "absorptive capacity frontier" that an economy can achieve

- Meeting these challenges requires both the technical capacity to understand the resources endowment parameters (quantity, quality, extraction methods and rate of extractions) and also the economics of extraction. Only then can one devise a fiscal strategy (level of tax rates, royalties, cost recovery limits, corporate taxes, depreciation allowances, and SWF[85]). Yet adequate human and financial resources are lacking in many resource-rich countries. For instance, Sierra Leone's Environmental Protection Agency (EPASL) illustrates the capacity problem. In 2010, EPASL had a budget of US$150,000 a year with nine staff. Given such limited resources (human capacity and operational budget), carrying out its broad mandate of setting environmental standards, monitoring the impacts of all activities nationwide and mainstreaming environmental priorities across government, was close to impossible. It had a backlog of more than 200 environmental impact assessments pending review (ECA, 2011).
- The use of natural resources can produce significant externalities, as discussed in the previous chapter. For example, Lahiri-Dutt (2016) documents extensive environmental damage caused by coal mining in India, including forest degradation, complete alteration of the flora and fauna leading to decay of the local agricultural economy, land subsidence, falling water table, and pollution of rivers by coal washeries. At the same time, communities – especially poor indigenous communities such as the Adivasi – have been displaced and have seen their traditional livelihoods of hunting and fishing destroyed. Such externalities may be hard to address by existing political institutions. For instance, environmental problems often take decades or even centuries to emerge; their solutions may take equally long.
- Sustainable development requires that the mineral assets generate material benefits for the future generations that are deprived of it which introduces accountability issues on how much wealth mineral assets generate and how this wealth should be distributed. (ECA, 2011).
- Capturing a fair share of income flows that come from the granting mineral rights and, more critically, the recovered resources is problematic. In competing to attract investment, resource-rich developing countries may be compelled to provide incentives – in the form of favourable tax regimes and less stringent environmental regulation – that reduce their potential resource rent capture. By means of an example, many deals signed by African countries when demand was limited and the economic environment unfavorable saw many extraction companies receive extensive exemptions in taxes, duties, waivers or reduced royalties, which resulted in significant lost opportunities when the 2000s commodities boom hit. For instance, when gold prices rose from $300 to $1,600 between 2000 and 2010, mining companies' revenue rose at four times the rate of government's revenue. In Zambia in 2010, mining exports were $10 billion but the government revenue was only $240 million or 2.4% of the export revenue (APR, 2013). How to ensure the receipt by governments of a fair share of mining revenues in a competitive yet dynamic world is a challenge. This is because volatile markets that fluctuate complicate competition for investment. Governments are under pressure to provide sufficient incentives for extractive companies to invest, while collecting adequate revenue for socio-economic development. A properly structured fiscal regime seeks to balance these objectives.

[85] Governments can mitigate the impact of the Dutch Disease by delaying consumption or investment in the domestic economy, in favor of purchasing foreign financial and capital or property assets instead. This deferral from spending domestically can be achieved through sovereign wealth funds (SWFs) managing a portfolio of foreign investments (also see box …).

6.1.2 Power asymmetry

Arguably, the terms of many contracts have not been sustainable in the long run due to those contracts delivering disproportionate benefits to investors as a result of their (investors') superior negotiation position (Darby, 2010). Countries usually operate from a position of weakness in relation to extractive companies mainly due to:

- Their inability to get a fair deal due to weak negotiation capacity. Generally, the mining companies know more about the nature and value of the resource and can leverage the information asymmetry to extract an unfair share;
- The consolidation of the extractive sector is such that a few multinationals control production and thus have significant leverage in negotiation; and
- Complex organizational structure and accounting practices of mining companies and their extensive use of offshore companies make it difficult for poorly staffed governments and authorities to monitor, regulate and hold mining companies accountable. The inability to monitor mining activities and sales of mineral wealth means that governments cannot receive their rightful share of extractive revenues.

The weak negotiation capacity has been recognized and a number of initiatives to support governments have been put in place such as the African Legal Support Facility and the Connex Initiative which is described briefly in Box 6.1 below.

Box 6.1 Improving negotiating capacity – The CONNEX Initiative

Extractive projects tend to be large, costly, risky and long lived. They often require complex contracts between governments and investors (mostly foreign) that define the long-term relationship between the parties. Negotiating such contracts is a challenge. Geologists need to ascertain the quality of a deposit; industry specialists assess market conditions, investors' strategies and prices; financial analysts model trade-offs between, say, royalties and income taxes; other specialists evaluate environmental and social impacts (Sauvant, 2017). Host countries need experienced lawyers to negotiate the terms of contracts (including renegotiation provisions) with the world-class advisors typically available to large foreign investors. However, many governments face challenges from lack of expertise, an imbalance of financial resources, time pressure, and the potential for corruption.

No institution currently provides governments with comprehensive, multidisciplinary negotiation support on short notice (if need be) regardless of economic sector or geographic region. Only partial support is available for resource-constrained host countries, for example, through the African Legal Support Facility and the International Senior Lawyers Project (Sauvant, 2017).

The G7 Initiative on "Strengthening Assistance for Complex Contract Negotiations (CONNEX)," launched at the G7 Brussels Summit in 2014, aims to provide developing country partners with multi-disciplinary and concrete expertise for negotiating complex commercial contracts, with an initial focus on the extractives sector. The CONNEX Initiative is designed to ensure such complex commercial contracts are well-conceived and well-negotiated for a host country's successful and inclusive development, while protecting the interests of the host country and investing companies. Three pillars constitute the CONNEX Initiative: information integration and accessibility on existing resources; enhancing existing negotiation support; and linking to long-term capacity building and increasing transparency. Connex has also established a collaborative relationship with the Columbia Center on Sustainable Investment (CCSI) on its open web portal (www.negotiationsupport.org) to enhance the accessibility to negotiation support through the integration and accessibility of relevant information (CONNEX, 2016).

The CONNEX initiative recognizes that immediate assistance such as dispatching experts for the contract negotiations through the CONNEX Initiative should be carried out in parallel with the long-term capacity building and the improvement of transparency.

One of actions to implement the Initiative is the CONNEX Support Unit providing independent, high-quality, demand-oriented, multi-disciplinary and rapid support as well as expertise during negotiation of large-scale, complex investment contracts in the resource sector. Government bodies of developing countries can request support: (see http://connex-unit.org/)

6.1.3 Political economy dynamics

- Resource extraction has been shown to weaken governance capacity by producing rent seeking dynamics and cleptocracy (Fearon & Laitin, 2003; cited in GiZ, 2003), which in some cases explains the prevalence of conflicts in resource-rich countries. A particular problem in these countries is that as governments receive large extractive revenues, they tend to be less reliant on revenues from taxation, which in turn undermines the government's accountability to its electorate.
- The point nature of many extractive resources tends to be very attractive to military and political "entrepreneurs" as receiving huge rents simply entails capturing a very small territory, a state Moore (2000) calls "political underdevelopment". Indeed, the combination of valuable resources with weak States may encourage violent domestic and/or cross-border conflict. UNEP (2009) estimates that as high as 40 per cent of intrastate conflicts are linked to or fueled by natural resources. Discovery of natural resources also tends to give rise to nationalism and irredentist tendencies. Local stakeholders tend to become more radicalized.

In addition to these enduring characteristics of the mining governance landscape, a number of other challenges, some of more recent origin, complicate such governance and need to be taken into account for it to be effective. The rest of this section discusses these challenges and makes general suggestions as to how they can be addressed, which are elaborated later on in the Report.

6.1.4 The Centre is losing power

Centralized power at the level of the national government is being dissipated upwards, downwards and horizontally, creating a new governance landscape for governments.

- Bixler *et al*. (2015) report that there has been a dramatic shift in technology and social norms that have fundamentally changed the way we coordinate and make decisions at individual, organizational, and societal levels. The term "network society" has been applied to this mode of organization. Through networks, people leverage informal relationships to exchange ideas, build rapport, identify common interests, work together, share power, and solve problems of mutual interest.
- Lockwood *et al*. (2010) note that the world has seen shifts in power and authority upwards from national to supranational scales as apparent in the use of international conventions, and downwards to sub-national and local scales via the devolution of central government responsibilities.
- The accessibility of information and communication technologies to even the poorest people in the poorest of countries has created an informed society and this is changing the narrative of governance. As a result, the following trends are being observed:
    - There has been acceleration towards more disaggregated and diverse governance, in which a wide variety of groups (international institutions, national governments, sub-national governments, state- and privately-owned corporations and a rich variety of civil society groups) are involved in influencing governance norms and rules (Darby, 2010).

- Also, increased pressures from an informed citizenry for a greater say in decisions, and growing interdependencies among a wide range of actors, necessitating greater interactions, have contributed to the trend towards a greater horizontal distribution of power.
- Similarly, power shifts rather than greater participation, as well as equity and responsiveness of government to citizens, often lead to transfer of power to private bodies, customary authorities and non-governmental organizations (NGOs)/ Civil society organizations (CSOs). This is creating issues of legitimacy, accountability and inclusiveness (Lockwood *et al*., 2010).
- OECD (2011; cited in Atanasijevic, 2016) argue that the "majority of states in the global South can be described as hybrid political orders". Such orders are characterized by the co-existence and overlap of conflicting claims to legitimacy and economic resources by many actors (state and non-state). The assumption of a strong state is inadequate when formulating interventions embedded in the complex realities of hybrid political orders (Atanasijevic, 2016).
- Corporations are also being asked to take on greater social responsibilities. Corporate Social Responsibility (CSR), which has been the social engagement mechanism through voluntary contributions to wider society – beyond their shareholders and core business - has been challenged. Boundaries between voluntary and mandatory engagement are recently blurring[86;] for example, legislation on CSR reporting is also debated in the European Union (GIZ, 2003).

Globalization is also changing the global governance landscape. As globalization progresses new challenges and new actors are coming into place. The global governance landscape is also becoming more complex.

- The commodities boom of the 2000s pushed many large-scale natural resource projects into more politically unstable and fragile states. This can be perceived as a general trend towards natural resource investments moving into countries in geopolitically unstable regions and into more fragile environments such as the Arctic (Emmerson & Lah, 2012).
- The world has seen a rise in resource nationalism – both in producer States keen to maximize revenues, as well as in consumer States keen to secure supplies (Darby, 2010). This has seen countries revising mining contracts and launching new mining policies.
- The increasing importance of emerging countries' extractive corporations. These enterprises, which are largely, state-owned enterprises (SOEs), have become key players in natural resources exploitation at home and abroad (Acosta, 2010). This creates a new dynamic where traditional global governance tools that were built on Western values are becoming inadequate (GIZ, 2003).
- Also, as global power has shifted from G8 to G20, the diversity of G20 nations implies a less homogenous approach to issues of natural resources governance, such as issues of political and civil liberties that lie at the core of current transparency and accountability instruments (Carish & Rickard-Martin, 2013; Darby, 2010).
- Globalization has seen the rise of global terrorism and introduced a new security challenge for the natural resources sectors, creating a nexus between natural resource governance and security. Natural resources can therefore be leveraged to fund global terrorism.
- Consumers in the West (also the global middle class) are increasingly demanding ever more sustainably produced products and requiring that global supply chains provide these guarantees. This is resulting in re-arrangement of global supply chains. Thus, actors at different positions of

[86] CSR is a continuum going from charity to responsible business conduct. Thus, CSR may or may not include environmental aspects or considerations. CSR may be abused by scrupulous companies by providing charity while polluting the environment. In Ghana (ACET, 2017) and India putting in place CSR into law.

the supply chain are starting to request information about the extent to which sustainability is assured during mineral exploitation and processing to fulfill their supply chain responsibility. This is creating demand for standard setting platforms, whereby compliance can be verified by the business itself or by third parties. The Global Reporting Initiative is such a platform. This consumers' demand is also providing a business opportunity for some to charge a premium under various ethical labels such as Fairmined gold.

- Investors are also increasingly seeking to invest in businesses that support sustainability leading to a rise of sustainability-driven investments; for example, Dow Jones Sustainability Index. Consequently, companies that seek to get financing from capital markets must continually intensify their sustainability instruments. Many extractive companies are listed companies. Thus, as sustainability-driven investment grows, their values and their ability to attract investors will increasingly depend on how well they meet sustainability goals. Indeed, the growing power of investment managers is such that it has been argued that changing the investment grade depending on level of compliance to the Extractive Industry Transparency Initiative (EITI) standard can be an effective way of forcing transparency (Acosta, 2013a).

The changing governance landscape has outstripped abilities of both central governments and international bodies to develop effective regulatory frameworks and institutions (Darby, 2010). To respond to the changing governance landscape, new governance frameworks are needed. Some actions are proposed below.

Governance tools that are more flexible and anticipatory are needed. Such adaptive governance also calls for collaboration and learning, as well as the creation or strengthening of institutions that can structure and influence these processes. Governance frameworks in the natural resources sector should be flexible enough to accommodate changes as they occur and incorporate new actors and stakeholders as the need arises with the implication that one-size will not fit all. Adaptability calls for systematic self-reflection on procedures, processes and performance through monitoring, evaluation and review. It also calls for processes to change management as a result of review outcomes (Lockwood *et al*., 2010). Crona & Hubacek (2010) note that more research is needed to understand how relations among actors, and the structuring of these relations, affect natural resource governance outcomes.

There is the need to develop governance frameworks tailored to the needs of communities, civil society groups and governments at very local levels. These should not be simply a watered-down version of existing national-level transparency programs (Darby, 2010). Particular attention should be given to traditional authorities, as they are often grantors of the social licence to operate[87]. Box 6.2 below provides a case study in Ghana whereby a mining company is undertaking activities as part of its social licence to operate. State and provincial level governments, as well as traditional authorities also play a crucial role in managing conflicts between resource users. They also play critical roles in ensuring that revenues generated by major natural resource projects are converted into sustainable development in the communities where those resources are located.

[87] Beyond the formal licence granted by governments, mining companies need the acceptance of local communities in which they operate. This is the 'social licence to operate'.

Box 6.2 Obtaining a Social Licence to Operate (SLO)

The enclave nature of mining is a concern, especially given the fact that the public usually owns the minerals, yet it is excluded from the extractive activities. Mining companies aware of the tension are usually fairly proactive through Corporate Social Responsibility (CSR) so as to provide some benefits to local communities and buy their favour i.e. social licence to operate[88.] In Ghana, the formal gold mining sector has been particularly active with some ambitious CSR programs. One of the more successful initiatives is Newmont Ghana's Ahafo Linkages Program (ALP), which is a partnership between Newmont Ghana and the International Finance Company (IFC),

The Ahafo Linkages Program is designed to help maximize the growth potential of the following local businesses: (1) local suppliers development - helps local businesses acquire the skills necessary to work within Newmont's supply chain; (2) local economic development - works to diversify the local economy by building the capacity of businesses not directly involved in mining, such as egg producers, brick makers, and caterers; (3) strengthening the business association - strengthen the Ahafo Local Business Association (ALBA), an organization that fosters business growth in the region; ALBA currently has over 100 members working in a number of sectors; (4) training local trainers - training of local business service providers, who support local businesses on an ad-hoc basis during and after the close of the Ahafo Linkages Program; (5) business to business encounters - this is supplier–buyer matchmaking where potential clients are paired with ALP businesses for commercial relationship leading to appointments and deals; this event optimizes market diversification opportunities for companies receiving technical assistance.

According to Newmont, ALP has created more than 15,000 direct and indirect jobs. Between 2007 and 2009, 99 suppliers from its local Ahafo host communities were awarded contracts to the tune of $14.5 million. The company contracted business worth $272 million in 2008 with Ghanaian businesses. The businesses under the Ahafo Linkages Program also accessed $6.8 million from other clients apart from Newmont Ghana in 2009. The Program broadly offered training in record keeping, business management, market diversification, finance facilitation and technical/productive assistance to over 210 local small and medium-sized supplier businesses in its Ahafo host communities. A total of 341 Ghanaian businesses were also awarded contracts worth over $144.3 million accounting for over 60 percent of the Newmont Ghana's total purchases in 2009.

Source: IFC (undated).

The role of governments vis-à-vis the role of corporations in delivering development outcomes needs to be better clarified. While CSR is crucial in delivering sustainable development, the ultimate responsibility lies with government. Indeed, more ambitious CSR initiatives may undermine the legitimacy of governments and lead to citizens holding corporations more accountable to them than governments.

Effective solutions to natural resource management challenges demand working across jurisdictional and sectoral boundaries; that is, a networked system of governance. This will require practitioners, policy makers, and scholars to: (1) focus, refine, and expand the concept of governance to inform analysis of socio-ecological systems; (2) form networks with leaders who create opportunities for transformative collaboration around shared problems; (3) reflect on the nature of network successes and strategies for evaluating outcomes; (4) understand governance processes and practices at multiple scales and their mechanisms for engaging communities and other stakeholders in multi-level decision making; and (5) be sensitive to the fact that networks are susceptible to the differences in power, influence, and resources among network participants (Bixler *et al*., 2015).There is the need for a reconceptualization of the State towards a more practice-oriented perspective that seeks new entry

[88] Some see CSR as way to balm to ameliorate the concerns of local communities.

points for natural resource governance in fragile states. Atanajevisic (2016; citing Boege *et al*., 2008) argues that "states should be viewed as hybrid political orders or places in which diverse and competing claims to power and logics of order co-exist, overlap and intertwine". This, in his opinion, is an improvement over the current perception of States in terms of their ability to fulfil core functions and provide basic services (and thus labelling them as weak, fragile or collapsed).

In addition, there is a need to shift from a Western centric[89] governance model and engage emerging countries as co-creators of global governance. A serious and long-term diplomatic commitment needs to be urgently made to improve the quality of the dialogue on these issues with governments, companies and civil society groups in the emerging countries. Darby (2010) argues that inviting these countries to participate in existing international standards will continue to fail. Enrico & Rickard-Martin (2013) instead argue for balancing the interests of the industrialized West and East with the emerging voices of the resource-rich South, which would offer an opportunity to fashion governance norms for sanctions that will enjoy truly global respect. There is a need to demonstrate to middle-income countries and investors from those countries, that the natural resource governance agenda is not a front for global political competition, but rather a way of reducing risks to and costs of their investments in developing countries. This will probably require the development of new global, but more inclusive standards. One approach to doing so is to explore how instruments from emerging countries can be leveraged; for example, China's Due Diligence Guidelines[90], which are, interestingly, based on OECD due diligence guidelines.

Resource nationalism and revision of mining policy should be welcomed as an opportunity to engage governments on their appropriate role vis-à-vis mining companies in delivering development. By assuming a greater stake in the extractive sector, governments can also lower the unreasonable expectations on extractive companies (ICMM). Governments can also learn from experiences of how two Scandinavian countries successfully navigated these challenges (See Box 6.3).

[89] The Western Centric governance model puts great emphasis democratic institutions, transparency and accountability respect for individual human rights and limited government role.

[90] The guidelines call for Chinese mining companies undertaking outbound mining investment, cooperation and trade to strictly "observe the UN Guiding Principles on Business and Human Rights during the entire life-cycle of the mining project" and to strengthen "the responsibility throughout the extractive industries value chain". The Guidelines further contain requirements to "conduct risk-based supply chain due diligence in order to prevent engagement with materials that may have funded or fuelled conflict". They apply to all Chinese companies which are extracting and/or using mineral resources and their related products and are engaged at any point in the supply chain of minerals. The Guidelines are designed to align with international standards and allow for mutual recognition with existing international initiatives .e.g. OECD Guidelines and legislations. See , https://www.oecd.org/daf/inv/mne/CCCMC-Guidelines-Project%20Brief%20-%20EN.pdf

Box 6.3 Scandinavian resource nationalism in the early 20th century[91]

Ownership and control over key natural resources was a recurring political question for the two Scandinavian kingdoms of Sweden and Norway during what is often referred to as the first wave of globalization. Both countries were rich in natural resources, especially forests, minerals and hydropower, and were also largely dependent on capital from abroad. The inflow of foreign capital into natural resource industries created unease over the increase of foreign influence, as well as the possibility of an unfavourable "dependant" economic development, where the home countries would not enjoy the full value of their resources.

Consequently, the two countries introduced a series of resource nationalist measures with the aim of addressing these concerns. In 1888, the Swedish government nationalized the unfinished railway to its largest iron ore deposits in Lappland from a bankrupt British company. Through its control over the railway, the Swedish state managed to push through a part-nationalization of the mines in 1907 with the other part being reserved for a Swedish owned company. In 1906, the government also introduced strict regulations on further acquisitions of forested lands by joint stock companies in the northern countries, in order to prevent further proletarization of forest-owning smallholders and farmers in the area. Initially, the public debate had especially focused on foreign owned sawmill companies, but was set to target all joint stock companies regardless of ownership. After a series of German acquisitions of smaller iron mines in central Sweden in the years leading up to the First World War, the Swedish Riksdag passed the Restriction Act in 1916, which restricted all joint stock companies where foreigners could hold more than 20% of the voting share power from obtaining new properties with forests, mines, hydropower or peat.

In Norway, the parliament passed a temporary concession law in 1906 for minerals, hydropower and forests, which was passed into permanent law in 1909 and revised again in 1917. As a rule, the Norwegian governments denied new foreign acquisitions of forests, but unlike the Swedish Restriction Act, the Norwegian concession laws were not used to bar new foreign direct investments in mining and hydroelectricity. Instead, these were mostly welcomed as long as the investor was willing to accept a series of concession terms. These included provisions on locally produced machinery and materials, restrictions on foreign labour, royalties and nationalization without remuneration after a set period of time -- usually 60-80 years. Initially, Norwegian owned companies were exempt from these terms, but this exemption ended in 1909 in order to prevent circumvention as well as a political desire to also regulate all private resource industries. Public owned hydroelectricity generation on the other hand remained free from these regulations.

While the contingency of historical development makes it impossible to draw any absolute development "lessons", a few factors stand out in the experience of Scandinavian resource nationalism: Firstly, resource nationalism was messy. Even in fairly stable and religious and ethnically near homogenous countries like Sweden and Norway, resource nationalism stirred up major political disagreements over exactly what constituted the 'national interest' and if any group or economic sector should have a privileged access to resources or resource rents.

Secondly, timing was crucial for the Scandinavian resource nationalist policies. Resource nationalist policies in both countries were generally introduced at an early stage in the development, before much foreign direct investment had been sunk into the projects. These policies were generally not retroactive, which meant that resources already owned by foreign owned companies were allowed to retain their properties unimpeded. This likely reduced the level of conflict between the Scandinavian governments and private business, as well as foreign investors' home governments.

Thirdly, regulatory consistency was important. Most of the resource nationalist policies described above were introduced before or during the First World War, when the value of the key resources of the two kingdoms was generally increasing. However, these policies were not reversed in the economic downturns of the early 1920s and 1930s, despite some calls to remove them to spur investments. This consistency over time likely increased the credibility of the two countries resource policies.

Fourthly, building independent state capacity was vital. For the resource nationalist policies to work, they had to be made in such a way that did not 'throw the baby out with the bath water'. In order to avoid unintended

[91] Contribution by Andreas R.D. Sanders

consequences, the Scandinavian governments needed knowledge of the industries they sought to regulate. However, this also opened the possibility of regulatory capture, if representatives from these industries had too large influence over the shape and form of regulations. The two countries tried to solve this in somewhat different ways. The Norwegian system relied more on checks by democratic institutions in the concession system, while the Swedish system was more technocratic and gave more independence to experts.

Fifthly and finally, the results varied a lot. While some of the Scandinavian resource nationalist initiatives could be seen as a success, they often failed to live up to their ambitions of their supporters, and sometimes brought unintended negative consequences for economic development. Yet, it is also possible that the resource nationalist interventions also mollified the public's uncertainties to economic globalization. The retention of some control over some politically sensitive sectors may explain part of the foundation for the broad and stable support for a pragmatic open economy in the two countries.

6.1.5 Financialization of natural resources

Financialization has been defined as the 'increasing importance of financial markets, financial motives, financial institutions, and financial elites in the operation of the economy and its governing institutions, both at the national and international levels' (Epstein, 2005; cited in Nölke *et al*., 2013). It has been asserted that this growing dominance of finance has led to a profound transformation of modern capitalism (which some do not view in a positive light). Nölke *et al*. (2013) argue that for financialization to be sustained, it invariably needs to incorporate new economic sectors; for example, the public sector, social security systems, the housing markets or other spheres of social reproduction — and reorganize them according to the rationality of the financial markets.

The field of natural resources became a target of financialization as financial markets started seeking new assets to diversify their portfolios with assets that are negatively correlated with stocks and thus can act as a hedging strategy. Tang & Xiong (2010) trace the financialization of commodities to the 2000s. They argue that because commodities offer a diversification benefit to portfolios of stocks and bonds, fund managers were able to promote commodity futures as a new asset class for institutional investors in the early 2000s following the collapse of the equity market. As a result, billions of dollars of investment have gradually flowed into commodities markets.

The Institute of International Finance estimates that between 2005 and 2011, the value of commodity-related assets under management increased almost nine-fold to $450 billion (Sy, 2013). Much of the investments have flowed into commodity-index related instruments. Index instruments means that as investors move in and out of the various indices, the prices of the commodities in those indices move together irrespective of the fundamentals of demand and supply of the various commodities in the index. For example, crude oil, copper, cotton, soybeans, and live cattle – a seemingly unrelated set of commodities – went through a synchronized boom and bust cycle between 2006 and 2008 (Tang & Xiong, 2010). As a result of the financialization process, the price of an individual commodity is no longer simply determined by its supply and demand. Instead, commodity prices are also determined by a whole set of financial factors, such as the aggregate risk appetite for financial assets, and investment behaviour of diversified commodity index investors (Tang & Xiong, 2010). What happens in that the stock and bond markets can have the same impact on different commodities (Sy, 2013). This is having a negative impact on commodity markets. Büyükşahin & Robe (2013) find that financial traders could be important transmission channel of negative equity market shocks into the commodity space. Financialization of commodities is now a concern and has prompted calls for tighter regulation (Cheng & Xiong, 2013). However, this concern needs to be balanced with the fact that the increasing presence of index investors can have the advantage of improving sharing of commodity price risk (Kyle & Xiong, 2010).

There is no clear way forward on the matter of financialization. Much more research is needed to better understand how it will impact extractive resources and the effectiveness of various policy tools. Some proposals going forward are provided below.

It should be noted, however, that Tang & Xiong (2010) argue that policymakers need to be cautious about imposing any stringent position limits on financial investors as such limits also constrain the potential risk-sharing benefit. All the same, Tang and Xiang (2010) find that returns correlation between stocks and commodities has increased significantly in the wake of huge inflows to commodity-indexed investments. They argue that these findings provide a policy tool to stem the flow of investments in commodities as the past large inflow of commodity index investment was motivated by the low correlations observed in the historical data. Thus, simply improving public awareness of the increased correlation between commodities and stocks is likely to tame the rapid growth of commodity index investment and reduce the adverse volatility spill over effect.

In addition, more research is needed to better understand how financialization impacts the more fundamental aspects of commodity markets[92]. Cheng & Xiong (2013) investigate whether financialization has affected commodity markets through the mechanisms that underpin the functioning of these markets; that is, storage, risk sharing, and information discovery. They find that financialization may have transformed the latter two functions of commodity futures markets. They indicate that better understanding of these mechanisms can benefit from future research, particularly in the following areas:

- A systematic modeling of the different trading motives of hedgers and speculators at different times is necessary to uncover dynamics of risk sharing in commodity futures markets.
- Incorporating informational frictions and the informational role of commodity prices into existing theoretical and empirical frameworks is likely to significantly improve our understanding of the boom and bust cycles of commodity prices.
- Better understanding of how risk reallocation and information transmission from commodity markets affects the real economy and the global financial markets.

6.1.6 International investment law and sovereignty

Extraction of natural resources requires significant investments. For many resources-producing countries the investment (and the expertise) cannot be sourced internally and therefore must be sourced from international investors. This has seen many States creating appealing incentives to attract the needed investments. In an era of globalization, these investments have been increasingly underpinned by a heavy reliance on bilateral investment treaties (BITs) or on investment chapters in free trade agreements (the two together are referred to as international investment agreements or IIAs). Such treaties have largely overshadowed the role of so-called “state contracts”. International

[92] Research can then be used to support better regulation of commodity markets. As pointed in chapter 2 (Box 2.1) traders already had a stranglehold on commodity trade and indeed traders tend to be located in the global financial centres. So, for resource-rich countries, one avenue is to lobby for countries hosting commodity trading hubs to better regulate commodity trading and their financialization. Already CSOs in Switzerland (which is one of the most important trading hubs) are pushing for responsible business practices (with respect to human rights) to be required by the constitution (see chapter 9). Resource-rich countries may be able to influence commodity trading for their mutual benefits by partnering with CSOs and using other lobbying channels, Non-resource-rich countries can also seek an international convention to regulate trader though this is a much harder route.

investment law regulates certain investments made by foreign investors in a host state. It defines certain disciplines or standards of treatment that States agree to accord to foreign investors. In case of dispute, it provides foreign investors the possibility of bringing a claim against the host state before an international arbitration tribunal. The rationale for capital-importing countries granting enhanced protection to foreign direct investment was, among other things, the expectation that such investment would contribute to their economic and social development. However, Vinuales (2015) argues that international investment law has played an unbalancing role by overemphasizing the protection of investors over the authority of the host State and, more importantly, the public interest. ECA (2016) notes that the signing of BITs does not necessarily translate in increased flows of foreign direct investment. It calls for a balance between the need to protect investors and the necessity to provide policy space to developing countries to pursue their development objectives. It notes the punitive actions that can arise from dispute settlements.

Arbitration and foreign investment agreements seem to be trampling the principle that peoples and nations have sovereignty over their resources and that the public interest overrides the private interest. International investment law overemphasizes the protection of foreign investors. Vinuales (2015) supports these arguments by making the following observations:

- Virtually any type of state regulatory action is now subject to potential challenges under the broad “fair and equitable treatment” (FET) standard. FET clauses merely state that States shall accord fair and equitable treatment, leaving the specific implications of such treatment for arbitral tribunals to interpret. The growing reach and implications of FET, particularly in connection with the investor’s “legitimate expectations,” has come under much criticism.
- The pursuance of a foreign investment project (protected by international investment law) may come at the detriment of the human or collective rights of the population affected by extractive activities as well as of the aspirational goals for development of resource-rich countries. The protection of the environment in the area covered by the investment project may be governed by a multilateral environmental treaty, which directs the State to act in a manner inconsistent with the letter or the spirit of a narrow investment protection clause.
- Foreign investors can bring a claim against the host State directly (that is, without the need to fully exhaust domestic remedies) before an international arbitral tribunal constituted specifically to hear that claim. Further, many questions are not explicitly (or even implicitly) addressed in these treaties and remain applicable either as a matter of general international law or as a matter of systemic or simply contextual interpretation, and interpretation has tended to favour foreign investors. A recent study by UNCTAD found that foreign investors prevail in more than 70 percent of such cases (Mann, 2015).
- It is unclear which domestic laws have to be respected at the time the investment is made. Domestic law may impose several conditions for an investment in extractive industries to proceed, ranging from obtaining a licence to invest (admission), to the authorization to prospect, and to an environmental permit based on an environmental impact assessment. Quite debatably, investment tribunals have limited the scope of relevant domestic laws to mere foreign investment laws; that is, those regulating the licence to invest, as an investment “made” once the investment licence has been granted, irrespective of whether the main permits to conduct the relevant activities (for example, a permit to explore or an environmental permit) are granted.

Moving forward, there is a need to review international investment laws (See Box 6.4). Some avenues have been proposed:

It is critical for international or regional organizations to seriously recalibrate the investor-state dispute settlement (ISDS) system. Dupuy & Viñuales (2014) argue that investment arbitration is but one example of a broader and generally positive global movement towards the application of the rule of law at the international level through the use of international courts and tribunals. However, there are further avenues for reform that could improve the system significantly. Viñuales (2015) points to the following:

- Introduce an exhaustion of local remedies requirement.
- Ensure that tribunals do respect treaty requirements. In many cases, existing treaties expressly require the pursuance of grievances before domestic courts, and yet several tribunals have daringly disregarded the intent of the state parties.
- Pay greater attention to systems of control of investment tribunals. The interpretations given by different tribunals of fundamentally similar points has differed so widely that the very rule of law that investment arbitration is supposed to support has instead been undermined.
- There is a need to better integrate domestic law and other norms of international law (for example, customary concepts expressing sovereignty as well as human rights and environmental law).
- Investment treaty arbitration should be a two-way process in which investors have obligations too, whether arising from domestic law or contracts or from international soft-law standards. These need to be integrated in the interpretation of investment treaties.

Box 6.4 Before Signing International Investment Agreements (IIAs)

UNDP (2018) warns that governments should be wary before signing IIAs as most models remain silent on environmental and social issues. They advise that the governments should use the following checklist before negotiating a new IIA to attract foreign mining companies. Has the government:

- Understood the advantages and disadvantages of its IIA model and the current trends in addressing these issues.
- Reviewed whether its model IIA promotes or constrains sustainable development objectives, safeguards the right to regulate, while protecting and promoting foreign investment.
- Introduced or strengthened clauses about the protection of the environment and human rights in its IIAs.
- If a dispute occurs, ensured that dispute settlement tribunal has relevant environmental or human rights expertise, and required access for third parties to the arbitration.
- Considered getting support in developing their investment frameworks and treaties in line with sustainable development from specialist sources?

6.1.7 Illicit financial flows (IFFs) and sustainable development

As indicated before, one of the key pre-requisites to converting extractive wealth into sustainable development is capturing a fair share of revenues that come from extraction of resources. However, diversion of flows is a major challenge for many resource-rich countries. The sums involved can be substantial. Due to the very nature of the flows, data is hard to collect. Nonetheless, APR (2013) estimates that Africa loses annually close to $38 billion due to mispricing, an amount equivalent to total ODA received by African countries. The continent also loses an additional amount of $25 billion annually through other illicit flows. At a global level, Kar & Curcio (2011 cited in Le Billon, 2011) estimate a total of US$1.2 trillion in illicit flows during 2008 globally. This was 10 times the amount of ODA provided by OECD DAC that year.

Le Billon (2011) explains that illicit flows occur through three channels:

i. Corruption: Outright theft either by public officials or by public officials in collaboration with private firms. For instance, APR (2013) reports that between 2010 and 2012, the Democratic Republic of Congo (DRC) lost $1.2 billion in revenues from underpricing of mining assets in five deals only. This figure is double the combined budget of education and health of Congo (DRC), underscoring the scale of impact from these losses.
ii. Smuggling or illegal resource exploitation: Companies export the resources mined without full declaration thus not paying all the duties or just smuggle the resources out. Smuggling is especially rife in artisanal mining. Indeed, smuggling of diamonds which were then used to finance conflicts led to an international outcry that led to the Kimberley Process Certification Scheme (KPCS) in an attempt to stem the flow of "conflict diamonds."
iii. Accounting tricks: Extractive sectors involve complex technical and financial processes that require a high degree of expertise to properly assess tax payments. These complex processes open the door to manipulation, particularly if auditing capacity is limited or corrupt (Le Billon, 2010). To facilitate tax evasion many companies have obfuscating organizational structures. Companies use a myriad of offshore companies that trade with each other. This facilitates the illicit diversion of revenues in particular through the use of transfer pricing tools[93].

The common thread in illicit financial flows is the use of tax havens to channel the flows. Yet these off-shore centers typically have little or limited disclosure rules. Through "layering" (use of multiple investment companies) and other tricks they are able to hide real owners. Using this veil, even "respectable" multinational corporations can participate in questionable deals. Given the limited capacity of regulatory authorities and civil society, these arrangements are virtually impenetrable (APR, 2013). Developed countries now recognize this arrangement as a threat to their tax base. The recognition of this has brought the issue of illicit financial flows to the fore. How to tackle such flows is now a topic on the global governance agenda. Some global initiatives such as OECD guidelines (anti-bribery convention, corporate governance), OECD standards for automatic exchange of financial accounts information in tax matters are already in place.

With respect to natural resource governance, tackling illicit financial flows should be of paramount importance. Some suggestions by Le Billon (2011), AUC/ECA (Undated), Toigo (2016) and others include:

- Outlaw transfer mispricing**.** Countries should ensure that they have clear and concise laws and regulations that make it illegal to intentionally incorrectly or inaccurately state the price, quantity, quality or other aspect of trade in goods and services in order to move capital or profits to another jurisdiction or to manipulate, evade or avoid any form of taxation, including customs and excise duties (AU/ECA, undated).
- There is the need to develop comprehensive databases and benchmarks on prices of goods and services that can support tax authorities to analyse imports and exports. There should

[93] Transfer pricing refers to an accounting practice where companies charge their subsidiaries for services rendered. This can be used to avoid taxes by overpricing services provided by subsidiaries located in tax havens. One example of this is the case of Glenco in Zambia. One of its Zambian mining companies (Carlissa Investment) registered in the British Virgin Islands, which was in turn owed by Glenco Finance, registered in Bermuda, was selling Copper to Glenco at prices far below the market price (APR, 2013).

also be supporting systems to make data shareable and also to provide capacity development in transfer pricing. Countries should seek to develop special units dedicated to transfer pricing (AUC/ECA, 2011).

- Establish country-by-country reporting requirements through international accounting standards**.** Multinational companies tend to report consolidated accounts of their various operations rather than disaggregate by countries. This hides evidence of manipulations of accounts, as one cannot clearly tell where production is taking place and where sales are being recorded. Also, countries should look at restricted contracts to companies incorporated in fair-tax and high-disclosure jurisdictions.
- Transparency requirements should extend beyond revenues to licensing, contracts, physical resource flows, and other production factors, as well as to public expenditure and environmental impact assessment reports, data and decisions. Transparency should also include extending due diligence on politically exposed persons (that is, politicians and bureaucrats susceptible to being corrupted or defrauding the state) and also to trading and banking partners (Le Billon, 2011).
- Mandatory disclosure of beneficial ownership: This can make it easier for tax authorities to "follow the money" and assess the correct tax liability of an extractive company operating under their jurisdiction, as well as highlighting potential conflict of interest for politically exposed persons. Note that EITI has recently extended its scope to beneficial ownership and now requires implementing countries to ensure companies disclose their beneficial owners, with a view to reach full disclosure by 2020. The early EITI pilot mapping beneficial ownership, involving 11 countries points to a number of gaps and difficulties in getting to the bottom of complex corporate structures, highlighting that, significant work is needed both at the technical and the political levels.
- Move from voluntary to mandatory transparency and translate transparency into accountability. Continue to promote voluntary participation in disclosure schemes while extending mandatory disclosure instruments beyond current jurisdictions[94]. Also seek to create synergies between mandatory disclosure legislation and the voluntary instruments through data sharing.
- Integrate elements of the tax justice and tax evasion agendas in order to expand their relevance to the effort to reduce illicit financial flows. Countries should connect anti-corruption, illegal exploitation, and tax agendas. They should also foster dialogue between policy makers in these different areas. Identify options for synergies between increased revenues from taxation, formalisation of illegal exploitation, and anti-corruption reforms.
- Promote standards for tax maximization in the poorest resources-rich countries. There is a need for greater focus on promoting ethical standards and CSR practices that push corporations to maximise tax payments in the poorest countries. While companies would still aim to minimise global tax payments, such a standard would also encourage maximization of taxes in the poorest countries.

6.1.8 From formal vs informal dichotomy to an intertwined relationship

Natural resource governance is usually targeted at formally recognized stakeholders and in particular it assumes that formally licenced extractive companies do extraction. However, on the ground, there are many entities that extract natural resources under what would be called "informal" arrangements.

[94] Note that Mandatory disclosure regimes now exist in relation to stock markets in Canada and the EU.

Studies usually present a dichotomy between the formal and the informal, designating the co-existence of the two as 'dual economy'. However, the simple informal-formal dichotomy misses the range of actors and interactions among them under the formal and informal labels. The informal-formal is more of a continuum rather than a distinct dichotomy. The continuum of actors can be illustrated, for instance, in the multiple coal economies of India (Lahira-Dutt, 2014). They point to four economies: the state-owned enterprise, Coal India Limited (CIL), represents the 'national coal' economy; the private entrepreneur-owned collieries producing coal that is captive to power plants represent 'neo-liberal coal' economy; then non-legal small-scale mines produce 'state craft coal'; and the innumerable poor, spread throughout India's coal-bearing tracts illegally produce 'subsistence coal'. They argue that although the economies may on surface look distinct, the different production regimes create different sub-economies that interact in interesting ways. They show that instead of a clear-cut formal-informal division, it is more like the Russian dolls, whereby the informal contracting economy hides its informal labour arrangements within the formal Coal India Limited (CIL) economy. The coal produced by both serves the same market, yet in employment terms the contractors' labourers remain informal.

The overlap between formal and informal mining may create opportunities for formal mining to violate human rights and undermine sustainable development by essentially sub-contracting poor practices informally. So, a company may claim compliance with best practices while it sources minerals and metals from informal suppliers who are not observing these. More importantly, the formal company can be a shell for money laundering from illegal and informal mining activities as it has been observed in Colombia (OECD, 2016).

There is a growing recognition that the mineral policy framework needs to recognize the reality of informal mining (UNEP, 2012). Some proposed approaches for moving forward are numerated in the next few paragraphs (see also Chapter 3).

With regard to informal mining, it will be helpful to re-consider the current mind sets and legal frameworks altogether. The formal and the informal domains intersect, overlap and interact with each other instead of existing in a binary relationship. Yet this interdependence is rarely acknowledged in policy making. Lahiri-Dutt (2014) argues that to deal with the diverse worlds that recognize the informal-formal continuum worlds there is need to reconsider current legal frameworks. The very term "informal", is closely associated with illegality (UNEP, 2012). This is unfortunate as in many cases artisanal mining is a traditional means of livelihoods for many and in other cases the entry of formal extractive activities destroys other sources of livelihoods forcing people to go into artisanal mining such as the case of coal mining in India (Lahiri-Dutt, 2007).

Steps need to be taken to bring the artisanal and small-scale mining (ASM) sector into the mainstream by providing the required financial and technical support. The policy environment should encourage cooperation between small- and large-scale miners, including converting ASM into viable operating enterprises (ECA, 2002; ECA, 2011). Indeed, there is much that can be gained from decriminalizing informal mining and putting in place frameworks to support it. For instance, in Mongolia, efforts have been made through amendments to the laws (Minerals Law, Land Law and Personal Income Tax Law), which have made it possible to "formalise" the sector with very positive results for the government. The contribution of informally mined gold to the National Treasury increased significantly from 3.2 kg in 2013 to 3.2 tonnes in 2014 (Lahiri-Dutt & Dondov, 2016).

Governance instruments need to carefully assess potentially negative side effects such as job losses in the ASM sector due to unintended shifts to the large-scale mining sector. Instruments must be carefully considered, attentively monitored and accompanied by positive contributions to local development and active dialogue (Schüler, 2016).

There is need for better understanding of the overlap between formal and informal mining and the need for ways to address it. Formal mining companies have more resources and better capacity and this overlap can be used to transfer skills and other capacity. Indeed, local content development activities should seek to see how formal mining could be leveraged to develop ASM as sub-contractors. Moreover, recognition of ASM through such linkages can also reduce tensions and conflicts.

6.1.9 Climate change and the extractive sector

Climate change phenomena and mineral resource exploitation are closely intertwined as outlined in Chapter 5. Further, demand of minerals and metals is going to be profoundly affected by shifts to a green economy as discussed in Chapter 4.

The extent to which the extractive sector can mitigate impacts and adapt to climate change is crucial for the sector as well as for national and global economies. Some actions going forward are discussed below:

Regulations are needed to mandate what mines plan for climate change both during their operational lifespan and through decommissioning. Climate change may likely lead to more heavy precipitation events, resulting in more frequent accidents. Consequently, infrastructure such as dams should be constructed with strong consideration for all possible atmospheric conditions or seismic activities (Azam & Li, 2010; cited in Dolega *et al*., 2016). Current construction codes/standards that guide the development of mining infrastructure (for instance tailing dams building codes) need to be revisited to ensure that they are adequate. Regulatory certainty with regards to climate change also needs to be established before adaptation and mitigation efforts truly take hold in the mining sector. Developing this certainty should be a priority for regulators (Pearce *et al.*, 2009).

There is a need for better understanding of climate change risks and for developing mitigation and adaptation strategies. This calls for improved climate modelling and communication of climate change projections to better understand the risks that might affect mine sites, and the main mining regions (Pearce *et al*., 2009). There is also need for greater collaboration among mining companies, regulators, scientists and other industry stakeholders to develop practical adaptation strategies that can be integrated into existing and new mine operations, including in the post-operational phase (Pearce *et al*., 2011).

Greater flexibility in resource management plans and supply chains is also needed to accommodate abrupt changes in climatic conditions. This is critical given that a significant amount of mineral resources come from developing nations, which already lack resources for climate adaptation. There is therefore an increasing need to undertake robust measures to ensure that supply chains are climate-resilient (Rüttinger & Sharma, 2016).

The climate change-mineral resources link provides an entry point for a larger debate on environmental and social standards in mining (Rüttinger & Sharma 2016). As climate change has galvanized the world to seek greater collaboration, it is creating truly global governance platforms.

These platforms need to be leveraged in order to develop more effective governance platforms for the extractive sector.

Due to growing concerns about the impacts of climate change, it is becoming imperative that governance initiatives include climate change costs as part of the disclosures they receive from extractive companies. A group of Latin American NGOs/CSOs mounted a campaign calling on the EITI to include climate costs and also for EITI to define what it can contribute to the debate on climate change in the sector. NGOs/CSOs have also demanded that EITI modify the standard in order to ensure that fossil fuels companies disclose whether or not their projects can proceed in a 1.5 or 2-degree C world (Peters, 2016).

Policy makers could support and encourage the industry to address climate change risks more pro-actively by supporting international knowledge hubs. This calls for collective knowledge management, to develop a common pool of regional and catchment-wide expertise in preparing for, and managing both real and perceived impacts from climatic changes. There is also a need for engagement and communication across different stakeholder groups – to facilitate timely information exchange, build cooperative relationships and address community anxiety about the socio-ecological impacts of mining.

6.1.10 Host country capacity constraints

As pointed out in section 6.1, mineral resource flows can cause macroeconomic challenges (macroeconomic risks and absorptive capacity) that many countries are challenged to manage due to weak capacity and institutions. Host governments do not only need to attract investment in the extractive sector on terms that give them a fair share of the rents, but they also need to use these rents to develop the value chain and build new sectors in their countries. Some proposals towards this end include the following:

First, in order to convert extractive revenues into sustained levels of prosperity; governments need to build the capacity for domestic investment – referred to as "investing in investing" (Collier, 2011, p. 7). It includes the need to build capacity for public and private investment, build the financial system, and lower the unit cost of construction and equipment, for instance, through regional market integration.

Second, rent capture may be achieved through various tax instruments integrated into a package that is attractive for investors and host countries alike. Self-adjusting instruments that cater for both vibrant and stagnant global demand scenarios should be considered, such as Resource Rent Tax (RRT) or formula taxes that work on profitability rather than profit. Taxes that lead to sterilization of mineral deposits should be minimized or not used (ECA, 2011).

Third, building capacity of governments to be able to plan for and use natural resources effectively is crucial and urgent. In response to the challenge, one trend that has gained significant traction is saving part of the natural resources flows in Sovereign Wealth Funds (SWFs) domiciled mainly in rich countries (See Box 6.5). This approach has been successfully applied in some developed resource rich countries like Norway especially, to manage the "Dutch Disease". However, developing countries, and particularly those with high levels of international debt, may be cautioned against setting up Norwegian-style sovereign wealth funds that invest almost exclusively in foreign assets (Collier, 2007). SWFs are hard to justify in poor countries and are unlikely to help in the urgent task of delivering sustainable development. APR (2013) argue that such funds have returns of 1 % while investments in infrastructure have returns of 15-20% and can add about 2 % growth per year to African countries. Investment in social protection has an even higher impact. Well-designed social protection schemes can build resilience, support growth and reduce inequality. Social programs can be integrated with public works program to increase impact. Therefore, the need to build capacity is an urgent one. However, the issues of absorptive capacity and volatility are significant challenges for poor countries as well, and well-designed SWFs can be a component of an effective strategy for addressing them.

Box 6.5 Sovereign Wealth Funds (SWFs)

Resource-rich developing countries face the significant challenge of using their natural wealth to improve the living standards of average citizens, rather than wasting it through weak institutions and corruption- the "resource curse." One increasingly popular option for dealing with the resource curse is to sequester part of resource revenue in a special fund generally called a Sovereign Wealth Fund (SWF). These special-purpose financial vehicles aim to help ensure proper management of resource revenues. SWFs can have a number of components that may include:

- A stabilization fund, which captures in excess a pre-determined commodity price (used to project flows for budget purposes) and release these funds to support the budget when price falls below the predetermined price.
- A development fund that captures a portion of the resources flows and puts them in a fund to focus on long term projects e.g. infrastructure.
- A heritage fund, which captures the resources and saves them for future generations. These funds are long term investments to be drawn by future generations.

SWFs generate and afford the sponsors added flexibility to achieve downstream policy objectives subject to risk and uncertainty. For example, a SWF can help to stabilize the macro-economy by keeping some assets offshore. It can smooth resource revenues to make budget allocations more predictable. And, it can offer countercyclical resources for the economy following an economic shock. Moreover, as a storehouse of financial assets, SWFs can help maintain a balance between current expectations and long-term commitments. Through all of these functions, SWFs are capable of dampening or, at the very least, managing the negative consequences of resource wealth.

However, significant skills and also functions performed by the SWF, which is really asset management, are not traditional government functions. This implies that new skills and new institutional set-ups would be required. Governing, managing and operating a SWF can be inordinately challenging, as these are organizations modelled on high-performance western institutional investors (Clark & Monk 2012). For SWF to be effective countries need to build first-rate institutional investors capable of managing money on a global scale. In addition, SWFs will require institutional reforms to improve in-country capacity for revenue management. Therefore, SWFs do not substitute for good governance. In fact, they make the need for good governance to be in place a pre-requisite.

Further, for an SWF sponsor to realize the benefits of such a fund, the establishment of a SWF must be part of a broader package of institutional reforms designed to improve the country's capacity for resource revenue management. In short, the creation of a SWF will not, on its own, improve fiscal and monetary outcomes (Davis *et al*., 2003).

Fourth, stronger linkages need to be created between the extractive industry and local industry. In setting terms for access to mineral resources, governments should impose linkage conditions on mineral rights holders and provide incentives for investors to structure projects in ways that deepen project integration into the broader national—and regional—economy (Pedro, 2017: 26-28). Building on CSR efforts on the ground should be especially encouraged. For instance, the Ahafo linkages project implemented by Neumont Mining in Ghana had by 2010 assisted in the development of 125 local suppliers with business valued at $4.7 million. The Ghana chamber of commerce, the mining commission and the International Finance Corporation (IFC) are further building on this and are identifying firms that can be strengthened to increase supply (ECA, 2011).

In addition to the capacity of host countries to manage resource wealth for sustainable development, is the need for capacity to regulate the mining sector. As highlighted in Chapter 5, impacts arising from this sector either directly or through associated activities can undermine sustainable development though impacting future economic development of other important and natural resource-based sectors. Many countries have mechanisms in place for impact assessment and mitigation, principally the Environmental and Social Impact Assessment process for projects and the Strategic Environmental Assessment process for programmes, policies and plans. However, a number of resource rich countries have limited capacity of environmental regulators to effectively implement these processes (Brooks & Wright, 2016).

Large scale mining is a highly technical industry and therefore there is often a need for greater technical capacity within environmental ministries and departments to understand impacts and the mitigation measures that can be deployed. There is an increasing level of innovation within the mining sector to tackle these challenges but the incentives to use costly mitigation measures can be lessened if there is no awareness or demand from host governments. Equally inadequate staff numbers and limited financial resources within government further constrain their ability to place demands on proponents. Ensuring that resource wealth is channelled into building effective government institutions to regulate the mining sector will be an important component of the ability of this sector to contribute to sustainable development.

6.1.11. Planning for mine closure

If mine closure is not thought at the design of the mine, the impact of the mine closure can be very costly and fixing this tends to fall on the public purse as mines almost always close when they are losing money and their operators are strapped for funds and facing a variety of other challenges (NOAMI, 2010). Planning for mine closure must begin before approvals are given for the development of a mining project (MMSD, 2002). Significant benefits have been achieved at little or no cost, simply because proper advance planning results in pollution prevention. For example, it may cost nothing to achieve an acceptable slope on a waste dump if these steps are planned from the beginning. By contrast, re-contouring an established waste dump can be enormously expensive if no attention is paid to these issues until the mine closes (NOAMI, 2010).

The Mine Closure Plan, which should be submitted at the feasibility stage, must include plans for decommissioning, restoration and rehabilitation of each component of the mining area with cost estimates. An appropriate funding mechanism is essential to ensure sufficient funds are available for mine closure activities and that all decommissioning and rehabilitation requirements are complete. Further, the plan must be reviewed periodically. ICMM points that mine closure encompasses both managerial and technical issues (ICMM, 2008). It requires a continual testing of assumptions and recommendations to match evolving social, economic and environmental conditions and expectations. Mine closure is an on-going concern and indeed a work in progress. Even in countries like Canada which have put much effort in this, a NOAMI (2010) survey found that some risks like, that of third-party interference, catastrophic events or contingency planning for worst case scenarios are not addressed. Further most agencies managing mine closure lack consistent ways to store data and information, which is critical when addressing emergencies.

It is recommended to have an independent mine closure law that establishes a single agency to implement the law. This model gives the business community assurance that one agency will take the lead on its problems and that it will not have to answer to many differing opinions on how operation, reclamation and closure success will be measured (see Box 6.6 for a good practice). This model also allows the public and NGOs a single place to go for information on mining.

NOAMI (2010) proposes the following principles in formulating a mine closure policy:

- There should be a plan for mine closure.
- Legislation governing mine closure should be modernized.
- There should be a search for more appropriate technological alternatives for implementing a mine closure plan.
- There should be a search for more economically appropriate alternatives for carrying out mine closure.
- Governments should take into account the interest and opinions of civil society, especially those communities directly affected by mining enterprises.
- The experiences of those countries which have a well-developed mine closure policy regime should be taken into account.
- Specific standards or closure requirements should reflect a careful balancing of the benefits and costs of the standards or requirements. Policies should be designed to encourage mine owners to achieve a specific standard or requirement at lowest cost.
- Policies should be designed to encourage or provide incentives for technological innovation in mine closure, to reduce costs of compliance (economic incentives tend to provide greater incentives for innovation than technology or performance standards).

Box 6.6 Almadén mine closure – an example of good practice

Mine closure usually poses two challenges. On one hand, closed mines can pose environmental hazards as pointed above and on the other, mine closure can depress a city/region as the mine tends to be a major employer in the region. Mine closure can lead to ghost towns. It is therefore imperative that as one takes measures to mitigate potential environmental threats posed by a mine closure, one also needs to look at how the economic challenges can be addressed. Alamdén mine is a good example of leveraging a closed mine to generate new economic activity. The mine, which has only been closed since 2003, is now a well-organized museum with guided tours. It is also now a UNESCO world heritage site due to its long history that captures the history of mercury mining. This has made it a global tourist attraction. https://www.worldheritagesite.org/list/Heritage+of+Mercury.

6.1.12. The next frontier: governance of the impacts of deep-sea mining and broader lessons moving forward

Commercial interest in exploiting mineral wealth on the deep ocean floor first became a major topic of debate at the United Nations in the 1960s. However, technical challenges, the cost of extraction and environmental and legal concerns kept development slow. Now, with technology maturing, and among growing geopolitical concerns about security of land-based supplies, the interest has been rekindled, as shown by the rapid increase in the number of exploration contracts issued by the International Seabed Authority in the past decade. Areas approved for exploration now cover over 1.5 million square kilometres in the Pacific, Indian and Atlantic Oceans. Sites of mining interest often include highly vulnerable marine ecosystems and biodiversity hotspots. Environmental impacts threaten to be significant and could be irreversible, and are juxtaposed with short-term socio-economic benefits. This poses an important sustainability question and a complex governance challenge. Governance of deep-sea mining needs in particular to be framed by the Sustainable Development Goals 14 (oceans) and 12 (sustainable consumption and production).

As with other new industries, the dominant policy questions are whether, why, where and how to authorise or even encourage deep seabed mining, and how to ensure that any deep seabed mining contributes to fulfilling societal needs, including economic development. This section is meant to be a case analysis of future impact governance challenges relating to deep-sea mining and draws extensively on the final report of the MIDAS project[95] [96]and on a briefing paper by the Deep-Sea Conservation Coalition.[97]

Environmental governance of submarine deposits[98]

Many of the richest seafloor deposits are found in the half of the world's ocean floor that lies beyond the jurisdiction of any one country. Under the United Nations Convention on the Law of the Sea (UNCLOS), the sole authority governing the exploration and exploitation of the global seafloor is the International Seabed Authority (ISA). So far, the ISA has signed 28 contracts with member States and their contractors[99] (private or state-owned companies or agencies) for exploration of mineral deposits. The most recent exploration contract was awarded to Poland during the 23rd annual session of the ISA in 2017, in an area on the mid-Atlantic Ridge, which has been tagged by the Convention on Biological Diversity as an ecologically or biologically significant area, calling into question the application of the precautionary principle.

Under international law (UNCLOS) deep sea mineral exploitation must be governed "to ensure effective protection for the marine environment from harmful effects", to prevent damage to marine fauna, and to ensure the "protection and preservation" of the marine environment. Thus far, the ISA has developed its regulations for exploration and is working on its exploitation regulations. It has set a target date of 2020 to finalise the regulations for exploitation of deep-sea minerals. If this target is met, large-scale commercial mining of the deep seabed could begin in international waters within a few years after that, assuming market conditions are favourable.

These regulations must ensure that the key UNCLOS obligations are fully met. Key issues are core environmental concepts such as defining "serious harm" and 'harmful effects", fundamental principles such as the "precautionary approach", "common heritage of mankind", and transparency. In relation to mining activities which may cause serious harm, the ISA has the mandate under UNCLOS to: (i) set-aside areas where mining will not be permitted; (ii) deny a new application for a contract to conduct seabed mineral activities; (iii) suspend, alter or terminate operations; and iv) hold the contractor and its sponsoring state liable for any environmental harm (Levin et al., 2016).A recent review of the ISA has, however, confirmed several governance issues such as lack of transparency and environmental capacity[100]. The report concluded that the Authority is not yet fulfilling its obligations to ensure that

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95 MIDAS Research Highlights: High-level summary of the key project outcomes, 2016, http://www.eu-midas.net/library

96 MIDAS D9.6: Report on the implications of MIDAS results for policy makers with recommendations for future regulations to be adopted by the EU and the ISA, 2016 , http://www.eu-midas.net/library

97 Deep Sea Conservation Coalition, 2017, Deep-sea mining: briefing paper, http://www.savethehighseas.org/resources/publications/deep-sea-mining-briefing-paper/

98 http://eu-midas.net/legal_framework

99 For an overview of contractors and exploration areas: see https://www.isa.org.jm/maps

100 Seascape consultants, 2016, Periodic Review of the International Seabed Authority pursuant to UNCLOS Article 154, final report

activities in the area are carried out for the benefit of mankind. Outside the realm of ISA, individual countries can also permit mineral exploration and exploitation in the seabed areas within their national jurisdiction, known as their continental shelves. The world's first deep seafloor mining may start in 2019 within the 200-mile exclusive economic zone (EEZ) of Papua New Guinea, when the Canadian company Nautilus Minerals is due to start mining for gold, silver and copper from hydrothermal vent zones[101].

The economic implications of deep-sea mining are also still debated, closely linked also to the benefit sharing obligations under UNCLOS. A study by the German Ministry for Economics showed that the economic profitability of deep-sea mining is still very uncertain[101], and at least one government-level assessment of seabed mining has found economic claims questionable[102]. The social implications of deep-sea mining also remain to be considered. Local communities such as in Papua New Guinea are campaigning for a ban, fearing deep sea mining places at risk their food resources and livelihoods and emphasising they are the custodians of the world's largest ocean[103]. At the same time, new technologies could emerge which would make such mining more environmentally tolerable and the demand for minerals for green technologies continues to rise dramatically with no clear governance mechanism to meet such projections (Ali *et al.,* 2017). However, a 2016 report from the Institute for Sustainable Futures in Sydney, Australia concluded that even under the most ambitious renewable energy scenarios, this demand can be met without mining the deep sea (Teske *et al.,* 2016). The level of uncertainty on the demand side as well as the supply side is likely to continue and thus a clear understanding and governance path for impacts of such frontier resources becomes more urgent.

Deep sea mining and Sustainable Development Goals

Clearly there is a need to reframe deep-sea mining governance in light of the Sustainable Development Goals. The future requirements for deep sea mining need to be evaluated in a holistic manner; that is, taking into account transitions to sustainable consumption and production systems and changes in lifestyle as consumer awareness about the impacts of consumption increases worldwide[104]. If deep seabed mining is allowed to take place, then governments must ensure that the ISA regulations include robust requirements for[105]:

- strictly limiting adverse environmental impacts, with clear conservation and management objectives;
- strategic or regional environment management plans;
- site-specific environmental management plans;
- environmental impact assessments (EIAs);
- mechanisms for independent scientific review, monitoring and compliance;

[101] Ramboll IMS Ingenieurgesellschaft mbH, 2016, Analyse des volkswirtschaftlichen Nutzens der Entwicklung eines kommerziellen Tiefseebergbaus. Bundesministeriums für Wirtschaft und Energie Referat I C 4 Projekt Nr. 59/15, https://www.bmwi.de/Redaktion/DE/Publikationen/Studien/analyse-des-volkswirtschaftlichen-nutzens-der-entwicklung-eines-kommerziellen-tiefseebergbaus.html

[102] In New Zealand, the Chatham Rock (CRP) Environmental Protection Authority (EPA) decisions questioned economic claims made by proponents. http://www.epa.govt.nz/EEZ/previous-activities/notified-consents/chatham_rock_phosphate/Pages/default.aspx

[103] http://www.huffingtonpost.com/entry/deep-sea-mining-and-the-controversial-solwara-1-in_us_5964dbe9e4b0deab7c646bb5

[104] Deep sea mining: Charting the risks of a new frontier http://www.dw.com/en/deep-sea-mining-charting-the-risks-of-a-new-frontier/a-42258847

[105] Deep Sea Conservation Coalition, 2017, Deep-sea mining: briefing paper, http://www.savethehighseas.org/resources/publications/deep-sea-mining-briefing-paper/

- liability provisions, insurance and bonds, a redress and liability fund, and a sustainability fund; and
- transparency, including provisions to ensure public accountability and reporting, and public availability of environmental data.

The ISA must also improve its structure and working methods to ensure it has the capacity to develop and apply regulations to protect the marine environment. This means establishing procedures to ensure that it works with greater transparency and enhancing its environmental expertise, for instance, through the creation of an environment committee. The case of deep-sea mining and concerns over its likely impact underlines the importance of having an effective international governance system around resource extraction that bridges science and policy.

6.1.13 An integrated approach to evaluating impacts

The environmental impacts of mining outlined in Chapter 5 have an integrative scientific basis for evaluation. Extraction of minerals brings them from higher states of “entropy” – or natural disorder - in geological environments to lower states of “entropy” – implying a more ordered and refined output through the investment of energy. However, manufactured uses of these elements raise their entropy again. Energy in the form of extraction technologies as well as labour are then required to extract the metals back from their product use at the end of the product cycle. The viability of reuse and recycling of minerals in the stockpile of products is dependent on the durability of the product itself and the recoverability of the material. From a purely resource use minimization perspective it would be more sustainable to have a durable product than having to remanufacture products from disposable products.

However, if one considers the broader systems ecology of material usage, calibrating stocks and flows of minerals with rising demand, based on population or development, one has to consider whether durability of the product would necessitate more mining at the expense of recycling. For example, if we make more durable aircraft but there is still a greater demand for them, the metal locked in their existing stock would not be available for recycling, and hence mining of the metal would become necessary. Energy use calculations as well as the social and environmental trade-offs of mining versus recycling are needed in more detail to ascertain the optimal profile of recycled versus mined material sourcing. This section will consider the aforementioned hybridity of mineral supply and its implications for developing effective governance systems.

Combining concerns about energy usage and entropy, leads to another useful concept, called “exergy” which is being explored increasingly as a metric of understanding the irreversibility of certain kinds of resource extractions. The exergy of a material can be defined by its ability to do useful work in achieving thermal equilibrium with its environment. While energy can neither be created nor destroyed under normal circumstances, a material’s exergy can be destroyed based on an increase in entropy through mixing and dispersal. Both energy and exergy have the same measurement units (Joules) but for understanding material usage and sustainability, exergy is a more useful concept to be further developed (Dincer & Rosen, 2007). So far, the use of exergy in governance systems has been relatively limited to local or regional efforts at comparing energy utilization. However, the metric has potential for broader application as well in impact comparisons for more effective governance (Rosen, 2013).

Minerals will need to be considered from multiple supply sources and mining companies would need to reinvent themselves as material service providers from multiple sources rather than just mining itself. This may also involve the advent of new companies and players that form a new kind of industrial ecosystem. A potential win-win outcome related to mineral supply flows in this context is the use of minerals in green technologies, particularly for cleaner energy production that could in turn help to harness minerals more sustainably. The key to such an approach would be to track the overall impact reduction of the extractive process as more use of those minerals in green technologies could also lead to greater aggregate ecological impacts.

An IRP Report on Green Energy Choices undertakes an analysis of life-cycle impacts, land occupation, and material requirements of different technology groups. An interesting finding of the report is that when replacing conventional fossil fuel-based power plants, renewable technologies offer substantial reductions in both emissions of greenhouse gases and other pollutants, including those causing eutrophication, acidification, particulate matter and photochemical smog, and various forms of toxicity. For further details on the ecological impacts of renewable technologies see the IRP Report (UNEP, 2016). It is also essential to track the energy-material flow relationship. Substituting certain minerals for use in green technologies will likely have impact on energy consumption that is an important metric for systems-wide aggregate impacts. Furthermore, we need to consider the role of recycling within a "circular economy" paradigm with greater technical complexity (World Economic Forum, 2014). Postconsumer resource usage is also changing in ways to consider aggregate composites of metals and plastic or glass materials collectively for different uses. Thus, the conventional view of recycling metals through their disaggregated waste streams is also shifting (Sahajwalla, 2015).

6.1.14 Gender and extractive industries governance

Extractive industries -mining, oil, and gas operations and projects-are generally seen as the domain of men, where a rough and heavy work is carried out that women are physically not capable to undertake, and the work is carried out in places and contexts where women 'should not be'. These cultural and ideological representations of the formal, industrialised extractive operations, and their managerial masculinities, are inherently inappropriate and unhelpful for two reasons. First, they erase the long history of women's direct and indirect contributions to extractive industries—as workers, as wives sustaining and supporting the households' well-being, in building strong and healthy mining communities, and as supporters of men's struggles against capitalist exploitation (John 1980; Lahiri-Dutt & Macintyre, 2006; Mercier & Gier, 2007; Nash, 1979; Parpart, 1986; Pattenden ,2005; Rhodes, 2006; Rolston, 2014; Smith, 2008). The resultant gender-segregated labour regimes in these operations strip women of their autonomy and render invisibility to their political agency (Alexander, 2009; Gier & Mercier, 2006; Horowitz, 2017; Jenkins, 2014; Lahiri-Dutt, 2012; Loeb, 2007; Murray & Peetz, 2010). Second, the masculinities also undermine women's rights—to struggle against exploitation, to resist the gendered social impacts, to emerge from victimhood, and, most importantly, to contribute efficiently and effectively to extractive industries (Deonandan et al., 2017; Jenkins & Rondón, 2015; Keenan & Kemp, 2014; Lahiri-Dutt, forthcoming; MacDonald & Rowland, 2003).

Therefore, although naturalized in discursive, cultural, and ideological constructions as an essentially male domain, masculinity is not the natural order of mining, and a gender-neglect hides women and devalues their agency in this sector. This section focuses on how gender mainstreaming is related to meeting sustainable development goals through better governance of extractive industries, discuss policy issues, and offer examples of what can be done. It argues that gender inclusivity is essential for extractive industries governance, and substantiates the argument by offering examples of good practices and policies that can be taken to mainstream gender in the sector.

The Sustainable Development Goals (SDGs), set by the United Nations Development Programme, mainstream gender at their heart. In particular, Goal 5 relates to gender equality by arguing that the provision of equal access to education, decent work, and representation in political and economic decision-making processes to women will fuel sustainable economies and benefit societies and humanity at large. The specific targets that are relevant for extractive industries governance include: the ending of *all forms of discrimination* against all women in mining communities as well as in mining organisations and mining sites; ensuring women's full and effective participation and equal opportunities for leadership at all levels of decision-making in mining-related matters; undertaking reforms to give women equal rights to economic resources as well as access to ownership of and control over land and other forms of property and natural resources; enhancing the use of enabling technologies with a view to empower women; and adopting (and strengthening) policies and enforceable legislation that can promote gender equality and empowerment of all women in both extractive industries and in areas of their operation. A range of evidence, presented collectively in the book titled '*Gendering the Field: Towards Sustainable Livelihoods for Mining Communities*' (Lahiri-Dutt, 2011) has shown that the sustainability of economic developments triggered by extractive industries could be significantly increased by removing the inherent biases and by identifying strategies to ensure equal benefits for women and men in mining communities.

The gendered sustainable development targets are relevant to improve the governance of extractive industries to make them more efficient, and to make natural resource management more gender-just (Silva-Segovia and Salinas-Meruane ,2016; Sweetman & Ezpeleta, 2017). Currently, women are discriminated against in extractive industries, yet they experience a disproportionate larger burden of the negative impacts of mining. This is because the gender roles of women and men in most rural communities are such that it is women who are impacted more when environments are degraded and when the social and cultural fabrics are disrupted by new mining operations (Eftimie *et al.* 2009). The gendered impacts of large-scale projects exacerbate gender inequality and disadvantage women by overlooking their rights, needs, and aspirations leading to loss of traditional autonomy and power. (For country-wise analyses, see: for Canada, MiningWatch Canada 2005; for China, Huang & Ali ,2015; for India, Lahiri-Dutt & Ahmad, 2012; for Papua New Guinea, Macintyre ,2003; for Indonesia, Robinson 2003. For an overview, see Macdonald and Rowland 2003). Moreover, at higher levels of mineral-resource-related decision-making that pertains to extractive industries, women are conspicuously absent. The immediate task, therefore, is to mainstream gender in political, economic, and public aspects of extractive industries governance.

The international NGO Oxfam has shown that the impacts of mining are not gender neutral and although women bear the negative impacts of mining more than men, they rarely receive the benefits that men do. Hill *et al.* (2017) show that women are not consulted when extractive companies negotiate access to land, compensation, or benefits, that extractive operations undermine women's ability to provide food and clean water for their family and can increase their workload by damaging the environment, that compensation and benefits are paid to men who are seen as the heads of households denying women access to mining's financial benefits and thereby increasing their economic dependence on men, and that women can lose their traditional status in society when mining creates a cash-based economy where the transient male workforce can bring increased alcohol, sex workers, and violence into the community, affecting the safety of women. Evidence also shows that women mine workers often face discrimination and poor working conditions, are victims of sexual harassment, and receive lower wages or pay for equal work to those performed by men (Benya 2017; Botha 2016; 2015).

Two reasons, therefore, emerge to justify a gender-inclusive extractive industries governance. First, gender equality and inclusiveness can help to improve the performance of governance of extractive industries (Gibson and Kemp, 2008). It would be reasonable then to consider if instead of enhancing economic disparities between those who benefit from mining and those who do not, creating intergenerational poverty or entrenching vulnerabilities around their operations, extractive industries can transform the lives of millions of people in resource-rich developing countries and can help drive economic growth, create new jobs, and reduce poverty (Cane 2015). Discrimination against women can be an impediment to successful business development that can lead to or sustain longer-term economic growth. As evidence from other businesses suggest, gender sensitive governance can lead to improved management efficiency. Gender sensitive governance can also minimise disruptions in production or community conflicts. A World Bank policy brief (World Bank, 2013) suggests that employing women and incorporating women into community-level consultations can create a more predictable business environment with fewer production disruptions, thus avoiding cost increases and loss of income. The Minerals Council of Australia (2013) notes that women's economic empowerment can be good for community development as they have a better record of accomplishment of starting successful businesses and repaying microcredit loans; women also show a greater willingness to respect safety and environmental safeguards.

Second, extractive industries must use the opportunity to contribute to gender equality by stepping up its efforts to empower women and lead to a more gender-just, gender-equal, and inclusive future for humanity. There is growing evidence from across the world that gender inclusivity leads to better economic and social outcomes from new extractive projects. The World Bank (2013) notes that the benefits of including women's perspectives in extractive industries are many, that the employment of women brings community gains: where women have access to employment and contribute to household finances, families invest more in education, health, and nutrition, and have a better well-being, as compared to households where women have lesser access to employment and finances. The Bank also suggests that the consultation of women—in land compensation matters, in environmental decision-making, and in other forms of spending—leads to more sustainable investment because the decisions are more acceptable to both women and men in communities (Lahiri-Dutt, 2012). Growing evidence points to an increasing engagement of women in community affairs (Kemp *et al*., 2010), in mining companies' negotiations and agreements (O'Faircheallaigh 2013), in sustainability reporting (Grosser & Moon, 2008), in women's access to local economic and community development (Keenan & Kemp ,2014), in services and infrastructure (Keenan *et al*. 2014), in the inclusion of indigenous women in the workforce (Parmenter, 2011), and in the provision of employment (Lahiri-Dutt, 2006). Responses to gender concerns in industry initiatives have been much slower than in other natural resource management sectors (Macintyre, 2011), yet many mining companies are now involving women in community consultations to indicate preferred avenues for investment to have more sustainable outcomes and developmental impacts.

Following SDG 5, that recommends the implementation of new legal frameworks for female equality and removal of practices that harm women to end gender-based discrimination in the workplace, gender should be mainstreamed in the mining project cycle. In the first phase of exploration, gender analysis needs to be an integral part of social mapping to note the gender-differentiated livelihoods and coping strategies, the access to and ownership of resources, and the gendered power dynamics. Women need to be made a part of consultations for 'prior and informed consent', that is, at the beginning of community engagement. During the mine-planning phase, gender impact assessments can be integrated to social mapping surveys, cultural impact assessments, and R&R planning. During the construction phase, gender-differentiated needs would reveal the separate needs and interests of women and men. During mine operation, community development projects, training, and education can have distinctive gender focus, and similarly women-targeted credit can be offered to set up small businesses and develop income-generating activities. Planning for mine closure can similarly ensure that women are a part of community consultations and livelihood projects.

Historically, women have contributed to extractive industries, directly and indirectly. Yet, sex-based discrimination has forced women to stay out of the workplace in the extractive industries, without being able to claim the economic benefits. On the other hand, women in host communities have become more vulnerable to the risks and insecurities caused by the environmental, social and cultural impacts on the surrounding areas. Clearly, the concept that benefits will trickle down to the entire household through the male household head has not worked. At the same time, evidence from all around the world has accumulated to show that gender inclusiveness in extractive industries development is beneficial for both the communities and the mining operations. Instead of stepping backwards, the extractive industries need to rise to the occasion and take up the opportunity to mainstream gender in all areas of its operation in order to lead to a development that is sustainable, and that benefits both women and men in an inclusive manner.

6.2. Conclusion

The challenges of extractive resource governance are well known and some drivers have been well researched. However, other drivers that are more recent have not been well studied. This chapter has undertaken a comprehensive review of challenges and potential approaches. The approaches reviewed provide a good foundation for developing a more holistic framework, flexible enough to address both current and emerging challenges.

All stakeholders in the extractive value chain have a role to play.

- <u>Host countries:</u> Host countries governments have a critical role to play in ensuring mining supports sustainable development through designing effective fiscal regimes and building the capacity needed to effectively and efficient absorb mineral rents.
- <u>Home countries: H</u>ome states have much more power over mining companies and thus can mediate the significant power asymmetry between mining companies and host countries. Home countries are also critical to reforming of the international trade and investment

regimes that constrains the use of the full range of policy instruments to achieve resource-based industrialisation at the local level).[106]

- International Community: The international community also has a crucial role in closing governance gaps. For example, multilateral environmental agreements (MEAs) are crucial in managing and mitigating environmental impacts. Global policy action is needed for setting global standards in the form of rules and regulations, voluntary instruments and reporting obligations in areas that include:
    - Mining companies: Mining companies are expected to operate responsibly including disclosing information; producing integrated social and environmental impact assessments; participating in local area assessments; paying a fair share of taxes and royalties; and not engaging in corrupt and other illegal practices.
    - Civil Society Organizations: Civil society organisations play a key role exerting social pressure and shaping public opinion to ensure mining companies operate responsibly.

These roles will be discussed in greater detail in chapter 10.

The insights gained here can also help to better understand how existing frameworks can be made more responsive. In the next chapter, the report discusses the current governance architecture in the mining sector and also undertakes an assessment of how well existing governance instruments have fared. Insights from these two chapters will be useful in developing the key pre-requisites for effective governance of the sector, which is the subject of chapter 8.

[106] Acosta A (2013) Extractivism and Neoextractivism: Two Sides of the Same Curse, in Beyond Development: Alternative Visions from Latin America, ed. M. Lang and D. Mokrani. 6: 1–86, Quito: Rosa Luxemburg Foundation and Amsterdam: Transnational Institute. https://www.tni.org/files/download/beyonddevelopment_extractivism.pdf

CHAPTER 7- CURRENT GOVERNANCE ARCHITECTURE

7. 0. Introduction

The previous chapter examined the challenges of natural resource governance and presented ways of addressing these challenges. This chapter highlights the current natural resource governance policy frameworks or instruments, regulations and initiatives that seek to mitigate negative social and environmental impacts and also harness natural resource exploitation.

7.1. The Governance space

Four dimensions that are critical in characterizing natural resource governance are the actors, the spatial boundaries, the power relationships and the normative frameworks (Table 7.1).

Table 7.1 Dimensions of natural resource governance

Dimension	Description
Stakeholders (Figure 1.1)	Governments (home and host nations), intergovernmental organisations (IGOs), development and investment banks, insurance companies, investors, shareholders, and diverse communities within civil society (consumers, workers, local populations, trade unions, media). Different interests, social, cultural, political, economic and environmental contexts.
Geography (space and time)	Different spatial and temporal scales, including local, national, regional and international, and past, present, future and inter-generational. Spatial boundaries are often not aligned with the biophysical and spatial characteristics of resources (Mineral resources in particular are aligned with geology not with political boundaries). Temporal scales are often not aligned with decision-making processes.
Power relationships	Asymmetric relationships of power, authority, cooperation or influence at multiple levels. Vertical when predominantly hierarchical, horizontal when predominantly cooperative and voluntary.
Normative frameworks	More formal normative frameworks include treaties, laws, policies, contractual agreements and technical standards. Less formal normative frameworks include administrative, commercial, professional and cultural practices, and interpersonal relationships.

7.1.1 Stakeholders in extractive sector governance (Figure 1.1)

Stakeholders that participate in the extractive sector governance include but are not limited to 'home' and 'host' governments, intergovernmental organisations (IGOs), private commercial entities, and 'third' sector actors such as non-governmental organisations (NGOs), the finance sector and institutional investors, shareholders, industry associations, labour, consumers, and diverse communities within civil society. Each of these actors pursues different sets of interests at different spatial and temporal scales, in different social, cultural, political, economic and environmental contexts. A characteristic feature of the extractive sector is the influential role played by transnational corporations (TNCs), including state-owned enterprises from other countries (Cotula, 2012; Holden & Pagel, 2013; UNCTAD, 2009). The conflicting interests and asymmetries of information, negotiating skills, leverage and power between governments, TNCs and communities present important political economic challenges.

The divergence in expectations between stakeholders has been a key driver of conflict in the extractive industry. This happens as certain stakeholders may be excluded, or feel excluded, from the decision chain. Stakeholders may also lack knowledge of the economic specificities of a mining project, fail to collectively understand how mining can benefit each group, and view value creation as a "zero sum" game of winners and losers (Pedro *et al*., 2017).

7.1.2. Spatial boundaries

Different actors and normative frameworks shape extractive sector governance at different spatial and temporal scales, including local, national, regional and international. The spatial boundaries of governance at each of these scales are often not aligned with the biophysical and spatial characteristics of resources, many of which are location-specific point resources. Mineral resources are concentrated in relatively small areas, conditioned by specific geological features and are unevenly distributed, which means that they must be exploited where they occur, most often through capital, technology and know-how intensive techniques. Yet, many activities in the extractive sector, and impacts of these activities, straddle, migrate across, or may biophysically impact on assets located beyond jurisdictional boundaries. A recent example of such impacts is the collapse in November 2015 of a mine-tailing dam in Brazil, which generated a wave of toxic mud killing 20 people and severely affecting hundreds of kilometres of river, riparian lands, and Atlantic coast across the two States of Minas Gerais and Espirito Santo (Garcia *et al.*, 2017). Even in the absence of environmental catastrophes, the impacts of mining can extend well beyond the footprint of the operation. For example, in the Brazilian Amazon, mining has been shown to drive deforestation far beyond operational lease boundaries (Sonter *et al*., 2017). Particularly in remote locations, the need for new infrastructure and energy generation can lead to far reaching impacts across a landscape. Another example is the worldwide contamination by mercury emissions from coal burning via trade winds (UNEP, 2013). Extractive activities are also extending to global commons, for instance, sea-bed mining.

7.1.3. Power relationships

Chapter 2 highlighted the fact that the mining sector is capital-intensive and requires highly specialized skills. The minerals and metals value-chains are also global. Hence, the sector tends to be dominated by powerful MNCs, which creates significant asymmetry in power and information. This is particularly pertinent in the geographical south where governments lack skills and knowledge in the resources they have, their value and the complexities of the public management of this sector. The result is that these governments have weak bargaining power. This weak negotiation capacity is further compounded by the fact that their capital markets are highly under-developed, having them to rely on foreign capital.

7.1.4 Relevant normative frameworks

Decision-making by different actors concerning the extractive sector is enabled, constrained and influenced by a wide variety of normative frameworks. More formal normative frameworks include treaties, constitutions, laws, policies, regulations, contractual agreements, and international finance standards, and voluntary standards of practice.

Less formal normative frameworks include administrative, commercial, professional, voluntary agreements, cultural and interpersonal practices. The categories of normative frameworks are discussed below.

International agreements establish a basic architecture of extractive sector governance at a global level, through the recognition of several general rights and obligations of nations/ states. For example, States are afforded permanent sovereignty over extractive resources within their respective territories, and sovereignty or sovereign rights over certain extractive resources depending on where they are located offshore as defined by the International Seabed Authority governance framework[107]. Beyond the environment, there are also a number of international convention/agreements in other areas such as human rights (ILO 169) and mining in the Antarctic (Convention On the Regulation of Antarctic Mineral Resource Activities).

A number of multilateral environmental agreements also relate to mining. For example, mainstreaming biodiversity in the mining sector (among others) will be considered at the 14th Conference of the Parties (COP-14) to the Convention on Biological Diversity in Egypt in November 2018. Under the United Nations Framework Convention on Climate Change, the Paris Agreement is likely to have impacts for the extractive sector as countries move towards cleaner energy sources. Of particular relevance to the artisanal and small-scale mining sector is The Minamata Convention on Mercury, which aims to ban new mercury mines, phase out existing ones and move towards regulation.

International agreements are also working to keep pace with changes to the mining sector, in particular where mining is becoming more common in 'new' or particularly sensitive areas. Two examples of this are the Protocol on Environmental Protection to the Antarctic Treaty (which prohibits all activities relating to Antarctic mineral resources, except for scientific research), and the United Nations Convention on the Law of the Sea (UNCLOS). Under UNCLOS, a framework has been established (the International Seabed Authority) to regulate deep-sea mining activities, including developing and enforcing rules for mining in areas beyond national jurisdiction.

National laws, policies and regulations, establish detailed frameworks concerning rights to extractive resources, management and development of the extractive sector taking into account impacts on the environment and other economic sectors, and the allocation of associated benefits and impacts. An important issue in several countries is the discrepancy between formally recognized rights to resources, and the resource-related expectations and dependencies of local communities (Toulmin & Quan, 2000; Tiess, 2011; Hamor, 2004).

National level policies and laws that are (or can be) of particular relevance to the management of the mining sector and its impacts on biodiversity are:

- National Biodiversity Strategies and Action Plans (NBSAPs) (many of which include specific recommendations relating to the mining sector);
- National Development Plans (where they explicitly recognize the value of biodiversity such as those in Uganda and Ghana);

[107] Website: https://www.isa.org.jm/

- National Mining Policies and Codes (which can require or support certain technologies, obligations and / or approaches that consider biodiversity and ecosystem services); and
- Legislation that mandates environmental and social impact assessments and strategic environmental assessments.

A suite of national laws and policies are likely to play an important role in the governance of the mining sector, including those relating to protected areas and, fundamentally, those that enshrine human rights in decision making processes. However, a lack of capacity at the national and sub-national level to understand, implement, regulate and enforce legislation can prove a significant challenge. Lack of political will, low integrity and lack of input from CSOs are equally important.

International finance standards - The organisations funding mining operations are also increasingly aware of their environmental and social risks and responsibilities. In response to this, the International Finance Corporation (IFC), the World Bank and many other multilateral development banks have developed environmental and social safeguards. These set out the criteria that a project must meet in order to receive funding and have become important drivers for the uptake of internationally accepted standards. IFC's performance standards have been adopted by the Equator Principles Finance Institutions and have become a blue print of best practice for a number of industries, including mining and oil and gas. These include the IFC's Performance Standard 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources. Revised in 2012, the current standards require that projects achieve a no net loss of biodiversity in areas of natural habitat, and a net gain in areas of critical habitat through adoption of the mitigation hierarchy. They also include additional requirements for operations in protected areas (IFC, 2012).

Equally, the World Bank's Environmental and Social Framework, sets criteria for lending to governments and is expected to be launched in 2018. Given the important role that governments play in many stages of mining activities (particularly planning and through state-owned enterprises), this provides a valuable mechanism to embed environmental and social considerations into publicly funded projects.

Voluntary and private standards – As mining companies seek to earn a 'social licence to operate' (discussed in further details below), this has resulted in an explosion of soft regulation in recent years (Pedro, 2015). Such voluntary initiatives are aimed at addressing potential consequences of mining on the environment (for instance, owing to tailing spills, deforestation, loss of biodiversity, soil erosion, water depletion, and CO_2 emissions), poverty and inequality, employment and inflation, immigration, displacement, loss of ancestral lands and livelihoods and other human rights violations.

Industry associations play an important role in developing and disseminating good practice around environmental management within the mining sector. For example, in recognition of the risk that mining poses to protected areas, IUCN and ICMM have produced good practice guidance on protected areas and biodiversity. In line with Article 6 of the Convention concerning the Protection of the World Cultural and Natural Heritage, ICMM member companies have agreed not to explore or mine in World Heritage sites. The Mining Association of Canada's Towards Sustainable Mining initiative provides information and support to members to minimize and manage impacts, including developing a Biodiversity Conservation Management Framework and Protocol.

A number of certification initiatives for mined products have been developed, some of which include biodiversity among their criteria. Examples include:

- The Initiative for Responsible Mining Assurance, which aims to involve a range of stakeholders (including affected communities) in the development of an assurance system to improve the environmental and social performance of the sector (to be launched in 2018).
- Responsible Jewelry Council has developed a whole supply chain approach to its initiative, including consideration of performance against its responsible standards from mining raw materials to selling finished jewelry.
- Responsible Steel™ aims to ensure that steel certified under its scheme has been produced and sourced responsibly.

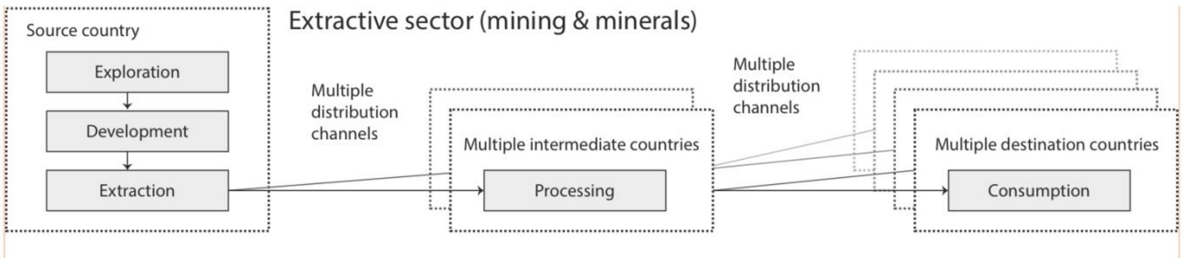
While by no means universally applied, such initiatives can help guide the mining sector towards more ‘sustainable’ and ‘responsible’ practices and recognize efforts made to avoid, minimize and manage environmental and social impacts. Many relevant initiatives are discussed further in Section 7.3 below.

As shown above, the governance space is made up of actors, spatial boundaries, power relationships and normative frameworks. These all play out in the mineral value-chain, which is discussed below.

7.2 Value chain governance

The movement of extractive resources across national boundaries is driven by the organisation of production, trade and investment into globalised supply and value chains (Kaplinsky & Morris, 2002) These chains have diverse characteristics – including different degrees of complexity, fragmentation, interconnectedness, and resource intensity, and different structures of control and ownership (OECD, 2013). Figures 2.1 and 2.2 below provide simplified examples of a supply and value chain in the extractive sector. They illustrate that minerals supply and value chains are characterised by interactions between multiple actors across multiple countries.

Figure 7.1 Supply and value chain in the extractive sector

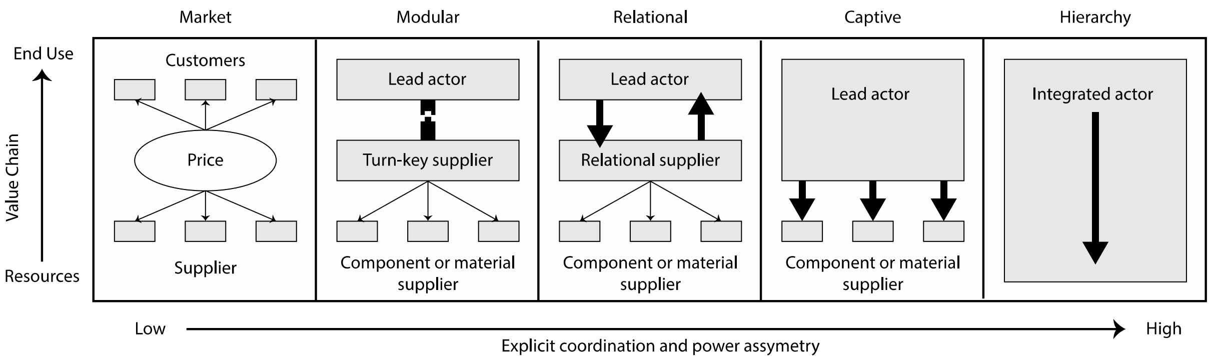


Source: Adapted from Dicken (2011).

Relationships –Both actors and normative frameworks are influenced and shaped by relationships of power, authority, cooperation or influence at multiple levels. These relationships can be hierarchical, or cooperative and voluntary. The prominent and influential role of private transnational entities, including transnational corporations (TNCs), not-for-profit organisations, and other formalised partnerships and associations, is a defining feature of extractive sector governance in recent decades. The ability of TNCs to influence extractive-sector decision-making across globalised value chains depends on the governance structure of the chain in question[108]. The aforementioned asymmetry of power between TNCs, government and communities, for instance, may prevent developing country governments from securing a 'fair' mining deal and this could also inhibit local communities from exercising their rights. Taxation base erosion and profit shifting thanks to sophisticated engineering of complex corporate structures put in place by some TNCs, involving subsidiaries located in tax heavens, have become sufficiently important an issue to deserve the attention of the OECD, who has put in place a work programme to address this problem[109].

Figure 7.2 presents five well-known illustrative modes of interaction between different private sector actors within globalised value chains, and corresponding degrees of power asymmetry and coordination. Extractive sector value chains tend to be characterised by high levels of concentration, with transnational mining companies exercising a high degree of coordination and power over private sector activities in the relevant value chain. A number of extractive sectors TNCs participate in collaborative networks designed to promote better governance within and across global value chains – a focal point being the International Council for Mining and Metals (ICMM), but some key global players are not yet part of ICMM.

Figure 7.2 Interaction between private sector actors within global value chains



Source: Adapted from Gereffi et al. (2005).

The operationalization of the governance concept requires careful consideration of two value chains - the natural resource extraction value chain and natural resources policy value chain (discussed below). It is how well these value chains perform that determines the quality of governance.

Finding, extracting and getting natural resources to the market constitute an expensive and technically demanding business. It is the domain of resource extraction companies. It is a high risk and capital-intensive affair. Each stage in the value chain presents challenges (environmental, social and economic externalities) and also opportunities for revenues generation and local content development.

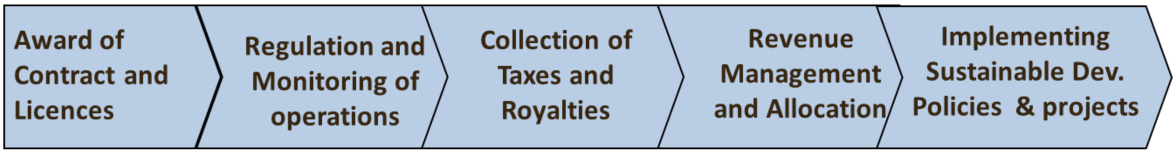
The increasing demand by consumers for sustainable products are moving the governance challenge to the customer level and to the full product life cycle (disposal/recycling level). Therefore, what happens after a resource is extracted, processed and transformed to a product, used and finally disposed, are legitimate governance concerns now. The downstream value chain is also relevant to any full consideration of a material life-cycle. However, this report focuses predominantly on the

[108] There are few cases where a TNC would do all activities in the value chain. Many just do mining and processing and others do smelting, refining and manufacturing.
[109] OECD Web pages on base erosion and profit shifting: http://www.oecd.org/tax/beps/

Extractives Production Value Chain, from the Framework Conditions applicable to the upstream activities (mining, ore processing/ metallurgy and refining, see Figure 2.2), with some consideration of the Downstream Value Chain in the context of consumer efforts to influence how metals and minerals extraction takes place, and who benefits from it.

How a country benefits from resource extraction depends crucially on the policies adopted. This is captured by the concept of a *policy value chain* for extractive resources. This is shown in Figure 7.3. The key challenge here is having the institutions and capacity to manage the extractive sectors and invest the resource rents.

Figure 7.3 The concept of a policy value chain



Source: World Bank (2009).

On the economic side, good governance of mineral extraction requires adequate incentives to attract investment into a risky business environment, combined with a taxation regime or revenue sharing arrangement to accord the host country a fair share of revenues. But beyond this central governance issue, there are other fundamental challenges of monitoring, regulation and management, in order to avoid the negative outcomes of mining described in Chapter 5 and ensure that benefits accrue to the host communities and societies as well as to the extractive industry.

Various instruments have been put forward to address the governance challenges and the negative impacts of the extractive sector. These efforts have usually been prompted by a challenge at a particular node of the value chain and as such these instruments/initiatives seemed to be narrow, focusing on a particular part of the node. To obtain a Social Licence to Operate at the local level, many extractive companies have sought to address the externalities that come with resource exploitation and mitigate risks. This has been the impetus of many current instruments/initiatives. Indeed, one can trace the growth of these instruments as each challenge rises to the top of the global agenda. Environmental damage has always been the most basic challenge as resource exploitation involves disturbing the natural environment and possibly also creates pollution that further damages the environment, sometimes for decades – and much more -after actual mine closure. As various concerns have come to the fore and become part of policy debates, new instruments have been rolled out. With the focus shifting to sustainable development more broadly, more instruments have been specifically oriented in that direction.

7.3. Overview of natural resource governance instruments/initiatives[110]

At present, a plethora of instruments are in operation (see Annex 1 for a list of almost 90 identified natural resource governance instruments[111]). It is possible that there are some that have been missed. We have treated with caution multilateral environmental agreements (MEAs) - See Box 7.1. These range from comprehensive policy frameworks to platforms for dialogues; from legally binding instruments backed by UN sanctions and national laws to voluntary instruments; and from a single stakeholder-led to multi-stakeholder platforms that bring together many types of stakeholders. Instruments also span across geographical locations, from specific sites to global initiatives.

Box 7.1 Multilateral Environmental Agreements (MEAs)

A Multilateral environmental agreement (MEA) is "an intergovernmental document intended as legally binding with a primary stated purpose of preventing or managing human impacts on natural resources. MEAs play a critical role in the overall framework of environmental laws and conventions. Complementing national legislation and bilateral or regional agreements, multilateral environmental agreements form the overarching international legal basis for global efforts to address particular environmental issues.

Over the years, many MEAs have been promulgated. Researchers and analysts agree that there is a proliferation of MEAs. There is no agreement on how many MEAs there are as the different methodologies used for counting MEAs have resulted in different numbers.

- The Ecolex project sponsored by UNEP, FAO and IUCN recognizes in total 519 environmental treaties (Kanie, 2018);
- The International Environmental Agreements (IEA) database includes over 1,300 historic and current IEAs.[112] The IEA website categorizes MEAs as: Energy; Freshwater Resources; Habitat; Nature; Ocean; Pollution (air, land, Marine and wasters); Species (Agriculture, bird, fish, mammals); Weapons and Environment.
- The UN website InfoMEAs lists 53 regional and 34 global treaties and protocols. It uses a much more compact categorization that groups them into four categories: Biodiversity; Chemicals and waste; Climate change and atmosphere; and Marine and freshwater.
- Kanie (2018) points that other research identifies more than 500 MEAs registered with the UN, including 61 on atmosphere, 155 on biodiversity, 179 on chemicals, hazardous substances and waste, 46 land conventions, and 197 on water issues.

Some MEAS are very specific to extractive industry. The Minamata Convention on Mercury is very specific on mercury regulation. Most of the MEAs are much broader covering issues that go beyond the extractive sector. The Convention on Biodiversity is a relevant MEA in the governance of extractive resources as extractive activities have potential to disrupt biodiversity. However, the disturbance of biodiversity goes beyond extractive activities. In this regard, it is hard to say which MEAs is relevant to extractive activity and which is not. Although many MEAs have implications on

[110] The terms instrument/initiatives as used here include standards, voluntary initiatives, international laws and treaties, assessments, indexes, foras and platforms. Some are voluntary, others mandatory. Some are just platforms for dialogues and sharing information, some are standards and codes of practice. The major criterion for inclusion is that the target of the instrument is the mineral resources industry. This can be explicitly stated or the fact that the challenges being targeted is largely driven by extractive activities, for example Illicit Funds Flows (IFFs) and biodiversity protection challenges are impacted by many sectors, however extractive activities tend to be the major culprit.

[111] Though the list is fairly comprehensive, we may have missed some of the initiatives and some may no longer be in use (for example Dodd-Franks).

[112] Defined to include efforts to regulate human interactions with the environment that involve legally binding commitments ("agreements") among governments ("international") that have environmental protection as a primary objective ("environmental")

extractive activities, the authors feel that including all MEAs as potential governance instrument muddles the governance landscape and we have been selective on those MEAs included (Morin & Bialais, 2018).

7.3.1 Mapping instruments

As there are potentially many ways to map extractive resource governance initiatives, the purpose of the mapping will have a major impact on how the mapping is done. For the purposes of this report, the central motivation is ensuring extractive resources contribute towards sustainable development. The core concerns around extractive resource governance mainly arise due to externalities associated with the extraction, ore processing, metallurgy and refining (Chapters 5 & 6 above), and typically relate to the capacity to effectively manage the sector in a way that delivers sustainable development. There are many aspects of sustainable development that are addressed by the existing instruments. Some are very narrow, focusing on a single issue such as human rights. Some focus on local level issues, while others focus on broader national development. Some sustainable development issues like conflict prevention, and transparency and accountability have become part of the global agenda with global efforts thus deserving special attention.

The other key dimension relates to stakeholders. Stakeholders, who make choices on what issue to pursue, drive the design of instruments, and these are mainly driven by their own self-interest. A Civil Society Organization (CSO)-led process can deliver very different results from an industry-led initiative while tackling the same issue. For example, Publish What You Pay (PWYP) transparency efforts got more traction when governments and development partners got on board to establish the Extractive Industries Transparency Initiative (EITI)[113] that has a multi-stakeholder membership. Mori *et al*. (2016) found that for many organizations, the key motivation for seeking sustainability certification was the fact that it adds value. But pressure from consumers and CSO are also important drivers.

The stakeholders that are targeted by any given initiative are equally important. So, an industry-driven initiative, targeting members of the industry is likely to have a greater impact than if it targets non-industry stakeholders. For example, the Canada Mining Association (CMA) moved from an ambitious Whitehorse mining initiative that targeted many stakeholders to a more targeted Towards Sustainable Mining (TSM) initiative that largely targeted specifically its members. The implication is that attention should be given to the lead stakeholder(s), the motivation of the stakeholder, and which stakeholder(s) the initiative targets.

The natural resource target is important too. Some issues are focused on a single or a group of related resources such as precious metals, while others are more general. In addition, the nature of the ore/ mineral extracted and the method of extraction generate very different challenges. For this reason, some instruments may target ASM and others LSM.

Geographical coverage is another important dimension. Some instruments target activities at a single location, while others apply to regions, and others are global.

Compliance requirements constitute another important dimension. Law (local and international) back some instruments and thus compliance is mandatory. Some are voluntary, but even for voluntary

[113] Website: https://eiti.org/

compliance requirements, there is a need to distinguish between where certification and auditing are required to claim compliance. Instruments can be knowledge and experience sharing platforms, policy frameworks or legal frameworks.

Another dimension of interest is the node of the value-chain targeted. There are three relevant value chains for extractives. There is the extractives production value-chain (upstream) that captures activities including exploration, mine development, production, sales (and mine closure). The extractives production value chain also has a downstream part that is concerned with processing of resources, manufacturing final products using the extractive resources as raw material, retailing, and recycling the products. The policy value-chain node is concerned with contracting, regulation, collection and allocation of revenues and executing sustainable development projects. An initiative can target one or several of the nodes.

An additional dimension is how the initiative relates to other instruments. The relationship can be to complement, to duplicate, and/or to assist implementation. As we seek to have interoperability and reduce the burden on stakeholders, it is important to know how an initiative relates to other instruments.

Based on the above discussion, the key natural resources governance (NRG) mapping dimensions are summarized in Table 7.2.

Table 7.2 Key NRG instruments mapping dimensions

Dimension	
Sustainable development issue of focus	Traditionally, companies have focused on issues related to responsible mining, for instance CSR and environment, and the corresponding instruments will be broadly classified as Sustainable Development-Responsible mining (SD-Responsible mining). Some issues that fall in the realm of responsible mining but have received much attention and thus require specific focus. One of these issues is conflict prevention, with corresponding initiatives to be classified as Sustainable Development-Conflict Prevention. Another concern has been transparency of natural resources revenues flow, with instruments focusing on this to be classified as Sustainable Development-Transparency & Accountability (SD-T&A). Instruments tackling broad macroeconomic issues e.g. industrialization, local content, taxation etc. will be classified as Sustainable Development-Macroeconomy.
Lead Stakeholder	There are mainly four groups of stakeholders: (i) government, (ii) civil society organizations (CSOs), (iii) industry/private sector, and (iv) public-private partnerships or multi-stakeholders.
Geographical Focus	There are three types of geographical coverage: (i) national, (ii) regional, or (iii) global
Natural Resources Focus	Instruments can cover: (i) extractive resources in general, (ii) mining, (iii) oil and gas, (iii) a mineral group such as precious metals; or (iv) a single commodity like coal or diamonds
Sector Focus	Sector covered can be (i) artisanal and small-scale mining (ASM), (ii) large-scale mining (LSM), or (iii) Both (ASM+LSM).
Impetus/Motivation	The motivations behind the initiatives are various. The key motivations are: (i) sustainable development, (ii) risk management (to pre-empt regulatory or consumer backlash), and (iii) marketing or branding.

Type	The main types of instruments are: (i) platforms (to facilitate dialogues, knowledge exchange/experience sharing and advocacy, (ii) policy framework, (iii) standards, guidance and indexes (benchmarking tools), (iv) capacity building platforms and toolkits and (v) Legal frameworks (laws and international treaties/conventions/agreements.
Compliance	There are three levels of compliance: (i) mandatory (legal requirement), (ii) voluntary, and (iii) mandatory (contingent) - where one must comply to be a member of an association.
Reference Instruments/standards	Many instruments refer to other standards. They can make reference, complement, adapt/adopt or implement.
Extractive Value Chain Node (upstream) EVC	Initiatives can be targeted at one or several nodes. The nodes are: Extractive production value chain (Upstream) that has exploration, development, production and trading/sales nodes.
Policy Value Chain Node	Initiatives can also target one or several policy nodes. The policy value-chain nodes are: (i) contract award, (ii) regulation and monitoring, (iii)taxes and royalty, (iv) revenue management and allocation, and (iv) implementing SD projects/policies.
Extractive Production Value Chain Downstream (DVC)	Initiatives can also target one or several downstream nodes from mine to recycling. The nodes are: (i) processing/beneficiation, (ii) smelting/refining, (iii) manufacturing products, (iv) retailing, and (iv) recycling.
Stakeholder Targeted	Stakeholders groups are the same as those defined for the lead stakeholder category above.

7.3.2. Summary of Instruments

This section will examine a number of initiatives with the aim of mapping them using a categorization developed above (Table 7.2). The list of initiatives has been developed using a combination of internet search, various reports and consultation with experts. While every effort has been made to capture as many as possible, the list is by no means exhaustive. However, the list provides a good representation of the landscape. Annex 7.1 contains the full listing of the initiatives.

7.3.2.1. Sustainable development coverage

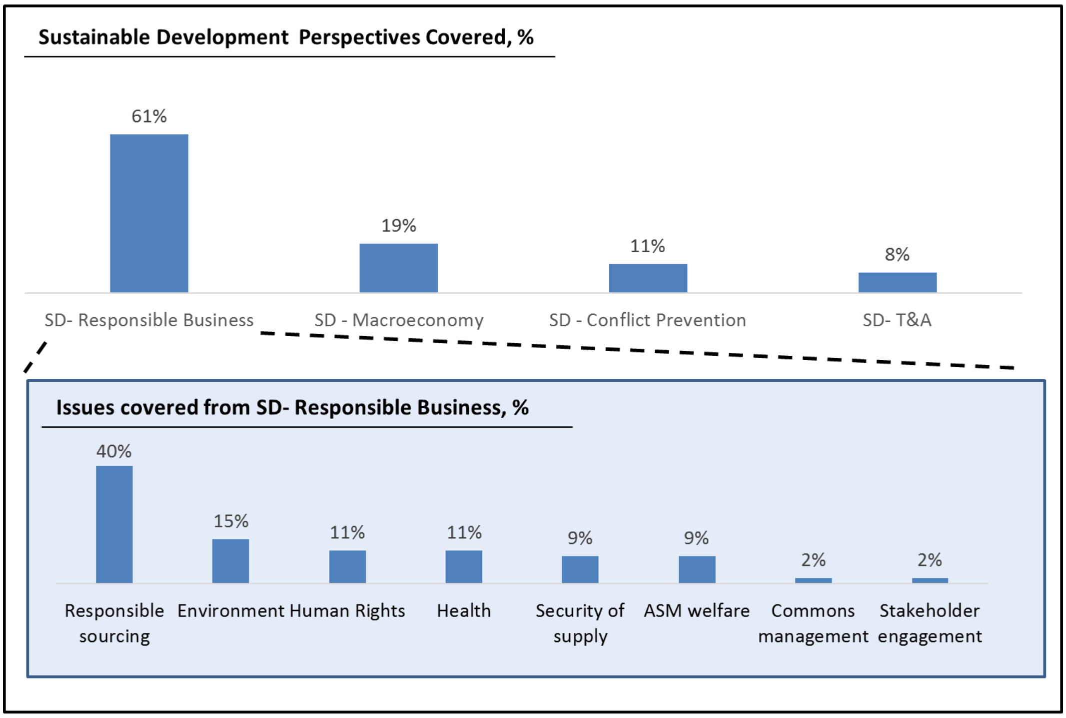
Table 7.3 shows the instruments grouped by the sustainable development perspective discussed in table 7.2.

Table 7.3 Initiatives by sustainable development perspective

Development - Responsible Business	Sustainable Development - Macroeconomy		Sustainable Development Conflict Prevention	Sustainable Development - Transparency & Accountability (T&A)
AGAM	ICMC	AMV	CFG	AC
AKVG	IFC-GPHJCEI	BIG-E	CFSI-CFS	EITI
ASI	IFC-PS	BEPS	Chinese DD	IFRS
BBOP	ILO169	Connex	CTC	KPCS
BetterCoal	ILO176	CRIRSCO	Dodd-Frank	OECD-Global Forum
BGI	IRA	CMN	ICGLR-RINR	PWYP
CASM	IRMA	FATF	iTSCi	StAR
CBD	MCM	FIASMEC	LBMA-RGG	
CCUWL	MPEPAT	ICMM	OECD –DD	
CRAMRA	NamiRo	IGF-MPF	PPA-RMT	
CMCCC- GSRM	NRRI	LPRM		
DDI/DDS	PDAC e3Plus	MInGov		
DI	RS	NRC/NRGI		
EICC-ESWG	RJC	OfD		
EPRM	RMC			
ETP SMR	RCI	RMDI		
EIP	RMF-RMI	UNDP-SEMESHD		
EO	RMI	UNGC		
Eps	RRMI			
Fairmined	SfH			
Fairtrade	STRADE			
FORAM	TAI			
FRP	TSM			
GBAI	UNCLOS			
GMI	UNFCC			
Green Lead	UNGP			
GRI	VPs			
HEI				

As Figure 7.4 shows, the bulk of NRG instruments examined in this report (61%) cover sustainable development issues related to responsible business practices. Figure 7.4 (lower panel) provides a further breakdown of issues covered under sustainable development-responsible business. Most of the instruments cover issue of sourcing sustainably and this covers many aspects of supply chains. So, several issues maybe covered as human rights, environmental concerns, mining practices etc. Other instruments tend to focus on a single issue. The issue that has most single-issue instruments tend to focus on is the environment. Though security of supply is a key motivation for instruments, there are few instruments that are exclusively focused on this, security of supply concerns tend to be part of the responsible business practices. Concern for welfare of Artisanal Small-scale Mining (ASM) is also becoming an important concern and about 10% of responsible business practices instruments focus on this.

Figure 7.4 NRG instruments



7.3.2.2. Mapping instruments by lead stakeholder

Many instruments are driven by the government or public sector, in particular the international bodies like the UN and Regional bodies like OECD (Figure 7.5 and Table 7.4). This is understandable given that responsible business practices are a crucial concern for the governments. Though about one-third of the instruments are multi-stakeholder-driven, only about 40% of the multi-stakeholder instruments are formal public-private partnerships indicating that 60% cannot be fully described as multi-stakeholder as they are led by industry (32%) or CSO (29%).

Figure 7.5 Analysis by lead stakeholder

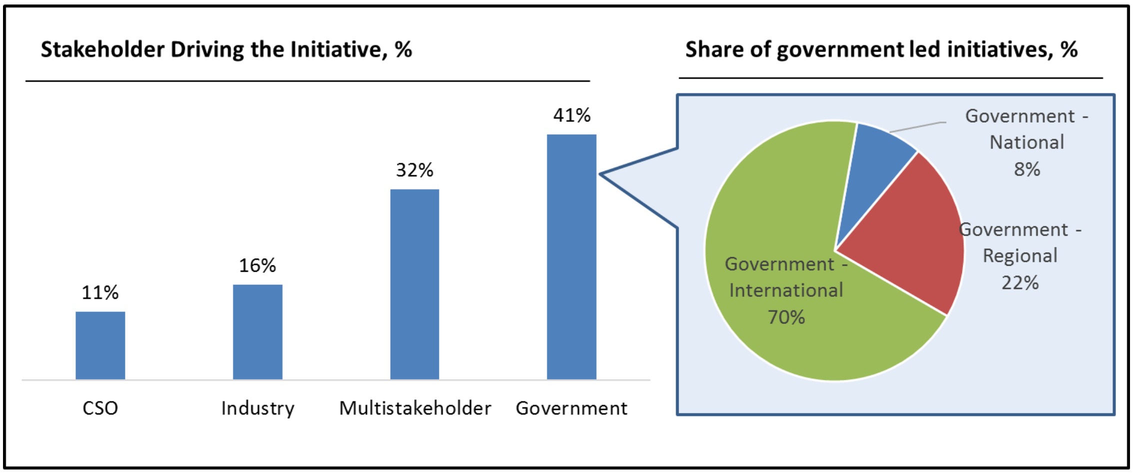


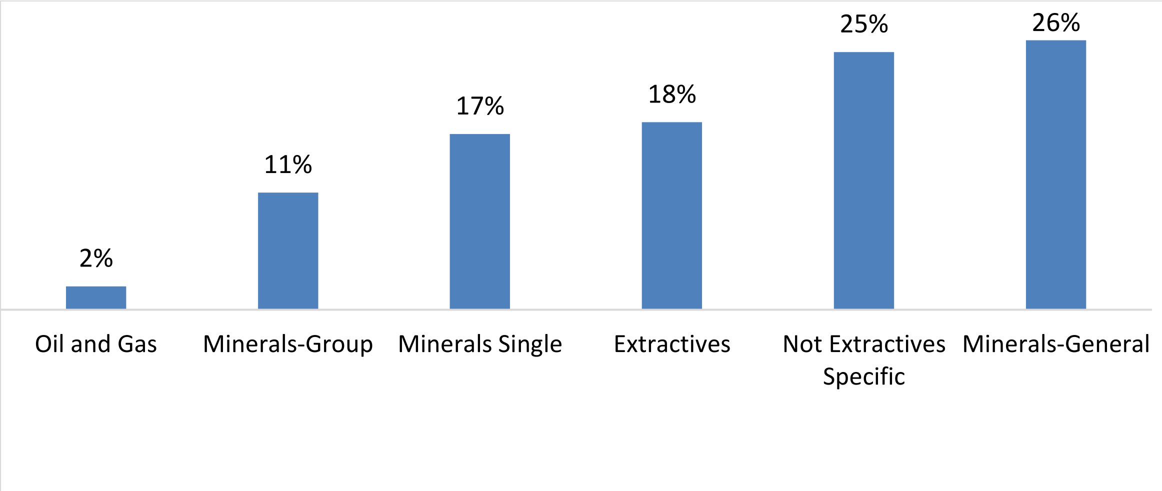
Table 7.4 Mapping by lead stakeholder

CSO	Industry	Multi-Stakeholder	Government		
			National	Regional	International/Global
CRIRSCO	BetterCoal	ASI	CTC	AMV	
EO	CFG	BIG-E	Dodd-Frank	BEPS	AGAM
Fairmined	CMCCC-GSRM	BBOP	OfD	Connex	AKVG
Fairtrade	EICC-ESWG	BGI		EIP	CASM
FIASMEC	EPs	CFSI-CFS		ICGLR-RINR	CBD
IRA	IFRS	Chinese DD		OECD –DD	CCUWL
NamiRo	iTSCi	DDI/DDS		RMI	CRAMRA
PWYP	LBMA-RGG	DI		STRADE	CMN
RMF-RMI	NRRI	ETP SMR			FATF
TAI	PDAC e3Plus	EITI			HEI
	RS	FORAM			IFC-GPHJCEI
	RMC	FRP			IFC-PS
	SfH	GBAI			IGF-MPF
	TSM	GMI			ILO169
		Green Lead			ILO176
		GRI			MCM
		ICMC			MInGov
		ICMM			MPEPAT
		IRMA			OECD-Global Forum
		KPCS			StAR
		LPRM			UNCLOS
		NRC/NRGI			UNDP-SEMESHD
		PPA-RMT			UNFCC
		RJC			UNGC
		RCI			UNGP
		RMDI			
		RRMI			
		VPs			

7.3.2.3. Mapping by extractive resource addressed

About a quarter of the initiatives/instruments address extractives (metals & minerals, in general, while another 18 % address the extractives in general (metals & mineral and oil and gas). Only two instruments address oil and gas exclusively (Figure 7.6 and Table 7.5). An estimated 18% are focused on a single mineral resource, with gold being the mineral targeted by most instruments. About 11% related to a group of minerals and these are mainly instruments focusing on tungsten, tin and tantalite (3Ts) and gold, which are minerals linked to conflicts in the Great Lakes region of Africa.

Figure 7.6 Analysis by extractive resource covered



It is useful to observe that a quarter of the instruments are not specific to extractive resources but apply to a broad range of sectors. These are instruments that address the general challenges of sustainable development. However, they single out the extractives sector as a high priority and some have specific sections on extractives. For example, the Global Reporting Initiative (GRI) has a special supplement on extractive and the International Financial Reporting Standards (IFRS) is in the process of producing a reporting standard focused on extractives.

Table 7.5 Initiatives by extractive resource

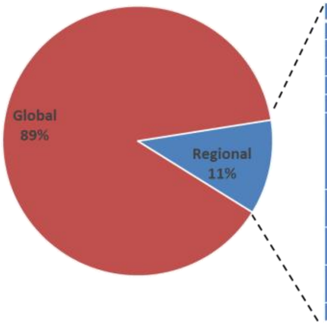
Oil & Gas	Minerals - Group	Minerals Single	Extractives	Not extractive	Minerals General
EO	CFSI-CFS	ASI	CMN	AC	AGAM
OfD	CTC	BetterCoal	EITI	AKVG	AMV
	Dodd-Frank	BGI	FIASMEC	BIG-E	CASM
	ICGLR-RINR	CCUWL	HEI	BBOP	CRAMRA
	ICMC	CFG	IFC-GPHJCEI	BEPS	CRIRSCO
	iTSCi	DDI/DDS	IRA	Connex	Chinese DD
	OECD –DD	Fairmined	MInGov	CBD	CMCCC-GSRM
	PPA-RMT	Fairtrade	NamiRo	EICC-ESWG	DI
	RJC	Green Lead	NRC/NRGI	EPs	ETP SMR
	SfH	KPCS	NRRI	FATF	EIP
		LBMA-RGG	PDAC e3Plus	FORAM	FRP
		MCM	PWYP	GRI	GBAI
		RS	RMI	IFC-PS	GMI
		RMC	STRADE	IFRS	ICMM
		RCI	UNDP-SEMESHD	ILO169	IGF-MPF
			VPs	OECD-Global Forum	ILO176
				StAR	IRMA
				TAI	LPRM

UNCLOS	MPEPAT
UNFCC	RMDI
UNGC	RMF-RMI
	TSM

7.3.2.4. Mapping by geographical coverage

Most instruments reviewed in this report – which largely exclude the plethora of national-level instruments – have a global coverage, reflecting the multinational scale of much of the formal extractive industry. Only eight (13%) of the instruments have a regional focus and these are mainly instruments targeting conflict minerals in the Great Lakes region (Figure 7.7)

Figure 7.7 Regional instruments



Code	Initiative Name	Regional Focus	Targeted Resources
AC	Aarhaus Convention	Europe	Not Extractive specific
AMV	Africa Mining Vision	Africa	Minerals - general
BIG-E	Batumi Initiative on Green Economy	Europe	Not Extractive specific
CTC	Certified Trading Chains	Great Lakes	3Ts
Dodd-Frank	US Dodd-Frank Act (Section 1502)	Great Lakes	3Ts + G
ICGLR-RINR	The International Conference on the Great Lakes Region – Regional Initiative against the Illegal Exploitation of Natural Resources	Great Lakes	3Ts + G
iTSCi	the International Tin Research Institute (ITRI) Tin Supply Chan Initiative	Great Lakes	3Ts
MPEPAT	Madrid Protocol on Environmental Protection to the Atlantic Treaty	Antartica	Minerals - general
PPA-RMT	Public-Private Alliance for Responsible Minerals Trade	Great Lakes	3Ts
SfH	Solutions for Hope	Great Lakes	3Ts

Casserite, Wolframite, Coltan (3Ts); Gold(G)

7.3.2.5. Mapping by the mining sector

Most instruments focus on the formal or large-scale mining (LSM) sector. The challenges of the informal sector are very different and require different approaches. Fourteen (23%) of the instruments have a focus on ASM sector (See Table 7.6). Half of these focuses on developing conflict free supply chains as the industry sought to comply with regulations or manage its public image. Seven of the instruments have the improvement of ASM sector as part of their objectives, even if the main objective is risk management.

Table 7.6 ASM-focused initiatives

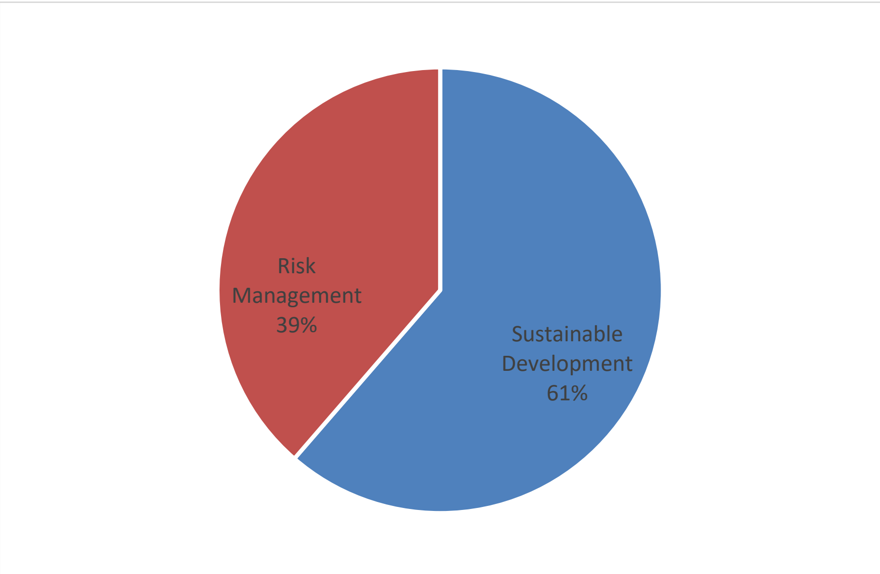
Initiative Code	Sustainable Development Issues Covered	Extractive Resource(s)	Impetus/ motivation
BGI	ASM Welfare, environment	Gold	Risk Management
CASM	ASM Welfare		Sustainable Development
CFSI-CFS	Conflict Prevention	3Ts+Gold	Risk Management
CTC	Good governance of ASM	3Ts	Sustainable development
DDI	ASM Welfare	Diamond	Sustainable development
Dodd-Frank	Conflict Free Supply Chains	3Ts+Gold	Public interest
Fairmined	Improve ASM welfare	Gold	Sustainable development
ICGLR-RINR	Formalize ASM, conflict free supply chains	3Ts+Gold	Sustainable development
iTSCi	Responsible sourcing	3Ts	Risk management
KPCS	Responsible sourcing	Rough Diamond	Conflict Prevention

MCM	ASM Welfare, environment	Gold	Sustainable development
OECD –DD	Respect human rights and avoid contributing to conflict through mineral sourcing		Sustainable Development
RJC	Human rights, labour rights, environmental impact, mining practices, product disclosure across the jewellery supply chain	Precious Metals-Gold Platinum, Diamond	Risk Management
SfH	Responsible sourcing while fostering development	3Ts	Risk Management

7.3.2.6. Mapping initiatives by motivation

Though the main objective of any initiative is sustainable development (at least some aspect of it), the key motivation in setting up the initiative is guided by the interest of the lead stakeholders. Risk management is the main reason for the setting up of 44% of the instruments (Figure 7.8). These are typically the instruments where the lead stakeholder is from industry. For the industry, the principal reasons for setting-up instruments are: obtaining the social licence to operate, ensuring security of supply (for downstream users), improving public image, and responding to consumer concerns. It is important to note that governments, CSOs or multi-stakeholders' coalitions largely drive instruments that have sustainable development as their main motivation.

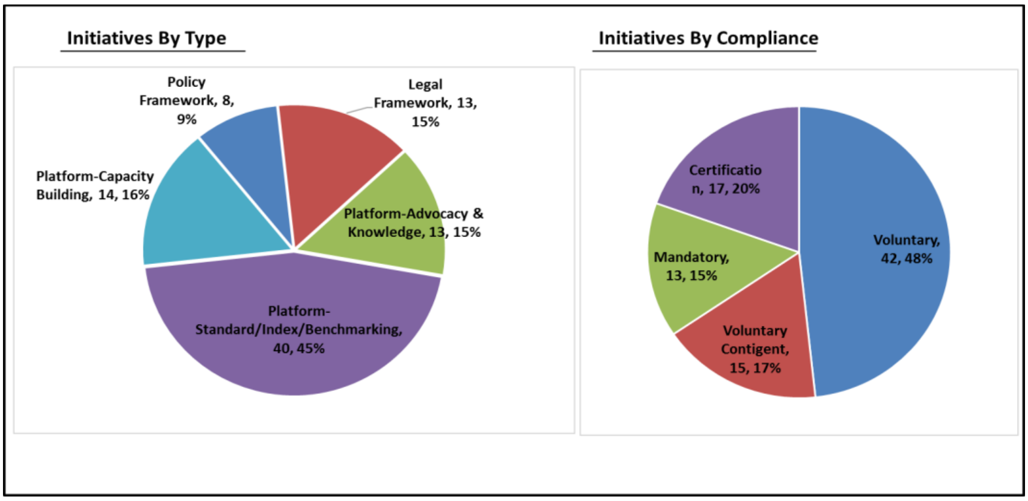
Figure 7.8 Instruments by driving motivation



7.3.2.7. Mapping by type of Initiative

Forty five percent of the instruments are platforms for standard setting or assessment/indexes or guidance i.e. benchmarking tools. This is followed by 16% of instruments that are platforms for capacity building (this includes networking, and knowledge sharing). Thirteen (15%) are platforms for advocacy (including dialogue and coordinating activities). Eight (9%) of the instruments are policy frameworks and 13 (15%) are legal frameworks (Figure 7.9).

Figure 7.9 Instruments by type and by compliance/participation



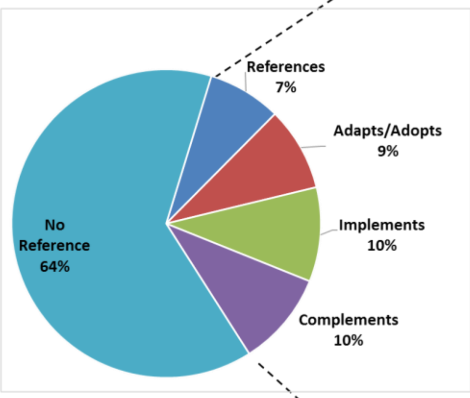
From the perspective of participation, 42 (48%) of the instruments are purely voluntary. Fifteen (15%) are voluntary but contingent on being a member of the organization proposing them. For instance, all members of ICMM must sign to commit to the ICMM principles (See Box 9.4). For 17 (20%) of the instruments, formal certification or audit by a third party is required to demonstrate compliance, while 13 (15%) instruments (are backed by force of law or by an international convention/agreement/treaty meaning they are mandatory.

7.3.2.8. Relation to other Instruments

As Figure 7.10 shows, about one-third (36%) of the instruments have a relationship with other instruments: 10% implement other instruments, 10% complement others, and 9% adapt or adopt other instruments114. This means that about one third of the instruments have potential for interoperability. This is of interest and can provide the building blocks for a flexible yet holistic governance framework.

Figure 7.10 Instruments in relation to others

[114] Please note that a neat classification is hard. For example, RMF-RMI maps its indicators to a wide range of related initiatives (i.e. implements) and also seeks to complement and amplify the work of other initiatives (see the RMI Methodology report 2017 at https://responsibleminingindex.org/en/methodology). In classifying we have tired to capture the key objective.



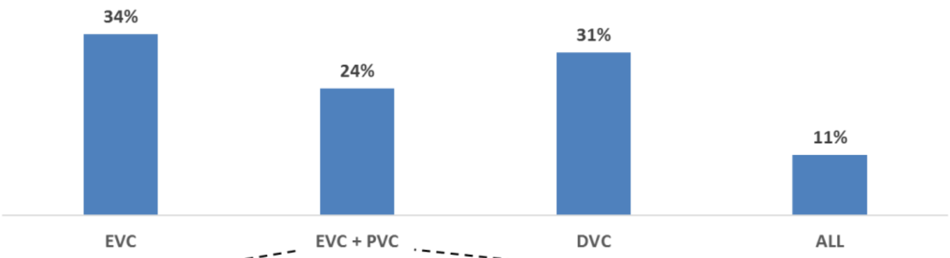
Initiative Code	Relation to other Initiatives	Reference initiatives
BEPS	References	Various OECD tax initiatives
BGI	Implements	Fairmined, RJC
CFG	Implements + complements	OECD DD, Dodd-Frank, LBMA_RGG
CFSI-CFS	Implements	OECD DD
Chinese DD	Adapts/Adopts	OECD DD
CTC	Implements	OECD DD
DDI	Complements	KPCS
EICC-ESWG	Adapts/Adopts	GRI
EITI	References	KCPCS
EPs	Adapts/Adopts	IFC-EHS
Fairmined	Adapts/Adopts	Fairtrade
ICGLR-RINR	Implements	OECD DD, CTC
ICMM	Adapts/Adopts	GRI
IFC-PS	Adapts/Adopts	World Bank EHS
IGF-MPF	Complements	NRC
IRMA	Complements	Various
iTSCi	Implements	OECD DD, Dodd-Frank, CFSI-CFP), the ICGLR-RCM, and BGR-CTC.
LBMA-RGG	Adapts/Adopts	OECD DD
MInGov	Complements	IGF-MPF
NamiRo	Complements	
NRC	References	RGI, EITI, MInGov, the ICMM-MPD Toolkit, PWYP, AMV
PDAC e3Plus	References	ICMM
PWYP	Complements	EITI
RJC	Implements + complements	OECD-DD, Dodd-Frank, Fairmined
RMC	References	ICMM
RRMI	References	OCED DD, UN guiding principles on business and human rights
SfH	Implements	ICGLR-RCM, Dodd-Frank. OECD DD

7.3.2.9. Mapping by value-chains addressed

The three value chains of interest are the extractive value-chain (EVC), the policy value chain (PVC) and the downstream value chain (DVC). All these value chains are addressed to various degrees. By design, all the value chains address an aspect of the extractive value chain (as that was the criteria for selection).

Thirty-four per cent of the instruments address the extractive value chain only, 24% address both extractive and the policy value chains, while 31% address the downstream value chain (Figure 7.11). Eleven percent address issues across the three value chains. It should be mentioned here that that the criteria for assigning an initiative to a particular value chain are very flexible. The initiative does not need to address all the nodes in a value chain. For instance, many of the instruments addressing DVC are mostly those concerned with performing due diligence as opposed to helping countries to develop downstream activities.

Figure 7.11 Instruments by value chain



Code	Code	Code	Code
BEPS	FATF	IGF-MPF	OECD-Global Forum
CASM	FIASMEC	LPRM	PWYP
Connex	ICGLR-RINR	MInGov	RMDI
CMN	ICMM	NamiRo	RMF-RMI
DI	IFRS	NRC/NRGI	StAR
EITI			

7.6. Looking ahead

The chapter has highlighted the fact that diverse actors, geographical spaces that extend globally, complex power relationships and many normative frameworks, characterize the governance space. This is reflected in the plethora of initiatives that have emerged as different actors pursue their interests. As we saw, some initiatives have very narrow scope (single-actor-driven) and some multi-stakeholder-driven having very broad scope. As a result, few initiatives explicitly address the SDGs. Perhaps, a more important question is whether they are effective in their defined domains be it narrow or broad. The next chapter discusses the effectiveness of the various instruments.

Annex A7.1 – List of Instruments

No	Abbreviation	Initiative full Name
1	AC	Aarhaus Convention
2	AGAM	Agreement Governing the Activity of States on the Moon and other celestial bodies
3	AMV	Africa Mining Vision
4	AKVG	Akwé: Kon Voluntary Guidelines
5	ASI	Aluminium Stewardship Initiative
6	BIG-E	Batumi Initiative on Green Economy
7	BBOP	The Business and Biodiversity Offsets Programme (BBOP)
8	BEPS	Base Erosion and Profit Shifting
9	BetterCoal	BetterCoal Code
10	BGI	Better Gold Initiative
11	CASM	Communities and Small-Scale Mining
12	Connex	Connex Initiative
13	CBD	Convention on Biological Diversity
14	CCUWL	Convention Concerning the Use of White Lead in Painting
15	CRAMRA	Convention on The Regulation of Antarctic Mineral Resource Activities
16	CRIRSCO	Committee for Mineral Reserves International Reporting Standards
17	CFG	Conflict Free Gold Standard
18	CFSI-CFS	Conflict Free Sourcing Initiative-Conflict Free Smelter
19	Chinese DD	Chinese Due Diligence Guidelines for Responsible Mineral Supply Chains
20	CMCCC- GSRM	China Chamber of Commerce of Metals, Minerals and Chemicals Importers and Exporters (CCCMC)- Guidelines for Social Responsibility in Outbound Mining Investments (GSRM)
21	CMN	Commonwealth Mining Network
22	CTC	Certified Trading Chains
23	DDI/DDS	Diamond Development Initiative/Diamond Development Standard
24	DI	Devonshire Initiative
25	Dodd-Frank	US Dodd-Frank Act (Section 1502)
26	EICC-ESWG	EICC Environmental Sustainability Working Group
27	EIP	European Innovation Partnership on Raw Materials (EIP)
28	EITI	Extractive Industries Transparency Initiative
29	EO	Equitable Origin
30	EPs	Equator Principles
31	EPRM	European Partnership for Responsible Minerals
32	ETP SMR	The European Technology Platform on Sustainable Mineral Resources
33	Fairmined	Alliance for Responsible Mining (ARM)-Fairmined Standard
34	Fairtrade	Fairtrade Gold and Precious Metals
35	FATF	The Financial Action Task Force
36	FORAM	Forum on Raw Materials
37	FIASMEC	The Fraser Institute Annual Survey of Mining and Exploration Companies
38	FRP	Framework for Responsible Mining

39	GBAI	The Global Battery Alliance Initiative
40	GMI	Green Mining Initiative (GMI)
41	Green Lead	The Green Lead Initiative
42	GRI	Global Reporting Initiative
43	HEI	Health in the Extractive Industries
44	ICGLR-RINR	The International Conference on the Great Lakes Region – Regional Initiative against the Illegal Exploitation of Natural Resources
45	ICMC	International Cyanide Management Code for the Manufacture, Transport, and Use [of] Cyanide in the Production of Gold
46	ICMM	International Council on Mining and Metals
47	IFC-GPHJCEI	IFC – 'A Strategic Approach to Early Stakeholder Engagement – A Good Practice Handbook for Junior Companies in the Extractive Industries'
48	IFC-PS	IFC Performance Standards on Environmental and Social Sustainability
49	IFRS	International Financial Reporting Standards for extractive sector
50	IGF-MPF	Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development /Mining Policy Framework
51	ILO169	ILO169 - Indigenous and Tribal People Convention 1989
52	ILO176	International Labour Organisation Convention on Mine Safety and Health (1995)
53	IRA	Indigenous Rights in the Arctic
54	IRMA	Initiative for Responsible Mining Assurance
55	iTSCi	The International Tin Research Institute (ITRI) Tin Supply Chan Initiative
56	KPCS	Kimberley Process Certification Scheme
57	LPRM	Local Procurement Reporting Mechanism
58	LBMA-RGG	London Bullion Market Association - Responsible Gold Guidance
59	MCM	The Minamata Convention on Mercury
60	MInGov	Mining Investment and Governance Review
61	MPEPAT	Madrid Protocol on Environmental Protection to the Atlantic Treaty
62	NamiRo	NamiRo
63	NRC/NRGI	The Natural Resource Charter (NRC)/Natural Resource Governance Institute (NGRI)
64	NRRI	Natural Resources Risk Index
65	OECD –DD	OECD Due Diligence Guidance for Responsible Supply Chain Management of Minerals for Conflict Affected and High-Risk Areas
66	OECD-Global Forum	The Global Forum on Transparency and Exchange of Information for Tax Purposes
67	OfD	Oil for Development
68	PDAC e3Plus	Prospectors & Developers Association of Canada
69	PPA-RMT	Public-Private Alliance for Responsible Minerals Trade
70	PWYP	Publish What You Pay
71	RS	Australian Steel Stewardship Forum/ Steel Stewardship Council Ltd

72	RJC	Responsible Jewellery Council
73	RMC	Responsible Mining of Cobalt
74	RCI	Responsible Cobalt Initiative
75	RMDI	The Responsible Mineral Development Initiative
76	RMF-RMI	The Responsible Mining Foundation - Responsible Mining Index
77	RMI	Raw Materials Initiative (RMI)
78	RRMI	Responsible Raw Materials Initiative
79	SfH	Solutions for Hope
80	StAR	The Stolen Asset Recovery (StAR) initiative
81	STRADE	Strategic Dialogue on Sustainable Raw Materials for Europe
82	TAI	The Access Initiative
83	TSM	Towards Sustainable Mining
84	UNCLOS	United Nations Convention on the Law of the Sea (UNCLOS)
85	UNDP-SEMESHD	Sustainable and Equitable Management of the Extractive Sector for Human Development
86	UNFCC	United Nations Framework Convention on Climate Change
87	UNGC	UN Global Compact
88	UNGP	UN Guiding principles on Business and Human Rights
89	VPs	Voluntary Principles *on Security and Human Rights* guidelines

CHAPTER 8 – EFFECTIVENESS OF MINERAL RESOURCE GOVERNANCE INSTRUMENTS

8.0 Introduction[115]

The mineral resources governance (MRG) instruments discussed in the previous chapter have played an important role in mitigating some of the most damaging impacts from the extractive sector though some serious accidents have occurred (for example, Brazil tailing dam accident). Building on these instruments will be very important in any attempt to ensure that this sector makes its maximum possible contribution to sustainable development. For this to happen, it is necessary to understand how effective they have been. That is the subject matter of this chapter.

8.1 Effectiveness of MRG instruments

In chapter 7, 89 governance instruments were enumerated. These existing instruments have made significant contributions to improved governance. Some of the success stories are summarized below.

- The EITI website points that, in countries like the DRC, Myanmar and Nigeria, the EITI has been central to many reforms of the sector. Across Central Asia, it has been central in many legislative changes. In Francophone Africa, government systems have been strengthened. In Latin America, trust has been built. Research suggests that EITI has improved the investment climate and that EITI has been less affected by corruption and tax evasion[116]. Further, Lujala *et al*. (2017) points that a review of 50 evaluations concludes that the EITI has succeeded in diffusing the norm of transparency, establishing the EITI standard, and institutionalizing transparency practices.
- The MMSD initiative that was the precursor of ICMM initiative aimed to create a shared idea of the appropriate and necessary roles for each of the major actors in mining and sustainable development – government, civil society, and the private sector – asking 'what is a company's role and what is not a company's role?'. An assessment of the initiative points that as a result the understanding of sustainable development in the mining and minerals sector has markedly improved and there was increased sophistication in talking about how mining should maximise its contribution to sustainable development. This success led to the launch of the CEO-led International Council on Mining and Metals (ICMM) initiative that outlines values its member should hold. ICMM has succeeded in implementing many of MMSD's recommendations for industry and provides the primary basis for collective action in the sector (Buxton, 2012). The ICMM has had good success in steering its member to responsible practices and also contributing to national development (see Box 9.7).
- The UN General Assembly 64th session Resolution notes that the implementation of the KPCS has had a positive impact in reducing the opportunity for conflict diamonds to play a role in fueling armed conflict. It further notes that the KPCS would help to protect legitimate trade

[115] There is no attempt in this chapter to assess the instruments legally.

[116] https://eiti.org/outcomes-impact-of-eitihttps://eiti.org/outcomes-impact-of-eitihttps://eiti.org/outcomes-impact-of-eiti

and ensure that the effective implementation of the relevant resolutions on trade in conflict diamonds.[117]

Much of the impact assessments of these instruments has, however, been anecdotal or self-assessments and thus it is hard to gauge the success of many instruments. It is unfortunate, but perhaps, not surprising given the complexities involved that the impact of many of the MRG instruments is not known. Miller & Bush (2014) highlight the importance of collating evidence to back up rhetorical claims over instruments, especially certification schemes. Schiavi & Solomon (2007) argue that for schemes to achieve their full potential, they should have in place monitoring mechanisms to assess performance claims. However, Stark & Levin (2011) and WWF (2013) found that few schemes had properly evaluated their effectiveness.

Though there seems to be no study that has comprehensively assessed the effectiveness of most of the existing instruments, there have been studies that have focused on assessing some aspects of certain instruments. For instance, Mori *et al*. (2016) reviewed several natural resource Sustainability Certification Schemes (SCS), while Stark & Levin (2011) assessed eight standards that are considered as the optimal for improving governance. Darby (2010) and Acosta (2013a) have assessed transparency and accountability instruments. Atanasijevic (2016) and ECA (2013) have evaluated efforts at managing conflict minerals in the Great Lakes region. Lipschutz & Henstridge (2013) have also assessed a number of mineral resource governance programs. Le Billon (2012) has assessed instruments on the potential for stopping illicit flows from the sector.

Based on these studies and other literature, identified shortcomings of current extractive governance instruments will be summarised and some thoughts provided on how performance challenges can be addressed. Each of the initiatives discussed in chapter 7 in some way contributes to governance in its defined domain. Thus, the critique is not meant to imply that initiatives are of no use, but to point that collectively there are governance gaps.

8.1.1 Unintended consequences

Some instruments had unintended impacts which have undermined their effectiveness:

- It has been argued that they distract from the pressing need to build effective global governance institutions to regulate multinational organizations. Further, they undermine the role of governments to regulate by building a false argument that voluntary self-regulation is more effective (Darby, 2010).
- Some instruments have had the perverse impact of achieving the opposite of the intended effect:
    - The US Dodd-Frank Act, which requires US-registered companies to ensure that their supply chains do not contribute to conflict or human rights abuse, led to the imposition of a national mining ban in the Democratic Republic of Congo (DRC) between September 2010 and 10 March 2011. As a result, it is estimated that up to two million artisanal miners were put out of work (Seay, 2012; cited in Atanasijevic, 2016). Due to a lack of alternatives, many had to turn to other sources of livelihood or to join armed groups that could have contributed to the

[117] U.N. General Assembly, 64th Session. Resolution adopted by the General Assembly. 64/109 The role of diamonds in fuelling conflict: breaking the link between the illicit transaction of rough diamonds and armed conflict as a contribution to prevention and settlement of conflicts (A/RES/64/109) http://www.un.org/depts/dhl/resguide/r64.shtml.

ensuing spike in violence. Parker & Vadheim (2015 cited in Atanasijevic 2016) estimate that violence in the DRC increased by almost 150 percent and looting by nearly 300 percent as a result of the Dodd-Frank Act.

- The implementation of Nigeria's Extractive Industries Transparency Initiative (NEITI) led to greater disclosure of information on extractives by government. However, the greatest beneficiaries seem to have been the elite, technocrats and policymakers. According to Shaxson (2009), these beneficiaries became strategic consumers of this information to better understand the nature of extractive industries in Nigeria and thus how to position themselves to better benefit.
- The OECD Due Diligence Guidance has created unfair competitive advantage for manufacturers and exporters who operate in non-OECD states who do not apply the rules vis-à-vis companies based in OECD countries (Carisch & Rickard-Mathew, 2013). This could be generalised as some countries enjoy a massive, but unsustainable, competitive advantage from having very low environmental and social standards in addition of being non-transparent.

Some proposals to address these shortcomings have been proposed. First, MRG instruments are not substitutes for governments. They should seek to empower governments by building skills and institutional capacity of the various bodies needed, such as functional Directorate of Mines, Environmental Agencies and Geological Surveys, to be able to deliver sustainable development. This also means building capacity of bodies designed to hold governments to account; for example, auditor general, parliament, and so on.

Second, while government regulations can enhance supply chain transparency, a purely regulatory response can lead to unintended consequences. The Solutions For Hope (SfH) initiative observes that, with respect to the Great Lakes region, without a parallel in-region development strategy, a regulatory approach to conflict minerals could discourage downstream companies from sourcing minerals from the very regions the policies are meant to assist. Responsible-sourcing instruments should include support for artisanal and small-scale mining (ASM) workers and local communities to participate in these value chains (Schüler *et al*., 2016b).

Third, there is the need for gradual implementation of laws, mechanisms and instruments that foster transparency-based natural resources governance and stakeholder engagement. This would allow for the formulation of alternatives in order to avoid unintended consequences. Atanasijevic (2016), for instance, argues that with regard to informal trade, incentives to trade informally such as the DRC's high export taxes compared to neighbouring countries should be removed before measures to enforce legal trade are implemented. ECA (2013) suggests that resources should also be provided to help host countries build the necessary capacity and enforce the required measures, as well as alleviate their negative impacts. Timing is also crucial according to Carisch & Rickard-Mathew (2013). They argue that ill-timed legal action can fundamentally undermine the quick and coercive power of sanctions. For instance, anyone under indictment by the international judicial system has little hope of political rehabilitation through compliance, and therefore has no incentive to bend to UN sanctions.

Fourth, deep understanding of relationships between stakeholders is important but it can be made difficult where stakeholders belong to differing cultures and no specific efforts are undertaken to overcome cultural differences. A lack of understanding of the relationship between stakeholders can lead to wrong assumptions of loyalty, confidence, authority and power. With regards to Eastern DRC, Atanasijesic (2016) observes that actors range from customary societal entities to traditional authorities and from state officials to armed groups and national military units. He points out that power; authority and economic profit are shared, interlinked and competing amongst various actors. However, he found that this *de facto* governance of minerals is characterized by a reasonably well-organized system of cooperation, coordination and hierarchical attribution of roles amongst different actors. He argues that this hybrid governance poses significant problems to the implementation of on-going state-centred and business-oriented instruments that seek to combat informal trade mainly through strengthening state capacity. This, according to him, is because this hybrid governance comprises a deep-rooted history of informal trade networks. He, therefore, argues that acting on misguided expectations can significantly impact the balance of the existing order and might result in insecurity without necessarily improving the transparency or traceability of the mineral supply chain.

8.1.2 Lack of buy-in.

Instruments have lacked buy-in from some key stakeholders due to a number of factors that are summarized below:

- Transparency and public quadruple bottom line accountability are not supported in some countries political systems.
- Major cultural differences among stakeholders.
- Compliance is expensive for most small and medium sized companies because of the costs involved to achieve compliance (needed investment and development of skills) and to demonstrate compliance (i.e., the assurance process) (Mori *et al*. 2016, Barry *et al*., 2012, ITC, 2010). Komives & Jackson (2014) have noted that accessibility is a particular concern for small-scale producers.
- Trust across stakeholders is low, especially between Civil Society Organizations (CSOs) and the private sector. Many CSOs have expressed reservations over working closely with the private sector due to reputational risks. They feel that working together is akin to selling out or they could be used as a 'rubber stamp' where the consultation is used to tick boxes. For example, Lehman (2015) states that CSOs are not adequately engaged in the EITI process. Indeed, the stakeholder engagement processes carried out by some of the instruments are considered superficial and ineffective (Mori & Ali, 2016). Some CSOs have built their own hurdles such as asking payments for some of their reports that should be made widely available as useful databases to measure progress towards transparency and quadruple bottom line accountability of individual companies.
- In some countries, traditional authorities tend to have stronger legitimacy than governments in their areas of jurisdiction because the people trust them. However, formal organizations (especially development partners and mining companies) are wary of engaging with traditional authorities since they are often not subject to the formal transparency and accountability requirements of formal state institutions (Lockwood *et al*., 2010).
- Many instruments have failed to achieve significant buy-in from both publicly and privately-owned companies from the emerging economic powers amongst the G20 states.

Buy-in can be improved through a number of actions. Mineral resources are not all alike, sustainability issues vary according the specific resource exploited and the methods used to extract the minerals and process them in order to produce a marketable product. At the same time, the political context matters too**.** There is a need for "context-specific governance solutions" in order to avoid "any and all" panacea of the idealistic and value-laden "good governance" term. Atanasijevic (2016) states that future research is required on the nexus between natural resource management and hybrid political orders that incorporate non-formal authorities.

In addition, simplified ways should be developed to implement sustainable governance standards. Work is also needed in learning how to overcome cultural differences, a topic that is well identified in the broader business community (Usunier & Lee, 2012), from where experience can be transferred to the mines and metals industry. This is necessary for those small to medium-scale companies that are interested in engaging in the agenda, but which do not have the resources to develop or be involved in developing more comprehensive standards. Part of this could include producing a map of existing mineral resource governance standards to help companies to negotiate their way through the current complex array of different standards.

Building credible information systems that can deliver accurate and accessible information is critical in building trust. The Canadian practice of making it compulsory, via the NI 43-101 National Instrument (Ontario Securities Commission, 2018), for companies listed on stock markets to provide details, according to specific rules, on reporting the information of the technical and economic studies they need to perform prior to obtaining their mining permits (resources and reserves reporting, conceptual studies, preliminary economic assessments, prefeasibility and feasibility studies) is possibly the best available current practice in this field. This practice facilitates the availability of a wealth of information and data to all stakeholders, inter alia via a national repository where all the reports are stored and can be retrieved by anyone worldwide[118]. Legitimacy is strongly associated with trust in information from governing bodies (Turner *et al*., 2016). Innovative use of new ICT platforms including social media can be crucial in communicating to wider stakeholders and getting buy-ins.

Linking an initiative to other well-known initiatives is also important for strengthening buy-in. This confers legitimacy and improves the branding potential of a scheme. So being able to claim compliance to the UN Global Compact, for example, can confer a competitive advantage. Also, the ability to satisfy regulatory guidelines such as the OECD due diligence requirements can provide market access (Gulbrandsen, 2005 cited in Mori *et al*., 2016).

8.1.3 Lack of compliance

Key challenges of MRG initiatives include the lack of compliance and lack of participation by some key companies or some States with a major role in the global mineral resources-based supply-chains. Indeed, many governance schemes have been criticized on the basis that they are voluntary. That is, there is no requirement for either a company or a country to adhere to them. Also, there are no tangible sanctions for not belonging to an initiative, or for belonging to an initiative but not implementing it (Darby, 2010). Acosta (2013; citing Global Witness, 2006) points out that although non-compliant members could in principle be expelled from the Kimberley Process Certification Scheme (KPCS), the credibility of the scheme is compromised by the fact that no country has ever been expelled despite 'significant implementation lapses'. Similarly, Stark & Levin (2011; cited in Mori *et al*., 2016) assessing different certification schemes, identified that violations do not carry consequences. Acosta (2014) asserts that the lack of sanctions in situations of non-compliance impacts

[118] However, it is important to note most mining companies – and minerals traders, and processing and financing companies, etc. – are not listed

the credibility of the schemes and stakeholders' perceptions. In addition, certified entities that are in compliance may be discouraged and that could affect their capacity to improve performance and generate positive outcomes.

There is a need for innovative ways to ensure compliance. Some approaches are discussed below:

A broader range of sanctioning mechanisms should be explored. Acosta (2013) points to the need to establish several layers of sanctioning mechanisms that range from domestic sanctions imposed by citizens; to informal industry sanctions (peer mechanisms); to donor conditionality and the challenge of individual investors and fund managers who demand greater transparency in order to invest. Private-sector driven mechanisms could be particularly useful. Acosta (2013) argues that private-sector instruments may help inform the design of appropriate institutional and reputational sanctions that make non-compliance costlier for governments.

In addition, efforts should be made to leverage on the positive side-benefits of compliance. Companies that adopt certification standards experience improvements in their management systems and more satisfied employees leading to higher productivity (Mori *et al*., 2016; citing Vogt *et al*., 1999; Lewis & Davis, 2015 and Delmas & Pekovic, 2013). Since sustainability certification systems tend to be developed based on best practices[119], for organisations seeking compliance certification need to improve their management systems or develop them based on best practices to comply. This leads to positive changes in management and production practices, which can improve performance, quality and productivity. This side-benefit is an important incentive for many organizations and should be leveraged to a greater extent.

There is the need for flexibility to allow different approaches for different participants. This is particularly critical to enable those with costs and/or technical difficulties to achieve the same goals through different approaches. Furthermore, technical and financial support and capacity building are important to ensure that schemes are more accessible and flexible (Mori *et al*., 2016).

8.1.4 Uneven focus

A key shortcoming of governance instruments is uneven focus on various crucial aspects of mineral resource governance; with some aspects addressed extensively, while others have received sparse attention.

- There has been uneven focus on the impacts of mineral resources extraction. In Africa, there is more focus on the financial impact of mineral resources, whereas in Latin America, focus is more on the social impacts (Lipschutz & Henstridge, 2013).
- Instruments geared towards strengthening civil society engagement represent the large share of existing instruments (Acosta, 2010).
- Within programs that target governments, there is an emphasis on capacity building for the executive branch of government, as opposed to the accountability actors within government - such as the legislature or audit functions (Lipschutz & Henstridge, 2013).

[119] Some of these best practices have been documented in a series of Reference Documents: Best Available Techniques on the Management of Tailings and Waste-Rock in Mining; Activities (European Commission, 2009); Iron and Steel Production (European Commission, 2013a); The Manufacture of Glass (European Commission, 2013b); The Non-Ferrous Metals Industries (European Commission, 2017d); The Production of Cement, Lime and Magnesium Oxide (European Commission, 2013c).

- The beginning and end of the value chain receive more attention than the middle parts of the value chain (Lipschutz & Henstridge, 2013).
- Instruments are biased in favour of "demand-side interventions". Instruments that encourage greater citizen involvement and participation to promote transparency and accountability illustrate this point. However, fewer instruments focus on incentives and the role of domestic political actors including legislatures (Acosta 2010).
- There is lack of comprehensiveness or holistic considerations in the many standards available. Some standards are overlapping on some issues, while others are not being addressed. For instance, existing voluntary instruments do not address adequately sustainability issues (WEF, 2015b).
- Instruments have focused more on information generation than comprehensiveness. Simply making information available is not enough because the documents generated tend to be highly technical in nature (Darby, 2010). Information also needs to be comprehensible and usable by stakeholders.

A number of actions have been proposed that can help make governance instruments more balanced and relevant. These are;

- While ensuring governments capture a fair share of extractive rents, there is also a need for the government to focus attention on the allocation of mineral resource wealth to ensure it is invested in a manner that enhances sustainable development outcomes. This can be achieved through a sharper focus on social outcomes such as health and education (including through the possible provision of cash transfers), holding governments accountable for these outcomes as well as investing to build capacity and effectiveness of institutions to regulate and manage the social and environmental impacts of mining. A key priority is the need to channel mineral revenue to promote transformational change of resource-rich countries.
- There is the need for greater focus on sharing relevant and accessible data, information and thus knowledge. They should be presented in plain and readily comprehensible language and be timely and accurate (Darby, 2010).
- Knowledge (and its management) is a key component of developing solutions to complex problems of mineral resources governance. Solutions to such problems have to be informed by a broad range of knowledge sources including scientific research, on-ground experience, and traditional ecological knowledge. Thus, the right kind of freely flowing information, together with effective cross-cultural communication, can stimulate the creativity that is crucial to solving the various manifestations of natural resource governance challenges (Lockwood *et al.* 2010).
- Supporting and stimulating the market for 'information intermediaries' – that is, organizations, which can then repackage information in specific ways, using various media, for different audiences, can improve comprehensiveness.
- Transparency and accountability could be greatly improved by focusing on developing government capacity in the area of records management, including online cadastral systems and making compulsory the public reporting of technical and economic project data along the lines set by the Canadian NI 43-101 standard. This standard is a major contribution towards transparency and better governance and it is compulsory for any company publicly listed on a Canadian stock market. Darby (2010) notes that the inability of all parties to quickly and easily establish the boundaries of local land titles (held locally), exploration, development and extraction licences (most often held nationally in the capital city), often leads to local conflicts. Strengthening government systems around the filing of, and public access to information is

important. Internet, GPS technology and Global system for Mobile communications (GSM) have created a significant opportunity to create highly effective systems that map the concessions held by major mineral resource users across all sectors; and these technologies at the same time, make information publicly available and easily accessible, thus empowering local communities to monitor the activities. This also relates to ensuring access to environmental information and data, including environmental and social impact assessment reports and management plans. Environmental data are important for informing the bidding process, strategic planning as well as monitoring project development, and transparency of this information enables stakeholders to hold proponents and governments to account.

8.1.5 Proliferation of standards

In the clamour to fill governance gaps due to weak regulatory capacity of resource-rich countries, there has been a proliferation of standards, many of which are voluntary. Proliferation has led to a number of challenges.

- Fatigue across all stakeholder groups – civil society groups, donors, and the private sector (WEF, 2015b; ECA, 2013). For example, the number of voluntary instruments overwhelms many mining companies and downstream users.
- Proliferation has also made it challenging for stakeholders to decide which instruments to adopt. Indeed, many mining companies report that they are uncertain about the value of particular upstream instruments, even where mining companies are currently investing significant resources (WEF, 2015b).
- Companies, to distract consumers from the real impact of their operations, can use the instruments as public relations exercises. Indeed, Darby (2010) argues that due to the proliferation of instruments, it is possible for companies and countries to search for the lowest-common denominator set of standards that will maximize their reputation whilst minimizing the need for actual action. Similarly, Stark & Levin (2011, cited Mori *et al*., 2013) refer to the potential for greenwashing in certification through the deceptive use of aggregated data to indicate compliance with schemes.
- The abundance of instruments makes it difficult to identify key messages and send appropriate signals to important stakeholders and supply chain partners.
- Having so many instruments makes it difficult for the sector as a whole to cooperate and identify common goals and strategies. Further groups with similar interests often compete for limited resources, championing their initiative or agenda over others (WEF, 2015b). In their study of certification schemes, Mori *et al*. (2015) find that though the majority of schemes (87%) cross-reference other standards within their own standards or guidelines, very few (33%) recognize the certificates, labels or claims provided by other schemes within their own processes.
- The instruments carry a large administrative burden that can be prohibitive for smaller companies. Note that filling the questionnaire that comes with certain initiatives can be very burdensome. For example, MInGov (a World Bank initiative) has a Questionnaire with 64 indicators and over 300 questions created.
- Voluntary instruments are also vulnerable to financial cycles (WEF, 2016). Donors are more generous during financial booms and cut down during financial slow down, the moment where help may really be needed.

The potential for integration and coordination between instruments and with government regulations/laws and industry and corporate standards should be considered in the design, implementation, operation and revision processes of voluntary instruments. Some ways to improve standards setting are discussed below.

There is a need for unified systems or at least a core set of crosscutting standards. These can then be complemented with mineral-specific modules to address gaps not covered by unified systems. WEF (2015) points out that the landscape can be simplified by classifying instruments by type. This can then form the basis for developing core standards.

Greater efforts are needed to find synergies between voluntary instruments and regulatory (mandatory) ones. As soft law, voluntary instruments can act as a feeder into regulation and, in doing so, help design and pilot “smart regulation”. They can be used to test ideas and build relationships among stakeholder groups in a pre-regulatory environment. For example, the International Cyanide Management Code (ICMC) has become a quasi-regulatory framework, which has been incorporated into the International Finance Corporation (IFC) framework; the next step is for it to be adopted into regulation. This process rewards companies who have worked with stakeholders to help develop and implement the Code. There have been some efforts to adopt elements of international standards into national law. For example, inclusion of principles such as the mitigation hierarchy and no net loss of biodiversity that are increasingly referred to in national policy and legislation. These concepts form part of the IFC performance standards and as such the implementation of these standards by large developments have increased the understanding of these concepts within a number of countries, ahead of their inclusion in legislation.

At a minimum, there is the need for cross-stakeholder coordination on goals, standards and metrics to increase interoperability[120] among the different instruments. Interoperability has the potential to reduce the costs of assurance and avoid duplication, which can lead to inconsistencies and a loss of credibility. It can also amplify the outcomes achieved by different instruments and further their reach. The potential for integration and coordination between instruments and with government regulations/laws and industry and corporate standards should be considered in the design, implementation, operation and revision processes of voluntary instruments (WEF, 2015a). Instruments, especially certification schemes, should operate together to improve interoperability and cross-recognition (Mori & Ali, 2016). A robust theory of change should inform this (ISEAL, 2018). ISEAL (2018) further points that achieving interoperability is easier said than done as standards/organization may lack shared objectives and strategies. The key is to start small, build trust and be creative. It is also important to find common ground in a non-competitive space to add value and also a space for sharing and learning across initiatives.

Moreover, standards should be developed in such a way that actors can graduate as they learn. A supportive approach for integrating mining companies with different performance levels is the Towards Sustainable Mining (TSM) approach, which allows members with low environmental performance to join the initiative and gradually improve. TSM statistics show that this top-runner

[120] ISEAL (2018) define interoperability as the degree to which diverse systems, organisations and individuals are able to work together to achieve a common goal. With respect to standards, interoperability is not only the capacity standards working together (i.e. recognise or reference other schemes), but about leveraging the diversity of stakeholders, expertise, coverage and approaches of the individual standards to create a more responsible sector.

concept gives positive incentives with the result that the average performance level of the members increases significantly, particularly in the first years of membership (WEF, 2015a).

Innovative use of emerging ICT platforms to automate information gathering across a number of standards is gaining ground. For example, GeoTraceability technology that combines traceability with bar codes, mobile phones and global positioning systems, aims at delivering real-time electronic tracing of mineral shipments and data availability prior to export in line with OECD guidelines and the International Conference on the Great Lakes Region (ICGLR)'s Certification Mechanism (Atanasijevic, 2016). As discussed in Chapter 4, emerging block chain technologies have great potential to improve chain-of-custody in certification schemes.

8.1.6 Lack of theory of change

Instruments have been criticized for lacking an explicit 'theory of change' on how activities can translate to strengthened governance (Acosta, 2010, 2013). For example, proponents of EITI make the assumption that accountability of governments and firms can be improved if data about revenues from the extractive sector is published and publicly debated. Further, this will lead to empowering citizens to demand more equitable management of resources and sustainable development (Haufler, 2010). This may not be the case and may actually empower the elites who are better suited to consume the information and thus better position themselves as pointed out previously in the case of EITI in Nigeria (See Box 8.1).

Box 8.1 Transparency – progress but not there yet

In the extractive industries, a lack of access to reliable information about the distribution of benefits and the impacts of projects can be a key contributor to a breakdown of trust and misperceptions, which can fuel social conflicts and spiral into violence. The importance of access to information has been recognized at the global level and initiatives promoting transparency are proliferating. Principle 10 of the 1992 Rio Declaration emphasises the need for citizens to have appropriate access to information concerning the environment that is held by public authorities and the opportunity to participate in decision-making processes. The Extractive Industries Transparency Initiative (EITI) was one of the global efforts to bring greater transparency to the extractive sector. The 51 EITI implementing countries commit to publishing annual reports that disclose the revenues from the extraction of the countries' extractive resources. Companies report payments to government (taxes, royalties) and the government reports what it has received. The reports are reconciled by an independent auditor and also include information related to beneficial ownership disclosure, licence and contract information.

Whereas initiatives such as EITI represent an important first step in providing public access to financial information in the extractive sector, they stop short of increasing transparency related to the social and environmental performance of projects. Financial transparency is critically important but concerns of local communities in the vicinity of operations tend to focus on the more immediate impacts of a project. This includes the impact of operations on the availability and quality of local water supplies or the number of local jobs created for example. Excluding this data from public disclosure creates 'information asymmetries' where stakeholders have unequal access to information. So far, efforts of increasing transparency in the sector do not go far enough to address these information asymmetries and help citizens understand the distribution of benefits and risks across a project lifecycle.

Acosta (2010) points out that the distinction between means and ends appears to be conflated. This is because while most transparency and accountability instruments are geared towards attaining an expected or desirable outcome such as improved economic performance or poverty reduction, most project interventions in fact seek process- oriented outcomes. These include increasing participation of CSO's, promoting disclosure of contracts, and/or demanding increased revenue transparency. The underlying assumption is that such outcomes would have a direct impact on greater objectives such as reducing corruption and poverty in resource- rich countries. However, many of these instruments fail to address the causal mechanisms (and obstacles) through which the intended development outcomes are likely to take place. Further, there is a wide variation on the critical aspects that define the development outcomes.

It is necessary to develop an explicit theory of change that identifies the different roles, political motivations and mechanisms that allow different stakeholders to oversee the government's commitment to greater transparency and accountability in the management of natural resources (Acosta, 2014).

Greater effort needs to be invested in determining casual linkages between project interventions and actual governance outcomes. This will entail a number of actions. There is a need for construction and maintenance of Key Performance Indicators (KPIs) that would link specific project interventions with outcome variables. The adoption of these benchmarks has been suggested to the EITI Board and Secretariat by a recent impact and evaluation study (Rainbow Insight 2009; cited in Acosta, 2013a).

There is the necessity to produce reliable, up to date and user-friendly datasets that allow a better assessment of project interventions through quantitative and qualitative methods. While it is good to have a theory of change, it is also critical to have an evaluation framework that can assess the impact of interventions. Assessing impact also entails capturing data at an appropriate level (Acosta, 2010).

The Theory of Change needs to be underpinned by a solid understanding of obstacles to change. Of note is that some attempts have been made in identifying the impact of intervening factors in the fight against corruption (Acosta, 2010). These highlight the importance of broader political institutions, and particularly the need for separation of powers and a stronger judiciary.

While many existing initiatives have faced several challenges, some researchers (for example, Le Billon, 2012) point to the fact that many of them have not been in existence long enough to demonstrate impact. Thus, an evaluation at this point may be premature. Le Billon (2012) further notes that many instruments have gradually gained support and acceptance within the international policy community mainly due to:

- greater awareness of the resource curse - many stakeholders are anxious to ensure that the long-term developmental failure associated with the 1970s commodities boom will not be repeated;
- support by prominent opinion leaders such as Tony Blair and George Soros; by multi-national businesses in developed countries like De Beers; by developed countries such as the United Kingdom and Norway; and by well-funded, well-organized civil society organizations like Global Witness;
- sustained, constructive, and voluntary multi-stakeholder approach, backed by national legislation once adopted;
- relative complementarity of these instruments; and
- public pressure due to the legitimacy enjoyed by this cause, making companies reluctant to reject these instruments publicly.

8.2 Stakeholder engagement

Effective engagement of stakeholders is central to successful stewardship of mineral resources (Mining, Minerals, and Sustainable Development Project (MMSD), 2002). GIZ (2003) argues that their crucial role emerges from the fact that, they: (i) (actions of stakeholders, particularly governments and mining companies) are the sources of governance problems; (ii) tend to advocate for a particular solution; (iii) are the objects of governance instruments; and (iv) are joint co-producers of governance. Barry *et al*. (2012) posit that the content of a scheme is based on the negotiation between subject matter specialists and interested stakeholders. Hence, awareness of their various roles is critical, underscoring the importance of stakeholder analysis so as to establish an effective partnership. However, it has been found to be complicated for a number of reasons.

- Governments may claim that development is their objective, yet the interest of government actors may be far from sustainable development. The state may be unable or unwilling to monitor and regulate the activities of extractive companies and therefore safeguard the interests of its citizens (Darby, 2010).
- Development partners claim to seek to enable resource-rich states to avoid resource curse dynamics and to reap positive development benefits. But their actions are, for the large part, determined by the agenda of their governments or their mother institutions (for international development organizations). This results in the duplication of efforts in reform instruments, for example, the Africa Mining Vision (See Box 1.2) and the National Resource Charter (NRC).
- Business organizations, due to their very nature, are not usually driven by an overarching policy vision. Rather, what drives them is their business needs arising in the context of local extractive operations or demands and expectations that other actors raise towards them. Thus, extractives corporations choose their fields of engagement selectively. They can be partners in governance in some areas, but might still cause problems in others. For example, they might engage in local development projects but at same time are responsible for serious environmental problems. They may also engage in voluntary instruments such as EITI but still lobby against more binding regulations. In addition, some private sector actors intentionally refrain from partnerships because of reputational risks.
- Civil Society Organizations (CSOs) seek to promote a perceived "common good" (Risse, 2002; cited in GIZ (2003). They play a key role in advocating for stakeholders likely to suffer the greatest loss from resource extraction and also in implementing many instruments to improve governance of mineral resources. However, they tend to be issues-oriented and thus may miss the bigger picture. Some tend to duplicate, to an extent, efforts made by other instruments, rather than coordinate efforts to cover as many nodes as possible, as they are in competition for resources from donors. They also tend to be wary of cooperating with governments and the private sector lest they are seen as being compromised. For this reason, they can be difficult partners and sometimes they can even radicalize the population so that positions become so entrenched that negotiations become impossible.
- Forming partnerships can also be challenged by different approaches stakeholders adopt. Some stakeholders adopt whole-value-chain approaches by seeking to support comprehensive reform of resource governance. This group usually concentrates on national level policy-implementation. A second group of actors takes a specific-nodes-approach by specializing on one or a few themes in resource governance, usually on such nodes along the value chain, which they consider crucial and where they believe they can have a meaningful impact (GIZ, 2003). See Box 8. 2 for challenges with stakeholder participation.

Box 8.2 Challenges of Stakeholder Participation

Though stakeholder participation is now claimed by many and indeed required even by financiers of projects, this exercise may just be about ticking boxes. Szablowski (2007) pays particular attention to a World Bank process which has been revamped in the wake of complaint that the World Bank had funded projects that displaced people. This has led to the inclusion of social specialist in the World Bank technocracy and also of participatory processes as a strategy to effect legitimacy. However, Szablowski argues that the participatory development has been mere rhetoric. Largely, the policy neglects participation as it does not require that basic measures are taken to enable informed local input into the decision- making processes. Szablowski notes that the World Bank participatory approach fails to account for power relations and is also highly expert-driven as opposed to participant- driven. Even in consultations, there is minimal input by the communities in the actual design of the process. More crucially, he notes that despite the fact that there is "consultation", there is no ultimate right of the community to refuse development. Bastida and Bustos (2017) examine the mining legislation development process in Bolivia. The authors observe that strengthening the capacities of the institutions and the actors that participate in decision-making is needed in fostering sustainable mineral resources management. This challenge needs to be addressed.

Some approaches to improve stakeholder engagements include:

- Collaborative efforts need careful thought. Actors that pursue a whole value-chain approach should ideally develop very close forms of collaboration. They will pool their efforts and resources as much as possible in order to increase the effectiveness of their interventions in order to avoid duplicating each other's efforts. It may prove beneficial to find division of labour among the actors with a comprehensive reform agenda, either along the different nodes of the chain when working in the same country or, alternatively, a per country division that could be supported by cross-country exchange of knowledge and best practices. For particular nodes of the chain, collaboration with more specialized actors may be preferable to sole reliance on partnering among generalist ones as the latter are likely to lack specialized knowledge and experience in certain fields (GIZ, 2013).
- It is also crucial that all stakeholders are meaningfully engaged**.** Mori *et al*. (2015) indicate that participation and cooperation of stakeholders in developing, monitoring and reviewing instruments is essential to assure the success of any certification scheme. Engagement can also help to regulate or reduce conflict and improve the legitimacy of the scheme. However, the heterogeneous nature of stakeholder groups underscores the importance of targeted strategies to engage groups that may not be heard through traditional governance channels (Turner *et al*., 2016). Darby (2010) notes that one way of improving stakeholder consultation (especially in the case of CSOs-private sector consultations which are fraught with reputational risk) could be to have independent third parties agreed on by all stakeholders to conduct the consultation process and based on a standard for the independent audit of stakeholder consultations.
- Stakeholder engagement should be strategic. ISEAL Alliance (2013); cited in Mori *et al.,* 2016) recommends that it is important to determine the most appropriate occasion to engage with stakeholders so as not to engage them unnecessarily at the expense of efficiency.
- There is also a need to understand underlying social structures in stakeholder engagement. In stakeholder engagement, diversity alone is not enough. Crona & Hubacek (2010) argue that bringing diverse views and opinions by selecting stakeholders from different organizations and sectors is not enough. They opine out that individuals are embedded in social ties, and these ties constrain and influence peoples' perceptions about management practices. Thus, the examination of social structures (formal or informal) offers many new insights that are relevant to mineral resource governance.

8.3. Conclusion

Addressing the issues and shortcomings discussed above will be crucial towards putting together a mineral resource governance framework in line with sustainable development imperatives. Though existing governance instruments suffer from a variety of shortcomings, they can be leveraged as building blocks for a new framework. If the new framework addresses all the peculiar challenges associated with various minerals management issues, it will likely be too complex to be of use. Thus, a suitable framework should be able to make use of the positive aspects of the various existing instruments and provide means to address current knowledge gaps, whilst reconciling the unintended consequences that are likely to arise if instruments are not well thought out. This is the topic of the next chapter which looks at pre-requisites of an effective governance framework. In Part III of the report, the structure of such a more holistic governance framework will be explored.

CHAPTER 9 – PRE-REQUISITES OF AN EFFECTIVE MINERAL RESOURCE GOVERNANCE FRAMEWORK

9.0. Introduction

Chapter 8 assessed various mineral resource governance instruments, highlighting their strengths and weaknesses, and suggesting approaches to enhance their effectiveness so as to help achieve the Sustainable Development Goals. This chapter throws light on the prerequisites for an effective governance framework.

Failure to govern mineral resources is not due to poor understanding of how natural systems work. Rather, the problem is primarily political and behavioural in nature, related to governance and the failure of humans to create institutional arrangements that support coordinated actions locally, nationally, and internationally. Indeed, as summed up by Lockwood *et al.* (2010), the natural resource governance (NRG) challenge is the quintessential "wicked problem"[121] that calls for novel policy and institutional responses.

The current global policy context provides new momentum and opportunity to address this problem. Sustainable development is now the global agenda with clear Sustainable Development Goals (SDGs) articulated and adopted by the global community. The key question related to the governance of mineral resources is how the exploitation of these resources can contribute to SDGs. This will require the capture of a fair share of mineral resource rents, equitable distribution and judicious investment of the rents, and the mitigation of mining activities' negative impacts discussed in Chapter 5. How to achieve this is the subject of the remainder of this report.

9.1. The need for a holistic framework

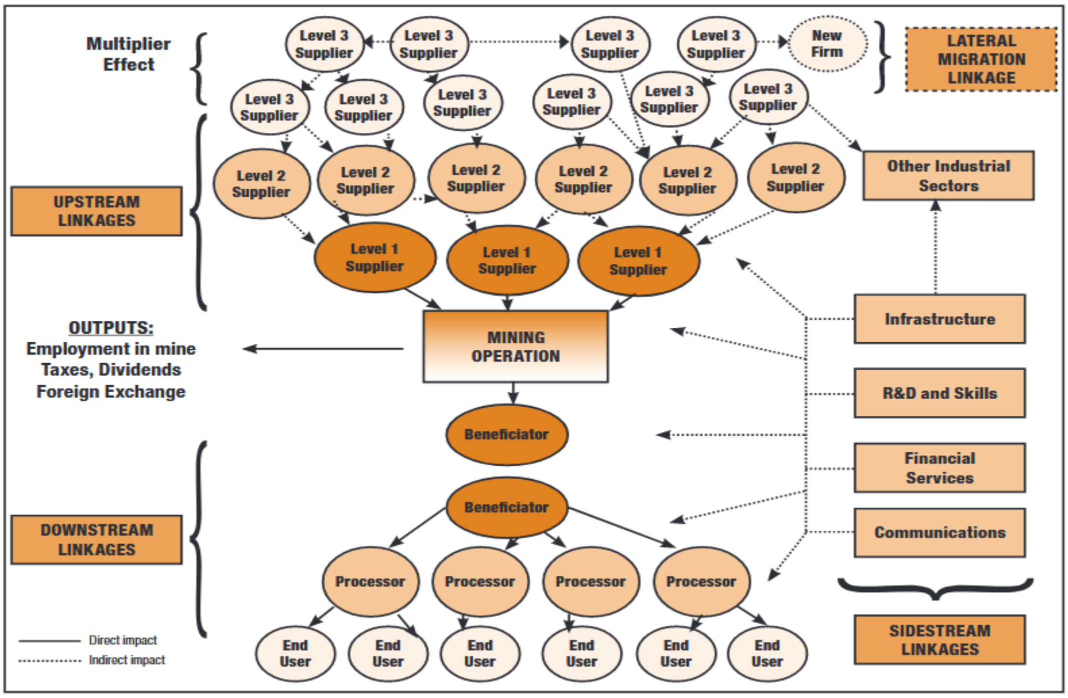
Chapter 7 identified three of the fundamental characteristics of mineral resource extraction as complexity, power asymmetry and competing interests in political economy. At the most basic level, a mineral resource governance framework should seek to increase transparency; build capacity to reduce the power asymmetry between governments, industry and other stakeholders; establish institutions that will enable trust to grow between competing interests and align understanding about what constitutes shared value; and protect all parties from the corrosive effects of corruption. Translating mineral wealth into lasting economic gains will further require a broad span of policies that convert extraction from an enclave industry and link it to broader economy through local content and value addition (APR, 2013; NRC 2010; Pedro, 2017). Figure 9.1 illustrates the multitude of actors and potential linkages. Mineral resource revenues should be leveraged to implement sustainable development projects – through stimulating economic diversification and careful investment in physical and social infrastructure and provision of public goods while at the same time

[121]As pointed in chapter 1 challenges that are classified as the "Wicked Problem" are characterized by complexity and contestation originating from multiple problem causes, divergent problem perspectives and solution strategies, and fragmented institutional settings that to be remedied necessitate institutional adaptation and innovation.

addressing externalities (social and environmental damage and economic) that mineral resource extraction engenders.

Figure 9.1 Linkages in the mineral resources sector

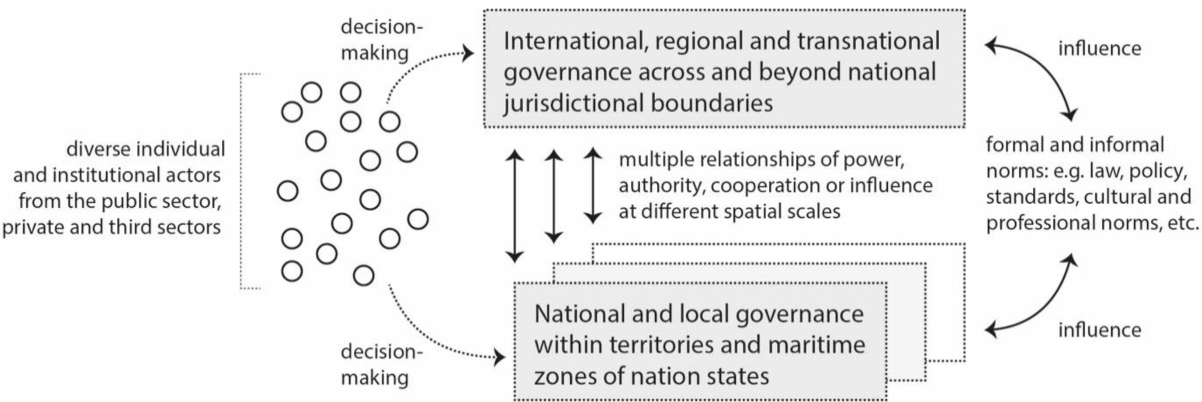
Linkages in the minerals industry and the relationship between firms



Source: Lydall, 2010.

As already further elaborated in Chapter 8, decision-making in the extractive sector is shaped by a complex global, regional, national and local architecture of relationships between individuals and institutions. The term *governance* (Box 1.1) refers to the many ways that individuals and institutions manage their common affairs in this context. Governance *of the extractive sector* is a process characterised by diverse actors, normative frameworks, hierarchical relationships, and spatial and temporal boundaries. These components are illustrated in Figure 9.2 below.

Figure 9.2 Key components of extractive sector governance



The management of mineral resources requires the interventions of different actors in different spatial and temporal horizons in both 'home' and 'host' countries. This is compounded by the challenges of managing point resources which are local in nature, but at the same time are governed by global instruments and are the subject of geopolitical tensions. This calls for a holistic framework.

While the framework above attempts to balance competing interests of various actors located in both 'home' and 'host' countries, it misses one key actor who is also impacted (may be even more). These are the future generations who may not have access to the depleted resources and who may have to deal with negative impacts of resource extraction and use. This begs for a framework that takes into account the needs of future generations. See Box 9.1.

Box 9.1 The Case for Intergenerational governance instruments?

Henckens (2016) makes the case for an international agreement on minerals based on both intergenerational equity and resource conservation arguments with a suggested quota development model. For some mineral resources the current level of extraction is likely to pose a problem for future generations. Depletion of a mineral resource means that it will become much more expensive for future generations to continue to use these minerals. While technology may reduce some of the adverse effects of depletion, future generations may be deprived of potential innovations for which these specific materials would be essential.

The question arises as to how the currently unsustainable extraction of mineral resources can be decreased to safeguard them for future generations. It is admitted that it is unlikely that market forces alone will sufficiently impact the prices of minerals to resolve the unsustainable use of certain minerals timely enough. An international agreement on the conversation and sustainable use of geologically scarce minerals is necessary. The agreement will recognize that the geological scarcity of mineral resources differs between different minerals. It will therefore make a selection of priority minerals, determine how far the extraction rate of these substances must be reduced and decide on a fixed time period within which the extraction must decrease from the current rate to a sustainable rate. The design of such an agreement will be based on two basic principles contained in existing international environmental agreements: (1) the inter-generational equity principle and (2) the principle of conservation of natural resources. Furthermore, the obligatory reduction of the extraction of mineral resources will affect the sovereign rights of resource countries to exploit their own resources. Any international agreement should make arrangements to ensure resource countries are adequately compensated for their loss of income.

Tilton (2010) argues that, while on the surface, mining may not be sustainable as mining resources are fixed and thus will be depleted; this is not the right way to look at sustainability. He argues for an opportunity-cost paradigm. This focuses on what society has to sacrifice or give up in order to produce more minerals. When the real price for a mineral commodity rises over the long run, it is growing less available or scarcer. So even in the absence of physical depletion, economic depletion may occur in the sense that mineral commodities become too expensive to use. However, technology tends to counterbalance this by coming up with new more efficient methods to exploit resources (that may not have been available with old technologies, new substitutes etc. Thus, the long-run availability of mineral commodities is now determined by a race between the cost increasing effects of depletion and the cost-decreasing effects of new technology. He argues that if society can continue in the future, as it has in the past, to create new technologies that offset the cost-increasing effects of depletion, mining can be sustainable indefinitely. This favourable future, however, is not assured. It requires that economic geologists, along with mining engineers, metallurgists, and others in the mining sector constantly develop new, lower cost methods for finding and extracting mineral commodities to offset the relentless upward pressure of depletion on costs. The success of economic geologists and others in this endeavour will determine the future of mining, and in turn shape the future for economic geologists. Mudd (2010) also points that true sustainability of mineral resources, however, is a much more complex picture and involves exploration, technology, economics, social and environmental issues, and advancing scientific knowledge and thus predicting future sustainability is therefore not a simple task.

9.2 The need to decouple economic growth from environmental and social impacts

The care of the environment is one of the key pillars of sustainable development (the others are social and economic impacts). However, mining by its very nature disturbs the environment and poses many threats to human wellbeing (as discussed in chapter 4). Therefore, for mining to deliver sustainable development, its activities must be conducted with due care for the associated environmental and social impacts. The World Summit on Sustainable Development provides the thinking that should guide mining. While acknowledging that minerals are essential for modern living and formally recognizing the concept of sustainable mining and minerals development, the Johannesburg Declaration (Box 9.2) agreed to stress actions and partnerships at all levels to address the issues and concerns (including environmental impacts) throughout the life cycle of mining operation. There was also emphasis on reclamation and rehabilitation of degraded sites (Dalupan, 2004).

Box 9.2 The World Summit on Sustainable Development (WSSD) or the Johannesburg Declaration

The 2002 Summit was a follow-up to the Rio (Earth) Summit of 1992. It reaffirmed sustainable development as a central element of the international agenda and gave new impetus to global action to fight poverty and protect the environment. The understanding of sustainable development was broadened and strengthened as a result of the Summit, particularly the important linkages between poverty, the environment and the use of natural resources. Governments agreed to and reaffirmed a wide range of concrete commitments and targets for action to achieve more effective implementation of sustainable development objectives. The Johannesburg Declaration created “a collective responsibility to advance and strengthen the interdependent and mutually reinforcing pillars of sustainable development—economic development, social development and environmental protection—at local, national, regional and global levels.” Agreements coming out of the summit included:

- A call on developed countries, which have not done so, to make concrete efforts towards the internationally agreed ODA targets (0.7% of GNP for ODA);
- Governments to actively promote corporate responsibility and accountability, based on the Rio Principles, and to support continuous improvement in corporate practices in all countries.
- Governments to enhance partnerships between governmental and non-governmental actors, including major groups and volunteer organizations, on programmes and activities for the achievement of sustainable development at all levels

For the mining sector, one key achievement of the WSSD was the adoption of the Mining, Minerals and Sustainable Development Project (MMSD) initiative recommendations by the industry. The MMSD initiative aimed to create a shared idea of the appropriate and necessary roles for each of the major actors in mining and sustainable development – government, civil society, and the private sector – asking ‘what is a company’s role and what is not a company’s role?’. Between 2000 and 2002 consultation was carried out across 20 countries in all regions covering over 700 participants. The results helped to frame the sector’s contribution to the 2002 Johannesburg Sustainable Development Summit. These were adopted and became the basis for guiding the mining industry actions. Mining executives committed to act to maximize their sector's contribution to sustainable development, and they adopted the MMSD agenda. The International Council on Mining and Metals (ICMM) – an umbrella organization of leading companies such as Rio Tinto and Anglo American -- succeeded in implementing many of MMSD's recommendations for industry.

A review of the MMSD in 2012 (Buxton, 2012) found that global rules for best practice in the sector have emerged in the decade since the MMSD report. Though there is still a lack of implementation, independent verification, public reporting, or consequences for non-compliance. A key challenge has been the capacity of governments in developing nations to ensure that mining contributes to sustainable development.

The crucial balance to ensure that mining delivers economic and social benefits while not causing irreparable damage to environment is hard to achieve and indeed economic benefits tend to trump environmental concerns. China is confronting the challenge and is now paying more attention to environmental impact of mining and trying to promote a more sustainable path (see Box 9.3).

Box 9.3 China's green mining initiative

China is the biggest producer of minerals globally with over 110,000 mines. These mines generate significant solid ore waste dumps (over 220 billion tons) and also significant environmental hazards (Lei *et al*., 2016). Sustainable development and in particular mitigating environmental degradation is an issue that is now on top of China's agenda and this has seen a determined shift to reduce environmental impact of mines.

In 2010, the Ministry of Land and Resources launched the "green mines" standard. The standard addresses the implementation of management systems related to health, safety and environment, energy efficiency, waste reduction, investment for environmental production, mine site rehabilitation and engagement in community development. By 2014, 661 mines were certified.

The Ministry of Land and Resources has also published a comprehensive plan to guide the green development of the mineral sectors from 2016 to 2020. The plan gives first priority to the ecological protection of Chinese mines and aims to establish model cases of green mines in at least 50 mining regions. The plan also encourages Chinese mining companies to become more involved in the governance of the internal mining industry, with regards to international norms, policies and standards for cooperation and investment in the global mining industry.

More recently the Ministry teamed up with five other ministerial departments, to jointly announce an initiative 'Guidance to Facilitate Development of Green Mines' (Dolega & Schüler, 2018). The new guidelines call for more support, in particular financial support, from different levels of governments for green mining development. The guidelines require all newly built mines to comply with the national standard for green mines; push technical upgrading of existing mines; and facilitate the building of a more effective/powerful system to support green mining development.

9.3 The need to protect human rights

As discussed in chapter 6, extractive resources engender conflict that lead to human rights violation. The protection of human rights is the responsibility of states. However, many governments in the global south may be unwilling to protect human rights, especially when exploitation of natural resources benefits the elites. In addition, governments may be unwilling as a result of undue influence by unscrupulous mining companies. Weak and fragile states may also be unable to enforce human rights. Indigenous people are particularly impacted (Box 9.4). This underscores the need for a governance framework that prioritises human rights.

Box 9.4 ILO 169 Convention - Advancing the Rights of Indigenous People

Though indigenous people constitute about 5 per cent of the world's population they account for 15 per cent of the poor. Further, where economic growth has resulted in overall decreasing inequality, indigenous and tribal peoples tend not to benefit from such progress; poverty among them is often increasing (ILO, 2015). They are particularly impacted by mining activities as their livelihoods are more tied to the land and especially rely on biodiversity services and also much less exposed to modern life. So, they tend to be hit much harder by the environmental and social impacts of mining discussed in chapter 5. Indeed, extractive industries have been accused of encroaching more and more onto indigenous territories that are rich in untapped natural resources (FAO, 2016).

The rights of indigenous people have been recognized as a major concern and this prompted the adoption of ILO convention 169. Convention No. 169 is based on the recognition of the aspirations of indigenous and tribal peoples to exercise control over their own institutions, ways of life and development and to maintain and develop their identities, languages and religions, within the framework of the States in which they live.

Emphasizing the principles of equality, consultation, participation and cooperation, the Convention is a framework for participatory democracy, social peace and sustainable development.

Though, as of 2015, only 22 countries had ratified Convention No. 169, ILO (2015) points that it has had far-reaching impacts on the laws and societies of ratifying member States. Major reforms have been achieved, such as the constitutional recognition and protection of the rights of indigenous peoples. Yet, the Convention's influence goes beyond ratifying countries: it has also helped in shaping laws and policies in many other countries as well as influencing the work of international organizations at the global and regional levels Indigenous and tribal peoples' rights and issues are now an integral part of major global agendas. For instance, concerns for indigenous peoples' rights and well-being are also an integral part of the 2030 Sustainable Development Agenda. The Addis Ababa Action Agenda recognizes that indigenous peoples' traditional knowledge, innovations and practices can support sustainable livelihoods, while also calling for a focus on indigenous peoples in the context of social protection.

ILO recognizes the need for further action in needed and seeks in its strategy to further intensify dissemination of Convention 169 including promoting dialogues among the key stakeholders, sharing experience of good practices and training.

ILO also recognizes that indigenous and tribal women face discrimination on multiple grounds, both outside and within their communities. The ILO will seek to develop interventions to address the specific barriers and challenges faced by them. This will include interventions to give women a voice within and outside their communities, building knowledge on the role of women in traditional economies, support for entrepreneurship, and awareness raising to mobilize for preventing and combating gender-based violence.

From a conceptual point of view, the debate on human rights due diligence revolves around a central question which is equally relevant to environmental considerations: to what extent should enterprises – or their CEOs – be held accountable for common goods or public interests, which may lie beyond the interests of their shareholders? So far, in most European jurisdictions, such a legal obligation has not yet been clearly enshrined in civil law. An exception is the United Kingdom, where the Companies Act of 2006 includes an obligation to respect the environment within the company's operations.

A potential for thinking about this is the UN Guiding Principles on Human Rights (see Box 9.5). It is currently the "dominant paradigm for discussing Corporate Social Responsibility (CSR)" (Jesse & Koppe, 2013, p. 188). Given that, until now, multilateral human rights treaties fail to hold multinational enterprises directly accountable for human rights violations, the framework calls on states to ensure that business enterprises do not violate human rights and that, remedies are available in case of violations.

Another major question is whether a home state of a multinational enterprise has a duty to protect citizens abroad from human rights violations; that is, whether it must ensure that the enterprise conducts itself in a human rights' sensitive way in its country of operation. Since 2011, home state duties concerning "extraterritorial" actions of their multinational enterprises have come to the fore, and it has become widely recognized that enterprises have human rights responsibilities across their value chains. The 2011 UN Guiding Principles are hesitant to establish a clear "extraterritorial" duty, but they encourage states to act as if the duty existed.

International human rights bodies have gone a step further by clearly affirming the obligation of states to regulate extraterritorial obligations of their business enterprises[122] . Moreover, in recent years,

[122] Ref. S. qil, s. Antwerp; ICESCR Art 2.

many legal scholars have argued that such "extraterritorial" obligations have already been codified in the human rights treaties, for example in Article 2 of ICESCR[123] . Some have also contended that it is not a question of "extraterritoriality" but in the scope of application of domestic law[124]. The emerging principle of common concern[125], as discussed above, justifies such an interpretation of existing international human rights law.

Finally, in as much as the protection of fundamental human rights amounts to a Common Concern, and given the lack of appropriate institutions at the global or regional level in this area, it has been argued that States should bear as a matter of principle an obligation to act beyond the scope of territorial application of their national laws to ensure protection of fundamental human rights (Cottier, 2012; Cottier *et al*., 2014).

Following this legal practice and debate, and considering the fact that extraterritorial actions of multinational enterprises – in particular of mining companies – have been the core focus of public debate in countries of the global north in recent years, it is widely claimed that home states should find ways to influence extraterritorial actions of their enterprises. The concept of "policy coherence for sustainable development" as enshrined in the UN 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals also fosters such a perspective (UN, 2015).

Box 9.5 UN Guiding Principles for Business and Human Rights

The 2011 UN Guiding Principles for Business and Human Rights (also known as the Ruggie framework) presented a conceptual framework that outlines the duties of states vis-à-vis business enterprises and the responsibilities of business enterprises. The framework rests on three pillars: (1) the duty of states to protect human rights; (2) the responsibility of business enterprises to respect human rights; and (3) access to remedies for those affected by human rights violations.

According to "the duty of states to protect human rights" (first pillar), states must take the necessary measures to protect their citizens from actions of enterprises that have adverse impacts on human rights. Following the principle of proportionality, a state should choose measures that intervene as little as possible while still being effective. This means that there is no need to go beyond voluntary standards of business enterprises as long as these are effective. If they prove to be ineffective, however, public regulation should be considered. Public regulation may consist of a binding duty to exercise due diligence, including a duty to report on human rights sensitive actions and a duty to care. While an obligation to exercise due diligence is normally considered for inclusion in civil and criminal law, regulations in other fields of law such as competition or risk insurance law, can have an equivalent effect. In the implementation process, the buzzword is "smart mix", indicating that a combination of voluntary and binding standards may be most appropriate in a majority of cases, given the limited effect of voluntary settings.

[123] Verweis auf Maastricht Principles, s. auch Buch, QIL

[124] Noch bei SKMR nachschauen, wie genau formuliert? CK s. Krajewski. Swiss Centre of Expertise in Human Rights (n 21).

[125] New concepts are seeking to capture the idea of shared responsibility in greater detail. One of these concepts is the emerging principle of common concern, which is invoked in several international treaties. The principle of common concern goes beyond the concept of the common heritage of mankind or the concept of global commons; it encompasses all uses of natural resources which are of common interest to the global community, irrespective of whether or not the resources are classified as heritage. Attempts at a more detailed definition of the principle of common concern are ongoing. Evolving theory suggests that it ought to be applied to problems related to natural resources which cannot be solved unilaterally. There should be a common interest in resolving these issues, and equity-related questions should be concerned. If these conditions are fulfilled, a general duty to cooperate is affirmed (irrespective of the classification as a home or host state); and in the absence of common action, an actor may act unilaterally. Given the globally shared interest in minerals, it should not be too difficult to affirm the existence of a "common concern". (Burgi Bonanomi, 2018)

The 2011 UN Guiding Principles also define how "intense" causality between the action of the enterprise and the human rights violations should be in order to trigger liability. Principle 13 of the Guiding Principles states that business enterprises should "avoid causing or contributing to adverse human rights impacts through their own activities". This includes impacts "that are *directly linked* to their operations, products or services by their business relationships, *even if they have not contributed to those impacts.*" This takes account of the fact that business enterprises may be involved in human rights impacts "either through their own activities or as a result of their business relationships with their parties." Importantly, activities can include both actions and omissions. As a consequence, a home state's duty to protect entails the obligation to ensure that parent companies exercise due diligence towards their subsidiaries.

There is currently no harmonised legal basis implementing the 2011 UN Guiding Principles has yet been established in Europe or in any other country. However, the Principles have galvanized the debate and contributed to the adaptation of "regulatory narratives".

The UNGP have had good success. In an assessment of its performance, Ruggie (2017) finds that though company uptake of the UNGPs is becoming more widespread, it remains partial and is not yet deep enough. However, uptake is not limited to Western firms or governments. A dozen developing countries already have issued or are in the process of developing National Action Plans. Even regulatory authorities in China are recommending that Chinese mining companies should "observe the UN Guiding Principles on Business and Human Rights during the entire life-cycle of the mining project." The International Bar Association has also issued an official guidance on what the UNGPs mean for law firms as businesses in their own right, and in their role as wise counsel to clients. The governing body of international football, FIFA has agreed to align it processes with UNGPs in the furor after awarding successive World Cups to Russia and Qatar that are seen as not respecting human rights[126]. The International Olympic Committee is considering a similar move.

UNGPs are getting entrenched in public domain and on UN process for uptake. For example, a white paper issued by a group of major investment banks in early 2017 which claimed that under the UNGPs investment banks have very limited responsibility for what their clients do with loans or advice the banks provide to them generated widespread push-back from civil society forcing the group to have to clarify several times[127].

9.4 The need for greater engagement of home countries

Most of the environmental and social impacts of minerals extraction discussed in Chapters 4 and 5 occur in the upstream end of the mining value chain. Further, as discussed in chapter 6, many governance challenges that give rise to the resource curse phenomena are most intense in the upstream part of the extractive value chain. Therefore, governance initiatives tend to focus on the upstream end of the value-chain. However, given the complexity of today's globalized value chains in commodity extraction and trading, responsibilities related to these value chains accrue to different actors. These include not only the host state and the multinational enterprise (directly or indirectly) involved in the mining as such, but also the investor's home state and international governance. All of these actors share the responsibilities to avoid and compensate for social and environmental impacts of mining and the other challenges associated with extractive activities; and each actor has a different task in fulfilling those responsibilities.

[126] Problems in Russia included its anti-LGBTQ law and the manner of land acquisition by the authorities for tournament purposes. In Qatar the core issue is migrant workers who essentially become bonded labor, exploited by recruitment firms and contractors (and even more so by subcontractors) building stadiums and other infrastructure.

[127]For more information see. https://www.business-humanrights.org/en/thun-group-of-banks-releases-new-discussion-paper-on-implications-of-un-guiding-principles-for-corporate-investment-banks.

Accordingly, it would be wrong to conceive negative environmental impacts as being solely the responsibility of enterprises and states directly involved in commodity extraction. Companies indirectly involved, such as through trading activities and the provision of logistics services, are also responsible for negative environmental impacts, being causally linked to the impacts through their supply chain (Bürgi *et al.*, 2015). The degree of responsibility depends on the degree of the causality of actions. This is also where the responsibility of the home states of indirectly involved multinational enterprises becomes relevant. A simple dichotomy between home and host countries fails to account for the complexity of mineral value chains. Many commodity companies engage in different, vertically integrated activities along the value chains of specific commodities; and they run operations at different stages of extraction, processing, and distribution of the product. For example, copper may be mined and extracted from the ore into refined copper bars in country A, in operations owned by a company from country B. The bars may then be exported to country C, where another country B-owned operation may turn the bars into wire, which is then exported to the country D, where it is built into electric motors. An investment has diverse impacts at each of these intermediate-processing stages (Gereffi & Fernandez-Stark, 2011).

In international law, such a framework of shared responsibility for environmental impacts can be derived from the existing human rights framework and – to a certain extent – from existing international environmental law (Bürgi, 2015a; Bürgi, 2015b). In addition, new concepts are seeking to capture the idea of shared responsibility in greater detail. One of these concepts is the emerging principle of common concern, which is invoked in several international treaties. The principle of common concern goes beyond the concept of the common heritage of mankind or the concept of global commons; it encompasses all uses of natural resources that are of common interest to the global community, irrespective of whether or not the resources are classified as heritage. Attempts at a more detailed definition of the principle of common concern are ongoing. Evolving theory suggests that it ought to be applied to problems related to natural resources, which cannot be solved unilaterally. There should be a common interest in resolving these issues, and equity-related questions should be concerned. If these conditions are fulfilled, a general duty to cooperate is affirmed (irrespective of the classification as a home or host state); and in the absence of common action, an actor may act unilaterally (Cottier, 2012). Given the globally shared interest in minerals, it should not be too difficult to affirm the existence of a “common concern”. This means that international governance also has a responsibility to avoid market failures in mining.

As regards home states’ responsibility to avoid market failures in mining, a key question centres around the extent to which a home state is responsible for actions occurring beyond its borders - also referred to as “extraterritorial” actions (see 9.3). In recent years, this question has been discussed extensively in the business and human rights debate. The “business and environment” debate has also offered some promising responses; particularly within the scope of the green economy agenda (see Section 4.2.9). Nonetheless, we are still a long way from an international recognized framework providing clear guidelines on regulatory questions of “extraterritoriality”. However, since international law is most advanced in respect of human rights, drawing lessons from the human rights framework can help to uncover regulatory gaps in environmental law. This, in turn, is an important step on the way to closing responsibility and liability gaps in globalized integrated value chains. The ensuing discussion points to the need for a governance framework that ties home and host countries in a shared responsibility.

The new focus on home states raises the question to which extent binding standards might be necessary to ensure that companies act responsibly across value chains. While the primary focus of these processes is on the implementation of human rights, environmental concerns have been included or not included on an arbitrary basis. Box 9.6 discusses the processes taking place in Switzerland. The Switzerland case is especially pertinent given the powerful role in plays in global value chains as a major commodity trading hub (see Box 9.6). The case for transparency can be further strengthened by existing initiatives that seek to compel companies to disclose what they pay to national governments. Publish What You Pay (PWYP) and Extractive Industries Transparency Initiative (EITI). Compelling home countries and also home countries companies involved in minerals value chains to be part of EITI and PWYP processes can further increase the engagement of home countries. It is instructive to note that EU reporting systems are making transparency easier.

Box 9.6 The Responsible Business Initiative in Switzerland

Switzerland is a good case study of the shift from a host state perspective to a home state perspective in governance. This shift of perspective is to a large extent the result of Civil Society Organizations (CSOs) – including Public, Eye, Alliance Sud, and Bread for All. The CSOs managed to raise the interest of a broad public in Switzerland in the Business and Human Rights agenda. As a result, the implications of the 2011 UN Guiding Principles are widely discussed, not only in both the executive and legislative branches of the Swiss government, but also in business forums and in the media.

The Responsible Business Initiative which is supported by about 80 CSOs and demands the introduction of a new Article 101a "Responsibility of Business" in the Swiss constitution. If the initiative is accepted, the Swiss government will have to put in place a legislation on "a mandatory due diligence". This includes a legal obligation for Swiss business enterprises to incorporate processes ensuring that human rights and the environment are effectively respected. This also extends to the enterprises' actions abroad, and to the companies under their control. According to the initiative, c*arrying out appropriate due diligence requires enterprises to "identify real and potential impacts on internationally recognized human rights and the environment"; "take appropriate measures to prevent the violation of internationally recognized human rights and international environmental standards"; "cease existing violations"; and "account for the actions taken".*

The initiative has triggered several parliamentary acts as well as a stakeholder process initiated by the Swiss government seeking ways to implement the 2011 UN Guiding Principles. So far, this has resulted in the issuing of a National Action Plan (NAP) by the Swiss government. In this NAP, the Federal Council recognizes that Swiss companies should carry out human rights' due diligence not only within, but also beyond Switzerland. However, it recommends not to go beyond voluntary standards, at least as long as mandatory standards are not widely established in other countries. Potential regulation in this area would have to have a broad base of international support to avoid placing Switzerland at a disadvantage as a business location.

Beyond human rights and environmental issues, another concern has been transparency in financial affairs and illicit financial flows. The Federal Council issued a background report on commodities in 2013. The aim is to ensure that Switzerland's strong commodity trading sector acts responsibly, and thereby to avoid reputational risks.

These developments have fostered innovative legislative processes in Switzerland whose end is not yet in sight. If Swiss voters accept the initiative, new obligations will have to be implemented into national law. With respect to human rights, the 2011 UN Guiding Principles explains quite clearly how obligations related to due diligence can be framed. With respect to the environment, however, the lack of a consistent framework assembling all established and emerging legal principles in this field of law will make this task much more difficult. The strength of new legal provisions in Swiss law will also depend on their legitimacy, which in turn depends on the extent to which the actors concerned have already accepted such duties as good practice.

In addition, efforts have been made to strengthen non-binding CSR frameworks. These efforts center on the OECD Guidelines on Multinational Enterprises. The Swiss OECD National Contact Point (NCP) provides an institution for mediation between companies and victims. Processes to render the NCP more effective and transparent are underway (OECD, 2017; Mugglin, 2017). Furthermore, the Swiss government has supported sector-driven private initiatives – for example, of the banking sector – to "translate" and implement the UN Guiding Principles.

9.5 The need for responsible business practices

At the local level, extractive activities are expected to provide jobs and local development, while at the national level there are expectations that revenues (taxes and royalties) will fund development projects. However, this is not usually the case. The highly capital-intensive nature of the industry means that few jobs are created (APR, 2013; NRC 2010; Pedro, 2017). Similarly, the enclave nature of the sector means that there are few linkages to the local economy (APR, 2013; NRC 2010; Pedro, 2017). At the national level, as we discussed in chapter 6, there are significant revenue leakages through accounting practices of mining companies and other forms of illicit financial flows (Pun, 2017; Le Billon 2011; APR 2013). This means that development objectives are not fully realised. Mining companies have tried to mitigate these through CSR activities at local levels and greater transparency through joining platforms like EITI at the national. These efforts, however, have not been adequate, which has led to clamour for greater local content and local participation in extractive value chains through legal mandates (AMV,2016; Pedro, 2017).

While this is leading to more responsible business practices, there is a need for greater integration of these practices in companies' strategies. The industry, through ICMM, has been pushing it members towards this direction and many of its members are now part of the GRI that keeps track of responsible practices (see Box 9.7).

Box 9.7 ICMM and Sustainable Development

ICMM is a CEO-led international organisation of mining and metals companies established in 2001 to ensure members' continued access to resources, capital and markets, by improving their performance on sustainability. ICMM's 25 company members have responsibility for more than 900 sites in more than 50 countries. Collectively, they account for between 30 – 50 per cent of global production of many major commodities such as aluminium, copper, iron ore and gold. ICMM seeks to minimise the impacts of mining and maximise its benefits, enhancing mining's contribution to society through strengthening the environmental, social and economic performance of the industry, and championing the responsible production of the materials

ICMM's work on sustainability is organised into three thematic areas:

- Environmental stewardship: Mining operations and host communities all depend on water, land and energy. Companies are increasingly expected to demonstrate responsible stewardship to secure access to these shared resources. Many firms are also involved in reducing emissions, supporting low-emission technologies and helping the communities in which they operate to adapt to the effects of climate change.
- Role of mining and metals in society: The mining and metals industry can help societies and economies develop, particularly in non-OECD countries. By supporting learning and contributing to economic and social progress, the industry delivers benefits beyond the direct jobs it creates and the taxes it pays.
- Human wellbeing: Responsible mining and metals production puts people first. This means a firm commitment to the safety, wellbeing and social development of the communities in which we operate. Despite the hazards of the industry, workplace accidents and occupational diseases are preventable through effective risk management; we are constantly looking at ways to help raise health and safety standards in our sector.

ICMM aims to achieve change through a number of avenues including:

Partnerships: ICMM has sustained engagement with international organisations such as the United Nations, OECD, World Bank, International Maritime Organisation, and leading civil society organisations like Amnesty International, GRI, Oxfam and WWF.

Training and Toolkits: ICMM has developed toolkits and best practice guidance in partnership with other stakeholders e.g. the water reporting guidance and guidance on managing impacts with communities. ICMM is also active in training through webinars and regional workshops on managing community relationships, closure, and water management.

In its pursuit of sustainability goals, ICMM has established 10 principles that members must adhere to. These are: (1) ethical business and sound governance; (2) sustainable development in decision-making; (3) respect for human rights; (4) effective risk management; (5) health and safety performance; (6) environmental performance; (7) conservation of biodiversity and land-use planning; (8) responsible use and supply of materials; (9) social contribution; (10) engagement and transparent reporting.

Member companies commit to implementing 10 principles and 8 position statements for sustainable development. These principles are benchmarked against leading international standards including the Global Reporting Initiative, the Global Compact and the Voluntary Principles on Security and Human Rights.

Part of the core of ICMM requirements is sustainability reporting. All member companies are expected to implement and publish independently verified reports on their sustainability performance. At the core of the framework is a requirement to use the Global Reporting Initiative (GRI) framework and its Mining and Metals Sector Supplement (MMSS). This is perhaps where the ICMM initiative is most challenged as many scholars have critiqued the GRI framework.

Fonsceca *et al*. (2012) summarizes some of the criticisms of GRI reporting as follows:

- GRI approach to reporting sustainability has significant problems that may ultimately camouflage organizations' un-sustainability as companies who follow the GRI framework tend to focus on specific issues within their organizations, running "the risk of losing sight of the big picture for sustainability. This practice can actually lead to flawed decision-making.
- The indicators run the risk of translating into generic, non-contextual statements about the company's overall plans and goals. For example, a model biodiversity program in a particular site may very well obscure biodiversity losses in different regions for companies that have many sites.
- Scholars have also criticized GRI-based sustainability reports for presenting unreliable information. These critics often argue that corporations are "cherry-picking" issues and manipulating the reporting process to portray an image of a socially and environmentally responsible company.

Aware of this problem, ICMM launched an Assurance Procedure that is helping to promote third-party auditing in mining companies' reporting practices. But Fonseca *et al.* (2012) argue that the role of third-party assurance is not to question the design of the GRI framework; rather it is concerned with the extent to which mining companies are complying with GRI. The auditors therefore cannot properly address misinformation, such as optimistic statements and incorrectly aggregated data that may be produced due to the framework's inherent flaws. They argue that the problems of GRI reporting stem first from the misuse of the framework's required principles and indicators. However, they posit that even if mining corporations were to fully comply with the GRI framework such an effort would be largely insufficient to structure a sustainability assessment and reporting process that could meet gold standard of sustainability reporting – The Bellagio Principles. They point that the GRI approach to assessing and communicating mining contributions to sustainability has gaps within each analysed principle.

While industry self-regulation and national mandates can go a long way in institutionalizing responsible business practices, the transparency and global nature of extractive value chain means that all gaps can be addressed. This makes a strong case for an overarching framework to guide responsible practices. For example, environmental practices can only achieve desired impacts if they are anchored in instruments that extend beyond national boundaries. One such proposal is the UN Guiding Principles on Business Environment (see Box 9.8).

Box 9.8 Case for UN Guiding Principles on Business and the Environment?

Given the legitimacy of the Ruggie framework and the fact that its structure has been widely-adopted to frame state duties and corporate responsibilities, its systemic approach could "provide a model to address State duties and business responsibilities to care for the environment" (Jesse & Koppe, 2013, p. 188). Jesse & Koppe (2013) even recommend analogous pillars, including (1) a state duty to care for the environment, (2) a responsibility of business enterprises to care for the environment, and (3) access for stakeholders to remedies in relation to breaches of these duties and responsibilities.

The scope of such a corporate responsibility and (home) state duty vis-à-vis the environment would need to be carefully laid out in Guiding Principles on Business and the Environment. On the one hand, substantive content may be derived from binding international environmental law, as codified in international environmental treaties or reflected in general principles of law and international customary law. On the other hand, specific environmental duties can be deduced from the above-mentioned, widely recognized voluntary CSR frameworks – including the OECD Guidelines, the UN Global Compact, and the ISO 26000 standards – but also from sector specific voluntary settings. In order to gain legitimacy, it will be important to refer to the legal basis in the corresponding explanations.

Jesse & Koppe (2013) have carefully compiled the most relevant general principles of international environmental law while also reflecting upon their meaning in a business context. Examples include the principle of prevention and the precautionary principle, the principle of good neighbourliness or the maxim *sic utere tuo ut alienum non laedas*. The prohibition of causing transboundary pollution is recognized as a rule of customary international law. It is further submitted that this prohibition, or a "duty of care is not limited to the environment in other states and to the environment in areas beyond national jurisdiction, but also extends to the environment – both the human environment and the environment as such – within states' own jurisdictions." While states have the sovereign right to exploit their own resources, such exploitation must be carried out with due regard to the environment, a duty which is reflected in a number of international agreements. In addition, a range of environmental standards frequently included in voluntary CSR frameworks is sufficiently recognized to nurture an overall environmental responsibility framework (Bürgi, 2015b; Jesse & Koppe, 2013). As with the Ruggie framework, the UN Guiding Principles on Business and the Environment would not need to be entirely built on binding law, but their legitimacy and success would depend on the extent to which the concerned business community and civil society accept the specific rules as adequate.

As pointed out in Chapter 1, extractive resources have the potential to deliver on the SDGs. This will require that responsible business practices be woven in all aspects of extractive activities. This topic is addressed in the next chapter.

9.6 The need for balance between security of supply concerns vs sustainable development aspirations

Though much of the extractive industry is located in OECD countries and emerging economies, extractive industries are important to the economies of many developing countries[128]. However,

[128] OECD is a group of mostly industrialized and wealthy countries that support free market. The 34-member countries are: Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain,

output from developing countries is largely used in the more developed countries as inputs to many key industries and thus these imports are also crucial to the economies of importing countries. This means that for developed countries, security of supply is of outmost importance, while for most resource-rich countries, development is the main concern. While both objectives can be achieved simultaneously this can be a challenge. Security of supply may override concerns for good governance and in many cases, minerals become the key enabler of poor governance. The clamour for quick development may also bring about resource nationalism (Box 9.9) that can dampen investment and deny people the much-needed development.

Box 9.9. Resource nationalism

Resource nationalism is characterized by the tendency for producer states to take (or seek to take) direct and increasing control of economic activity in natural resource sectors (Ward, 2009). Resource nationalism might be considered no more than a case of producer nations 'wanting to make the most of their endowment' (Andreason, 2015). Resource nationalism presents itself in various forms, including raising taxes and royalties, increases in local content requirements, indigenisation and local equity requirements, domestic processing, value addition, and the review and renegotiation of contracts (Botham, 2018).

The market cycle theory posits that commodity super-cycles prompt an increase in state intervention as governments seek to increase their share of revenue from rising commodity prices. Likewise, during periods of depressed prices governments of resource dependent countries implement various policy interventions, protectionist measures and new laws to increase revenue to counteract decreased revenues. However, Ward (2009) points that resource nationalism today is driven by a far more complex and varied set of factors than price alone, unlike that of the 1970s. It needs to be understood in the context of global concern for resource security, climate change, sustainable development and poverty reduction.

Therefore, a key pre-requisite for an effective governance system is that it is able to meet the two requirements, thereby creating a symbiotic relationship. The European Union Raw Material Initiative aims to strike this balance (See Box 9.10).

Box 9.10 EU- Raw Materials Initiative (RMI)

Given the continued and growing strategic importance of raw materials for European manufacturing industry, where one of the main drivers is the shift to a low carbon and circular economy, the European Union is implementing a wide range of actions under the EU Raw Materials Initiative (RMI) to help ensuring their secure, sustainable, responsible and affordable supply.

RMI has three pillars which aim to ensure:

1. Fair and sustainable supply of raw materials from global markets.
2. Sustainable supply of raw materials within the EU.
3. Resource efficiency and supply of "secondary raw materials" through recycling.

Sweden, Switzerland, Turkey, the United Kingdom, and the United States. Emerging economies are economies that are not too rich, not too poor and not too closed to foreign capital (Economist 2017).[128] Countries that fall into this category are usually considered emerging because of their developments and reforms. The IMF, the International Monetary Fund (IMF) classifies 23 countries as emerging markets. These are: Argentina, Bangladesh, Brazil, Bulgaria, Chile, China, Colombia, Hungary, Indonesia, India, Malaysia. Developing countries are countries that are not rich. The World Bank (though it no longer uses the term developing countries) classifies countries into four income categories using GNI per capita Low-income (<n $1,035); lower middle income ($1,036 - $4,085) upper middle income ($4,086 a- $12,615); and high- income (> $12,615). Low- and middle-income economies are usually referred to as developing economies, and the Upper Middle Income and the High Income are referred to as Developed Countries. The United Nations classifies 3 categories of countries: Developed, Countries in Transitions and Developing Countries. It is not clear what criteria is used to demarcate countries though it seems like it is the GNI per capita

Raw materials, in particular Critical Raw Materials, are important for the competitiveness of European key industrial value chains, including automobile, machinery, electrical engineering, ICT or defence sectors. Their availability is also a fundamental precondition for the transition to a low-carbon and circular economy, including e-mobility and renewable energy. This is what makes responsible sourcing and extraction of Raw Materials play an even more prominent role in RMI. Recognition of this fact features also prominently in the renewed EU industrial policy strategy adopted in September 2017.

Global demand for raw materials will increase as a consequence of growth in developing countries. It is important to keep in mind that the United Nations projects world population to reach 8.6 billion by 2030. Therefore, even in a perfect circular economy primary production of raw materials will remain necessary. Consequently, this will put a considerable and increasing pressure on resource-rich countries, their natural environment and local communities at extraction sites. Moreover, economic development, stabilisation of labour markets, migration levels and limiting poverty in numerous resource-rich countries depends considerably on an income from extraction of mineral resources. Therefore, increasing attention must be paid to the environmental and social impacts of their production, both in the EU and in non-EU countries.

The traditional approach assuring economic security of raw materials supply has been over the last years more and more complemented by responsible and sustainable governance, sourcing and extraction of raw materials. This evolution has potential to become a driver for responsible and sustainable growth and jobs both in the EU and in third countries. However, an important precondition is the capacity to monitor the sustainability of value chains sourcing raw materials. This requires their full transparency, availability of data and evidence.

The European vision is firmly committed to implementing the 17 Sustainable Development Goals (SDGs). The SDGs framework does not include an explicit goal on raw materials. However, raw materials sectors can contribute, directly or indirectly, to all goals. The EU supports SDGs implementation politically and financially via numerous EU and international actions. This includes the EU's Non-Financial Reporting Directive, Accounting and Transparency Directive, Conflict Minerals Regulation or Extractive Industry Transparency Initiative, OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas, European Partnership for Responsible Minerals.

The latest important EU policy linked to raw materials was issued on 17th May 2018. The European Commission adopted the agenda for safe, clean and connected mobility accompanied by the Strategic Action Plan for Batteries. Among others, the Action Plan aims at facilitating access to European sources of raw materials and at securing access to raw materials from resource-rich countries outside the EU. The Action Plan announces among others:

1. Using all appropriate trade policy instruments, such as Free Trade Agreements, to ensure fair and sustainable access to raw materials in third countries and promoting socially responsible mining.
2. Promoting ethical sourcing of raw materials for the batteries industry.

The EU approach on responsible and sustainable governance, sourcing and extraction of raw materials will be discussed and explained during the Raw Materials Week 2018 (http://eurawmaterialsweek.eu/events.html)

9.7 The need for data, information and knowledge

Information is crucial to making good decisions. However, the diversity of actors in the extractive value chain means the various actors require different types of information. As pointed out earlier (Chapter 7), due to significant variations in capacities of the actors, there are huge differences in information available (information asymmetry). This asymmetry means that some actors can capture disproportionate share of extracted resources creating the basis for the contestation that is a feature of the extractive value chain. Even when information asymmetry is not exploited to the benefit of the informed, it still creates mistrust that can lead to misunderstandings and even conflict. In recognition of the importance of access to information for effective public participation, the Aarhus Convention was promulgated (see Box 9.11).

Box 9.11 Aarhus Convention: increasing public participation in decision-making

The Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) recognizes access to information as a pre-requisite to effective public participation in policy formulation and decision-making. The Aarhus Convention grants the public broad and concrete rights of participation in decision-making and imposes on parties and public authorities, obligations regarding access to information. Among the obligations it imposes on Parties is the need to make environmental information available within no more than two months of a request; ensure that public institutions have and update relevant environmental information; encourage operators to inform the public regularly of the environmental impact of their activities; provide for public participation procedures which allow sufficient time and supply enough information for the public to participate effectively in decision-making; take due account of the outcome of the public participation process; and ensure that persons exercising their rights are not penalised, persecuted or harassed (ECA, 2004:15).

Accurate information requires that data be available and accessible to users. However, data collection can be a challenge due to the lack of transparency prevalent in the sector. This has been a concern of the civil society, which has prompted the establishment of initiatives (for example, EITI, StAR, PWYP) that focus on this as we showed in Chapter 7. Transparency alone is not enough as actors can be overwhelmed by information overload. This underscores the need for capacity to process the data and make it relevant to various stakeholders. Therefore, equipping stakeholders, especially the public with ICT tools and providing them with the knowledge to use the tools and make sense of the outputs is vital. On the government side, effective communication for policy-making needs to go beyond simple disclosures and develop a practice of two-way communication and careful explanation of government decisions; and the reasons behind them. Information and effective communication is particular key in meeting the threshold of Free, Prior and informed Consent especially with respect to indigenous peoples (see Box 9.12).

Box 9.12 Free Prior and Informed Consent (FPIC)

The ILO convention 169 discussed in Box 9.4 has been further strengthened by the 2007, the UN General Assembly adopted the United Nations Declaration on the Rights of Indigenous Peoples, recognizing their rights and making specific mention of Free, Prior and Informed Consent (FPIC) as a pre-requisite for any activity that affects their ancestral lands, territories and natural resources.

Free, Prior and Informed Consent (FPIC) is understood as follows:

- Free implies that there is no coercion, intimidation or manipulation;
- Prior implies that consent is to be sought sufficiently in advance of any authorization or commencement of activities and respect is shown to time requirements of indigenous consultation/consensus processes; and
- Informed implies that information is provided that covers a range of aspects, including the nature, size, pace, reversibility and scope of any proposed project or activity; the purpose of the project as well as its duration; locality and areas affected; a preliminary assessment of the likely economic, social, cultural and environmental impact, including potential risks; personnel likely to be involved in the execution of the project; and procedures the project may entail. This process may include the option of withholding consent. Consultation and participation are crucial components of a consent process.

FAO (2016) points that for an FPIC process to be effective and result in consent or lack of it, the way in which the process is conducted is paramount. The time allocated for the discussions among the indigenous peoples, the cultural appropriateness of the way the information is conveyed, and the involvement of the whole community, including key groups like women, the elderly and the youth in the process, are all essential. A thorough and well carried FPIC process helps guarantee everyone's right to self-determination, allowing them to participate in decisions that affect their lives. FAO (2016) also points that in the last two or three years, development experts have recognized that FPIC is not only important for indigenous peoples but it is also good practice to undertake with local communities, as involving them in the decision making of any proposed development activity increases their sense of ownership and engagement and, moreover, helps guarantee their right to development as a basic human rights principle.

The challenge around data relates not only to the mineral resource data, but also a suite of other social and environmental variables. Increasing accessibility and availability of data for use in the decision-making process does, however, require overcoming significant technical, social, and political barriers. At the global scale a number of tools have been developed to help increase access, including the Integrated Biodiversity Assessment Tool for biodiversity data. Taking on this broader challenge of integrating data to increase transparency and reduce conflicts, MAP-X has developed simple to use platforms (see Box A9.1).

9.8. Conclusion and way forward

The discussion in this chapter provides the context within which a governance framework must work. It elaborates seven pre-requisites (need for a holistic framework, need to decouple economic growth from environmental and social impacts, need for respect of human rights, need for greater home country engagement, need for responsible business practices, need for a balance between security of supply (global north) and sustainable development aspirations (global south) and the need for data, information and knowledge) that are crucial for an effective governance framework. Also, as discussed in previous chapters, there exist several instruments that address (in very instructive ways) the challenges of governance from different perspectives.

Lockwood *et al*. (2010; citing Howlett & Rayner, 2006) point that the term *new governance* has emerged to describe a mode of governing that shows a preference for collaborative approaches among government and non-government actors from the private sector and civil society. They indicate that this is crucial in policy areas that are informed by the discourse of sustainability. The authors also revealed that a new governance regime has an explicit ethical foundation in notions of participation, responsibility, stewardship and duty of care, which makes novel demands on institutions and policy.
Potential high-level approaches to a new natural resource governance framework have been advanced. The next two chapters seek to flesh out these approaches in much more detail.

Annex Box A9.1

Box A9.1 MapX CASE STUDY – Mapping and monitoring the sustainable use of natural resources[129]

Conflicts in the extractives sector threaten national cohesion and peace, and prevent the sector from making important development contributions. Indeed, one of the key manifestations of the resource curse is conflict. This is mainly driven by competition to control and thus capture the benefits from mineral resources. As was mentioned in chapter 6, there are many initiatives that are designed to reduce conflict and ensure minerals are conflict free. While competition over control/ownership of resources drives many of the resource-based conflicts, conflicts can also be grievance-driven as largely attributed to the externalities of extractive activities including pollution (see chapter 5).

In Peru, over $ 8.5 billion of investment in the extractive sector has been blocked due to conflicts, whilst such conflict has resulted in 53 people having been killed and more than 1,500 injured over the past 15 years. An estimated 80% of conflicts in the country were related to the environmental impacts of mining operations; above all, on the availability and quality of water resources. The International Finance Corporation and the International Council of Mining and Metals have found that 70% of operations of the world's biggest mining companies are located in water stressed areas. The impacts of climate change, including increasing water scarcity, can aggravate this situation. Appropriate governance responses are needed to address this. For instance, Principle 10 of the Rio Declaration emphasizes the need for citizens to have appropriate access to information concerning the environment that is held by public authorities and the opportunity to participate in decision-making processes.

Whereas a number of global initiatives are already promoting greater transparency in the sector, environmental transparency is often neglected. Transparency and accountability initiatives tend to focus to a greater extent on transparency on revenues and contracts, as in the case of EITI. While financial transparency is critically important, nevertheless concerns of local communities in the vicinity of operations tend to focus on the more immediate impacts of a project. This includes, for example, the impact of operations on the availability and quality of local water supplies or the number of local jobs created. Information on such impacts will help citizens understand the distribution of benefits and risks across a project lifecycle.

Much like other industries, the mining industry is undergoing dramatic transformations brought about by the information and communication technologies that are driving the fourth industrial revolution. These technologies include robotics, autonomous vehicles and 3D printing, which impact production and efficiency of mining operations. More crucially, the industry has embraced 'big data', producing ever more information relating to its operations. These technological developments have fundamentally altered how companies interact, communicate and share information with their stakeholders. These technologies can also empower people in their interactions with the extractive sector as it also allows them to access much of the information generated and also new information to reduce information asymmetry that has usually benefited mining companies.

Mandated by the G7+ group of fragile and conflict-affected states, UN Environment has partnered with the World Bank to develop an integrated information management and stakeholder engagement platform for the extractives sector. The online platform consolidates and authenticates information on the financial, social and environmental impacts of projects at the site, district or national level, and displays this information on a map to help analyse the performance and development outcomes linked to the extractives sector. MapX allows for multi-party data sharing and provides access to a range of datasets held by the government, private sector operators, academia, development partners and local communities in a single location. MapX implementing partners support stakeholders in a structured co-design process to identify specific information needs, improve the uptake of data within dialogue, decision-making and performance monitoring processes.

MapX is being designed to provide stakeholders with access to the "best available data" on an unbiased platform that includes a transparent authentication process for each layer. Impartial data authentication is

[129] Contributed by David Jensen and Inga Petersen

important as it helps build trust in the information. Prior to publication on MapX, each dataset is scored against a series of data integrity indicators including data sustainability, reliability, accessibility and openness as part of an independent assessment process. MapX then tracks the performance of each dataset over time to build trust in the information and provide feedback to data providers to improve data quality.

In the Democratic Republic of Congo, MapX is being implemented to support four separate objectives:

- Host Extractive Industries Transparency Initiative (EITI) reports and related company-level, site-specific data in order to provide users with project-level information dashboards and performance monitoring tools.
- Help EITI stakeholders visualize and contextualize information about impacts of the extractives to improve understanding and informed decision-making.
- Facilitate the mainstreaming of EITI data with other national datasets by integrating all key layers into a single platform using a spatial data infrastructure.
- Apply the data integrity assessment to provide quality monitoring of national data sets.

Even though the platform is still in the early stages of implementation, a number of lessons have started to emerge. First, relating payment and production information to individual mining concessions is critically important in order to bring financial data to life and make it relevant to local communities. MapX visualizes payments at the site level by concession or company. It dynamically streams live data from the national mining cadastre and matches this with EITI payment data in order to visualize the total volume of payments across the country. The resulting financial heat map can then be compared to other key socio-economic indicators to determine important correlations including human development indicators for example.

Second, top-down, one-size-fits-all solutions do not exist. Stakeholders in the extractives sector demand solutions that can adapt to local circumstances, build on existing national or local systems, and provide tools that are specific to the context. In DR Congo, for example, MapX was customized to track changes in specific variables and land cover over time. This resulted in the development of a dedicated time slider tool following specific demands for this functionality by platform users.

Third, information needs to be disaggregated by project to be truly relevant to local stakeholders. Above all else, local stakeholders want to know how an extractive project is impacting and benefiting their communities. MapX has developed project-specific dashboards, which display key information such as ownership, annual production, workforce statistics etc. This allows for monitoring of benefit and community development agreements and can also be used to share the company’s environmental performance data.

Fourth, in order to ensure sustainability of the platform, it needs to be embedded in government systems. In DR Congo, MapX helped identify overlaps between mining concessions and protected areas, providing critical data points for the national ministry of planning. In addition to embedding the platform in national government systems, stakeholders also require targeted and sustained capacity building to ensure the long-term use of the platform.

Last but not least, the information included in MapX may need to be interpreted, visualised and packaged in different formats to reach the intended audience. In order for all stakeholders to benefit from the information presented on the platform, going forward MapX will need to develop targeted outreach products in appropriate formats that take local capacity such as literacy rates into account. This could include translation into local languages or tailored offline products such as printed maps, for example.

In summary, MapX was able to demonstrate in DR Congo that transparency in the extractive sector is not an end in itself. Customised tools are required to utilise transparency and access to information as an effective instrument for stakeholder engagement. In order for information to contribute to better dialogue, evidence-based decision making, and conflict prevention, the financial information needs to be related to data on the socio-economic and environmental impacts of the sector. Information is most useful for local communities if the information is disaggregated to the level of individual projects and the key takeaways are relayed in appropriate formats both online and offline.

Annex 9.1 Screenshots of MapX[130]

(More information on the MapX website is available at www.mapx.org)

Figure A9.1: MapX implementation of the data integrity framework. Here depicted the composite score obtained by one of the data layers in DR Congo

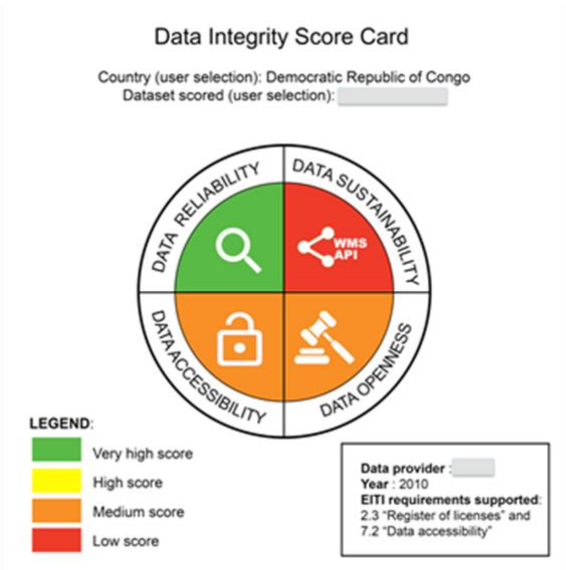


Figure 2: Example of a heat map – The map shows how high concessions payments contrast with high poverty rates in Eastern DR Congo. (note: the example is for demonstration purposes only and does not show authenticated data)

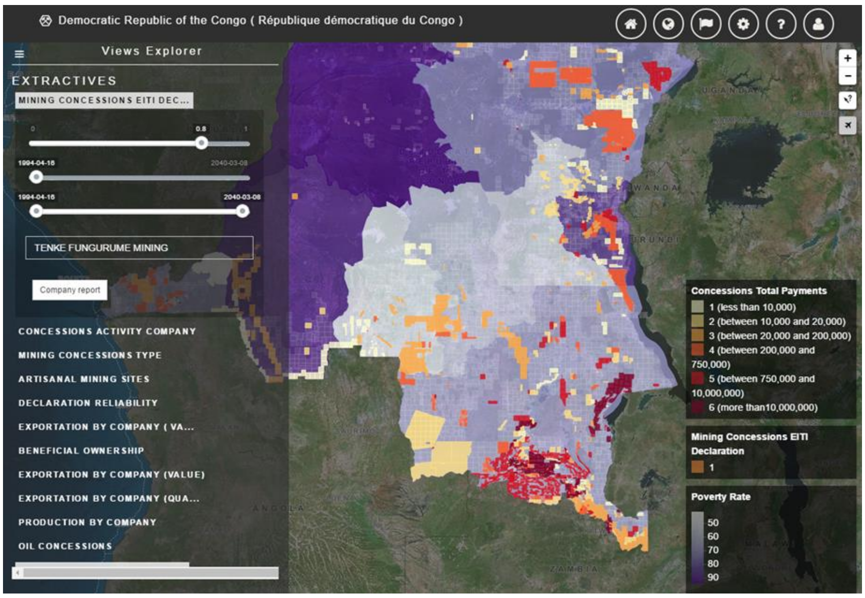


Figure 3: Satellite image of Tenke Fungurume mining operations in DR Congo

130 Contributed by David Jensen and Inga Petersen

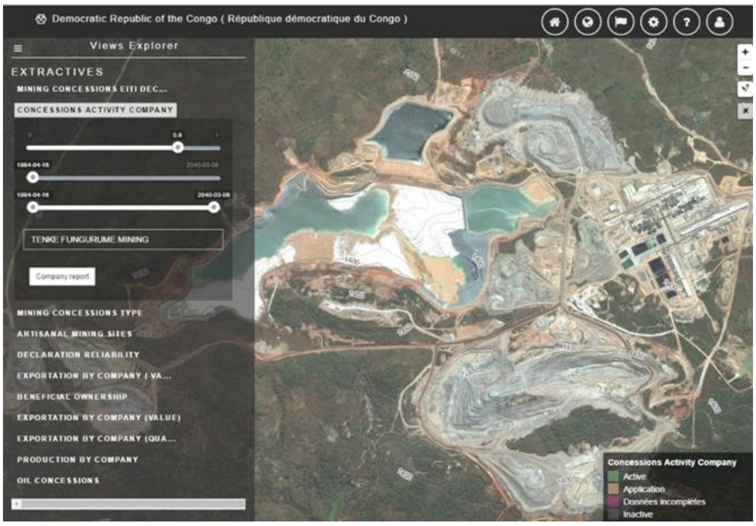
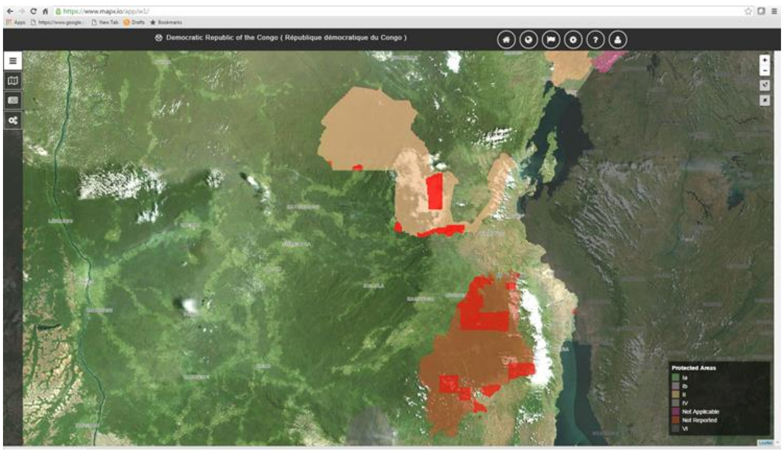


Figure 4: Corresponding company specific performance dashboard of Tenke Fungurume mining

Figure 5: Overlap analysis of protected areas and expired mining exploration licences in North Eastern DR Congo



PART 3: MINERAL RESOURCE GOVERNANCE FOR SUSTAINABLE DEVELOPMENT

Chapter 10 -Towards a Sustainable Development Licence to Operate

10.0 Introduction

As pointed out in the earlier parts of this report, mineral wealth provides an opportunity for the transformation of livelihoods by leveraging resource earnings and other development opportunities[131] to transform economies and build new sources of competitiveness. This has been the case of some of the resource-rich OECD countries such as Sweden. Indeed, the resources sector can generate direct, indirect and induced multiplier effects (ICMM, 2015: 35-40) as well as spawn new industries or through backward, forward, spatial and other linkages facilitate development in other sectors of the economy that can be more important than the mineral resources sector itself. However, this is easier said than done. The resource curse remains a challenge for many resource-rich countries.

In chapters 2 and 6, we discussed that the extractive sector has failed to deliver promised benefits and indeed in some cases mineral wealth continues to fuel conflicts. Traditionally, the governance of the extractive sector has largely been defined by the relationship between mining companies and governments[132]. This relationship has mainly been predicated on the sharing of revenues centred on regulations on how the extractive industries should be carried out. However, as pointed out previously, this relationship remains problematic mainly owing to: (i) a mismatch between expectations and reality as well as divergence of perceptions about what constitutes benefits and value (WEF 2013: 6-7); (ii) lack of trust, especially on tax transparency and corporate tax payments (PWC, 2015: 28); (iii) power/information asymmetry between mining companies and governments with mining companies having an upper hand; and (iv) the tendency of a race to the bottom where governments tend to offer a lot of incentives as they compete to attract mining investments, especially when commodity prices fall (PWC 2015: 32-33).

This gives mining companies an upper hand in negotiating contracts often resulting in mining companies' interests superseding other interests, particularly those of local communities. Even when governments succeed in obtaining a fair share of revenues, the adverse outcomes of mining such as environmental and social impacts and/or other externalities of mining activities may not be adequately mitigated or compensated for. It should also be noted that governments may squander whatever mineral rents they receive or may lack capacity to manage the rents effectively and transform them into sustainable development outcomes. It should be recognized that there have been recent efforts by resource-rich countries in Africa (Algeria, Angola, Botswana, Ghana, Nigeria, and Senegal, to name a few) to develop sovereign wealth funds (SWF) to ensure better use of mineral rents. Wills & Finch (2016) argue that the results have been mixed and the key motives for their establishment, namely (i) securing intergenerational transfers, (ii) sterilising or parking resources

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[131] The transformative potential of the mineral resource sector does not derive solely from the effective use of resource rents. A point in case is trunk resource infrastructure (such as railways, and ports) which can be used to create opportunities in other sectors of the economy (such as agriculture) that cannot afford investments in such expensive infrastructure. Equally so, procurement of goods and services, which constitutes between 50-65 per cent of the production costs of a typical mining operation, can enable the emergence of a vibrant cluster of local suppliers with a significant impact to the domestic economic both in terms of job creation, acquisition of new skills and revenue flows (ICMM, 2015: 35-40).

[132] The government can be national, local or even traditional authority. This depends on the laws of the countries and how they assigned authority over resources.

abroad to cool off the economy during commodity booms, and (iii) stabilizing the economy, might not equally apply in Africa, especially in countries facing other pressing priorities.

10.2 The Social Licence to Operate

The first victims of insufficient regulation or lack of capacity to enforce regulations and manage the sector are local communities where mining activities are located since, they bear the brunt of social and environmental impacts of these activities. This fact has seen significant activism by civil society to advocate for better outcomes, and also conflicts have arisen between mining companies and the affected communities. These conflicts with communities have been shown to have high financial, opportunity and personal costs to mining companies and their personnel (Franks *et al*., 2014). In several cases, “protests and unrest at the mining site have delayed or stopped projects” (EY, 2015).

The term Social Licence to Operate (SLO) was coined in the 1990s to capture the need for mining companies to receive acceptance by local communities where they operate. SLO is thus defined as obtaining and maintaining community support and acceptance of extractive activities. In the broadest terms, SLO tends to be regarded as the ongoing acceptance or approval of extractive operations by those local community stakeholders who are affected by them and those stakeholders who can affect their profitability (Moffat *et. al*., 2016). In essence, it is about managing risk of conflict at the local level, and reputational damage at the national and international levels. SLO is now the fourth most significant business risk for mining companies (EY, 2016). Invariably, for many successive years, securing and maintaining SLO has been considered amongst the top 10 biggest business risks for mining and metals companies (EY 2015; EY 2016). Today, mining companies consider community acceptance to be as crucial as the formal licenses and permits granted by governments. They have recognized “the value and necessity of embedding sustainability in their business models and operating in tandem with communities to create mutual value and retain their SLO” (EY, 2016).

<u>A critique of SLO</u>

Since the introduction of the concept of the SLO in the late 1990s[133], it has become the prevailing discourse for ensuring the broad, on-going acceptance of mining projects by local communities and society in general. It can be regarded as a largely intangible agreement (or a form of ‘social contract’) between mining companies and civil society, based on a growing common understanding of the need for greater public participation in decision-making, a fairer share of mining proceeds and benefits, and assurances that mineral development will be conducted safely and responsibly (Prno, 2013). Despite the term’s widespread uptake by industry and the aforesaid positive attributes, the notion of a Social Licence to Operate has been criticised on several grounds. These relate to both the social licence discourse and its practical implications (Owen & Kemp, 2013).

Though intended as an abstract and unwritten construct, it is precisely its corresponding innate uncertainty that makes it problematic. The lack of clarity with respect to the substance and parameters of the social license and by whom and how it is enforced, are serious shortcomings hindering the establishment of a legitimate, structured and continuous approach to addressing public concerns in the extractive sector. The inherent ambiguity of the concept is linked to the fact that a social licence has no legal force or recognition. This has raised questions as to how it reconciles with

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[133] Ibid.

assertions that a social license is a necessary condition to operate, and whether attempts to institutionalise it can erode existing legal processes and institutions (such as established formal environmental review regimes to inform legal permissions for mineral resource development, BGS, 2015).

The use of the term 'licence' has been characterised as misleading, insofar as it suggests the granting of specific permission for, or public acceptance of, a mining project, even if the reality is one of reluctant tolerance or absence of overt opposition or conflict (BGS, 2015). This can be particularly problematic in certain political contexts where the public expression of dissent may be explicitly prohibited or otherwise punishable.

Moreover, the use of the term 'social' may serve to aggregate diverging opinions among a diverse or heterogeneous group of stakeholders, therefore masking some dissenting or marginalised views (Agrawal & Gibson, 1999; Owen & Kemp, 2013; Lesser *et al*., 2017).

The Social Licence to Operate, as its name suggests, also focuses mainly on the *social* dimension of mining projects, with less attention paid to the *environmental* component. While some environmental concerns may be addressed, if raised by local communities and other actors, the SLO is far from a comprehensive means for protecting the environment from adverse impacts associated with mining.

The fundamental critique of the Social Licence to Operate framework is that it was developed as industry's pragmatic response to business risk. Its agenda is limited to accommodating community demands to the minimum extent necessary to avoid public opposition and social conflict, and the associated costs of reputational damage and operations delays or disruptions. Some argue that it has been opportunistically used to serve the particular objectives and goals of companies, activists and governments (Bice & Moffat, 2014; Owen & Kemp, 2013).

In summary, SLO has been a response to manage risk as opposed to a response to deliver sustainable development which for the society is the key expectation. Indeed, depending on the relationship between society and the mining companies, it has been found that where livelihoods are dependent on mining companies, local communities may accept many externalities of mining activities (Moffat *et al*., 2015). So, attribution and possession of the SLO does not necessarily mean that communities obtain improved outcomes in return. In essence, SLO defines the minimum of what a mining project can get away with in a particular location. In reality, a mining company can have varying practices in different locations as the local conditions dictate what they can get away with. This narrow and business-driven agenda means that the SLO is an incomplete framework for establishing higher standards of social and environmental performance, and stakeholder engagement for long-term sustainable development.

The dissatisfaction with the current regulatory framework largely defined by Mineral Development Agreements (MDAs) between central governments and mining companies and the social contracts between mining companies and impacted communities (the SLO) has seen a significant movement in the extractive resource governance landscape as new actors have pushed the boundaries on what is acceptable practice and defined expectations over and beyond what the MDAs[134] and local communities can allow. The crucial developments include:

- The fact that mining companies can obtain SLO and still cause harm, has seen CSOs seek to expand what is acceptable and what is not acceptable. It should be noted that SLO is granted by those impacted and those who can impact on the profitability of the company. The fact that CSOs have the potential to impact on mining companies has meant that they have expanded the stakeholder community that mining companies have to contend with. For example, the push for greater transparency such as the EITI has been the work of international CSOs
- At the national level, the contribution of mining activities to the broader economy has been questioned. There has been a growing clamor for a shift away from the enclave nature of the extractive sector to the promotion of greater value addition and linkages between the extractive sector and other sectors of the local and national economies. Many countries have been enacting local content and local participation policies. The Africa Mining Vision has produced a framework to forge greater linkage of mining activities to local economies (see Box 1.2)
- Crucially, consumers of final products are also increasingly concerned about how the products have been sourced. Sustainable consumption is becoming a global trend and mining companies, being part of the global supply chains, have to demonstrate sustainability of their practices.
- Home countries are also becoming more active in regulating mining companies as pressure for responsible sourcing by consumers /citizens increases. New laws and regulations that govern how companies behave and source abroad – for example, the Dodd-Franks Acts – are being put in place.
- Growing divestment or disinvestment trend among institutional investors who are removing stocks from companies, which they consider a high ethical risk[135] because of their questionable human rights record, social concerns, health and safety practices, corruption and taxation scorecard, and/or environmental and climate change performance.
- At the international governance level, environmental issues have been elevated to the global level and increasingly regulated by Multilateral Environment Agreements (MEAs).
- Industry has also sought to raise the bar and make sustainable development a key outcome; an example being ICMM's 10 principles (see Box 9.7).

It is now clear that it is no longer just the licence granted by governments and the acceptance of the local community that is needed. SLO has moved from the local community to also encompass national

[134] Getting the mining law right can indeed be a challenge. Bastida (2008) points that while there is a consensus on the need to articulate law and policy in ways that meet sustainable development objectives, the precise definition of these are much contested, are context specific and allow for much divergence in policy outcomes. This also means moving away from mineral laws as only governing and regulating minerals exploration and exploitation to a more comprehensive approach that conceives mineral law as a legal framework for acquisition and use of mineral resources in a sustainable manner. However, there are significant challenges. Bastida (2018) points that there is need to work on the gaps in the design of legal and institutional frameworks, and on strengthening the capacities of the institutions and actors that participate in decision-making for the sustainable management of resources and for ensuring that mining contributes to sustainable development. Further while international frameworks can be a good starting, Bastida and Bustos (2017) warns that there are enormous challenges faced in seeking to effectively anchor the principles and concepts found in international normative frameworks within the legal and political contexts and trajectories of each country.

[135] See The Church of England-Extractive Industries: The policy of the National Industry Bodies of the Church of England and the Ethical Investment Advisory Group's Advisory and Theological Papers, https://www.churchofengland.org/sites/default/files/2018-3/Extractive%20Industries%20Policy%20and%20Advice.pdf

and international communities. In addition, companies do not only have to contend with national laws but also with international laws.

The result of these developments has been the emergence of a plethora of instruments as discussed in chapter 7. It was also shown in chapter 8 that although these instruments have played a critical role in resolving certain problems, they have many challenges. Risk management still informs many of the instruments driven by industry. A few address broad sustainable development outcomes, however they are largely voluntary, meaning that compliance is not required. More crucially, the different instruments may not necessarily be aligned, as they are designed opportunistically to respond to a particular challenge such as conflict minerals, without consultation with other stakeholders. So, one instrument, while advancing the interest of one stakeholder, may harm another stakeholder. For instance, as discussed earlier, the enactment of the Dodd-Frank law, while satisfying the consumers' interest in conflict mineral-free supply chains, it saw manufacturers shying away from ASM sources in DRC which served to impoverish people dependent on ASM and also escalate the violence driven by these supply chains (Atanasijevic, 2016).

As discussed also in chapter 6, the traditional governance challenges are being compounded. For instance, the financialization of commodities has decoupled commodity price formation from supply and demand dynamics, thus exposing producer countries further to external shocks and macroeconomic instability arising out of commodity price fluctuations.

Therefore, effective governance of extractive resources so that they can deliver the sustainable development promise remains a challenge. There is a clear need for a better governance framework. Chapter 9 discussed the key perquisites for such a governance framework as:

i. the need for a more holistic framework;
ii. the need to decouple economic growth from environmental and social impacts;
iii. the need to respect human rights;
iv. the need for greater engagement with home countries;
v. the need for responsible business practices;
vi. the need to balance security of supply concerns with sustainable development aspirations; and
vii. the need for data information and knowledge.

In essence, a new framework that makes the delivery of sustainable development as the basic minimum for mining activities is required.

10.3 Towards a multi-level, holistic and integrated governance framework

As indicated earlier, there have been significant efforts in developing instruments to address governance gaps in the extractive sector. However, most existing policy frameworks and instruments for governing the mining sector tend to be sectorial in nature and narrow in scope. Fundamentally, the explosion of governance approaches and instruments have not succeeded in promoting shared benefits, transformational change and bringing about a transition away from the 'extractivist' and anthropocentric model widely prevalent in the developing world, whereby the extractive sector is an enclave with few linkages to the local economy[136]. To achieve this, sustainable development approaches would need to be adopted based on new integrated metrics: the quadruple bottom line approach, where success is measured on the strength of economic outcomes, sound environmental management, the respect for social values and aspirations of a diverse group of stakeholders, and the observance of the highest governance and transparency standards.

In order to articulate a broader and more collaborative agenda for the mining industry, this report calls for a new model of governance to support the contribution of the sector towards the achievement of the Sustainable Development Goals (SDGs) and other international policy commitments. It argues for moving away from the amorphous and metaphorical nature of the Social License to Operate and the sectorial and one-dimensional nature of existing governance instruments. Instead, a much more holistic, integrated and inclusive governance approach should be adopted, premised on the need for positive economic, social and environmental outcomes, and appropriate governance mechanisms to achieve these. This framework is termed a "Sustainable Development Licence to Operate (SDLO)" and is applicable to governments, companies and the range of other stakeholders involved in the mining sector. Table 10.1 illustrates the difference between the existing orientation driven by SLO and the proposed SDLO framework.

Table 10.1: Social Licence to Operate vs Sustainable Development Licence to Operate

Dimension	SLO	SDLO
Community targeted to grant licence	Local community	Local + National + Global Community
Lead actor/Driver	Industry	National Government + Civil Society + Private Sector + Development Partners.
Objective/Motivation	Risk management (mainly to avoid conflict and reputation damage).	Clear and explicit recognition of planetary boundaries and need to decouple natural resource use, environmental and social impacts from economic growth, in a projected scenario of increased resource intensity till 2050.
Issues Covered	Highly dynamic and fluid. Defined by location and "community" demands. Highly opportunistic in issues addressed.	Defined by a quadruple-bottom line approach and all the four dimensions of the sustainable development discourse, namely environment, social, economic and governance/transparency. Relatively unchanging though contextualized at local levels.
Basis of relationship	Trust, Leap-of-faith, threat of reputational damage.	Quest to align views on what constitutes value and benefits; laid down agreements on sustainable development; and recognition that achieving sustainable development in the extractive sector is a joint responsible of several stakeholders in host and home countries.

[136] 'Extractivism' is defined as "those activities which remove large quantities of natural resources that are not processed (or processed only to a limited degree), especially for export" (Acosta, 2013b, p. 62). A legacy that remains since colonial times, the extractivist mode of accumulation refers to the exploitation of raw materials needed primarily to fuel the development and growth of industrialised and emerging nations. It typically generates few benefits for the host country due to the resulting limited demand for domestic labour, goods and services; lack of value addition and linkages to the rest of the economy; depletion of finite resources; environmental destruction; and incentives for 'rent-seeking' behaviour which undermine effective and democratic governance. [Acosta A (2013b) Extractivism and Neoextractivism: Two Sides of the Same Curse, in Beyond Development: Alternative Visions from Latin America, ed. M. Lang and D. Mokrani. 6: 1–86, Quito: Rosa Luxemburg Foundation and Amsterdam: Transnational Institute. https://www.tni.org/files/download/beyonddevelopment_extractivism.pdf].

Areas covered	Intangible. Based on unwritten expectations that evolve as needs change or community awareness rises.	Based on well-known and agreed upon development goals, country mining visions (CMVs) and identified set of priorities resulting from credible multi-stakeholder consultative processes.
Spatial coverage	Local project level and to some extent governance of particular value chains.	Global, local, macro, meso and micro as issues are interlinked through complex dynamics. Global, standards inform best practices for mining companies, governments, financiers, development partners, CSOs and all stakeholders.
Role of national government	Develop the local regulatory context with which SLO is granted.	Define broad national development goals which mining activities must be aligned to; Formulate, CMVs, where relevant; Domestic international governance instruments (standards, codes,) in national legal and regulatory frameworks; Foster domestic accountability and appetite for good governance; Commit to judicious use of rents generated to support broad development goals and in particular shift mining from enclave production model to a model tied to local industry through local participation and local content; Create platforms for credible multi-stakeholder dialogue.
International community	Little role though some international agreements on environment can translate to redefine SLO.	-Define the development goals, environmental and other standards that at the minimum must be met irrespective of national laws; -Work towards the establishment of an interventional convention on extractives; -Use G7, G20 and other global fora to foster dialogue and secure global/regional/bilateral agreements and actions on relevant extractive industry issues.
Home country	Opportunistic, mainly responding to public concerns and pressure from activist e.g. need to curb trade in conflict minerals	Develop regulatory context that defines what companies can do abroad; Take a proactive stand in balancing the need for their security of supply and the need for mining to deliver sustainable development in the host country, i.e. be a reliable partner in delivering SDGs.
Mining companies	Manage risk of conflict and reputation damage	Commit to sustainable development principle and partner with governments and other development partners in delivering this; Commit to responsible business practices.

The *Sustainable Development Licence to Operate* (SDLO) attempts to address both the inadequacy of the existing governance landscape and instruments for mining and the need to translate the complex array of post-2015 global commitments into a manageable set of principles and requirements that can be used by relevant stakeholders involved in extractive sector governance. It situates mining within broader development objectives in recognition of its propulsive capacity to promote growth and industrial development, when well managed (UNECA and African Union, 2011). The SDLO advocates for fairer deals, equal share of benefits among stakeholders and a concerted consolidation of existing instruments and initiatives pertaining to the mining sector. This requires clarity on the pathways to shared views, greater alignment on what constitutes value and benefits, reducing inconsistencies and contradictions in goals and objectives of existing instruments and initiatives, and identifying commonalities and inter-linkages among them, with the view to, ultimately, ensuring greater alignment with the SDGs. This could result in a better understanding of the pathways to the SDGs; reduction of conflicts and grievances; greater simplification, clarity and a hierarchy of hard (mandatory) to soft policy and regulatory instruments, thus enabling greater understanding of the pathways to the SDGs; and the emergence of new integrated solutions and improvements in global and local development practice. If mining is to deliver sustainable development, then SDLO seeks to provide guidance on how to achieve this through an illustrative set of principles and policy options.

10.4 Operationalizing SDLO – key design principles and policy options

The contours of what constitutes the SDLO are still being defined and its supporting Theory of Change[137] equally so. As indicated in Table 10.1 above and in the preceding discussions, the foundations of the SDLO lie in the unequivocal recognition of planetary boundaries and on the need to secure a lasting alignment of what constitutes value and benefits to stakeholders in host and home countries and deliver a fair share of the benefits to all. The SDLO framework is based on some key design principles to ensure that it is holistic and proactive in delivering the promise of extractive resources in enhancing sustainable development. The key principles and the policy implications are discussed below.

a) Alignment to national development plans and policy coherence grounded on robust laws and regulations

SDLO is not a substitute for laws and regulations but makes a strong case for ensuring that the policies, laws and regulations in the extractive sector respond to shared visions (e.g. Country Mining Visions) and are fully aligned with national development plans and aspirations as well as with other sectoral policies (e.g. industrial and trade policies, science and technology; and education policies) in a holistic and coherent manner (Pedro, 2016). This is important for maintaining a coherent strategy for the mining sector and the broader economy and thus contributing to the achievement of the Sustainable Development Goals.

The SDLO proposes governing extractive activities through robust and detailed laws and regulations as a means of limiting reliance on the negotiation of extensive and complex individual mining contracts. It seeks to standardize contracting laws through a generalized legislative framework that includes standardized forms. To foster resource-driven industrialisation, greater value addition, local procurement of goods and services and stronger linkages between the extractive sector and other sectors of the local economy, it argues for the use of competitive bidding processes in licensing

[137] A Theory of Change is a “results chain” which describes and illustrates “how and why a desired change is expected to occur under specific circumstances. It links what an organization does and how its activities lead to the desired goals. This requires first the identification of the goals and the steps that needed to achieve change. Through backward mapping it lists all the conditions and enablers that must be in place (and how these related to another casually) for the change to occur or the goals to be achieved”. http://www.theoryofchange.org/what-is-theory-of-change/.

mineral terrains, where relevant. These aspirational goals would be included as biddable factors to decide the allocation of mineral rights (UNECA and Africa Union, 2011: 206-210).

b) Systems thinking – integrated natural resource management and decoupling natural resource use, environmental and social impacts from economic growth

As discussed in Chapter 5, extractive industries place large demands on natural resources such as land and water. Its activities can lead to polluting water resources, biodiversity loss and ecosystem destruction including land degradation and desertification. Therefore, there is a need to look at the dynamic relationships between mining, and land and water. This calls for a systems-thinking approach that accounts for the nexus between resources so as to steer policy efforts towards integrated natural resource management along the mining value chain.

Government policies need to continue to require the incorporation of environmental protection and reduction of the energy intensity of mining operations from the outset of the mining process in order to address the challenges of climate change, water stress and pollution, and loss of biodiversity. In this context, strategic environmental impact assessments and integrated spatial planning or landscape planning are crucial to ensuring that a mining project effectively contributes to local and national development and environmental sustainability. These instruments help protect local habitats, manage forests and water resources more sustainably, arbitrate between conflicting land use options and reduce poverty and improve the livelihoods of local communities (WEF, 2016).

Special attention should also be paid to better understanding and managing of the environmental and other impacts of mining in resource corridors (Adam Smith International, 2015)[138] pristine and fragile environments, including biodiversity conservation areas and deep-sea beds.

In addition to policy regulation, voluntary initiatives such as the Equator Principles can serve as reference frameworks for investors to mainstream standards of good practice and manage environmental and social risks in their projects and business models. As proposed in the previous chapter, consideration should be also given to the formulation and adoption of 'UN Guiding Principles on Business and the Environment' in a similar fashion to the existing UN Guiding Principles on Business and Human Rights (see Box 9.5).

Efforts to mainstream natural resource accounting and new mineral resource assessments should be scaled up. Current assessments are rather narrow in scope for they are based on technical and economic variables without due account to other considerations including the need to decouple natural resource use, environmental and social impacts from economic growth.

c) Multi-level approach

The SDLO recognizes the links and divergence of interests between the different stakeholders across the global mineral value chains and how their actions or lack thereof can contribute or undermine the overall governance in the sector. A global multi-level governance architecture will therefore need to address not only an agenda for resource security, resource efficiency and decoupling of resource use, environmental and social impacts from economic growth that is of particular importance to developed

[138] Adam Smith International defines resource corridors as a mine, oil or gas field (the anchor project) connected for export purposes to a gateway such as a seaport through a dedicated network of roads, railways or pipelines, supported by power and water supply networks.

nations, but also the need for continuous economic development, structural transformation and economic diversification in resource exporting and other developing countries. The SDLO framework thus seeks to integrate local, national and international governance issues.

Local level (downstream value chain)

At the local level, the key policy considerations that need to be part of the framework include:

- people come first and therefore local people and in particular the indigenous people should be at the centre of decision making and should be making informed policy choices regarding activities on their lands and their human rights must never be violated;
- the need to protect the local environment and mitigate the negative impact of mining activities and this should be in line with national and international guidelines especially those clearly articulated in Multilateral Environment Agreements (MEAs);
- mine closure and rehabilitation of mine sites (post-mining) policies should be in place from the onset and revised on a regular basis;
- there is need to pay attention to the social impacts of mining and mitigating these - the proper approach should be driven by an Avoid, Mitigate, Restore principle[139];
- local development should seek to move away from charity driven Corporate Social Responsibility (CSR) activities to exploring how people and local businesses can be more involved through inclusive business models[140] such as enhancing the capacity of local suppliers to enable them to enter the procurement value chain and supply relevant goods and services (an example is Newmont's Gold Ahafo Links program discussed in Box 6.2);
- access to information and data to facilitate participation in project preparation and decision making should be granted in formats and language that can be understood by local people, in line with internationally agreed principles (e.g. Aarhaus Convention); and
- greater efforts should be made to empower communities to better use and consume as well as engage mining companies, local and national governments, international CSOs and other development partners including home countries so that actions taken on behalf of them are informed.

National level (policy value chain)

Interventions at the national level are equally important to improve the contribution of mining to sustainable development. National governments thus have a critical role to play in managing the sector, including awarding exploration and ownership rights; fashioning mineral concession agreements that ensure mining companies mine responsibly, contribute to the realisation of national development goals and aspirations (UNECA and African Union, 2011: 206-210); mainstreaming strategic environmental assessments and domesticating natural capital accounting, adequately incorporating social and environmental assessments in national and local development plans; designing effective fiscal regimes; ensuring transparency and accountability; and channelling

[139] **Avoid** - Avoid creating impacts from the outset; **Mitigate** - measures taken to reduce the duration, intensity and / or extent of impacts that cannot be completely avoided; **Restore** - measures taken to rehabilitate or restore ecosystems following exposure to impacts that cannot be completely avoided.

[140] Inclusive business models (IB models) are intended to circumvent existing market failures and inefficiencies to successfully integrate the poor, either on the demand side as clients or on the supply side as distributors, suppliers of goods and services, or employees. An example is Newmont's Gold Ahafo Links program discussed in box 6.2

extractive rents into national and local public investment for broad-based development and inclusive growth.

The full realization of the propulsive potential of the extractive industry as an engine for growth and structural transformation requires breaking away from the enclave nature and extractivist model prevalent in many jurisdictions.

The Africa Mining Vision (AMV) presents one such comprehensive governance framework that extends beyond the narrow confines of the mining sector. The AMV seeks to integrate mining into industrial and trade policy and to extricate Africa from its historical role as an exporter of raw-materials to become a manufacturer and supplier of knowledge-based goods and services. It espouses a developmental approach meant to break mining enclaves by fostering economic and social linkages between the extractive sector and other sectors of the local economy, promoting resource-based industrialisation and economic diversification, developing socio-economic infrastructure for broader use and accelerating regional integration (African Union, 2009). The AMV Action Plan, which is structured around programme clusters, specific goals, outcomes and activities, was developed in 2011 for the practical application of the vision for the continent. It is supported by a Country Mining Vision Guidebook aimed at facilitating the domestication of the AMV at the country level through multi-stakeholder consultations leading to the formulation of a shared vision, agreed objectives, clear accountability and joint responsibility on how the extractive sector can contribute to broad-based development and structural transformation of their respective countries (UNECA, 2014; UNSDN, 2014; Pedro, 2016).

The extractive policy value chain discussed in section 7.2 provided a further framework for countries to translate mineral wealth into sustainable development.

<u>Home country level (downstream value chain)</u>

Security of supply and protection of investments will remain central for home countries. This is perhaps where much revolution is needed as home states have much more power over domiciled mining companies and thus can mediate the significant power asymmetry between mining companies and host countries. Home countries are also key to affording developing countries sufficient policy space to achieve structural transformation and economic diversification (including through reform of the international trade and investment regimes that constrains the use of the full range of policy instruments to achieve resource-based industrialisation (RBI) at the local level) (Acosta, 2013b; UNECA & African Union, 2011).Creating jobs in developing countries is becoming a pressing necessity as a means to stemming increasing migratory flows to the West.[141] RBI offers an opportunity to achieve this goal given the superior job elasticity of the manufacturing sector as compared to the primary sector. The following actions will be needed:

- increased policy coherence for development between home countries and host countries' policies (STRADE, 2017);
- better internal alignment of home countries' development and cooperation strategies and coordination of their activities (STRADE, 2017);

[141] See EU External Investment Plan, https://ec.europa.eu/europeaid/eu-external-investment-plan-factsheet_en

- effective support to linkages development, the establishment of joint ventures, national suppliers' development programmes and promotion of local entrepreneurship, capacity building and strengthening of R&D institutions (STRADE 2016; STRADE 2017; STRADE 2018);
- better regulation of activities of trans-national corporations (TNCs) to mitigate the power over host countries;
- making international investment laws fairer, especially reducing the over-protection of investors, including through increased recognition of local laws in handling disputes between investors and host countries;
- effective actions towards balanced and more durable contracts[142] (OECD, 2018) tackling illicit financial flows, combating commodity price volatility and ensuring a fair deal for host countries through, amongst others, international transparency and accountability initiatives, as well as regulation of tax havens;
- greater attention to regulation of commodity trading hubs to ensure fairness in trading; and
- better regulation of the financial sector to reduce the volatility that is being caused by increased financialization of commodities.

<u>International level</u>

The international community also has a crucial role in closing governance gaps. Already guidelines such as the UN Global Compact on Human Rights define the limits of acceptable behaviour, while various multilateral environmental agreements (MEAs) are crucial in managing and mitigating environmental impacts. Global policy action is needed for setting global standards in the form of rules and regulations, voluntary instruments and reporting obligations in areas that include:

- coordination of mining policies and instruments and agreement on international mining standards (including pressurizing transnational corporations (TNCs) to disclose information and adhere to global codes of conduct, and ensuring host countries receive a fair deal);
- influencing incentives and behaviour (e.g. eco-labelling of metals);
- technology transfer; and
- financial regulation (to regulate the financialisation of commodities and to curtail illicit financial transactions, transfer-pricing abuse, use of tax havens and other tax evasion or avoidance techniques).

It should be recognized that a number of proposals have been put forward for improving the governance of resources (including mineral resources) at the global level in support of sustainable development. These range from the creation of extended sustainable commodity agreements, to an International Convention on Sustainable Resource Management, an Integrated Resource Management Agency, and an international metals covenant Ekins & O'Keefe, 2014; Bleischwitz & Bringezu, 2007; Bleischwitz *et al.*, 2012); Wilts & Bleischwitz, 2012). Proposals for such global governance regimes for sustainable resource management should complement other related arrangements in the mining sector, and aim to promote mineral resource sufficiency and security of access, the decoupling of mineral resource use, environmental and social impacts from economic

[142]The OECD has produced an advanced draft of eight (8) Guiding Principles for Durable Extractive Contracts for public comment. The 8 principles are: (i) contracts must be aligned with long-term visions and strategies defined by the host government; (ii) contracts should be anchored in transparent and quality long-term relationships and partnerships between host governments, investors and communities; (iii) There should be a balance between the legitimate interests of host governments, investors and communities, including indigenous peoples where relevant: (iv) contracts should maximize overall value, including economic, social and environmental outcomes; (v

growth, and the contribution of mineral resources to the achievement of the Sustainable Development Goals.

Mining companies

Under the SDLO framework, mining companies are expected to operate responsibly including through better alignment of their work with national visons and development plans; respect human rights; contribute to the decoupling of natural resource use, environmental and social impacts from economic growth, including by reducing the energy intensity of their activities; disclosing information; producing integrated social and environmental impact assessments; participating in local area assessments, remediation of environmental damages and in particular making adequate plans for mine closure and rehabilitation; paying a fair share of taxes and royalties; trade their commodities fairly; and not engaging in corrupt and other illegal, criminal or illicit practices.

Local communities and civil society

Civil society organisations and local communities affected by the mining process can play an important role in the agreement on and implementation of mining practices and policies, including by exerting social pressure and shaping public opinion to ensure mining companies operate responsibly.

a) Multi-stakeholder approach,

Decisions concerning the mining industry are made with the involvement of all stakeholders. All relevant actors should be included through, amongst others, information exchange, media campaigns, and collaboration with institutions such as those with oversight roles. A community-orientated, context-sensitive approach to engagement requires in-depth knowledge of local culture, circumstances and power dynamics, alongside a sophisticated approach to engaging diverse voices (including alternative and marginalised voices) within affected communities (Owen & Kemp, 2013). It is thereby important that industry engages in broad-based collaborative social dialogue regarding each mining project. In doing so, it needs to articulate an agenda which balances its own commercial needs with managing and meeting broader expectations about the contribution of mining to sustainable development (Ibid).

b) Transparency and accountability

A new governance approach must recognize that although appropriate legal, regulatory, and voluntary frameworks and instruments may, to a large extent, already be in place to govern the mining sector, the problem is all too often the uneven or outright lack of their enforcement. In order to implement laws and policies governing the mining sector, transparency is an essential, even if not a sufficient, prerequisite. Strengthening domestic accountability equally so.

The key to all players at all levels being effective is access to information across the whole mining value chain. Information on contracts and licences, social and environmental impacts assessments, royalties and tax payments, revenues and expenditures should be easily accessible. Transparency helps share pubic auditors' burden with others actors such as unions, civil society organizations, researchers and other stakeholders who can play an important role in analyzing data, reporting on findings and thus demanding on accountability across all levels. Transparency is also crucial to help combat ills associated with transfer mispricing and other forms of illicit financial flows.

c) Flexibility: ability to leverage existing instruments and also incorporate new instruments as needs arise

A plethora of instruments have been proposed and applied to improve governance with various degrees of success. At the same time, there has been exasperation with respect to the growing list of instruments. Actors are at a loss at what instrument to apply when and where. The SDLO should not be considered as a new instrument but rather a framework that articulates governance issues across the whole mineral value-chain and assigns responsibilities to various parties. The fact is that no one instrument can be able to govern a mineral value chain from local level to consumer level as actors change and regulators also change in the globalized supply chains. The key is to ensure that instruments governing a particular value chain interact with, and do not contradict, one another. The SDLO evolving Theory of Change and outcome framework (Harries *et al*., 2014) achieves this by first making sure that the overall goal to achieve is sustainable development. It assumes that this goal is shared by all stakeholders in the value chain. Second, it notes the importance of identifying and clarifying how the instruments and related activities are related to each other casually for the goal to be achieved, equally ensuring that the instrument can be plugged into a larger framework in a transparent way[143]. By clarifying the pathways and articulating at each level what needs to be done it points to where an instrument can be plugged in.

10.5 Operationalizing the SDLO

10.5.1 Three pathways

The principles discussed above capture what an effective SDLO framework should look like. What still needs to be articulated is how such a framework can be operationalized. There are several pathways, namely: (i) the SDLO can be operationalized through a global international agreement that commits countries to a governance framework much like SDGs commit countries to sustainable development; (ii) a second pathway can be a global platform for continued dialogue and advocacy on cross cutting issues; and (iii) another approach can be through the use of regional platforms to engage host and home regions so that issues of sustainable development and security of supply are reconciled through regional PACTs. A detailed description is provided below:

(i) An international agreement or convention on extractives

Mineral value chains are global, yet the key parties involved - the host country and the home countries - have very different objectives. The home countries want minerals to support development, while the home countries are chiefly concerned about security of supply. While these two goals need not be at odds, when pursued independently they can be. For example, concern for sustainable development can give rise to resource nationalism, while concern for security of supply can lead to promoting the interests of investors above those of the host countries, further reinforcing the imbalance of power between the mining companies and host countries. Achieving alignment between the two goals so that they reinforce each other rather than work in conflict could arguably best be

[143] See "What is Theory of Change?" http://www.theoryofchange.org/what-is-theory-of-change/

achieved through an international agreement that recognizes and balances the interests of both host and home countries. An international agreement is also attractive as it can substitute the lack of capacity of host countries for managing mining activities or negotiate in equal terms with mining companies.

There are a number of compelling reasons for this pathway in operationalizing SDLO:

- There has been a recent trend towards global agreement on matters relating to sustainable development. The agreement on SDGs, the Paris Climate Change Agreement and the Aichi Targets on Biodiversity point to a growing appetite for global agreements on sustainable development issues.
- Further, matters that are pertinent to the extractive sector are gaining traction in the global agenda. In particular, curbing illicit financial flows has become a global priority and some agreements such as on exchange of information by tax authorities are already in place.
- Resolving some issues that are critical for enhancing the contribution of the extractive sector to sustainable development can best be achieved through international action. There is a need for better regulation of commodity markets to reduce volatility and also achieve fair commodity pricing, which is key to address both sustainable development concerns and security of supply fears. There is need for greater transparency across the whole mineral supply chain: data on mineral reserves, production costs, marketing of commodities and other activities of the sector should be available and made easy to understand. Achieving these will require action and coordination across countries to improve information flow and thus reduce uncertainty. This could be ensured through international protocols and standards for reporting. Perhaps one way would be to improve and consolidate current reporting instruments (such as RMI, GRI, and EITI) and adopt them as part of a global standard.
- The proper valuation of mineral resources and reserves is also crucial for securing investments and planning for mine development and construction. This requires better geological data and, improved modelling. Beyond valuation, there is a need for new accounting methods to cater for the fact that mining impacts on the delivery of biodiversity services. New accounting standards are needed. Developing these will require international efforts to agree on new methodologies and, further, international agreements will be required so that they can be mainstreamed.
- Meeting the agreed SDG and climate change targets will substantially raise demand for materials, especially technology minerals and development minerals. Therefore, international treaties such as the Paris Agreement will need to pay greater attention to material needs and mechanisms for ensuring any embedded targets can be met. This could be achieved via an international agreement on extractives.
- Bilateral Investment Treaties (BITs) are skewed towards investors. BITs have often been used abusively by foreign investors that have been taking governments to court for imposing environmental and social protection mechanisms (Ali *et al*., 2018). There is need to move towards a fairer framework that is anchored on an international treaty.

Thus, there is a strong case for an international agreement pathway. However, international agreements can take a long time to be negotiated. Furthermore, the number of countries that produce minerals and those that use them as industrial inputs are just a subset of the global community – as opposed to climate change which directly concerns all countries – which could dampen the enthusiasm for a global agreement.

Nevertheless, some of the issues that have a direct bearing on the extractive sector are already subject to international conventions such as the Minamata Convention on Mercury. A piecemeal but well thought out approach premised on a series of international agreements on various key issues could be the way forward. MEAs could serve as the starting point of a process to better govern the extractive sector through international conventions.

Another approach that has been proposed is to use public-private partnership to improve coordination. Ali *et al*. (2018) have proposed a Smart Mineral Enterprise Development (SMED) approach which entails a partnership between public and private entities to consider pathways whereby public sector data sharing on geology can be coupled with research innovations in the private sector both upstream and downstream of mineral supply. SMED processes aim to address key technological bottlenecks in mineral supply and demand. Core to the "smart" element of SMED is the system of communication between supply and demand centres as well as the research and development community. The timing of the signals between technological demand and supply constraints can be much better coordinated to induce entrepreneurial activity in a more proactive way than is usually the case in ad-hoc entrepreneurial systems. The SMED approach also considers environmental and social risk safeguards linked to capital markets and stock exchanges to ensure that a more sustainable outcome from junior high risk/high reward firms can also be maintained. This can be undertaken through existing certification schemes that ensure that environmental and social risks are not compromised in the rush to encourage entrepreneurship.

ii) A global platform for agenda setting, continued dialogue and agreement

SDLO can also be operationalized via a global platform for agenda setting, continued dialogue and agreement on cross-cutting issues, especially reconciling security of supply issues with aspirations to promote resource-driven development. Again, given the fact that only a subset of countries is involved in the mineral supply chains means that an appropriate platform should be one that brings both host and home countries together without involving too many other countries.

The G20 platform, which has a balance of both, can be an appropriate forum as both issues of security of supply and issues of sustainable development are pertinent. The G20 platform does also take on board some agendas, for example, the G20 has adopted Compact With Africa (CWA) in March 2017 with the aim of using G20's political backing to push African governments, international organizations, and bilateral partners to prepare comprehensive, country-specific investment compacts to encourage private-sector investment. Central to the CWA is the concept of mutual commitments to implementing measures and developing instruments to improve the framework conditions for private investment, including in infrastructure. This will be through country specific-specific reform compacts between individual African countries and international organizations such as the African Development Bank, International Monetary Fund and World Bank Group (collectively, the IOs), and the G20 members. Ten African countries—Benin, Côte D'Ivoire, Egypt, Ethiopia, Ghana, Guinea, Morocco, Rwanda, Senegal, and Tunisia—are part of the compact. Participating G20-AAG members were Canada, the European Union, France, Germany, Italy, Japan, the Netherlands, Norway, Spain, the United Kingdom, and the United States of America.

Like the CWA, the agenda undertaken by such a platform to operationalize the SDLO should seek to be comprehensive and seek to commit both host countries and home countries to specific reforms.

The G20 global dialogue platform approach has the attraction that, like the CWA, it can encourage specific agreements between countries and thus can be tailored to specific minerals and also between the countries that use them and those that produce them. This can be easier to implement than blanket international agreements.

iii. Bilateral regional agreement between host and home regions

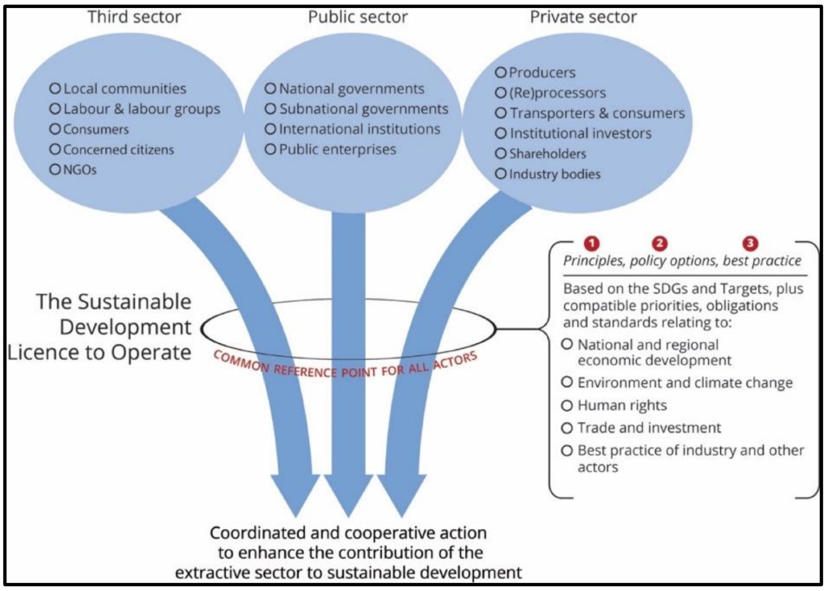
SDLO can also be operationalized at a regional level when the negation between regions can achieve a compact that balances the key concerns of the need for sustainable development and security of supply. This will require, as a first step, host and home regions developing regional strategies, and then using these as the basic building blocks for the SDLO framework. Africa through its African Mining Vision (see Box 1.2) and Europe through EU Raw Materials Initiative (RMI) (Box 9.10) have already put in place a strategy for sustainable development and for security of supply, respectively. Building on these two initiatives, the EU and Africa could implement an SDLO framework reconciling concerns, resolving contradictions and closing governance gaps.

A bilateral pact is probably more likely to deliver faster results as countries' commitments are likely to be stronger given that the extractive strategy document being used is a component part of the national development plans. For instance, the AMV is cascaded to Country Mining Visions (CMVs) that then feed into national development plans, industrial policies and other sectoral interventions through model Mineral Development Agreements (MDAs)/laws, local content, national suppliers' development programmes, and local participation policies, among others.

10.5.2 Partnership (Holistic Framework)

The SDLO is, in essence, a partnership between key stakeholders; that is, a holistic framework in the extractive value chain to ensure mining is performed sustainably, while meeting the twin goals of sustainable development for exporting countries (host countries) and also security of supply for importing countries (home countries) (Figure 10.1). The key stakeholders have shared responsibilities in delivering the key pre-requisites of mining governance. This is shown in Table 10.2.

Figure10.1 Sustainable Development Licence to Operate framework



Source: Pedro et al. (2017).

Table 10.2 Stakeholder's responsibilities

Key Pre-requisites	Local level	National Level (Host Country)	Home Country	International Level	Mining Industry	CSOs and Research Community
The need to decouple economic growth from environmental and social impacts	Conduct impact assessment Build capacity to engage mining companies and government	National laws and institutions and coordination mechanisms that are in line with global best practices - Independent mine closure laws to deal with future and legacy mine closures New mineral resource assessment methodologies	Standards for due diligence on environment	Push for domestication of MEAs Standards for natural capital accounting New mineral resource assessment methodologies Technology transfer Regulation of mining in commons International agreement on investor guidelines e.g. Equator Principles	Articulate and adopt Avoid, Mitigate Restore principles Mandatory Sustainability reporting New mineral resource assessment methodologies	Advocacy and education of local communities Certification tools Consolidate accountability tools
The need to protect human rights	Education and information on rights Empower local communities in advocacy Support structures to exercise rights e.g. legal support	Domesticate UN Guidance on human rights in local laws	Standards for due diligence of human rights	Push for domestication (implementation) on human rights agreements Agreements on extraterritorial duties of states in regards to human rights	Commit to human rights e.g. sign on to global compact on human rights Strengthen compliance systems and develop appropriate corporate structures to	Research and advocacy with special attention to indigenous peoples

	- Develop conflict resolution mechanisms				guarantee human rights	
The need for greater engagement of home countries	Empower local communities to better engage home countries for supportive laws	Build shared responsibility into contract agreements	Acknowledgement of shared responsibilities Cooperation on tax compliance to curb illicit financial flows Responsible business practices/laws	Formalizing shared responsibility in international agreements	Adopt practices of home countries in host countries i.e. best practices rather than minimum acceptable	Mapping of value chains and mapping of causality to better assign responsibility Mapping of financial flows and tax compliance
The need for responsible business practices	Shift from charity-driven CSR to Inclusive Business (IB)models	Make IB part of the contracting agreements			Adoption of sustainable business practice e.g. ICMM's 10 principles	More research on Inclusive IB models Advocacy on IB models
Security of Supply + Sustainable development	Promote sustainable management of raw materials Develop SDG targets at local level	Articulate long-term development policy and role of extractive sector Enact local content and local participation policy Establish national supplier development programmes to build local suppliers' capacity to enter the minerals value chain	Support good governance and transparency in mining deals Promote sound investment climate Link raw material imports to broad development support Fair trading regulation Better regulation of commodity financialization	Commit government to sustainability as key pre-requisite for engaging in mineral supply chains International agreement on taxation	Adoption of sustainable business practice e.g. ICMM's 10 principles Paying fair share of taxes	Benchmarking of prices to curb transfer mispricing Build capability to interpret financial statements and engage mining companies on tax justice

		(especially procurement of goods and services). Develop SDG targets for industry				
The need for data and knowledge	Avail data in local languages and also tools to make sense out of data Create platforms for regular interaction between community, mining company and government Adopt prior and informed consent policy	Commit to transparency e.g. EITI Adopt open data policy Create platforms and process for public participation e.g. WEF Mineral Value Management (MVM) framework Join global initiatives of sharing and exchange of tax data Perform due diligence on politically exposed individuals and also on trading and banking partners	Mandatory sustainability reporting Mandatory reporting on financial flows and beneficial ownership	International agreement on reporting of financial flows International agreement on sustainability reporting	Commit to transparency e.g. EITI Develop industry guidelines on reporting financial flows Make sustainability reporting a requirement	Research and analysis to increase transparency

10.6 SDLO and the Sustainable Development Goals SDGs

Since sustainable development is a key impetus for the SDLO, the Sustainable Development Goals (SDGs) offer appropriate goals and targets that the SDLO should seek to support. Indeed, if well managed, the mining sector can play a positive role in promoting broad-based development and structural transformation in relevant countries. This includes an important contribution to the implementation of all 17 Sustainable Development Goals (SDGs); and in particular to those relating to poverty eradication, decent work and economic growth, clean water and sanitation, life on land, sustainable and affordable energy, climate action, industry and infrastructure, as well as peace and justice (UNSDSN, CCSI, UNDP and WEF ,2015).

Mining generates significant revenues through taxes, royalties and dividends for governments to invest in economic and social development (Goal 1). Mining can help drive economic development and diversification through direct and indirect economic benefits, the development of new technologies and by spurring the construction of new infrastructure for transport, communications, water and energy (Goal 9). It can alter the lives of local communities, offering opportunities for jobs and training, while contributing to economic and social inequities, if not appropriately managed (Goal 8). However, mining requires access to land and water, presenting significant and broad landscape impacts that must be responsibly managed (Goals 6 and 15). Mining activities are also energy- and emissions- intensive in both the production and downstream uses of mining products (Goals 7 and 13). Finally, mining can contribute to conflict and violations of human rights (including rights of indigenous peoples), if representative decision-making of citizens and communities in extractives development is not observed (Goal 16) (UNSDSN, CCSI, UNDP and WEF, 2015).

A preliminary analysis of synergies and trade-offs between mining activities and delivery of all 169 Targets of SDGs was undertaken for the purposes of this report.[144] The analysis identified synergies between mining and 108 of the 169 (64%) SDG Targets, and trade-offs between mining and 54 of the 169 (32%) SDG Targets. These can be categorized broadly into three key domains, where decisions about mining contribute to, or undermine, humanity's ability to:

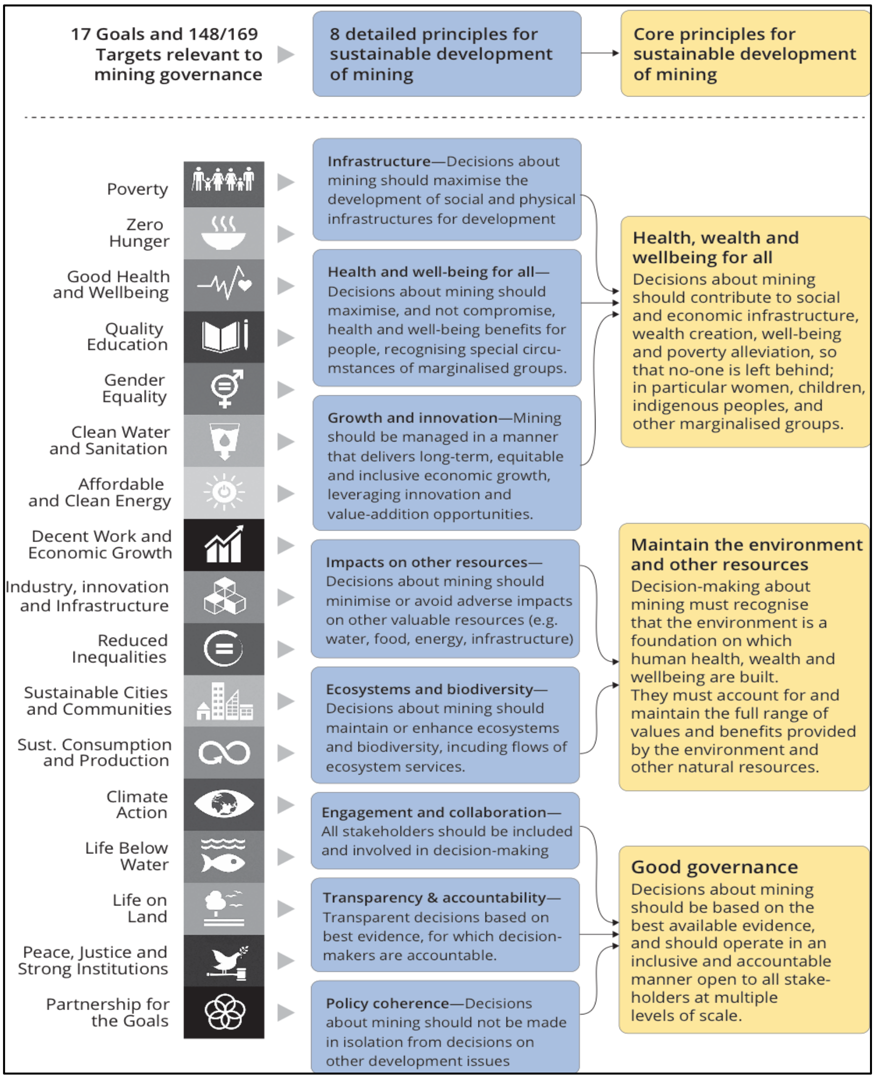
- realise individual and collective aspirations for wealth and well-being;
- build social and physical infrastructures for sustainable development; and
- achieve sustainable management of the environment and natural resources.

The dominant theme, as far as trade-offs are concerned, was the potential adverse impacts of mining on local communities, health, and the natural environment including ecosystems and biodiversity.

The analysis highlights how mining is a foundation of social and economic development, and affects delivery of outcomes across all SDGs. It also highlights how it is not possible to develop the mining sector without understanding how it affects and depends on well-being, infrastructure and the environment. Figure 10.2 provides some principles that could be taken forward to advance the SDGs (Appendix 10.1 provides a detailed analysis of policy options under each of these eight identified principles).

[144] Methodology—for each Target, a keyword search was undertaken for published evidence of synergies or trade-offs between mining and delivery of that Target. No attempt was made to weight this evidence—the process simply identified whether evidence was readily identifiable or not. For this approach, absence of evidence is not evidence of absence of a synergy or trade-off between mining and the relevant Target.

Figure 10.2 Illustrative principles for sustainable development of the extractive sector



There is a growing body of industry, government and civil society practices that focus on maximising synergies of mining with sustainable development, while minimising trade-offs; for example, guidance published by the International Council of Mining and Metals (ICMM). There is also a growing appetite for consolidation of instruments by mining companies.

Some key gaps exist in these documented practices as illuminated by mapping them against the SDGs and Targets. First, there is a relative paucity of documented best practices for value addition and innovation hubs built around mining activity. Second, gaps also exist for best practices for transnational cooperation to safeguard and stabilise international flows of mining products in accordance with sustainable development standards. Moreover, there is currently a notable absence of international agreements regulating trade flows of mineral raw materials other than the general trade liberalisation framework established under WTO agreements. The financialisation of commodities has made this task urgent. Third, gaps also exist in the case of best practices for collaboration between different government agencies to manage nexus issues associated with mining, with integrated resource planning efforts remaining in their infancy in most countries. Although considerable progress has been made at a site-specific level to minimise the environmental impacts of mining – as demonstrated, for example, by the ongoing work by the International Union for Conservation of Nature and ICMM to develop good practice guidance for mining and biodiversity[145] – there are still gaps in knowledge and practice in the analysis and managing of the cumulative environmental impacts in mining districts.

These gaps represent key opportunity areas for innovation for relevant mining sector stakeholders. Some implications for the design of laws concerning mining include the following:

- Vertical silos and the prevalent mode of mining regulation need to be structurally transformed, so that they pay adequate attention to wellbeing, infrastructure and the environment. The complexity of relationships identified in this analysis challenges conventional structures and processes of decision-making in government and private entities. Mining development decision-makers, and environmental permit issuers, need to collaborate with colleagues in other portfolios and vice-versa, supported by legal frameworks that empower and sustain such coordination. Landscape planning and strategic environmental assessments need to be mainstreamed.
- Legal frameworks need to provide mechanisms for progressive implementation of best practices for managing synergies and trade-offs between mining and sustainable development, including incentives for innovation in this context.
- There is potentially a case to be made at an international level for legal frameworks (such as treaties) designed to secure sustainable supply of raw materials—including through price stabilisation, capacity building support to host countries, and more coherent application of ethical, environmental and other standards relating to international trade in mining products.[146]
- Legal frameworks need to establish a basis for developing and entrenching national and local visions of how mining can contribute towards sustainable development (Pedro, 2016; Pedro, 2017). The Africa Mining Vision (Box 1.2) and its supporting Country Mining Vision Guidebook (UNECA, 2014; Pedro, 2016) for instance, provides such informative reference point. Such vision statements perform the function of establishing a collective view on the appropriate balance between mining and other activities that contribute to (or undermine) sustainable development.

10.6. Conclusion

This chapter discussed the need for a shift from the piecemeal efforts aimed at building a governance framework for natural resources towards a more holistic approach that assigns responsibility to all actors in the mineral value chain. The framework named the Sustainable Development Licence to Operate (SDLO) seeks to ensure that mining realizes the promise of delivering sustainable development for host countries, without compromising the security of supply for home countries. The SDLO framework does not seek to replace existing instruments but rather provides a way of organizing them so that one can determine which governance gap a given instrument fills and thus create a more coherent governance landscape that makes it easier for stakeholders to select a parsimonious set of instruments that fit a particular mineral value chain. The framework can also point to areas where

[145] See, e.g.: https://www.iucn.org/content/good-practice-guidance-mining-and-biodiversity
[146] See e.g. the discussion of 'Sustainable Commodity Agreements' at:
http://www.psi.org.uk/pdf/2006/SIA_CommWP_Dec%202006.pdf and
https://www.mcgill.ca/mjsdl/files/mjsdl/5_2_6_gantz.pdf

new instruments might be needed and how a particular instrument will interact with others instruments.

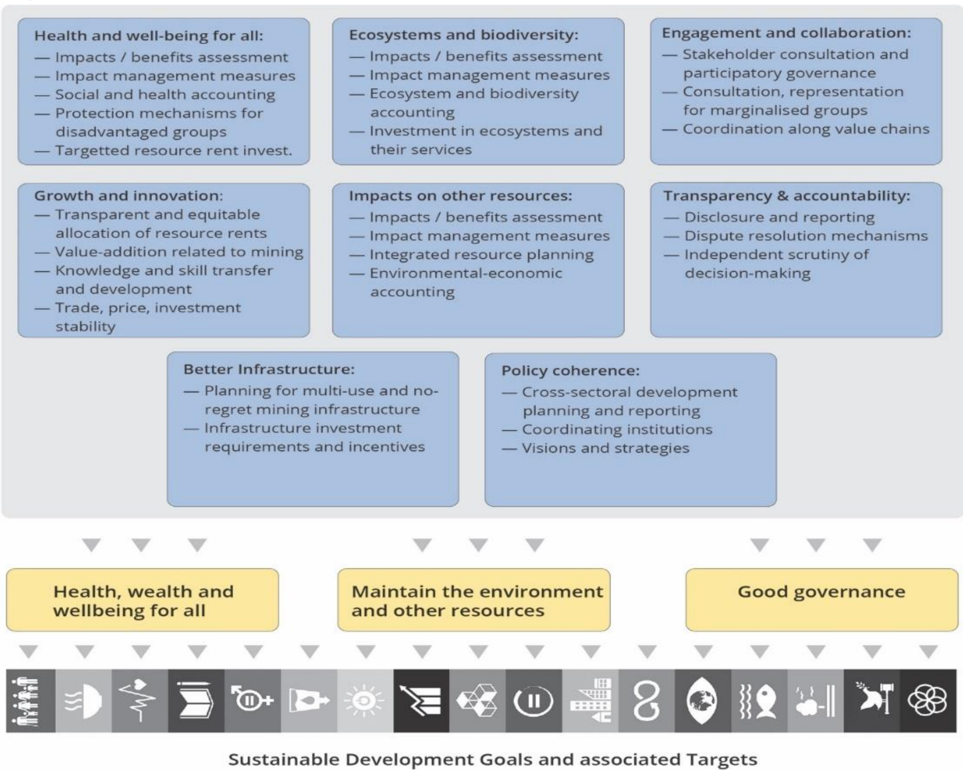
The chapter also points to how the SDLO can drive sustainable development by linking the SDLO to SDGs. It points to the principles and policies that will be needed to make mining an enabler of SDGs. Illustrative policy options for sustainable development of mining are shown in the appendix.

Appendix 10.1: Illustrative policy options for sustainable development of mining

The principles outlined above would need to be operationalised in a wide range of policy domains, by different actors from the public, private and third sector. A holistic and integrated implementation of SDLO principles would also need to extend across the entirety of mineral value chains—from licensing of mineral terrains, geological mapping, mineral exploration, mine development, mining, mineral processing and refining, ore transportation, manufacturing of end-use products, to recycling and mine closure. In order to take a first step towards identifying policy options for sustainable development of the extractive sector, the Working Group reviewed existing literature and organised identified options under the principles discussed in Section 10.6 above. Key policy options are illustrated in the figure below (Figure A10.1) and explained in more detail below. Most of the options presented are primarily relevant to actors in the public sector. However, several are relevant to all actors.

The policy actions capable of delivering a transition to sustainable development in the extractive sector are highly dependent on the specific context and organisation in which they are implemented. A range of actions, implementation options and illustrative examples that elaborate on the summary in Figure A10.1 are set out below. These represent only a starting point to defining the normative content of the SDLO. In several cases, the SDLO policy options incorporate, acknowledge and connect influential policy assessment initiatives and standards (such as the African Mining Vision and the Natural Resources Charter) that focus on specific subsets of the very broad range of issues relevant to implementing the 17 SDGs and 169 Targets in the extractive sector.

Figure A10.1 Illustrative policy options for sustainable development of the extractive sector



A10.1 Health and well-being for all

The following policies, implementation options and illustrative examples should be considered as part of efforts to ensure that decisions about mining maximise, and do not compromise, health and well-being benefits for people, recognising the special circumstances of marginalised groups (including but not limited to indigenous peoples, ethnic minorities, women, children, and others):

Policy	Implementation options	Illustrative examples
Fair contracts	• Embed equity considerations in contractual instruments and relationships relevant to mining.	• OECD Guiding Principles for Durable Extractive Contracts (Draft).[147] • Impact and Benefits Agreements (IBAs).[148]
Assess impacts and benefits of mining for health and well-being	• Require Social Impact Assessments (SIA) to be undertaken and taken into account for proposed mining activities.[149] • Couple SIAs with related assessments: health, occupational risk, human rights, and other well-being factors.[150] • Ensure policies in relevant countries are informed by Social Lifecycle Assessments of extractive sector value chains. • Ensure policies in host countries are informed by Sector-Wide Impact Assessments (SWIA) of mining.[151] • Ensure policies and practices are informed by agreed UN principles concerning health and well-being.	• Development regulations in Australian States for SIA, and accompanying Guidelines.[152] • IFC Performance Standard 1 on Assessment and Management of Environmental and Social Risks and Impacts.[153] • UNEP Guidelines for Social Lifecycle Assessment of Products.[154] • ICMM Guidance on Health Impact Assessment and Occupational Risk Assessment.[155] • EU Raw Materials Information System.[156] • Myanmar Centre for Responsible Business SWIA for Myanmar.[157] • International Labour Organisation Fundamental Principles and Rights at Work.[158]

[147] http://www.oecd.org/dev/guiding-principles-durable-extractive-contracts-pd-nr.htm
[148] http://www.infomine.com/library/publications/docs/Fidler2007.pdf
[149] See, e.g.: https://www.iaia.org/uploads/pdf/SIA_Guidance_Document_IAIA.pdf.
[150] See, e.g.: http://www.tandfonline.com/doi/abs/10.1080/14615517.2013.782978.
[151] See, e.g: https://www.sciencedirect.com/science/article/pii/S0301420713000536.
[152] See e.g.: http://www.planning.nsw.gov.au/Policy-and-Legislation/~/media/8B6753256417468F80E11708762DA11D.ashx
[153] http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/performance-standards
[154] http://www.unep.fr/shared/publications/pdf/dtix1164xpa-guidelines_slca.pdf
[155] https://www.icmm.com/en-gb/publications/health-and-safety/good-practice-guidance-on-health-impact-assessment
[156] http://rmis.jrc.ec.europa.eu
[157] http://www.myanmar-responsiblebusiness.org/swia/mining.html
[158] http://www.ilo.org/declaration/lang--en/index.htm

Manage health and well-being impacts of mining	• Establish agreements with affected stakeholders concerning the long-term management of impacts and benefits. • Ensure that a mitigation-hierarchy approaches (avoid, mitigate, restore) are applied by relevant decision-makers. • Ensure use and appropriate resourcing for health and safety management systems. • Ensure that decision-making is consistent with international agreements concerning pollution and human rights.	• Impact and benefit agreements in Canada.[159] • ICMM Guidance on Health Impact Assessment and Occupational Risk Assessment.[160] • IFC Performance Standard 1 on Assessment and Management of Environmental and Social Risks and Impacts.[161] • Minamata Convention on mercury and UN Environment Global Mercury Partnership. • UN Guiding Principles for Business and Human Rights.
Establish accounting systems for health and well-being impacts associated with mining	• Implement relevant components of the international standards concerning health and well-being statistics and accounts. • Monitor activities of mining companies against health and well-being criteria	• WHO International Classification of Functioning, Disability and Health (ICF).[162] • Responsible Mining Index.[163]
Establish protection mechanisms for disadvantaged groups	• Including but not limited to the groups acknowledged in the 2030 Agenda for Sustainable Development and international human rights instruments: women, children, the poor, indigenous peoples. • Recognise and protect formal and informal land rights of communities.	• Impact and benefit agreements in Canada.[164] • BSR Recommendations for the Mining Sector on Women's Economic Empowerment in Sub-Saharan Africa.[165] • ICMM Good Practice Guide on Indigenous Peoples and Mining.[166]
Targeted investment of resource rents to address health and	• Ring-fence appropriate share of mining revenues for social and health purposes including poverty	• Mining community development agreements.[167] • Conduct and compensation agreements.[168]

159 http://www.infomine.com/library/publications/docs/Fidler2007.pdf;
160 https://www.icmm.com/en-gb/publications/health-and-safety/good-practice-guidance-on-health-impact-assessment
161 http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/performance-standards
162 http://www.who.int/classifications/icf/en/
163 https://responsibleminingindex.org
164 http://www.infomine.com/library/publications/docs/Fidler2007.pdf;
165 https://www.bsr.org/reports/BSR_Womens_Empowerment_Africa_Mining_Brief.pdf
166 https://www.icmm.com/en-gb/publications/mining-and-communities/indigenous-peoples-and-mining-good-practice-guide
167 https://openknowledge.worldbank.org/handle/10986/12641
168 https://www.dnrm.qld.gov.au/__data/assets/pdf_file/0004/480388/guide-land-access.pdf

wellbeing impacts of mining	reduction (e.g. social and health management funds).	

A10.2 Growth and innovation

The following policies, implementation options and illustrative examples should be considered as part of efforts to ensure that mining is managed in a manner that delivers long-term, equitable and inclusive economic growth, leveraging innovation and value-addition opportunities associated with the extractive sector.

Policy	**Implementation options**	**Illustrative examples**
Allocate resource rents on a transparent and equitable basis	• Ensure that mining development contracts between governments and the private sector are compatible with international best practice guidance. • Establish an appropriate Mineral Rights Cadastre and secure land and mineral rights (including recognition of informal rights). • Establish an appropriate framework for formalisation of artisanal and small-scale mining. • Ensure publication and tracing (both within countries and internationally) of financial flows associated with the extractive sector.	• Natural Resource Charter and Benchmarking Framework.[169] • OECD Guiding Principles for Durable Extractive Contacts.[170] • World Bank Guidance on Promoting Transparent Access to Mineral Resources.[171] • Financial Action Task Force Recommendations.[172] • Publish What You Pay.[173] • Extractive Industries Transparency Initiative.[174] • Formalisation programmes for artisanal and small-scale mining.[175] • International Financial Reporting Standards for the extractive sector. • Base Erosion and Profit Shifting.
Incentivise and undertake value-addition measures related to mining	• Establish strategies and policies concerning: industrial clustering, mineral 'beneficiation', in-country spending, procurement of local goods and services, and local participation through equity and management. [176] • Establish strategies and policies for improving standardisation and	• Local procurement initiatives.[177] • Mining Shared Value.[178] • Mineral Beneficiation Policies in South Africa, and Indonesia,[179] and elsewhere.[180] • Small grants and equipment leasing schemes (e.g. in Tanzania) through World Bank SMMRP project.

[169] https://resourcegovernance.org/sites/default/files/documents/natural-resource-charter-benchmarking-framework-report-2017-web_0.pdf
[170] http://www.oecd.org/dev/guiding-principles-durable-extractive-contracts-pd-nr.htm
[171] https://openknowledge.worldbank.org/handle/10986/18399
[172] http://www.fatf-gafi.org/publications/fatfrecommendations/documents/fatf-recommendations.html
[173] http://www.publishwhatyoupay.org/resources/
[174] https://eiti.org
[175] Analysis of formalization approaches in the artisanal and small-scale gold mining sector (UN Environment, 2012)
[176] http://includeplatform.net/wp-content/uploads/2015/03/GTF-Local-Content-MOG-in-Ghana-SR-formatted.compressed.pdf
[177] http://www.csrm.uq.edu.au/docs/4361%20CSRM%20SME%20Report%20Email%20V2.pdf
[178] http://miningsharedvalue.org
[179] http://unctad.org/meetings/en/Presentation/SUC%20GCF2015%20Sujatmiko.pdf
[180] https://www.eunomix.com/cmsAdmin/uploads/eunomix-africa-mineral-&-beneficiation-policy-quarterly-monitor-no-2-final-4dec2015_001.pdf

	quality control of support sectors for mining.	
Establish knowledge and skill transfer incentives and requirements	• Establish strategies and policies concerning: employment and training (locality and sector-based); small and medium enterprise development connected with mining activities.	• Indigenous employment initiatives in Australia.[181] • Local Content Legislation in Ghana.[182] • Capacity building partnerships: ACP–EU Development Minerals Programme; GEF-GOLD programme.
Establish mechanisms for trade, price and investment stability	• Establish national strategies and policies for trade and price stabilisation in the extractive sector (e.g. subsidies, variable taxation, and other fiscal measures). • Establish national legal and policy frameworks to secure long-term and responsible investment in mining. • Establish frameworks for International collaboration concerning stabilisation of international commodity trade relating to the extractive sector.	• Natural Resource Charter and Benchmarking Framework.[183] • Investor protections in host countries. • Incentives and requirements for responsible investment applied by home and host countries: Responsible Mining of Cobalt; Equator Principles; Responsible Raw Materials Initiative; Initiative for Responsible Mining Assurance; etc.

A10.3 Better infrastructure

The following policies, implementation options and illustrative examples should be considered as part of efforts to ensure that decisions about mining maximise the development of (and minimise impacts on) social and physical infrastructures that can be leveraged to support a wider range of development objectives.

Policy	**Implementation options**	**Illustrative examples**
Establish and implement plans for multi-use and no-regret mining infrastructure	• Establish strategies and policies for post-closure land use planning. • Establish strategies and policies for shared use of mining infrastructure.	• Reforestation of Sapphire mines in Madagascar.[184] • Beria Corridor in Mozambique, Lamu Port-South Sudan-Ethiopia Transport Corridor.[185] • African Mining Vision • Integrated Resource Corridors Initiative (IRCI) Scoping & Business Plan.[186]

[181] https://www.csrm.uq.edu.au/docs/CSRM%20Report_FINAL%20TO%20PRINT_singles.pdf.
[182] http://includeplatform.net/wp-content/uploads/2015/03/GTF-Local-Content-MOG-in-Ghana-SR-formatted.compressed.pdf
[183] https://resourcegovernance.org/sites/default/files/documents/natural-resource-charter-benchmarking-framework-report-2017-web_0.pdf
[184] http://pubs.iied.org/pdfs/17439IIED.pdf
[185] http://pubs.iied.org/pdfs/12606IIED.pdf
[186] https://www.adamsmithinternational.com/documents/resource-uploads/IRCI_Scoping_Report_Business_Plan.pdf

Establish incentives and requirements for investment in social (e.g. health, education, public institutions) and physical (e.g. roads, ports) infrastructure	• Establish strategies and policies for managing interactions between mining activities and infrastructure in other sectors. • Establish incentives and requirements for extractive sector investment in wider development infrastructure for: health and well-being (see 10.5.1), ecosystems and biodiversity (10.5.4), and other resources (10.5.5).	• National legislative reforms in ~90 countries focused on boosting investment.[187] • Programme for Infrastructure Development in Africa (PIDA).[188] • A Framework to Approach Shared Use of Mining-related Infrastructure.[189] • District Mineral Funds in India, funded by mineral royalties.[190]

A10.4 Ecosystems and biodiversity

The following policies, implementation options and illustrative examples should be considered as part of efforts to ensure that decisions about mining maintain or enhance ecosystems and biodiversity, including associated flows of valuable ecosystem goods and services:

Policy	Implementation options	Illustrative examples
Assess impacts and benefits of mining on ecosystems and biodiversity	• Require Environmental Impact Assessments (EIA) to be undertaken and taken into account for proposed mining activities. • Couple EIAs with related assessments: strategic environmental assessment (including sector-wide impacts), assessment of relevant transboundary impacts, and assessment of ecosystem service flows.	• UNECE Environmental Performance Review Programme. • See also 10.5.5 below (impacts on other resources).
Manage impacts of mining on ecosystems and biodiversity	• Ensure policies and practices are informed by relevant multi-lateral agreements concerning ecosystems and biodiversity (in particular the Convention on Biological Diversity).[191] • Ensure that mitigation-hierarchy approaches (avoid, mitigate, restore, offset) are applied by relevant decision-makers.	• Biodiversity offsetting policies for mining.[192] • Guidance on developing biodiversity offsets in Andean ecosystems.[193] • ICMM Good Practice Guidance for Mining and Biodiversity.[194] • Responsible Jewellery Guidance on Biodiversity.[195]

[187] http://pubs.iied.org/pdfs/12606IIED.pdf
[188] https://au.int/en/ie/pida
[189] http://ccsi.columbia.edu/files/2014/05/A-Framework-for-Shared-use_March-2014.pdf
[190] http://mines.gov.in/writereaddata/UploadFile/PMKKKY%20Guidelines.pdf
[191] See: www.cbd.int
[192] https://portals.iucn.org/offsetpolicy/ and https://www.iucn.org/sites/dev/files/content/documents/understanding_government_biodiversity_offset_policies_in_the_mining_sector_november_2017.pdf
[193] www.forest-trends.org
[194] https://www.cbd.int/development/doc/Minining-and-Biodiversity.pdf
[195] https://www.responsiblejewellery.com/files/Biodiversity-RJC-Guidance-draftv1.pdf

	• Ensure use and appropriate resourcing for environmental management systems. • Ring-fence appropriate share of mining revenues for ecosystem and biodiversity management.	• ISO 14001: Environmental Management.[196] • Guidance Natura2000 and extractive industries[197]
Establish accounting systems for impacts of mining on ecosystems and biodiversity	• Ensure that all relevant data is organised and communicated in a manner compatible with international accounting standards and best practice.	• World Bank WAVES Partnership, and work by UN Economic Commissions (e.g. UNESCAP) on natural capital accounting.[198] • UN Framework for Development of Environment Statistics.[199] • UN System of Environmental-Economic Accounting (Ecosystem Accounts).[200] • Natural Capital Protocol.[201]
Incentivise and require investment in ecosystems and their services	• Identify and implement ecological and other 'greener' alternatives to conventional built mining infrastructure. • Establish payment schemes for ecosystem services (PES).	• WWF/AECOM Review of Screening Tools for Sustainability and Climate Resilience of Infrastructure Development. • The Nature Conservancy Development by Design approach, and green infrastructure pilots.[202] • Global Environment Facility investments in PES schemes.[203]

[196] https://www.iso.org/iso-14001-environmental-management.html
[197] http://ec.europa.eu/environment/nature/natura2000/management/docs/neei_n2000_guidance.pdf
[198] https://www.wavespartnership.org
[199] https://unstats.un.org/unsd/envstats/fdes.cshtml
[200] https://unstats.un.org/unsd/envaccounting/seea.asp
[201] https://naturalcapitalcoalition.org/protocol/
[202] www.nature.org/ourinitiatives/
[203] *www.thegef.org/sites/default/files/publications/28252nomarks_0.pdf*

A10.5 Impacts on other resources

The following policies, implementation options and illustrative examples should be considered as part of efforts to ensure that decisions about mining minimise or avoid adverse impacts on other valuable resources that underpin development (e.g. land, water, food, energy, climate, infrastructure).

Policy	Implementation options	Illustrative examples
Assess impacts and benefits of mining for other resources	• Require Environmental Impact Assessments (EIA) to be undertaken and taken into account for proposed mining activities. • Couple EIAs with related assessments: strategic environmental assessment (including sector-wide impacts), assessment of relevant transboundary impacts, and assessment of resource implications of mining including supply and criticality assessments.	• IFC / CAC Advisory on Participatory Water Monitoring.[204] • UNECE Convention on Environmental Impact Assessment in a Transboundary Context, and Protocol on SEA. • EU Supply Risk Assessment (EU, 2015), Yale Study on Materials Criticality, BGS Risk List, etc. • WEF, Blueprints for a Greener Footprint: Sustainable Development at a Landscape Scale.[205]
Manage impacts of mining on other resources	• Ensure that policies and practice are consistent with relevant international agreements on pollution. • Ensure that policies and practice are informed by development objectives and risks in other key sectors (e.g. agriculture, tourism, urban development, energy). • Ensure that mitigation-hierarchy approaches (avoid, mitigate, restore, offset) are applied by relevant decision-makers. • Establish, as appropriate, alternative livelihood programmes for artisanal and small-scale miners. • See 10.5.3 above for options concerning infrastructure management.	• EU Raw Materials Initiative.[206] • EU Natura2000 Guidance concerningextractive industries.[207] • UNECE Best Practice Guidance on Effective Methane Drainage and Use in Coal Mines. • Minamata Convention on mercury and UN Environment Global Mercury Partnership. • UNECA Compendium on Best Practices in Small-scale Mining in Africa (ECA, 2002).
Establish and implement integrated plans for resource management	• Including implementation of relevant components of the UN Framework Classification for Resources.	• Nordic common subregional guidelines for applying UNFC to the minerals sector. • UNECA and African Minerals Development Centre adoption of UNFC

[204] www.cao-ombudsman.org/howwework/advisor/documents/watermoneng.pdf
[205] http://www3.weforum.org/docs/WEF_Blueprint_for_a_Greener.pdf
[206] http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52008DC0699
[207] http://ec.europa.eu/environment/nature/natura2000/management/docs/neei_n2000_guidance.pdf

		as part of efforts to implement the Africa Mining Vision and SDGs. • Land use planning legal and policy frameworks in Australia, China, the EU, South Africa, Mexico, and elsewhere.[208] • Land use planning legal and policy frameworks in Brazil, Chile, Colombia, Mexico and Peru.[209] • Integrated Resource Corridors Initiative (IRCI) Scoping & Business Plan.[210]
Establish systems for environmental-economic accounting	• Ensure that relevant data is organised and communicated in a manner compatible with international standards.	• The UN System of Environmental-Economic Accounting (SEEA). • Natural Capital Protocol.

A10.6 Engagement and collaboration

The following policies, implementation options and illustrative examples should be considered as part of efforts to ensure that all relevant stakeholders are included and involved in decision-making about mining.

Policy	**Implementation options**	**Illustrative examples**
Establish stakeholder consultation processes to inform decision-making	• Establish policies and requirements for consultation with local communities. • Establish policies and requirements for multi-stakeholder consultation on strategic / sector-wide issues.	• Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention) • Responsible Mineral Development Initiative (RMDI) Implementation Manual.[211]
Establish frameworks for participatory governance	• Establish frameworks that bring actors together from multiple levels of governance (local, national, regional). • Include diverse stakeholders from the public sector, private sector, civil society, local communities and others. • Establish participatory governance frameworks that formalise artisanal and small-scale mining.	• Informing dialogue processes for artisanal and small-scale mining in Tanzania and elsewhere.[212] • Participatory land use planning in the United Kingdom. • See Chapter 3 above on ASM.
Establish consultation and	• Including but not limited to the groups acknowledged in the 2030	• Legal requirements concerning free prior and informed consent in Colombia.[213]

[208] UNCCD Global Land Outlook Working Paper: https://static1.squarespace.com/static/5694c48bd82d5e9597570999/t/593a42d7197aea88458703df/1496990441721/Land+Use+Planning+__G_Metternicht.pdf
[209] ELLA, Practical Action, DFID: Policy Brief: Land Use Planning for Extractive Industries.
[210] https://www.adamsmithinternational.com/documents/resource-uploads/IRCI_Scoping_Report_Business_Plan.pdf
[211] http://www3.weforum.org/docs/WEF_RMDI_Implementation_Manual_2017.pdf
[212] http://pubs.iied.org/pdfs/16635IIED.pdf
[213] http://pubs.iied.org/pdfs/12606IIED.pdf

representation requirements for marginalised groups	Agenda for Sustainable Development and international human rights instruments: women, children, the poor, indigenous peoples.	• Legal protections for indigenous rights in the context of mining in India (see Box 11.2 below).
Establish frameworks for coordinated governance along extractive sector value chains	• Establish institutions and standards for coordinated value chain governance. • See 10.5.2 above and 10.5.7 below concerning value chain transparency.	• OECD Standards for Mineral Supply Chains.[214] • Ethical mineral schemes and standards: Better Gold Initiative (BGI), Fairtrade Gold, Fairmined Gold, Tin Supply Chain Initiative (iTSCi), and Diamond Development Standards (DDS), Conflict-Free Gold Standard (CFGS). • Other commodity-specific standards and programmes: Aluminium Stewardship Initiative; BetterCoal Code; Conflict Free Sourcing Initiative; Chinese Due Diligence Guidelines for Responsible Mineral Supply Chains; Certified Trading Chains; Diamond Development Standard; Kimberly Process Certification Scheme; etc.

A10.7 Transparency and accountability

The following policies, implementation options and illustrative examples should be considered as part of efforts to ensure that *(1)* decisions about mining are made in a transparent manner based on the best available evidence, and (2) decision-makers are held accountable for the consequences of their actions.

Policy	**Implementation options**	**Illustrative examples**
Incentivise and require disclosure and reporting of mining activities and impacts.	• Including social, economic and environmental impacts, broadly defined.	• Extractive Industries Transparency Initiative.[215] • The Mining Local Procurement Reporting Mechanism.[216] • OECD Base Erosion and Profit-Sharing project (home countries).[217] • Responsible Mining Index.[218] • Global Reporting Initiative (GRI) G4 Mining and Metals Sector Disclosures.[219]

[214] www.oecd.org/corporate/mne/artisanal-small-scale-miner-hub.htm
[215] eiti.org
[216] miningsharedvalue.org/mininglprm/
[217] www.oecd.org/tax/beps/
[218] https://responsibleminingindex.org/index/
[219] https://www.globalreporting.org/resourcelibrary/GRI-G4-Mining-and-Metals-Sector-Disclosures.pdf

		• EU Non-Financial Reporting Directive.[220] • EU Directives concerning Transparency and Accounting.[221]
Establish institutions and frameworks for resolving disputes between different actors	• Ensure that disputes concerning the extractive sector are justiciable and subject to the rule of law. • Establish mechanisms for alternative (non-judicial) dispute settlement. • Where relevant, establish institutional frameworks for settlement of transboundary disputes concerning mining.	• Natural Resource Charter Benchmarking Framework.[222] • Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention).
Establish institutions and frameworks that ensure independent scrutiny of decision-making about mining	• Including separation of regulatory and development functions within government, and corporate governance regulation.	• Natural Resource Charter and Benchmarking Framework.[223]

A10.8 Policy coherence

The following policies, implementation options and illustrative examples should be considered as part of efforts to ensure that decisions about mining are not made in isolation from decisions concerning other development issues.

Policy	**Implementation options**	**Illustrative examples**
Establish long-, medium- and short -term visions and strategies concerning mining and sustainable development	• Including nested visions and strategies and nested levels of scale (local, national, regional, and across value chains). • Durable contractual agreements between mining companies and governments.	• African Mining Vision (AMV, 2016). • Indian Sustainable Development framework for Mining.[224] • UN Economic Commission for Europe Pan-European Strategic Framework for Greening the Economy.[225] • Country Mining Vision (CMV) Guidebook.[226] • OECD Guiding Principles for Durable Extractive Contacts.[227]
Establish integrated planning and reporting frameworks for	• Integrated spatial planning frameworks and processes, for surface and sub-surface resources.	• Land use planning in Sweden, including designation of mineral deposits of national interest.

[220] https://ec.europa.eu/info/business-economy-euro/company-reporting-and-auditing/company-reporting/non-financial-reporting_en
[221] http://lexicon.ft.com/Term?term=EU-accounting-and-transparency-directives
[222] resourcegovernance.org/sites/default/files/documents/natural-resource-charter-benchmarking-framework-report-2017-web_0.pdf
[223] resourcegovernance.org/sites/default/files/documents/natural-resource-charter-benchmarking-framework-report-2017-web_0.pdf
[224] http://mines.gov.in/writereaddata/UploadFile/Sustainable_Development_Framework.pdf
[225] www.unece.org/fileadmin/DAM/env/documents/2016/ece/ece.batumi.conf.2016.6.e.pdf
[226] https://www.uneca.org/sites/default/files/PublicationFiles/country_mining_vision_guidebook.pdf
[227] www.oecd.org/dev/guiding-principles-durable-extractive-contracts-pd-nr.htm

mining and other sectors contributing to sustainable development	• Integrated reporting frameworks for mining and sustainable development.	• ICMM Guidance concerning mining and the SDGs. • Global Reporting Initiative. • Indicator framework of the 2030 Agenda for Sustainable Development. • CMV Guidebook • South African Mining Charter
Establish laws, policies and institutions for coordinating decision-making about mining with that about other sectors and issues	• Ensure recognition of the extractive sector in national laws and policies for sustainable development. • Embed wider sustainable development considerations into legal and policy frameworks for the extractive sector. • Discuss the merits of intergovernmental agreements concerning mining and sustainable development (e.g. a multi-lateral Convention on Extractives).	• Natural Resource Charter Benchmarking Framework.[228] • Kenya Mining and Minerals Policy and Mining Act 2016.[229] • CMV Guidebook

A10.9 Policy gaps and opportunities

The tables presented above highlight the diverse range of policy options that are available to align decision-making in the extractive sector with sustainable development. However, several key gaps (and opportunities) are revealed when existing policy responses to mining are compared against the Sustainable Development Goals.[230] These include the following:

Governance of development minerals (versus energy minerals and metals)

As discussed previously, development minerals include: Selenium, Iodine, Lithium, Kyanite, Bromine, Vermiculite; Wollastinite, Mica, Graphite, Garnet, Diatomite, Zeolites, Fullers Earth, Perlite, Flurospar, Barite, Silicon, Talc, Bentonite, Pumice, Feldspar, Kaolin, Potash, Soda Ash, Sulphur, Dimension Stone, Rock Salt, Phosphate, Gypsum, Lime, Cement and Sand and Gravel. Development minerals dominate global mineral production in terms of volume (Franks *et al.*, 2017 after USGS, 2017), representing 84% of all mined commodities. Of the top ten most produced minerals and materials, eight are Development Minerals (28 of the top 40). Sand tops the list with an estimated production at 40 billion tonnes per year, making it arguably the most utilised natural resource after water. A recent conservative estimate for world consumption of aggregates (sand and gravel) exceeds 40 billion tonnes per year, representing twice the yearly amount of sediment carried by all rivers globally, making human activity the largest transforming agent with respect to aggregates (UNEP, 2014).

Development minerals can be characterised generally by their low price as a function of weight, and their relatively low value on international commodity markets. Despite their importance for economic

[228] https://resourcegovernance.org/sites/default/files/documents/natural-resource-charter-benchmarking-framework-report-2017-web_0.pdf
[229] https://www.idlo.int/sites/default/files/pdfs/highlights/Kenya%20Mining%20Policy%20Popular%20Version-LowRes.pdf
[230] For detailed discussion — see Columbia Center on Sustainable Investment, UNDP, UN Sustainable Development Solutions Network, World Economic Forum. Mapping Mining to the Sustainable Development Goals: An Atlas. July 2016, unsdsn.org.

development, in many countries the legal and regulatory frameworks concerning development minerals is unclear. For example, they are often excluded from the scope of mining legislation. Further effort is needed to identify governance options for the development minerals sector, building on the current achievements of capacity building initiatives such as the ACP-EU Development Minerals Programme.[231]

Transparency and accountability[232]

Previous chapters emphasized how a lack of access to information about the socio-economic and environmental impacts of mining projects can be a major contributor to conflict. Obtaining trustworthy and impartial data can be all but impossible for project-affected communities. At the same time, we have entered the so-called 'information age' which is defined as '*a time in which information has become a commodity that is quickly and widely disseminated and easily available through the use of computer and communication technologies*'[233]. We are better connected than ever before. Even though women are still 14% less likely than men to own one, in total over 80% of citizens in the developing world now have mobile phones[234]. With better connectivity also comes increasing scrutiny of the mining sector. Information about incidents of human rights violations or environmental pollution, for instance, can no longer be geographically contained and companies are increasingly vulnerable to reputational damage that can impact their operations globally. For many extractive companies, transparency has, therefore, become 'the first line of defense' and as a consequence many companies are moving towards integrated reporting or so-called ESG (environmental, social and governance) reporting which includes sustainability, social and environmental information alongside operational issues.

Voluntary reporting initiatives aside, and despite the uncertainty surrounding the future of the Dodd Frank Act section 1502, the trend to increase mineral supply chain transparency has become irreversible. The recently passed European regulations on '*supply chain due diligence obligations for Union importers of tin, tantalum and tungsten, their ores, and gold originating from conflict-affected and high-risk areas*' create mandatory supply chain due diligence for European importers of tin, tungsten, tantalum and gold[235]. Expanding on the scope of Dodd-Frank and the OECD Due Diligence Guidance which focus primarily on the Great Lakes region, the European regulation takes a global perspective and will apply to gold produced in Colombia for example[236]. Responding to strong consumer demand, this trend is likely to include other commodities in the future. In order to prevent importers from turning their backs on high-risk and conflict affected areas to source materials elsewhere, reliable information and practical tools need to be made available which enable investors and importers to effectively assess and address risks in their supply chains.

As a result of the increased emphasis on transparency, more information is being generated in the extractive sector than ever before. However, there are a number of issues related to the substance

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[231] http://www.jm.undp.org/content/jamaica/en/home/operations/projects/poverty_reduction/acp-eu-development-minerals-programme-.html
[232] David Jensen and Inga Petersen — UN Environment, Post-Conflict and Disaster Management Branch
[233] Definition of 'Information Age' https://www.merriam-webster.com/dictionary/Information%20Age
[234] The World Bank '#GenderMatters: From digital divides to digital dividends'. January 13, 2016. http://blogs.worldbank.org/developmenttalk/where-are-women
[235] See: http://data.europa.eu/eli/reg/2017/821/oj
[236] The OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas is available here: http://www.oecd.org/corporate/mne/mining.htm

and form of the information. Regarding the former, transparency efforts in the mining sector have overwhelmingly focused on financial transparency but have stopped short of increasing environmental transparency (for example, the Extractive Industries Transparency Initiative). Similarly, whereas the centrality of human rights in supply chain due diligence as mandated by the OECD and the EU is undisputed, both frameworks insufficiently address environmental impacts and environmental rights. Taking gold as an example, the use of mercury for amalgamation in artisanal and small-scale mining is widespread and poisons water sources, fish stock and communities with devastating and irreversible effects on human health and wellbeing. In order to promote sustainable development outcomes including sustainable livelihoods, increased emphasis and transparency related to the environmental impacts of the sector are essential.

For other issues where data is being made available, such as socio-economic impacts, the data is often fragmented, not readily available, or outdated. In some cases, there is simply too much information to allow communities, investors or importers to discern what is important to them. In addition, information produced by the government, companies or non-governmental organizations working on the ground is not always trusted by affected communities and other concerned parties. Simply making more information available is not enough. Tools are needed to make the information useful for all stakeholders. Aggregating, verifying and interpreting the available information can play a critical role to improve stakeholder dialogue, enable inclusive decision-making and participatory monitoring. The best approaches involve multi-stakeholder processes that focus on bottom-up knowledge creation to build trust among stakeholders, rather than top-down models. In Peru, following the wave of conflicts in the extractive sector, the law now includes provisions to allow for participatory environmental monitoring of operations. Since 2008, over 40 groups have been registered with the Ministry of Energy and Mines to support monitoring efforts[237].

Efforts to improve transparency play an important role in conflict prevention and enhanced sustainable development outcomes, given that information asymmetries between stakeholders are a major contributor to conflict in the sector. In order to effectively address underlying causes of conflict, efforts of improving transparency as a means for conflict prevention and more informed and inclusive decision making must extend to including environmental and social impacts of operations. This helps citizens better understand the distribution of costs and benefits across the project life cycle and build trust among stakeholders. In order to maximize the impact of the available information, dedicated tools are needed to consolidate, verify and analyze data, making it accessible for all stakeholders.

The need for reliable information and related analytical instruments is not limited to upstream mining affected communities but extends to include all actors along the mining and metals supply chain, including importers and investors. In order to enable concerted efforts to address supply chain risks related to human rights violations, involvement of armed groups or environmental crime, supply chain actors require open access to authoritative and consolidated data. Considering the political economy of information, the task of aggregating, authenticating and publishing data provided from a variety of sources including academia, government, the private sector and NGOs should ideally fall to impartial third parties. The emphasis on trustworthy data is not only required for risk management purposes

[237] In 2008 regulations on participatory committees created OEFA (Organismo de Evaluación y Fiscalización Ambiental https://www.oefa.gob.pe), a specialized technical agency ascribed to the Ministry of Environment, responsible for the assessment, supervision, enforcement and sanctions in environmental matters and licensing.

but is equally important in order to track the effectiveness of policy, legislative and development efforts which promote responsible sourcing.

Formal recognition of interests and rights concerning mining

This issue has been discussed at length in Part II of this Report.[238] In summary, there is a need in many countries for legal recognition of the rights and activities of artisanal and small-scale mining, including the rights and interests of indigenous peoples.[239]

[238] See also for example: Spiegel, S. J. (2012). Governance Institutions, Resource Rights Regimes, and the Informal Mining Sector: Regulatory Complexities in Indonesia. World Development, 40(1), 189–205. http://doi.org/10.1016/j.worlddev.2011.05.015
[239] For further discussion see IIED's work on formalization of mining rights in Tanzania, Madagascar and elsewhere.

Chapter 11 - Implications and implementation of the SDLO

11.0 Introduction

In an era characterised by unprecedented governance complexity and an urgent imperative for sustainable development,[240] current modes of governance for mining are not fit-for-purpose. The SDLO framework presented in Chapter 10 is advocated as a flexible means to enable different actors to illuminate specific deficiencies of mineral resources governance in specific contexts, using the normative lens of the 2030 Agenda and other global commitments concerning the environment and sustainable development. It consequently provides an entry point and reference frame for navigating the complex nexus of issues and challenges associated with the extractive sector, in order to identify actions needed to realise the 2030 Agenda's vision of a better future.

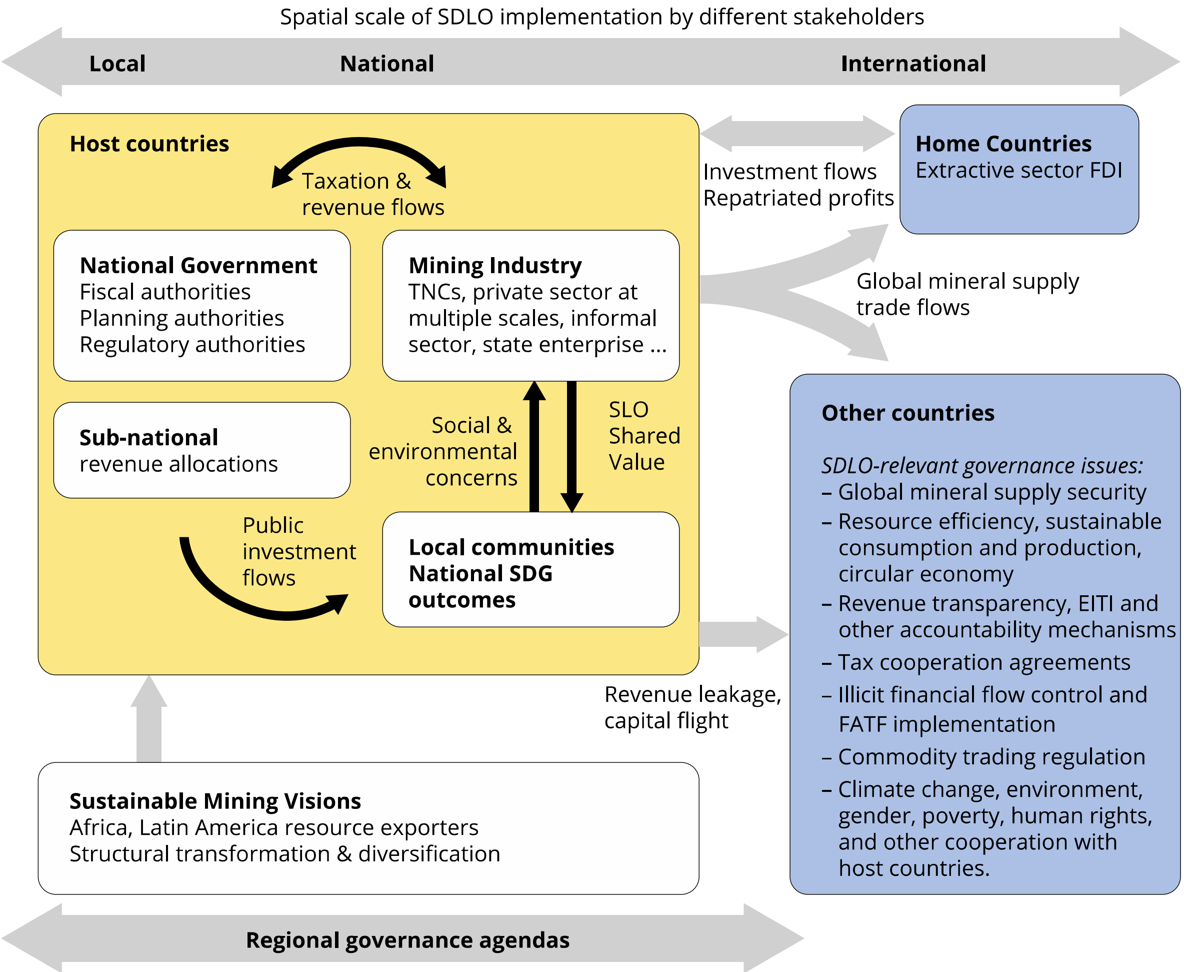
This Chapter discusses *(1)* key implications of the SDLO for different groups of actors involved in governance of the extractive sector, and *(2)* implementation options for embedding the SDLO in relevant governance processes. The discussion is prefaced with an overview of key relationships between different groups of actors involved in extractive sector governance, and priority areas for international cooperation to implement the SDLO. Particular attention is devoted to explaining the relevance and utility of the SDLO in a context where the proliferation of extractive sector initiatives (discussed in Part II of this Report) have created a widespread sense of "initiative fatigue" (See Chapter 8) and reluctance to focus limited resources on yet another contribution to the sector's sustainability.[241]

11.1 The SDLO, Global Governance and the 2030 Agenda for Sustainable Development

Global mineral production and trading link together resource-exporting countries, hosts to international mining investment, and industrialized resource-intensive economies, many of them home to mining multinationals or international financial and commodity trading hubs that play key roles in global resource supply flows. While each of these groups faces distinct priorities in their national and international agendas, SDLO implementation opens new opportunities for international cooperation between host and home countries, and the international community at large. A clear mapping of these opportunities is necessary to implement SDLO within a global governance framework. Figure 11.1 (below) illustrates the diverse international linkages and governance issues relevant to SDLO implementation within a global context. It highlights how (1) different actors' issues are connected across local, national and international scales through flows and finance and information, and through shared concerns, and (2) SDLO implementation might emphasize different subsets of governance issues concerning mining.

[240] See e.g. Jeffrey Sachs, The Age of Sustainable Development (Columbia University Press, 2015).
[241] See e.g. Resolve Solutions Network and World Economic Forum, Voluntary Responsible Mining Initiatives, A Review, August 2015: http://www3.weforum.org/docs/Voluntary_Responsible_Mining_Initiatives_2016.pdf.

Figure 11.1 International governance context for SDLO implementation



Many of the policy implications of the SDLO are also analysed in the 2016 Atlas Mapping Mining to the SDGs[242] published by the World Economic Forum and partners (see Figure 11.1 above). Figure 11.2 below, reproduced from the Atlas, illustrates a series of implications of the SDGs for mining companies (emphasising issues relevant to larger and/or transnational companies), and their connections to public policy agendas

[242] Columbia Center on Sustainable Investment, UNDP, UN Sustainable Development Solutions Network, World Economic Forum. Mapping Mining to the Sustainable Development Goals: An Atlas. July 2016, unsdsn.org.

Figure 11.2 Issue areas concerning mining and sustainable development

Source: 2016 Atlas Mapping Mining to the SDGs[243]

11.2 Implications for host country governments

The SDLO highlights the extent to which sustainable development of mining can only be realized by transforming vertical silos and current modes of resource governance, and by paying appropriate attention to supporting infrastructure (social and physical) and the natural environment.244 It also reveals the tremendous complexity of inter-relationships between the extractive sector and sustainable development, which challenges conventional structures and processes of decision-making in government entities. Decision-makers who shape or whose work is affected by the extractive sector can no longer operate in silos—they will need to find ways of widening participation, creative collective ownership and building consensus. In practice, this will require greater institutional cohesiveness and a transformation in the structure of decision-making, including the integration of vertical and horizontal planning and a long-term perspective. This requires strong local and national

[243] Columbia Center on Sustainable Investment, UNDP, UN Sustainable Development Solutions Network, World Economic Forum. Mapping Mining to the Sustainable Development Goals: An Atlas. July 2016, unsdsn.org.
[244] For analogous observations in the energy sector—see FF Nerini *et al*, (2018) Energy.

visions (see, for instance, the Africa Mining Vision, discussed previously) that are sensitive to the need for global collaboration. Given the cross-cutting relevance of mining for the SDGs, structured analyses such as the one presented in Chapter 10 can help to ensure that actions concerning mining are compatible with wider local, national and international development priorities. In so doing, this type of analysis can help the design of policies that are more coherent and balance synergies and trade-offs across well-being, infrastructure and the environment in specific settings.

The SDLO principles—or others compatible with the holistic normative position of the 2030 Agenda for Sustainable Development—should be embedded as factors to consider in relevant regulatory processes, and should be justiciable to the extent appropriate. In many legal frameworks concerning mining there is a complete absence of priority setting concerning the merits of mining in the context of other activities and interests (although in a number of cases this broader perspective is incorporated to varying degrees into planning laws and policies). Legal frameworks need to establish platforms and institutional spaces for stakeholder consultation and deliberation, including a wider range of actors than just government authorities and the relevant project developers. Such platforms and spaces are both a direct normative feature of the 2030 Agenda (that is, they are stipulated by various Goals and Targets), and an important means to forge consensus and compromise concerning delivery of other Goals and Targets.

Another significant implication is that impact assessment and permitting processes for mining in many countries need to change, from siloed and specialised activities (for example, EIA) to holistic and inclusive processes grounded in the principles mentioned above. In many countries, environmental impact assessment processes focus predominantly on site-specific biophysical impacts on the environment[245] without consideration of how such impacts might affect flows of valuable goods and services beyond the site of the mining development in question.[246] The case for cumulative environmental impact assessments in large mining districts was made earlier. Box 11.1 below provides examples of how legal and regulatory structures in India grapple with cross-sectoral development impacts and opportunities of the extractive sector particularly to incorporate the principle of "common good" into the private enterprise of mineral extraction ; to ensure that the full impact of mining activities is adequately captured for purposes of accountability; and to ensure that local communities, especially those in vulnerable situations are not exploited in the name of "development"

Box 11.1 Mining and the SDLO: some legal perspectives from India[247]

India produces as many as 86 minerals, which include 4 fuels, 10 metallic, 46 non-metallic, 3 atomic and 23 minor minerals (including building and other materials). The Indian mining sector is a mix of large-scale and small-scale mining, with several large companies (both public sector and private sector) that have integrated operations to produce steel, aluminium, copper, and so on. Most mineral production is for domestic consumption. Federal laws concerning the granting of concessions and for regulating issues relating to

[245] For example: habitat loss, site-specific pollution levels.

[246] For example, coastal mining might degrade areas of mangrove ecosystems that are not significant in terms of total areas lost, but are significant in terms of impacts on provisioning services for fishing (that is, fish spawning grounds), and regulating and maintenance services for nearby communities (such as water filtration and protection from storms and flooding). In some cases the economic value of ecosystem services lost has been demonstrated for far exceed the economic returns associated with mining: for further discussion see the Synthesis Reports of the TEEB Initiative.

[247] By S. Vijay Kumar, Distinguished Fellow TERI, New Delhi, India.

environmental impacts, involuntary displacements, and so on, provide a comprehensive framework covering mining.

In India, approaches towards increasing the 'sustainability" in mining related operations have taken the form of creating a generic "Sustainable Development Framework" [248] which aims at ensuring that mining "is socially responsible, environmentally, technically and scientifically sound; with a long-term view of development; with genuine, mutually beneficial partnerships between Governments, communities and mining companies; and based on integrity, transparency and cooperation".

However, the reality is far more complex, and cases before Indian Courts show how difficult it is, in practice, to reach a correct balance. Mentioned below are three landmark cases that were decided by the Indian Supreme Court. In the first one, the Court points out that revenue maximization (that is, mineral royalties) cannot be the only factor relevant to decision-making about mining; the public good doctrine mandates that the "public good" must be served. In the second case, the Court, realizing that mining has regional impacts beyond lease boundaries (particularly in the case of small and medium-scale operations), is in the process, hands-on, of fashioning a framework (Comprehensive Environment Plan for the Mining Impact Zone or CEPMIZ) to mitigate regional level impacts and develop physical and social infrastructure in the mining regions by mandating contributions by the mining companies over and above the statutory payments on account of royalty and compensatory afforestation. In the third case, again, the Court is mandating an additional payment of 20% of profits for the socio-economic development of indigenous populations on the basis of Constitutional principles.

Case 1: The public trust doctrine in extraction of natural resources[249]

The President of India had made a Reference to the Supreme Court seeking its Opinion on the permissible methods for disposal of natural resources across all sectors (including minerals). The Court vide its Judgement dated 27th September 2012, discussed the matter in depth, and underlined several principles which had evolved in recent times based in substantial part on International Conventions and Conferences.

Reiterating that the State is the trustee of natural resources, which are by nature meant for public use and enjoyment, the Court invoked the Doctrine of Public Trust. The doctrine does not exactly *prohibit* the alienation of the property held as a public trust, but states that it is the duty of the Government to provide complete protection to the natural resources as a trustee of the people at large. The Court held that the courts must make a distinction between the Government's general obligation to act for the public benefit, and the special, more demanding obligation that it may have as a trustee of certain public resources. "Common good" is the sole guiding principle for distribution of natural resources.

The manner in which the common good is best sub-served would, however, depend on the economic and political philosophy of the government. Revenue maximization is not the only way in which the common good can be sub-served. Revenue considerations may assume secondary consideration to developmental considerations.

The Supreme Court also cited from the *National Audubon Society Vs. Superior Court of Alpine Country* (Mono *Lake case)* in the Supreme Court of California where the Court said: *"Thus the public trust is more than an affirmation of State power to use public property for public purposes. It is an affirmation of the duty of the State to protect the people's common heritage of streams, lakes, marshlands and tidelands, surrendering the right only in those rare cases when the abandonment of the right is consistent with the purposes of the trust."*

Case 2: Karntaka Iron Ore Mining Case[250]

[248] http://mines.nic.in/writereaddata/UploadFile/Sustainable_Development_Framework.pdf
[249] SPECIAL REFERENCE NO.1 OF 2012 under Article 143(1) of the Constitution of India. Judgement dated SEPTEMBER 27, 2012.
[250] Supreme Court of India: WRIT PETITION (CIVIL) NO. 562 of 2009;
Samaj Parivartana Samudaya & Ors vs State Of Karnataka & Ors ;Judgement of 18 April, 2013.

There are 266 iron ore mines in Karnataka, out of which 134 are located in forest areas. In Bellary District, 148 mines (out of which 98 are in forest areas) cover 10,598 hectares of land. The Indian Bureau of Mines in 2005 estimated the total iron ore mineral reserves in Karnataka to be about 1,148 million tonnes (with additional probable resources of about 8 billion tonnes). Iron ore mining in Bellary received a push when the Karnataka State Mining Policy in the year 2000 outlined a policy of "Export Oriented Development" and the State government de-reserved 11,620 square km for private mining that was earlier marked for mining by state entities alone. The changes in mining policy went hand in hand with increasing demand from China due to the Beijing Olympics.

An NGO, the Samaj Parivartana Samudaya instituted a writ petition seeking the Supreme Court's intervention on the ground that the mining practices were environmentally damaging, requesting to stop all mining and other related activities in forest areas of the State .The Court , besides other directions, ordered the setting up of a mechanism for the purpose of taking various ameliorative and mitigative measures .Resources were sequestered to be used exclusively for the socio- economic development of the area/local population, infrastructure development, conservation and protection of forest, developing common facilities for transportation of iron ore (such as maintenance and widening of existing road, construction of alternate road, conveyor belt, railway siding and improving communication systems). A detailed scheme in this regard was to be prepared and implemented. The Court also directed the formulation of a plan called "CEPMIZ" to be funded by the mining companies.

The CEPMIZ will provide for adequate mitigative measures to tackle the adverse impact of mining that have occurred in the past as well as because of future mining operations. In addition, it should ensure the inclusive growth of the area surrounding the mining leases (mining impact zone) takes place by providing adequate provisions / projects for education, health, drinking water, infrastructure, afforestation, soil conservation, and so on. Adequate provisions for the infrastructure facilities, medical facilities, schools, colleges and others in the project area should also be made.

Case 3: The Samatha Case[251] *— protecting tribal rights and customs and ensuring sharing mining revenues with local tribal communities.*

In the early nineties, *Samatha*, an advocacy and social action group working on the rights of tribal (indigenous) communities and for the protection of the environment in Andhra Pradesh, was involved in supporting local tribes over leasing of tribal lands to private mining industries. The tribal community wished to regain control over their lands rather than work for wages in the mining operations on their own lands leased out to non-tribals. After losing the initial battle in the lower and High Court, Samatha filed a Special Leave Petition in the Supreme Court of India. The four-year legal battle led to a historic judgment in July 1997 by a three-judge Supreme Court bench. It was a landmark judgment in favour of tribal rights, based on Constitutional provisions which provided for the protection of tribal rights and customs, and which sought to provide for their planned development consistent with their culture.

One of the features of the Indian Constitution is the direction and philosophy to protect the tribes from exploitation and to preserve the valuable endowment of their land for their economic empowerment. The Constitution has directed the State to provide facilities and opportunities among the concerned people to remove social and economic inequality and to improve equality of status. Accordingly, the Supreme Court held that since the State is enjoined to protect the social, economic and educational interest of the tribes when the State leases out the lands in the Scheduled Areas for exploitation of mineral resources, it transmits the attendant constitutional duties and obligations to those who undertake to exploit the natural resources to improve the social, economic and educational circumstances of the tribal communities. Accordingly, in a path breaking direction, the Supreme Court held that when land is leased out for mining purposes, as a part of the administration of the project, the licensee or lessee should incur the expenditure for development of the tribal area.

[251] The case is titled: Samatha vs State Of Andhra Pradesh And Ors on 11 July, 1997(Supreme Court case no.:Appeal (Civil) 4601-02 of 1997).

The Supreme Court also mandated that at least 20 percent of the net profits should be set apart as a permanent fund as part of an industrial/business activity for the establishment and maintenance of, inter alia, water resources, schools, hospitals, sanitation and transport facilities by laying roads so that the constitutional objectives of social, economic and human resource empowerment of the tribes could be achieved and peace and good government is achieved in Scheduled Areas. This 20% allocation would be over and above the expenditure for re-forestation and maintenance of ecology statutorily required to be done.

Regional political integration platforms have a role in establishing initiatives for harmonized policies, increasing host countries' bargaining power to upgrade current regimes and investment conditions to their advantage. As well as preventing fiscal competition among host countries to attract investment through lax taxation and subpar standards relative to international benchmarks and best practice—see Box 11.2

Box 11.2 Latin America 2003-2012 experience suggests upgrade in mining regimes[252]

State appropriation and efficient investment of resource rents is crucial for Latin American metal and oil exporting countries, especially in periods of high international prices. During the 2003-2012-price boom, mining sector rents[253] more than tripled rising from 0.6% to 2.0% of regional GDP. Countries with a longer mining tradition (Argentina, Chile, Colombia, Peru and Mexico) succeeded in appropriating approximately 20-30% share of these rents[254] annually during the period, whereas smaller countries with incipient mining sectors and weaker fiscal capacity (Guatemala, and Honduras) appropriated only 10% or less. Lack of independent mechanisms to ensure that mining profits and costs are transparent throughout price cycles remains a pending issue. EITI implementation for disclosure of revenue payments is just beginning in the region[255].

The 2003 price hike caught major metal exporters, Chile and Peru, with low marginal tax rates on mining relative to international benchmarks. During the 1990s, Chile successfully used relatively lax fiscal treatment to attract major mining investments that multiplied its production capacity to become a top copper exporter. It realized only minor revenues from large private mining for over a decade, and consistently relied on State mining company CODELCO for the lion's share of mining revenue. By 2000, Peru decided to follow suit with a similar strategy including extended fiscal stability clauses, just a few years prior to the boom. In both countries private mining appropriated extraordinary windfall profits (approximating 70% of estimated total mining rent) during the boom period, to the extent that companies began making additional voluntary payments to the government in Peru. Both metal exporters, Chile and Peru, introduced new royalties in 2004 in an effort to supplement the corporate mining income tax, and increase government take. Introduction of these new royalties was widely opposed by industry during the legislative process, and their revenue contribution turned out to be marginal.

In contrast, the same 2003-2012 period saw oil exporting countries with State-owned and mixed-ownership enterprises (Brazil, Bolivia, Colombia, Ecuador, Mexico, and Venezuela) appropriating 60-75% share of

252 Contribution from Jean Acquatella, Working Group Member.

253 Mining sector rent, refers to the World Bank WDI statistic: mineral rent (as percentage of GDP) calculated as the difference between the value of production for a stock of minerals at world prices and their total costs of production at minehead. Basket includes tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite and phosphate.

254 States share in rent, refers to the ratio state mining revenues divided by the mineral rent WDI statistic

255 Only Peru and Honduras have implemented EITI; Colombia and Guatemala are pending assessment; and Mexico, Guyana and Surinam signed up in 2017.

hydrocarbon rents. This reflected the long tradition of oil tax/contract systems of including progressive instruments that ensure a rising national share of rents during price up-cycles[256].

A lesson that emerges from this experience is the need to upgrade mining regimes to incorporate such instruments/clauses as contingency measures in preparation for future up-cycles. Regional political platforms are ideal means for host countries to join forces in pursuing the strengthening of their mining regimes, increasing bargaining power to their advantage. Strengthened regional initiatives towards harmonized standards, tax/contract policies, and fiscal treatment of mining investments in line with international best practice, remain an untapped opportunity.

Data source: ECLAC (2012, 2014).

11.3 Implications for home country governments

The comments made in Section 11.2, concerning cross-sectoral connections and complexity of mining, apply equally to home country governments. See also the comments made in Section 11.1 concerning international cooperation to deliver the SDLO. Some additional implications of the SDLO for home country governments include the following:

- The SDLO provides a normative reference point for international capacity building partnerships such as the EU Sustainable Development Fund[257], supporting their alignment with the 2030 Agenda in holistic terms.
- The SDLO also provides a reference point for organizing and evolving the myriad of disclosure requirements imposed on mining companies as a consequence of the domicile in the relevant home country.

SDLO implementation efforts focusing on governance issues in home countries might consider targeting the following priority areas:

Strengthening host countries' fiscal, revenue management and public investment capacities

Sustainable mining initiatives to date (SLO, shared-value, and so on) have focused mainly on improving the industry's environmental and social performance at the local level in host countries. The SDLO's focus on SDG outcomes addresses a broader scope of governance challenges faced by resource-exporting countries, aspiring to turn mineral wealth into a driver for structural transformation and diversification[258]. These governance challenges extend beyond mining industry actors, and concern host country governments' capacity to perform core fiscal, budgetary and public investment functions required to deliver positive outcomes from extractive sector development.

At the national level, these functions include building the capacity of fiscal and budgetary institutions to ensure fair national appropriation of resource rents, and their efficient investment towards national

[256] Common practice in oil-exporters is the use of scaled royalties, windfall taxes (triggered above certain price thresholds) and the use of risk- or production-sharing contracts, to ensure a larger government take during oil price upcycles. Direct participation of the State, either through public enterprises or through shareholdings, is also the general rule.

[257] See EU Regulation 2017/1601 establishing the European Fund for Sustainable Development (EFSD), the EFSD Guarantee and the EFSD Guarantee Fund. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv%3AOJ.L_.2017.249.01.0001.01.ENG

[258] As expressed in the Africa Mining Vision (AMV) and other international declarations. Please refer to: Antonio Pedro, Elias T. Ayuk, Christina Bodouroglou, Ben Milligan, Paul Ekins, Bruno Oberle. *Towards a sustainable development licence to operate for the extractive sector*. Mineral Econ (2017) 30: 153.

development priorities; while minimizing rent dissipation in current expenditures, revenue leakage and capital flight. These core functions encompass all five stages in the extractive industry value chain described earlier, in addition to capacities for managing cyclical mineral revenue over price cycles. International cooperation to support SDLO implementation should target technical assistance and training in all these areas.

At the global level, international agendas on tax cooperation, control of evasion and illicit financial flows, all reinforce each other, closing loopholes and reducing revenue leakage away from resource-exporting countries.[259] Implementation of these international efforts also demands strengthened fiscal capacities in resource-exporting countries. Coordinating both levels of intervention can potentially contribute to improved outcomes worldwide.

At the regional level, resource-exporting countries' collective interest is best served by working towards harmonized foreign investment performance standards and common tax/contract and concession awarding policies. ECA (2016) argues that rather than relying exclusively on Bilateral Investment Treaties, African countries should consider regional approaches when developing a legal framework for foreign investment.

Coordinating implementation of transparency and accountability agendas at the national and international levels

International political attention to transparency and accountability agendas has grown to cover an increasing number of issues. From financial information sharing and oversight aimed at curbing international tax evasion and illicit flows, to the monitoring of labour conditions and corporate sustainability performance measures across global value chains. EITI's initial coverage of resource revenue payments is now extending to beneficial ownership disclosure and commodity trading transparency[260]. As international pressures for transparency initiatives continue to extend their reach, they offer opportunities to strengthen parallel national level initiatives for increased civil society oversight and democratic accountability of resource rent allocation and use by governments and industry in extractive regions[261]. For instance, an increasing trend towards more formal and periodic civil society monitoring of national governments' resource-revenue allocation and its local development impacts, took hold in several Latin American countries (including Peru, Colombia, Ecuador, and Bolivia) during the last resource boom. Strengthening third sector monitoring and civil society capacity to use information disclosure for public accountability in resource-exporting countries is another target area for international cooperation and training in support of SDLO. The need for increased technical assistance in this area has been identified by several international organizations and aid agencies like the World Bank, NRGI, EITI, GIZ and DFID among others.

[259] Refer to Figure 11.1, other countries SDLO relevant governance issues.
[260] EITI 2017 work plan establishes disclosure of beneficial ownership and increased transparency of commodity trading, as strategic areas for future work in addition to disclosure of revenue payments.

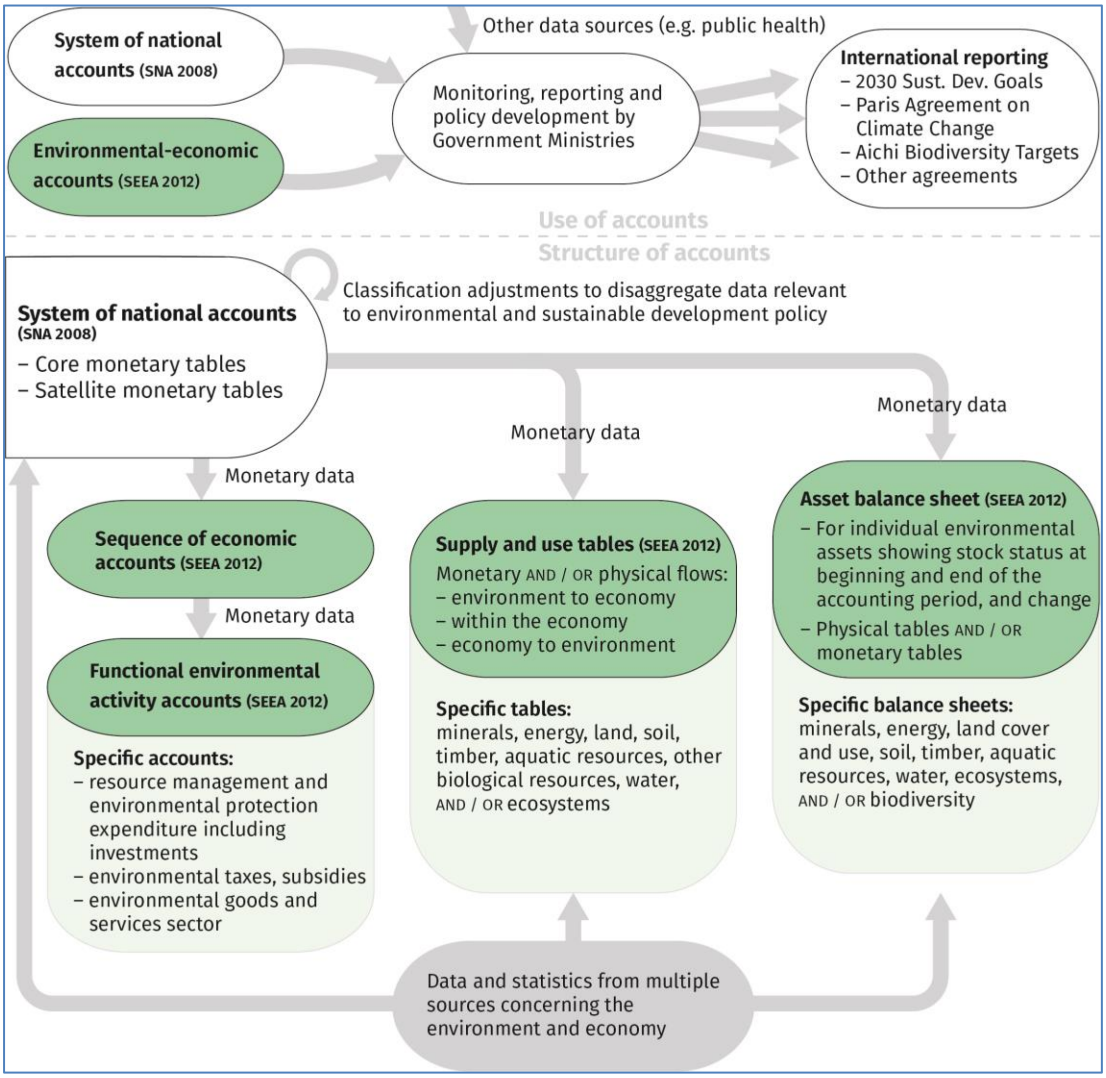
Integrated planning for mineral and other resources

Mineral resources governance around the world at national and sub-national levels is characterised by the widespread absence of planning of mining that is underpinned by a 'nexus' approach that attempts to optimise flows of benefits from both minerals and other stocks of natural capital especially the ecosystems and biodiversity. Institutional structures for deliberative dialogue between different stakeholders are an important component of such planning. These enable consensus-making on issues where view might diverge (e.g. appropriate or acceptable resource rents, development important of mining versus other sectors, conceptions of development benefits), and place less reliance on the role of "strong government" as the top-down arbiter of planning decision-making.

There is also a need to establish frameworks enabling natural resource accounting, monitoring and reporting, as inputs to these more holistic and inclusive planning processes. Policy reform in this context can benefit from considerable technical progress over the last decade, in particular the statistical standards and approaches documented in the UN Framework for Development of Environmental Statistics, and UN System for Environmental-Economic Accounting (SEEA).[262] The structure and function of SEEA accounts for natural resources are shown in Figure 11.3 below. The Figure illustrates how the System establishes a framework for integrating environmental and economic data and statistics concerning mineral resources and other environmental assets, in a manner compatible with national accounts that follow the UN's System of National Accounts standard.[263] These integrated accounts can then be used as an analytical basis for monitoring, reporting and policy development by Governments, including international reporting efforts focused on the Sustainable Development Goals, Paris Agreement on Climate Change, Aichi Biodiversity Targets, and other relevant international commitments. In collaboration with the World Bank WAVES Partnership and other international initiatives, a growing number of countries (including Australia, Botswana, Guatemala and others) have undertaken work to compile subsoil resources accounts following SEEA standards.[264]

Figure 11.3 Structure and uses of the System for Environmental-Economic Accounting.

[262] See for example: United Nations, United, European Commission, FAO, OECD Group. (2015). System of Environmental-Economic Accounting 2012 Experimental Ecosystem Accounting (pp. 1–198); United Nations, United. (2014). System of Environmental-Economic Accounting 2012 Central Framework (pp. 1–378).
[263] See https://unstats.un.org/unsd/nationalaccount/sna.asp.
[264] See: https://www.wavespartnership.org/en/knowledge-center



Exploring opportunities to bolster long-run resource supply stability through innovative cooperation between resource-exporters and the international community.

International cooperation to bolster long-run global resource-supply security offers mutual benefit opportunities. Resource-intensive economies like OECD countries and China are paying increasing attention to long-run supply stability scenarios for key industrial metals, among other resource inputs currently sourced upstream from developing regions. Current stop-go investment cycles in international mining exploration and development driven by price cycles, have direct negative consequences for long-run global mineral supply security; hurting as well resource-exporting countries' development and SDG prospects. This global governance challenge calls for renewed exploration of innovative cooperation options, such as joint planning of long-run extractive investment commitments into resource-rich regions, aimed at achieving balanced global supply/demand expansion with increased price stability. Exploring options to stabilize investment flows for extractive exploration and development in host countries, among other options to strengthen global supply security and reduce the risks of volatility, can only be tackled through broad multilateral and regional-level platforms. Promoting renewed discussion of such options in line with resource-exporting countries' development aspirations, and industrial economies' long-run supply security prerogatives, should form part of the aims of the SDLO.

Resource supply security is closely linked with resource efficiency, recycling and re-use, among other green and circular economy agendas gaining increased political attention in OECD countries, alongside the 2030 sustainable development agenda (SDGs 2030, climate change, biodiversity and so on). This international context provides fertile ground to implement the SDLO normative vision through coordinated action between resource-exporting and resource-intensive economies along global value chains, committing upstream and downstream actors while enabling each group to advance their respective priorities at the same time. A systemic learning approach should guide implementation of the global SDLO governance framework.

11.4 Implications for other stakeholders

As mentioned previously, there is a wealth of useful governance instruments to regulate and help improve the contribution of the mining sector to sustainable development. Far from re-inventing the wheel, the SDLO seeks to build on the plethora of existing policy options, and instruments, as much work has already been devoted in developing these, they are part of existing policy structures, and it would permit the creation of synergies and avoidance of duplication. The paragraphs below consider specific implications of the SDLO for three broad sets of actors: policy makers at multiple scales, the private sector, and third sector actors including non-governmental organizations and civil society.

11.4.1 Policy makers

There is recognition of the danger of “initiative fatigue” as the “proliferation of instruments and lack of linkages make it challenging for mining companies to decide which ones to adopt and make a focus on sustainability costlier to implement” (Resolve & WEF, 2015, p. 6). Importantly, for many countries the challenge relates less to the absence of appropriate constitutional provisions, legislation, regulations, contracts and licences, but more to the challenge of enforcing these. Therefore, an improved governance approach needs to focus on creating linkages and efficiencies between different governance instruments, as well as on their implementation, in order to better guide the sustainable development performance of mining industries worldwide. The SDLO Principles and Policy options (discussed in Chapter 10) provide a linking structure for such efforts, which could in practice also benefit from the development and use more holistic standardised protocols and indicators in appropriate cases. Box 11.3 summarises existing standards that could be supplemented to that end.

Box 11.3 Towards a standard protocol for planning and monitoring of mining operations[265]

International guidelines exist listing properties of exploration results, mineral resources, and reserves to be considered for public reporting (CRIRSCO,2013). They focus on geological and technical information, mentioning environmental aspects rather casually. A more detailed scheme of water reporting by mining industry was provided by ICMM (2017). For the reporting of GHG emissions, standards still seem to be under development (ICMM, 2011). Data on mining operations is scattered amongst public and private institutions, remains often undisclosed, and is mostly incomparable. What is needed is a standard protocol for assessing the compatibility of mining with sustainable development which can be applied worldwide for every industrial mining operation. This could for example by based on a minimum set of key performance indicators of planned, operated and closed mines:

The International Resource Panel suggests establishing such a standard protocol based on a minimum set of key performance indicators of planned, operated and closed mines:

- Geo-referenced location

[265] Contribution from Stefan Bringezu *(presentation at FORAM pilot event, 27 June 2018, Nancy, France)*

- Total extraction of minerals (per annum and cumulative)
- Used extraction (run of mine); and unused extraction (waste rock, overburden)
- Total water extracted
- Withdrawal (pumped or diverted from natural water bodies; by source)
- Consumption (part of withdrawal which is evaporated, i.e. not released back to the same catchment area)
- Total land used
- Whole area occupied for extraction and processing, disposal, transport and administration
- Area transformed by extraction and disposal
- Area reclaimed by rehabilitation (with type of after-use)
- Total energy used by type of energy carrier and per unit of total extraction

The total extraction of minerals determines the three-dimensional order of magnitude of landscape change and related environmental pressure. The relation of used to unused extraction indicates the resource efficiency of the extraction process. The amount of water withdrawal and consumption determines potential conflicts on water use with neighbouring activities. The extent of total land use and transformation determines the pressure to natural ecosystems. The energy used for each unit extracted indicates the energy efficiency of the mining operation, and together with the type of energy carrier used may be used to calculate greenhouse gas emissions.

These four environmental footprints do not provide a comprehensive basis for assessing a mining operation's environmental impacts. For example, they do not account for water abundance and/or scarcity at a site location, or the phase of the operation which will affect for example the amount of land rehabilitated. They do, however, provide some insights concerning the broad magnitude of environmental pressure of resource extraction. Reporting these data in a standard format would be useful to assess environmental impacts; check potential conflicts (e.g. on water, biodiversity) in advance; support the search for less burdensome options, prepare licenses to operate, and feed monitoring of resource flows at regional and national level.

In addition, effective governance of the mining sector requires a legal system that is comprehensive, consistent, and universally applicable to all projects. In addition to adopting policies/legislation, governments also need to build the institutional capacity to implement the rules and strengthen domestic accountability. As such, rules and institutions, in turn, need to be supported by a critical mass of citizen understanding and engagement (Collier, 2013).

However, as stated earlier, there are no universal solutions, and very different governance solutions may apply to countries with dissimilar industry characterises, facing particular challenges, or at different stages of economic development. Differentiated governance approaches are needed, for instance, for countries where standards and guidelines can be easily implemented, compared to others with a large artisanal and small-scale mining sector, or with high levels of corruption, or that are affected by conflict and war. Governance strategies thus need to be tailored to a particular country's socioeconomic, geopolitical, historical and cultural background.

11.4.2 Private sector actors

As outlined elsewhere in this Report, there are a myriad of private sector initiatives focusing on mining and sustainable development. In this context, the principal utility of the SDLO is to operate as a 'meta-governance' framework— that is, providing a lens through which private sector actors can:

- Combat 'initiative fatigue' by mapping their engagement with, and participation in, external sustainability initiatives against the 2030 Agenda, in order to identify options, gaps and strategic opportunities—for example by identifying the most relevant indicators from the

Global Reporting Initiative; Global Compact and the Voluntary Principles on Security and Human Rights; and many others.

- Align internal activities with the SDGs and Targets, in order to mitigate social, economic and environmental risks, and capitalize on innovation opportunities associated with transitions to sustainable development.
- Align business models with host countries' national development aspirations and improve stakeholder engagement towards a shared understanding of what constitutes value.

Many of the implications for private actors of the SDLO are analysed in the 2016 Atlas Mapping Mining to the SDGs[266] published by the World Economic Forum and partners (see Figure 11.2 and explanatory text above). The SDLO also builds on the achievements of the International Council for Mining and Metals (see Box 9.7 above) and other related initiatives, but is broader in scope—intended for relevance across organisations other than large mining companies. The SDLO is also intended to be relevant in contexts where formal governance of mining is either absent or minimally enforced, and/or where governance processes are characterised by informality, complexity and decentralisation (see discussion in Chapters 3 and 6). In such contexts the SDLO could function either as a proxy for formal government regulation or as a basis for informal governance and self-assessment in light of the holistic global expectations concerning sustainable development.

11.4.3 Third sector actors

Third sector actors—including civil society organisations, research institutions, non-governmental organisations, and others— must and can play crucial and influential roles in extractive sector governance. Key implications for such organisations include the following:

- As discussed in Chapter 10, complex synergies and trade-offs exist between mining and sustainable development. Decisions about mining profoundly affect humanity's ability to realize aspirations of greater welfare and well-being, build physical and social infrastructures for sustainable development, and achieve sustainable management of the natural environment. There is an urgent need to better organize, connect and extent this evidence—and the SDLO provides an organizing framework for research-focused third sector organizations to address this need, working beyond disciplinary silos.
- The SDLO can also be operationalised by third sector organizations as a normative framework for support the representation of marginalized stakeholders in governance processes, and hold governments and the private sector to account—for decision-making that either reinforces or undermines efforts to achieve sustainable development. An important aspect of the SDLO's utility in this context is its use the SDGs to interpolate diverse social, economic and environmental issues with national and global political commitments.
- The investment decisions made by institutional investors and informed by issues considered in the SDLO can send signals to the market and contribute to requiring or incentivizing mining companies to incorporate sustainable development principles and practices into their business models at a faster rate.

Although global practice is varied, mining projects can be characterised by Governments and project proponents as "inevitable" or "essential" for national development given macro-level opportunity costs and wider benefits of not proceeding. In this context their dialogue with local communities can be fashioned on the premise that it contains "an offer they cannot refuse". Such an approach starts

[266] Columbia Center on Sustainable Investment, UNDP, UN Sustainable Development Solutions Network, World Economic Forum. Mapping Mining to the Sustainable Development Goals: An Atlas. July 2016, unsdsn.org.

by disempowering local communities at the outset. However, difficult to contemplate, the embedding of a "right of refusal" is essential to a constructive dialogue and for the reaching of an outcome that all parties can accept (if not be happy about). Box 11.4 illustrates this point with a powerful narrative, which cannot be said to have conclusively ended.

Box 11.4: Community consent to Mining[267]—Bauxite mining and the licence to mine in forest areas inhabited by indigenous communities.[268]

M/s. Sterlite Industries India Ltd (SIIL) (parent company of Vedanta) filed an application for environmental clearance for the purpose of starting a 1 million tonnes per annum capacity Alumina Refinery Project in Lanjigarh, District Kalahandi, Odisha State. However, an objection was raised to the grant of clearance sought by Vedanta on the ground that the Refinery would be totally dependent on mining of bauxite from *Niyamgiri Hills* (situated in Lanjigarh), which was a vital wildlife habitat, part of which constituted an elephant corridor, and also on the ground that the project would disturb local tribes (indigenous peoples) like the *Dongaria Kondh.*

The matter came up in the Supreme Court. Although the State of Odisha had brought to the notice of the Court the lack of basic infrastructure facilities in the Tribal areas of both the districts, the abject poverty in which the local (including tribal) people were living in Lanjigarh, the lack of proper housing, hospitals and schools, and the likely positive employment and other benefits of the project, nevertheless the Court did not agree to clear the project in the manner proposed. Instead, it suggested that clearance could be given if a specific development framework was adopted, incorporating not only mitigating measures against adverse environmental impacts, but also an area developmental plan. The Court also suggested that M/s SIIL should deposit, every year, 5% of its annual profits before tax and interest from the Lanjigarh Project to be spent for the development of health, education, communication, irrigation and agriculture of the said scheduled area within a radius of 50 km.

However, local opposition continued and a Report of the Ministry of Environment and Forest projected the impact on ecological and biodiversity values of the Niyamgiri hills upon which the tribal groups, *Dongaria Kondh* and *Kutia Kondh*, depend. The Report also pointed out that the narrow definition of the "Project Affected People" adopted by the company for purposes of compensation runs contrary to the letter and spirit of the Forest Rights Act, 2006. Simply because tribal groups did not live on the hills does not mean that they have no rights there, when in fact they were dependent on the usage of the area. It was also asserted that the local tribes and others have deeply held religious beliefs and rights in the Niyamgiri hills, in particular the hill top known as Niyam-Raja.

The Forest Rights Act was enacted by Parliament to recognize and vest the forest rights and occupational rights in forest dwelling tribal communities who have been residing in such forests for generations but whose rights could not be recorded. The Act recognized the role of the forest dwelling tribal people in the sustainable use of resources, conservation of bio-diversity and maintenance of ecological balance and thereby strengthening the conservation regime of the forests. The Act also noticed that tribal rights on ancestral lands and their habitat were not adequately recognized in the consolidation of State forests during the colonial period resulting in historical injustice to the tribal communities, who are integral to the very survival and sustainability of the forest ecosystem. Under the Forest Rights Act, power is conferred on the Gram Sabha (local village community) for determining the nature and the extent of individual or community rights. Much other legislation also gives a role to Gram Sabha and the Gram Sabha is the nodal institution to safeguard and preserve the traditions, customs of the people, their cultural identity, community resources and community mode of dispute resolution.

The Supreme Court held that the question of whether the tribal people have any religious rights – that is, rights of worship over the Niyamgiri hills – have to be considered by the Gram Sabha. The Supreme Court therefore gave a direction to the State of Odisha to place these issues before the Gram Sabhas.

[267] SUPREME COURT OF INDIA: WRIT PETITION (CIVIL) NO. 180 OF 2011; Judgment dated April 18, 2013. Orissa Mining Corporation Ltd. Versus Ministry of Environment & Forest & Others

[268] By S. Vijay Kumar, Distinguished Fellow TERI, New Delhi, India.

The outcome was that the year 2013 witnessed the holding for the first time in India, of a referendum on the development narrative that had so far been uncontested in the mainstream. People of small tribal hamlets in the Niyamgiri hills were asked to voice their opinion on bauxite mining in their habitat. Amid heavy security cover of Central paramilitary and state forces, the forest dwellers—*Dongria Kondh* and *Kutia Kondh* tribals, and *Gouda* and non-tribals – spoke of a way of life embedded in the hills' unique ecology. They told the District Judge, appointed observer to the meetings, that mining will destroy their god Niyam-Raja and their source of sustenance—over 100 perennial streams, and the local ecological balance and the source of their food and livelihood. All the 12 Gram Sabhas unanimously rejected mining.

All these cases had a deep impact on the approach of the Ministry of Mines to the question of management of the mineral concession framework. In 2011, the Ministry had come out with a "National Sustainable Development Framework". [269]It was clear however that a framework in itself had only limited persuasive value. In 2015, the legislation governing the grant of concessions was amended to provide for the constitution of "District Mineral Foundations" which are expected to develop and implement plans for socio-economic development of the local area, ensure maintenance and creation of community assets and to develop the skills and employment potential in the local area. The Foundations will receive an amount equal to a third of the royalty collected in the District. Since annual mineral royalties in India are of the order of $5 billion, the Foundations would receive roughly $1.6 billion annually for local area development.

11.7 Conclusions

Appropriate governance of mineral resources, so as to enhance their contribution towards sustainable development, is a shared responsibility across nations and different actors along the mining value chain. This is in line with the new era of international cooperation brought about by the Sustainable Development Goals (SDGs) which are universal to countries of the Global North and South while acknowledging the diversity of circumstances and capabilities across countries. From an ethical standpoint, developed importing nations should share responsibility for the adverse social, economic and environmental impacts of mineral resource extraction occurring in mainly developing exporting countries. A global multi-level governance architecture will therefore need to address not only an agenda for resource security, resource efficiency and decoupling of resource use and environmental impacts from economic growth that is of particular importance to developed nations, but also the need for continuous economic development, structural transformation, resource-based industrialisation and economic diversification in resource exporting and other developing countries, as articulated in frameworks such as the Africa Mining Vision.

Aside from its universality, the 2030 Agenda for Sustainable Development was also revolutionary in terms of the inclusivity of discussion that led to the adoption of the Sustainable Development Goals. The Sustainable Development Licence to Operate similarly advocates for an inclusive multi-stakeholder approach, whereby decisions concerning the mining industry are made with the involvement of all relevant stakeholders. All relevant actors should be included through, amongst others, information exchange, media and other campaigns, and collaboration with institutions such as those with oversight roles. A community-orientated, context-sensitive approach to engagement requires in-depth knowledge of local culture, circumstances and power dynamics, alongside a sophisticated approach to engaging diverse voices (including alternative and marginalised voices) within affected communities (Owen & Kemp, 2013). It is thereby important that industry engages in broad-based and long-term collaborative social dialogue regarding each mining project. This goes beyond what could currently be obtained through the short-term environmental and social impact

[269] https://mines.gov.in/writereaddata/UploadFile/Sustainable_Development_Framework.pdf

assessments. In doing so, it needs to articulate an agenda that balances its own commercial needs with managing and meeting broader expectations about the contribution of mining to sustainable development. In summary, each and every stakeholder has a role to play to ensure that the extractive sector supports sustainable development.

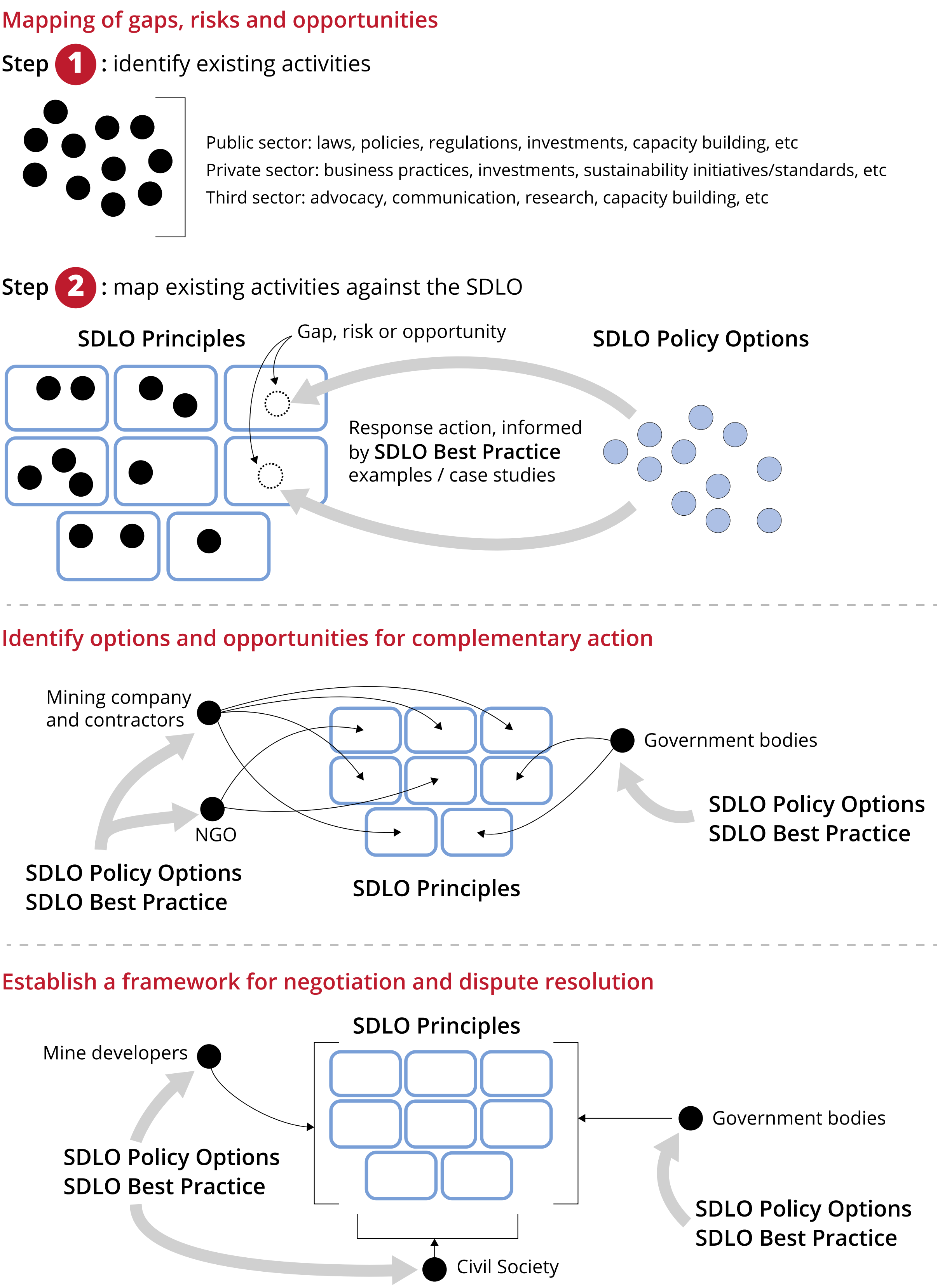
Figure 11.4 below provides some illustrative process examples of how different actors might use the SDLO to align their activities with the 2030 Sustainable Development Agenda. These include use of the SDLO principles to:

- map gaps, risks and opportunities relevant to sustainable development, and respond through implementation of SDLO policy options as appropriate (for example, review by a private sector organization of its engagement with sustainability initiatives, in order to strategically identify priority initiatives for engagement);
- identify options and opportunities for complementary action by different actors across multiple sectors, informed by SDLO policy options and best practice; and
- establish a common framework for negotiation and dispute resolution, informed by SDLO policy options and best practice.

In practical terms, these use cases for the SDLO could be embedded into mining sector governance and multiple levels through a diverse range of activities, including but not limited to the following:

- *Private sector benchmarking and certification* — Establishment of a scheme and corresponding indicator framework that is structured around the SDLO Principles, for voluntary certification and benchmarking of mining companies or as a framework to assess investment risk. Box 11.3 above has already discussed some relevant options focusing on environmental sustainability. To avoid duplication of existing initiatives and accommodate different levels of capability, this certification could be designed to operate at a 'meta' level, with performance that could be demonstrated by participation in other issue-specific initiatives. The certification process should be clearly and explicitly interlinked with the Global Reporting Initiative, Natural Capital Protocol and other cross-sectoral standards focused on sustainable development.
- *Public sector benchmarking and associated capacity building* — Establishment of a scheme to monitor and benchmark a country's performance in terms of implementing the SDLO into national legislative and policy frameworks, focusing on both mining specifically and holistic policy frameworks for natural resources management. This benchmarking should be interlinked with existing UN processes concerning sustainable development review and reporting by national governments, and could be used to structure and inform the wide range of international capacity building programs relevant to the mining sector and sustainable development. For example, the SDLO could:

Figure 11.4 Illustrative examples of SDLO implementation



    - Provide an analytical basis for structuring the activities of the EU Raw Materials Initiative that focus on implementation of the SDGs in non-energy extractive industries.[270]
    - Be adapted for use as part of the Mining Policy Framework (MPF) Assessment developed by the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development.[271] As outlined in Chapter 10, there are considerable overlaps between the subject matter scope of the MPF Assessment and the SDLO, with the latter being broader given its grounding in the full range of topics covered by the Sustainable Development Goals.
- *International agreements to strengthen transnational governance of mining* — The SDLO Principles and Policy Options could be used as the normative foundation of negotiations to establish new international agreements that address the wide range of governance gaps highlighted in this report. These could include but are not limited to:
    - global commitments concerning extractives under the auspices of the UN Environment Assembly and other appropriate bodies.
    - bi-lateral and plurilateral agreements designed to support sustainable and less volatile trade in mineral commodities between exporting and importing countries and regions. Specific policy responses that could be embedded in such agreements include: recognition of non-discriminatory SDLO-based standards for production; tariff and other trade incentives to support compliance with sustainability standards; and mechanisms such as long-term commodity pricing agreements to channel greater investment in sustainable mining and value addition activities. Such measures may prove crucial to the funding model for higher standards in extractive sector, which may in some cases entail increased short-term costs.
    - non-binding model instruments published by UNEP, IGF or other appropriate entities, articulating SDLO-compatible commitments that can be embedded into national policy frameworks and transnational mining visions. Longstanding precedent for this approach exists in the agriculture and fisheries sectors, where FAO Voluntary Guidelines have played an instrumental role in strengthening global responses to a range of governance issues — see for example the Voluntary Guidelines on Responsible Governance of Tenure, which were finalized through intergovernmental negotiations including non-government participation, and serve as a reference point of relevant principles and internationally accepted standards that relate to tenure governance of land, fisheries and forestry in the context of national food security.[272]

Realising these proposed options for SDLO implementation will depend on sustained and long-term commitment from diverse actors, working amidst of the many governance challenges surveyed in Part II of this Report. Several specific shorter-term opportunities and pathways towards SDLO implementation are discussed in Chapter 12 below, set against the backdrop of key conclusions that emerge from the Report as a whole.

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270 See: https://ec.europa.eu/growth/sectors/raw-materials/policy-strategy_en
271 See: http://igfmining.org/mining-policy-assessment/
272 See: http://www.fao.org/tenure/voluntary-guidelines/en/

Chapter 12 - Summary and conclusions

12.0 Introduction

In this Report the International Resource Panel has sought to: *(1)* synthesise current evidence concerning technical, environmental, social and economic characteristics of the global extractive sector; *(2)* systematically analyse current evidence concerning governance challenges in the extractive sector; and *(3)* identify and characterise governance options for the sector that are compatible with delivery of the 2030 Agenda and other global and regional commitments to sustainable development. The Panel's principal findings and recommendations on these points are summarised below.

12.1 The challenge of the governance of resource extraction

The previous chapters have outlined many challenges for the governance of natural resources, as well as the many initiatives that have been established to address them. However, at present these initiatives are fragmented and inadequate to properly address the challenges in line with Agenda 2030.

Extraction of mineral resources has increased markedly in recent decades, and over the last decade at a faster rate than economic growth (Ekins *et al*., 2017). There is currently an oversupply of some mineral resources in world markets, but the supply/demand balance varies greatly over time (Ali *et al*., 2017). In addition, there is a significant long-term challenge—of how to meet the mineral resource needs of a growing global population that may reach 8.5 billion by 2030, 9.8 billion by 2050 and 11.2 billion in 2100 that is expected to reach 8.5 billion by 2030.

Though their demand will track economic cycles, the overall demand trajectory for minerals remains upward as economies grow, technological innovation continues, and resource intensity deepens as developing countries catch up.[273] In recent years, existing mining companies and investors have reduced exploration budgets in response to a cycle of declining commodity prices,[274] which will delay responses to future increases in demand. Although the budget decline stopped in 2017, its level remains well below the 2012 exploration budget, showing growing aversion to risk by investors. These trends do not bode well for future supplies of minerals and metals to the world economy. This makes it likely that, over the coming two to three decades when availability of metals for recycling is expected to remain low (Reuter *et al*., 2013), the mining sector will struggle to meet demand for several minerals (such as copper) for which substitutes are not readily available (Ali, *et al*., 2017; Reuter *et al*., 2016; Graedel *et al*., 2015).

In this context, there is a significant risk in this context of price volatility, which could hamper the efforts of mineral-rich countries to manage their endowments in a manner that delivers enduring benefits for societies, economies, and governance. Major disasters such as the Benito Rodrigues tailings dam collapse in Brazil (Hatje *et al*., 2017) one in a list of 140 major tailing dam failures reported

[273] See e.g.: Daniele La Porta Arrobas et al. The Growing Role of Minerals and Metals for a Low Carbon Future. World Bank Group, June 2017, documents.worldbank.org.
[274] See e.g.: S&P Global. Worldwide Mining Exploration Trends. March 2017, marketintelligence.spglobal.com.

since 1960, also highlight the need to carefully balance mining with stewardship of other valuable natural resources and the rights of local people and communities.

Despite the extractive sector's potential to act as a catalyst for development in mineral-rich countries, many challenges prevent this potential from being fully realised.[275,276] These include: the volatility of commodity prices which have exposed especially resource-exporting developing countries to external shocks triggering macro-economic instability (Alba, 2009); illicit financial flows and other difficulties of managing large and volatile inflows of foreign capital;[277] lack of transparency and accountability and the associated risk of corruption; technical complexities of large-scale projects which exacerbate the management problems of the sector in jurisdictions with limited national capacities; enclave nature of mining with weak linkages to other economic sectors; lasting environmental damage of some mining projects; global asymmetries of power and conflicting stakeholder interests leading to social conflict; and redefinitions of resource nationalism, in the absence of consensus on what would constitute shared value from mining.[278]

Extractive industries need to continue serving humanity's development as they have done for millennia, but they now need to fully integrate the unprecedented challenges and constraints humanity is confronted with, making the decoupling of economic growth from its negative impacts on the global and local ecosystems on which human well-being depends, an absolute necessity.

Technological advances in the extractive sector are likely to transform production and consumption dynamics with profound global implications, with possible negative impacts on job creation and local procurement of goods and services. These challenges are compounded by the uneven geological distribution of mineral deposits, which give the future of the extractive sector an inevitable geopolitical dimension.

Another important issue for several countries is the discrepancy between formally recognised rights to mineral resources, and the expectations and dependencies of local communities. Policies in developing countries have in some cases facilitated large-scale acquisition of formal property rights by commercial sector actors (including transnational corporations), which can prove difficult to regulate, to enable mining (German *et al*., 2011). Negative outcomes of property acquisition by the extractive sector include expropriation without adequate compensation of rights held by individuals and communities; extinguishment of long-standing informal rights held by individuals and communities; dislocation of local communities from acquired areas; destruction of local livelihoods; and a development model that maximises marketable private benefits (for example, mining) to the detriment of public benefits (for example, clean water) (MEA, 2015; Kareiva *et al*., 2011).

Finally, the extractive sector's development benefits are impeded by incomplete accounting of sector impacts on wealth, which in comprehensive terms includes infrastructure and financial capital, institutions and communities, and natural capital including biotic and abiotic components of the

[275] See: Antonio Pedro *et al*. (2017).
[276] See: African Union, ECA (2011)..
[277] See: Report of the High- Level Panel on illicit Financial Flows from Africa. AU and ECA Conference of Ministers of Finance, Planning and Economic Development, www.ECA.org.
[278] See: Africa Progress Panel. Africa Progress Report (2013):

environment (World Bank, XXX).[279] A range of impacts on institutions and communities and on natural capital assets (including ecosystems) are not currently valued in markets, and represent well-documented externalities of the extractive sector.[280] *In this context there is a clear need for effective governance of the extractive sector across local, national, regional and global scales, to ensure that needs for minerals are met, without undermining other development outcomes and the needs of future generations* (Ekins *et al.*, 2017; Ali *et al.,* 2017; WEF, 2015).

12.2 The potential benefits of resource extraction

There is substantial evidence that, if resource extraction is well governed, it can provide important development benefits. The 'resource curse' can be avoided and resource extraction turned into national and local prosperity. As shown by Ericsson & Olof (2017) mineral-rich countries experienced up to 70% improvement in their Human Development Index over non-mining countries based on data for the 1996-2014 period. The evidence also shows that mining countries exhibited relative improvements in governance indicators improvement. Hence, the centrality of good governance in unlocking the benefit of mineral wealth is unambiguous. Minerals and metals industries can, if well governed to reduce to a minimum their negative impacts, provide lasting benefits including multiplier effects that create new jobs in other sectors of the economy foster the development of a diversity of skills of importance to other sectors of an economy, and/or create financial reserves for future generations, as it is the case with the Norwegian Government Pension Fund Global, currently worth over 1 bn $US.

The purpose of this report has been to describe efforts that are being taken to improve the governance of resource extraction, and synthesise these with other ideas in order that the benefits of resource extraction may be realised in practice. This synthesis is called in this report the Sustainable Development Licence to Operate (SDLO).

12.3 The essence and vision of the SDLO

Decision-making in the extractive sector is shaped by a complex array of governance frameworks and initiatives operating at multiple scales (Ekins *et al.,* 2017; Lipschutz & Henstridge, 2013). This complexity is compounded by the highly globalised mineral value chains, characterised by the involvement of diverse stakeholders. The many initiatives discussed earlier in this report, that have adopted different approaches to different aspects of challenges of resource governance, have undoubtedly brought benefits and improved resource governance over what it might otherwise be, but these initiatives are fragmented. Overall, as all countries strive to achieve sustainable development, there is a need for a framework that enables, at each level of globalised value chains, all actors to assess the compatibility of their decision-making with overarching global commitments to sustainable development, including efforts to address the above-mentioned specific governance challenges.

[279] World Bank. The changing wealth of nations: measuring sustainable development for the new Millennium. openknowledge.worldbank.org.
[280] For an early example of efforts to internalise these externalities in commercial decision-making, see: Natural Capital Protocol: Case Study for Tata Group, 25 September 2017, www.naturalcapitalcoalition.org.

The need to reform and harmonise this governance landscape is given impetus by the adoption of several landmark global commitments in 2015— a historic year for global efforts to meet humanity's present needs, without compromising the ability of future generations to achieve their own needs.[281]. These commitments include the 2030 Agenda for Sustainable Development, the Paris Agreement on Climate Change, Addis Ababa Action Agenda on Finance for Sustainable Development, and Sendai Framework for Disaster Risk Reduction.

The ambitious post-2015 global commitments on sustainable development— plus the 2020 Aichi Targets for Biodiversity agreed in 2011— aspire for transformative change in a world confronted by grave social, economic, political and environmental challenges, and have far-reaching normative implications for mining sector governance. For example, the global normative framework for effective governance of mining has become considerably more multi-faceted, than the conventional "resource nexus" issues domain (concerning energy, food and water) or the conventional three-dimensions of sustainable development (concerning society, economy, and environment). As discussed, and illustrated in detail in Chapters 10 and 11, sustainable development entails balancing of synergies and trade-offs between decision-making about mining and delivery of all 17 Sustainable Development Goals plus 169 Targets recognised in the 2030 Agenda.

Recent analyses including the 2016 Atlas Mapping Mining to the SDGs (UNSDN, 2016) (see Chapter 11), published by the World Economic Forum and partners, highlight how a well-managed mining sector can promote delivery of the SDGs and Targets, both in relevant countries and globally. The notion of sustainable development—integrating the multiple linkages between people, planet, prosperity, peace and partnership—has become the organising framework for global development cooperation and is key to framing discussions about the extractive sector's future. As noted, a growing range of frameworks and initiatives focus on delivering overlapping subsets of this global development vision, but do not currently operate in a sufficiently coordinated or integrated manner.

As noted above, the imperative for a new internationally agreed governance framework arises from the inadequacy of the existing governance landscape for mining as discussed in Parts II and III of this Report, and from the need to translate the complex array of post-2015 global commitments into a manageable set of requirements that can be used by all stakeholders involved in extractive sector governance. The *Sustainable Development Licence to Operate* (SDLO) attempts to address these two needs. It is similar to the Social Licence to Operate (SLO) in that it is designed to improve the societal net benefits of mining, and is not designed necessarily to function as a licence in the compulsory or regulatory sense. However, the proposed SDLO extends the SLO concept in several important ways, so that it can function as a framework oriented towards the achievement of sustainable development.

First, the SDLO addresses a broader subject matter, covering the nexus of all environmental, social and economic concerns that fall within the subject matter ambit of the SDGs and Targets. Second, the SDLO is designed to be relevant to all stakeholders in the mining sector —articulating a set of internally consistent principles and policy options that are compatible with the SDGs and Targets, plus other priorities, obligations and standards compatible with the 2030 Agenda. Finally, the SDLO is designed to set out not only minimum standards of behaviour as a basis for either self-assessment or regulation,

[281] This overarching definition of sustainable development was first proposed by the 1987 Report of the World Commission on Environment and Development, entitled Our Common Future. Text available at: http://www.un-documents.net/wced-ocf.htm.

but also evidence-based best practice and opportunities for enhancing the extractive sector's contributions to sustainable development.

The SDLO is fundamentally different from the SLO in that it recognises that all parties (governments, mining companies and local communities) have rights and responsibilities, and need to discharge them in a collaborative manner in order to further sustainable development as a practical solution in local and global contexts.

The SDLO is an aspirational goal, a framework of rules and principles applicable to all stakeholders, rather than a mere "licence" to one or more of the parties, and requires all parties to *continually* take steps in a synergistic manner to improve social, environmental and economic outcomes generally and ensure better implementation of the 2030 Agenda of Sustainable Development in particular.

12.4 Making the SDLO operational

Operationalising and mainstreaming of the SDLO (and consequently the SDGs) throughout the complex and multilevel global governance architecture for the minerals and metals industry mining will depend on sustained and long-term commitment from diverse actors, working amidst of the many governance challenges surveyed in Part II of this Report. As discussed in Chapter 11.7, key implementation pathways for the SDLO include:

- *private sector benchmarking and certification*, including use of the SDLO to strategically review and map existing initiatives against the SDGs and internalize them in business models and practice;
- *public sector benchmarking and associated capacity building*, using the SDLO as a means to granularly assess the compatibility of public policy, regulation and stakeholder engagement with the SDGs and update those instruments accordingly to deliver better development outcomes at national, sub-national and local levels; and
- *international dialogue* concerning options for new agreements to strengthen transnational governance of mining including mechanisms to foster transparency and quadruple bottom-line accountability, to address illicit financial flows, price volatility, and security of mineral supply and generate shared value to host and home nations, in a manner compatible with sustainable development.

The SDLO requires concrete action on a number of broad fronts. These include:

- Devising (or aligning) national mineral policies and strategies of host countries (and manufacturing policies of home countries) in line with the SDGs. This not only relates to SDG 12.2 (sustainable use and efficient management of natural resource), but also SDGs 8.2 (achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour intensive sectors), SDG 8.4 (improve progressively, through 2030, global resource efficiency in consumption and production and endeavor to decouple economic growth from environmental degradation), SDG 9.2 (promote inclusive and sustainable industrialization) and of SDGs of a cross-sectoral nature such as removal as removal of poverty, gender equality ,inclusivity, climate change actions, sustainable use of terrestrial and marine ecosystems.
- Framing (or amending) laws relating to economic development, management and regulation of minerals in line with the above policies and strategies. This not only relates to laws governing extraction of minerals, but also other regulatory instruments applicable to the sector such as education, environmental protection, human health industrial policy,

investment, labour, research and trade. industrial policy, trade, education, environmental protection and human health.

- Creating, empowering and capacitating national, sub-national and local institutions concerned with i) surveys and assessments of mineral resources; ii) management of the resources; iii) regulation of their exploration and extraction and iv) management and regulation of the social and environmental impacts. Assessments of mineral resources and decision-making based on verifiable feasibility studies, incorporating environmental and social baseline studies; auditable environmental and social impact assessment and strategic management plans; mine closure and post-mine management plans to enable better decision making regarding sustainability of extraction as well as inter-generational issues; management and regulation of extraction ensures that the public trust responsibility for the management of the resources is properly discharged; and the capacity to ensure proper management and regulation of social and environmental impacts is essential to enforce the accountability of mining companies under the licence to operate.
- Integrating, on a continual basis, sectoral plans and operations with national, and sub-national and local SDG plans. National, sub-national and local plans for implementing the SDGs generally need to take into account the positive as well as negative outcomes of mining projects in implementing targeted interventions.

Within these general principles, there is a number of practical actions to be undertaken by specific stakeholders to further strengthen the contribution of the minerals and metals industries to the UN SDGs through the development and the global use of the SDLO framework.

This summary is structured according to the life-cycle of the minerals and metals industries, as shown in Figure 12.2, which builds upon Figures 2.1 and 2.2. The boxes with a plain border represent the main stages of the life cycle of minerals and metals and of the related materials flows:

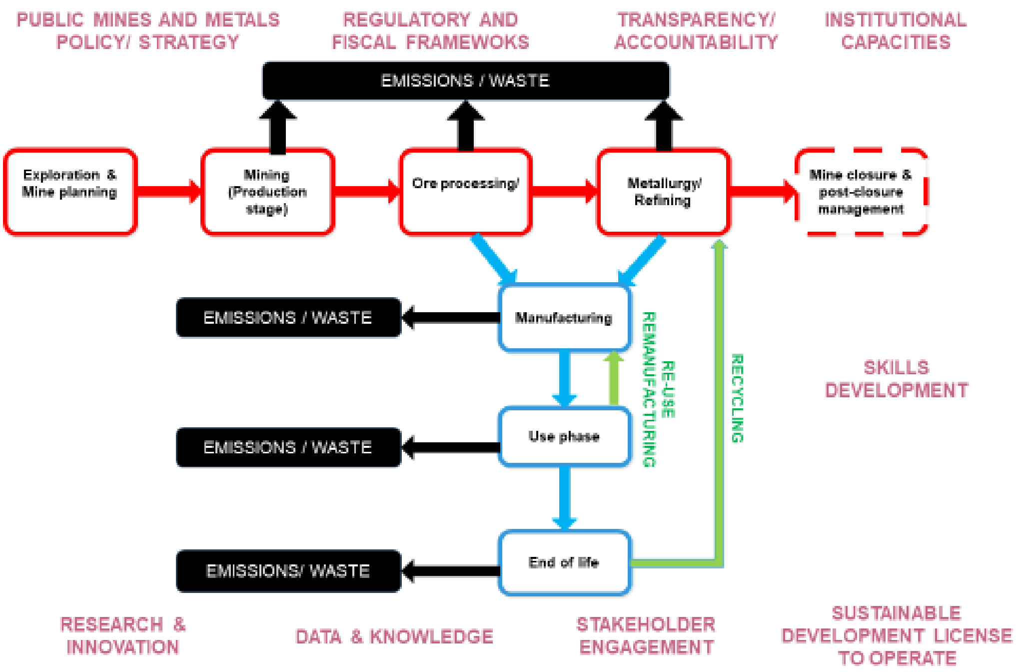
- Mineral exploration and mine planning
- Mining
- Ore processing
- Metallurgy/ Refining
- Manufacturing
- Use phase
- End of life

This schematically describes the traditional, linear and unsustainable, life cycle of minerals and metals. Several elements are added to this scheme as they are very important in the SDLO context:

- Framework conditions that impact on the sustainability of the mines and metals industries
- Mine closure and post-closure developments, shown in a box with dashed borders, as it is not part of the materials flows
- Black boxes and arrows that show the key sources of environmental challenge that need to be addressed
- Green arrows showing some of the key components that need to be fully operationalised, to turn the linear life cycle into a circular one. To keep the diagram as simple possible some additional steps needed to foster a circular minerals and metals materials flow are not shown, such as eco-conception of manufactured goods to make them easier to maintain and, later on, to re-use or remanufacture specific components and/to recycle metals and minerals from end-of life products, and the fight against planned obsolescence. However, whatever the most

needed developments towards a circular economy will be, there will be a continued need for the extraction of minerals and metals into the foreseeable future.

Figure 22.1 The main stages of the minerals and metals lifecycle and their framework conditions



Source: Christmann, unpublished

Further ideas for making the SDLO operational are now grouped according to the governance level at which they will need to be implemented. They need discussion at the broad international level and the development of an international consensus to achieve in view of effective implementation. Individual countries and regions could take important initiatives to help initiate the process. However, there are a number of themes that are important at all levels of government.

Transparency, accountability and reporting

Transparency and accountability principles should be enshrined in all the laws governing the mines and metals industries. Public authorities should make agreement by investors and operators to transparency and quadruple bottom-line accountability a precondition for obtaining exploration and mining permits. The application of ISO 26000 and GRI compliant reporting of the sustainability performance of individual operations should be actively promoted by all governments, as well as the commitment by companies to operate according to the Equator and the EITI principles, with simplified procedures for small-scale operations. Ecolabelling of minerals and metals should be introduced, widening the existing metal standards to integrate compliance with the SDLO framework conditions.

Reports produced by mining companies for their shareholders and/or for banks that finance their activities should be subject to a national reporting standard similar to the Canadian NI 43-101 standard for projects up to the feasibility stage and to annual GRI compliant reporting for active mining/ ore processing/ metallurgical/ refining operations. All these reports should be publicly disclosed.

The use of blockchain technologies[282] to improve compliance and traceability towards better governance in the extractive sector should be scaled-up.

All reports produced by mining companies for their shareholders and/or for banks that finance their activities should be subject to a national reporting standard similar to the Canadian NI 43-101 standard for projects up to the feasibility stage and to annual GRI compliant reporting for active mining/ ore processing/ metallurgical/ refining operations. All these reports should be publicly disclosed.

Institutional capacities

Governments need to ensure that the above-mentioned core institutions the core institutions needed to promote and regulate the minerals and metals industry, including a Geological Survey, a Mining Directorate and an Environmental Directorate/ Agency (details on their respective roles, are given below) are functional, with proper experienced staff, budgetary and material resources as well as authority to promote and regulate the development of the mines and metals industries in line with the SDLO concept. In the case of developing countries, governments should assess the possibility to share some key resources/ expertise at the regional level, with the support of regional institutions.

Skills development

Larger mining, ore processing, metallurgical or metal refining projects and operations are technically and managerially complex operations requiring a wide range of experienced professional skills in fields as diverse as accounting, geology, environmental, electrical, mechanical and mining engineering and management, health and safety management, communication (frequently intercultural communication), maintenance of electrical and mechanical equipment, internal auditing, laboratories, legal advice, operation of heavy complex machinery, and training in all these skills. The local availability of such skills plays an important role in determining the returns of mines and metals industrial activities to the local economy and the development of value adding activities beyond the production of minerals and/or metals. This is likely to be an issue in numerous developing countries, where investment in the development of training facilities, possibly at regional scale, is needed in order to progressively secure greater returns to national economies.

Research and innovation

Research and innovation are continuously needed to:

- provide tools to explore more efficiently for mineral resources that will be more and more difficult to discover as high-grade outcropping deposits have mostly been discovered
- produce minerals and metals using less energy, water and other inputs while at the same time generating less emissions and waste;
- develop substitutes for scarce and/or costly minerals and metals;

[282] https://www.weforum.org/agenda/2018/07/4-ways-blockchain-will-transform-the-mining-and-metals-industry/

- develop recycling of minerals and metals from end-of-life products;
- develop innovative materials requiring less minerals and metals for a similar service or providing more sustainable performances during the use phase and/or being easier to recycle.

Value-adding to minerals and metals much depends on the success of research and innovation and on the derived intellectual property that can be traded on the basis of innovations. This requires action over many years. Developing countries should be supported by minerals-importing nations in their efforts to engage in research and innovation.

Data and knowledge

Environmental, geological, market, life-cycle, material science and technological data and information, as well as the knowledge that can be derived therefrom, are of critical importance to policy making, investment decisions and to inform stakeholders on a reliable, factual, basis.

Therefore, public investment in data acquisition, conservation, management and modelling as a public good is also one of the framework conditions to be met to develop and inform mineral resources governance. Public and unrestricted access to such data should be promoted. It is key to boosting mineral discovery, fostering sustainable environmental management and ensuring adequate supply of minerals and metals for the future.

Stakeholder engagement

Every effort should be undertaken, if a government decides to foster the development of national/ regional minerals and metals industries, to develop stakeholder understanding of the sustainability issues at stake and of the means to ensure that their development will provide a sound, sustainable, development basis that will benefit the impacted populations and the country's development. Adequate platforms to narrow the perception gaps about what constitutes value in the minerals and metals industry should be established and relevant collaborative strategies for shared value creation should be formulated[283]. Active stakeholder engagement from the onset of a potential mining project is a key factor towards its success, potentially saving much resources that otherwise could be expended grappling with costly protracted conflicts. Trust among stakeholders is very easy to destroy.

Particular attention is required to overcome the complexity of intercultural dialogue as it is frequently the case that investors are from cultures very different of the cultures of the countries/ regions where their intended investment will be made.

As already noted, effective resource governance will require different mechanisms and initiatives at the local, national and international levels.

Local governance

Local governance mechanisms should will need to include:

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[283] http://www3.weforum.org/docs/WEF_RMDI_Implementation_Manual_2017.pdf; https://www.oecd.org/dev/Framework_Public-Private_Collaboration_FINAL.pdf

- Empowerment and capacity building of local communities and community-level institutions to dialogue with mining companies at the pre-mining, mining and subsequent stages to iteratively optimize the social and environmental impact management, including impact mitigation plans, environmental management plans, mine closure plans etc.; to ensure that the transparency and accountability requirements placed on companies are adequately leveraged, and to be able to conduct Social Audits to continually improve developmental outcomes.
- Internalisation within mining companies of the SDLO responsibilities, including adequate capacity to plan, manage, proactively disclose issues relating to the mining project, and address local community issues in a credible and appropriate manner. In large mining projects mining companies should be able to participate in SDG-related planning activities of the sub-national and local Governments. Opening-up procurement opportunities for the provision of goods and services by local small and medium-scale enterprises (SMEs) could be of particular importance given that typically procurement constitutes sixty percent of operating costs of a mining project. National suppliers' development programmes[284] jointly executed by governments and mining companies would help improve the ability of the SMEs to benefit from such opportunities. National/ regional professional training facilities should be set up at an early stage of mining development projects to ensure that the development of this industry activities will benefit to local employment.
- New relationships between the stakeholders based on co-responsibilities and transparent risk management and strengthened by robust dispute management and resolution mechanisms.

National/State/Provincial governance

At a national level, the SDLO requires that the laws and regulations foster:

- The emergency of a mining sector that is fully linked with the local economy and catalyzes greater local processing, value-addition and resource-driven industrialization;
- A positive interplay between mineral development and sound environmental management, so that solutions can be found to mitigate adverse environmental impacts through innovation and stakeholder involvement.
- Full development of geoscientific databases to facilitate location and estimation of mineral resources enabling planned management of known mineral resources for optimal developmental outcomes.
- Capacity development of sectoral institutions to adequately address not only the normal management tasks, but also to ensure incorporation of sustainable development practices into the business processes.
- Development of sectoral funding mechanisms for activities such as database creation and regulatory capacity enhancement. This may include some form of taxation at national or sub-national levels to create a funding stream that can be applied for these specific purposes.

In order for this to happen, host countries may make a start by laying out a Strategic Plan and/or Country Mining Vision[285] up to 2030 and 2050, respectively, (as well as a Vision up to 2050), identifying targets, measurable indicators to assess progress, the milestones as well as the financial, human and

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[284] https://www.uneca.org/sites/default/files/PublicationFiles/scaling_up_value_creation_ghana_report_final_version.pdf

[285] https://www.uneca.org/sites/default/files/PublicationFiles/country_mining_vision_guidebook.pdf

material resources, for achievement with regard to the above-mentioned concrete actions. The Vision or and Strategic Plan or would take into account the current status of the sector in the country, the sectoral and general governance situation, and the capacity/ resources to move forward along the sustainability path. Ideally, it would be reviewed and updated every few years to take into account the situation. and capacity to move forward along the sustainability path. Ideally, the Vison and Plan would be reviewed and updated to take into account the situation from time to time. It would need to consist of actions proposed within the sector, as well as a set of actions in other sectors impacted by or impacting on mining, along with the stakeholders. Mapping of the actions to the relevant SDG would ensure that the Plan is well aligned with Agenda 2030. The Country Mining Vision Guidebook (UNECA, 2015) offers a step-by-step guidance on how to formulate and implement It may be advantageous to develop general Guidelines and Toolkits for the shared visions based on credible and well-informed multi-stakeholder consultative processes. Additional insights could be found in a review of the mineral resources' strategies of the G-20 countries published in 2013 provides a detailed insight of the strategies of all G-20-member countries (Hilpert & Mildner, 2013). The recently adopted South African Minerals Charter 2018[286] gazetted on 27 September 2018 reveals how painfully difficult it is to narrow the gaps of perception on what should be the core content of national Visions and/or Strategic Plans, especially if it includes mandatory requirements.

The Vison and/or Strategic Plan should be a formal, public, government paper developed by national/ regional governments with the close involvement of all stakeholders. It should be prepared and published under the authority of the highest level of the State (President of Prime Minister) in order to obtain the support of all concerned ministries (Mines, Trade and Industry, Public Works, Environment, Finance, Labour, Education, Research). It should recognise the priority given to the sustainable development of the mines and metals industries based on the SDLO framework. It should establish public reporting obligations of a standard similar or better than the Canadian NI 43-101 standard for all mine development projects, from the prospecting/ exploration to the feasibility (inclusive) stages, and make the formal consultation of populations that will be impacted by mining projects compulsory and verifiable. These obligations should also be mandatory for private equity funded projects. Specific, reduced, obligations could be defined for small-scale mining and artisanal mining. The importance of skill development and of research and innovation should be recognised as well as the establishment of a sovereign wealth fund that should manage most of the public revenue coming from the mines and minerals industries, with a long-term perspective.

In line with the Aarhus Convention on "Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters"[287], an important element of the Strategic Plan should be a Mining Law, which should describe and make compulsory and verifiable the consultation of populations that may be impacted by the development of new projects. As such, relevant information on such consultations should be included in the reports prepared for exploration or mining projects should be prepared by companies for the information of their shareholders or partners such as banks and institutions providing loans, including for projects financed out of private equity. These reports should be made publicly available according to a national standard comparable to, or better than the Canadian NI 43-101 standard.

[286] http://www.dmr,gov.za/resources
[287] https://www.unece.org/fileadmin/DAM/env/pp/documents/cep43e.pdf

The Mining Law should also include explicit references to the UN SDGs, to the rights of local populations, and to International Agreements and Standards such as the ISO family of standards (especially the ISO 14001 and 26000 standards). It should make mandatory the preparation by applicants seeking a mining permit of a bankable feasibility study as a core component of the documentation required by the Environmental and Mining Directorates as part of the mine permitting process. The Mining Law should also make mandatory the reporting on an annual basis, of the sustainability performance of mining and related processing/ metallurgical/ refining operations, compliant as a minimum to the GRI reporting guidelines available for the Mines and Metals industries. Simplified obligations could be established for SMEs and artisanal mining.

The Strategic Plan should support the three core public institutions needed to promote and regulate the development of the mines and metals industries:

- *Environmental Directorate/ Agency*: in charge, in close coordination with other ministerial departments, of developing environmental policies, laws and regulations for consideration by the government, and of evaluating mandatory EIAs, EMPs as well as mine closure and post-mining plans; in charge of monitoring compliance with the Environmental Law and any contractual obligations; in charge of acquisition, management, conservation and dissemination (in coordination with the two other institutions) of public environmental/ natural resources/ natural hazards data and statistics;
- *Mining Directorate*: in charge, in close coordination with other ministerial departments, of developing mines and metals-related policies, laws and regulations for consideration by the government, of promoting and regulating the mining sector, of monitoring and supervising the development of the industries and their compliance with the Mining Law and any related contractual obligations; in charge of the preparation and analysis of statistics related to minerals and metals and of their public dissemination; in charge of economic studies on markets and their trends to inform the government's policy-making process;
- *Geological Survey*: in charge of the acquisition, conserving, management, modelling and dissemination of geological, geophysical, geochemical and other data necessary to describe the national geology and the related natural resources (e.g. minerals, groundwater, geothermal energy, subsurface space), as well as related natural hazards.

Feasibility studies are an important part of any mine planning process. They should be prepared by independent, well-experienced, engineering firms and signed by Qualified Persons, as defined in the NI 43-101 Standard. They should include environmental and social baseline studies, describing the initial conditions, for the area that will be impacted by mining, of air quality, fauna, flora, surface and groundwater (qualitative and quantitative assessment, hydrodynamic regime in the case of groundwater), of soil, of natural hazards, of cultural heritage and initial social conditions. They need also to include:

- a detailed *Environmental Impact Assessment (EIA)* describing how the proposed mine and related facilities/ infrastructure will impact on these initial conditions and how natural hazards may impact on the proposed project. Based on a precise characterisation (major and trace elements, mineralogy) of the minerals/ ore to be extracted and the processes that will be applied to extract and process the minerals/ ore to turn them in one or several marketable product(s), it will describe the expected emissions to air, soil and water as well as the waste streams that would be generated annually, over the lifetime of the proposed project, and the impacts such emissions and waste streams may have on human and animal well-being and on the provision of local ecosystem services.

- a detailed *Environmental Management Plan (EMP)* describing over the lifetime of the planned operations how the identified or potential impacts will be mitigated, how performance will be publicly reported with measurable/ verifiable indicators, at least on an annual basis.
- a *Mine Closure Plan (MCP)* detailing how the mining and related operations will be terminated at the end of the mine life in a manner that provides an environmentally and socially sound opportunity for the later use of the land impacted by mining and related activities. It needs to include a financing plan showing how the costs of the rehabilitation will be covered by the owner of the mine permit and the conditions that will apply for the transfer of the land leased for mining activities back to its legal owners.
- a *Post-Mining Plan (PMP)* detailing all the precautionary, mitigating monitoring and other measures that will apply for a duration of a specified number of years after mine closure. The monitoring is needed to ensure that there is, for instance, no leakage of metals or chemicals into the environment and that the remaining structures such as former tailing ponds and waste heaps are stable. These measures need to be at the cost of the company that operated the mine and related facilities, who will remain legally liable in case of non-conformities. It should also foresee the production of a public annual report informing on the conditions observed at the past mining site/ related facilities. It should also detail how the cost of implementing the PMP will be covered by the applicant.
- the *guarantees* that the applicant for a mining permit will deliver to the national/ regional government to ensure the proper implementation of the MCP and PMP.
- a report that integrates the outcomes of public consultations having taken place during their preparation, with detailed provisions for the resolution of conflicts with an independent last resort arbitration. The conflict resolution process should include public hearings of representatives of local populations when these are part of the conflict

Special conditions could be defined by the regulatory authorities in consideration of the size of the planned production rates and of the potential impacts of the planned project and the local ecosystem characteristics/ vulnerabilities. Simplified obligations could be envisaged for small-scale operations.

A major consideration for countries with mining, especially developing countries, is how they can benefit from a fair share of the mining revenues. The OECD Guiding Principles for Durable Extractive Contracts[288] articulate how best to achieve this outcome. Where these revenues derive from taxation, the taxation regime should be based on simple, stable and enforceable taxation rules and have a number of characteristics:

- Exclusion of the use of transfer pricing by companies or individuals investing in the development of mining and related activities, and the use of tax havens to avoid national taxes;
- Practical measures to prevent taxation base erosion, alongside with the guidance developed by OECD[289] to prevent taxation base erosion and profit shifting practices;
- Transparency of the payments received by all public authorities (national, regional or local levels) from the mines and metals industries;

[288] https://www.oecd.org/dev/Guiding-Principles-public-consultation.pdf
[289] See http://www.oecd.org/tax/beps/

- Flexibility in the taxation regime, such that taxes may be reduced in periods of low profitability, or loss-making of the mines and metals industries to ensure the continuity of existing operations, while they may be increased if the market price of the produced minerals/ metals exceeds an agreed threshold, to provide a fair share of windfall profits;
- Mandatory public disclosure of the payments received by the authorities from the mines and metals industries.

International governance

The challenges confronting humanity in the XXIst century and the threats to its own future existence are such that a deep re-thinking of investment conditions, of supply chain management and of international trade framework conditions appear necessary. Business as usual driven by the search for short-term profits, with no responsibility for the related externalities may just accelerate the problems this world is already facing and that will be further aggravated due to the global demographic, urbanisation and rapid resource intensive global middle-class development trends described in Chapter 4.

Minerals and metals are unique resources of strategic importance to humanity and as such need to be produced and used with care and stewardship. Therefore, an international mineral resources governance agreement should be established, ensuring that minerals and metals are produced and marketed within the SDLO and UN SDG frameworks, with pricing that fully integrates the externalities of their production and marketing. Supply chains should be traceable, auditable and non-conformity be identifiable and remediated. The SDLO framework is essential to develop a new level international playing field for mineral resources extraction and use.

The SDLO would work most effectively when there is an international architecture that supports host countries in their journey towards sustainable development by:

- Maintaining knowledge repositories;
- Disseminating best practices and sharing experiences;
- Helping manage risks beyond the scope of the host country;
- Making available tool kits for evaluation of various aspects of the mining sector;
- Compiling Global "State of the Sector" reports from time to time, incorporating country visions and Strategic Plans for moving towards more sustainable sectoral practices; and.
- Creating and managing Guidelines and Toolkits for the development of Strategic Plans and Visions.

Of significant importance to mineral resources governance is the work of the These functions could be placed with the Committee for Mineral Reserves International Reporting Standards (CRIRSCO) and of the United Nations Economic Commission for Europe's (UNECE) Expert Group on Resource Classification (EGRC), which operates the United Nations Framework Classification for Resources (UNFC). The current (2009) UNFC version does not make disclosure of technical compulsory, nor the use of Competent Persons as defined in NI 43-101. Jointly, they provide an international scheme for the classification, management and reporting of energy, mineral and raw material resources. Both initiatives provide a compatible resources and reserves reporting framework, with NI 43-101 putting more stringent obligations on disclosure and the quality and transparency of what is disclosed. NI 43-101 and the national Australian reporting standard JORC are the most widely used reporting standards used worldwide as it can be seen from the weekly updated, freely accessible, online map of worldwide exploration and mine development projects provided by RSC Mining and Mineral Exploration Services[290]. The projects listed are only those that report their activities on a voluntary basis or further to national reporting obligations.

United Nations Economic Commission for Europe's (UNECE) Expert Group on Resource Classification (EGRC), which operates the United Nations Framework Classification for Resources (UNFC), an international scheme for the classification, management and reporting of energy, mineral and raw material resources.

Effective governance of mineral resources fundamentally requires better signalling between demand for particular emerging technologies that require minerals and the extractive enterprises that will supply them. A stakeholder-driven Geological Programme Board, including geological surveys and mining/recycling companies, and public-private partnerships in relation to exploration, would address this issue, but there is currently no effective international mechanism to facilitate such arrangements. The European Union has launched an initiative that may foster such a framework, the "Towards a World Forum on Raw Materials (FORAM)"[291] and several NGOs such as the World Resources Forum[292], the World Materials Forum[293] and the World Circular Economy Forum[294] may play a role in fostering such an international mechanism. Currently, there are only ad- hoc arrangements and contracts between particular demand firms and suppliers, which are often economically and ecologically inefficient. Instead, an international coordination mechanism is needed, whereby data and knowledge are shared on economic geology, environmental conditions and issues as well as medium/ long-term mineral demand demand/supply balance scenarios, as well as mineral demand needs, alongside transparency on impacts and benefits. Building on the work of the EGRC and modelled on the International Energy Agency, the international coordination could be facilitated through the formation of an International Mineral Agency (in a modified version of the International Energy Agency, or an international agreement (either a separate treaty or a protocol that considers the mineral needs of complying with existing environmental agreements).

Through these institutions or others, continuous coordinated international effort would be required to develop the SDLO framework conditions with a special focus on one hand on developing countries and on the other on so far informal small-scale activities. Collecting available existing documented best practice and making it available via a single Internet portal would support capacity building. This web portal could also provide links to existing Massive Open Online Courses (MOOC) related to minerals, metals, materials, resources governance, research and innovation. Informal artisanal mining would need to be turned into formal small-scale operations providing its stakeholders with security of tenure and support to develop sustainable extraction practices.

Capacity building and training; institutional strengthening; data acquisition, conservation, management and modelling; research and innovation, the development of web-based multilingual access to data, information, and knowledge (including above mentioned best practice reference documents and MOOCs) all require human skills, material and financial resources. Mobilizing

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[290] Online interactive map- based information service: RSC Mining and Mineral Exploration Services
[291] http://www.foramproject.net/index.php/project/
[292] https://www.wrforum.org/
[293] https://worldmaterialsforum.com
[294] https://www.sitra.fi/

Providing these resources at the international level through a special **Facility** or **Trust Fund** (to be managed by an international body such as UN Environment, the UN Development Programme or the World Bank) of several US$ billion should not be beyond an industry which Reich *et al*. (2017) estimate had a total value in 2015 of $US3.6 trillion.

If managed by an international body such as UN Environment, the UN Development Programme or the World Bank a financial resource of a few billion from the industry could do wonders to achieve the development of the framework conditions summarised here, without having a significant effect on minerals and metals prices.

The development of the conceptual framework presented in this report could be taken forward by several existing international initiatives such as the World Resources Forum and the World Materials Forum. With the support of regional/ international organisations such as the UN Regional Commissions, other UN bodies such as UN Environment and the UN Development Programme, the European Commission, the African Union Commission, the ASEAN, the OECD, the World Bank, the G20UN bodies such as UN Environment and the UN Development Programme, and progressive national governments, it is possible to imagine the development of the framework to the point where an international agreement on Mineral Resources Governance could be obtained and effectively implemented.

In the shorter term, there are several specific opportunities that could be used to take the first steps towards refinement, implementation and use of the SDLO throughout global governance of the extractive sector. For example:

- The UN Environment Assembly, the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development, and wider ongoing UN processes focused on reviewing progress towards the 2030 Agenda on Sustainable Development, could serve as fora for negotiation of an international consensus regarding both the normative content and structure of the SDLO, and specific policy options and programmes for its implementation.
- Ongoing bilateral and plurilateral discussions between governments about trade in security of supply of mineral raw materials and resource-driven development (for example discussions between the European Union and the Africa Union as well as between the European Union and Latin America, via MERCOSUR and/or the UN Economic Commission for Latin America and the Caribbean (ECLAC). The dialogue could also be developed between the European Union and the 79 countries being members of the Africa, Caribbean and Pacific Group of States, linked to the European Union by the Cotonou Agreement[295], Africa as well as Europe and Latin America, under the auspices of the EU Raw Materials Initiative and Strategy)) could utilize and refine the SDLO as a template for new international instruments to strengthen transnational governance of mining and associated trade flows.
- The 8060+ existing standards and instruments relevant to specific aspects of mining sustainability (see Chapter II) could use the SDLO as a basis for benchmarking their own activities, or aligning their activities with wider political commitments on sustainable development—for example by embedding or adapting the SDLO Principles within documentation and standards, or by using the SDLO as a means to identifying opportunities for inter-standard collaboration. The relevant principals and other interested parties of bodies in charge of institutions and/or initiatives such as the EITI, ICMM, Equator Principles Financial

[295] www.acp.int

Institutions (EPFIs) GRI, and the Responsible Mining Index, to name a few, should jointly explore the opportunities for and upwards harmonization of global standards of good practice and consolidation of existing initiatives and instruments for ease of application, improved efficiency, greater enforcement, and less duplication or redundancies.

- Relevant international communities of experts could consider options for forming a 'High-level Panel on Sustainable Development of Mining', whose activities would build on the analysis presented in this Report and develop an authoritative and standardized set of SDLO Principles and Policy Options, including recommendations for the design of transnational instruments to strengthen mining governance. Illustrative examples of this model from other sectors include the Global Ocean Commission,[296] whose recommendations were influential in the decision to launch a new global round of negotiations concerning ocean areas beyond national jurisdiction, and the newly established High-Level Panel on Building a Sustainable Ocean Economy.[297]
- At the national, sub-national and local levels, it would be important to use the SDLO as an indicative framework to undertake a SDLO gap analysis with the view to formulating national determined SDLO paths, updating and adapting existing national visions, policies, strategies, laws, regulations and practice to the exigencies of the Agenda 2030 and the quadruple bottom line principles articulated in this report. Of vital importance is the need to reduce the perception gaps on what constitutes benefit in the extractive sector among relevant stakeholders and generate development outcomes based on the concept of shared value.

Given the urgency and enormity of gearing the extractive sector towards for sustainable development, we encourage all stakeholders to build on the foundation presented here in this Report, to enable the metals and minerals sector to realised its contribution to sustainable development by 2030, and beyond. The Investing in Africa Mining Indaba (4-7 February 2019), the Prospectors & Developers Association of Canada (PDAC) Convention of 3-6 March 2019 and the fourth session of the UN Environment Assembly (UNEA 4) in 11-15 March 2019 offer unique and immediate platforms to keep the momentum up, divulge the report and articulate further the pathways to the operationalisation of the SDLO.

[296] See: https://www.some.ox.ac.uk/wp-content/uploads/2016/03/GOC_2016_Report_FINAL_7_3.low_1.pdf

[297] See: https://www.regjeringen.no/en/aktuelt/norway-establishes-international-high-level-panel-on-sustainable-ocean-economy/id2587691/

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