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International Resource Panel

Mineral Resource Governance in the 21st Century

GEARING EXTRACTIVE INDUSTRIES TOWARDS SUSTAINABLE DEVELOPMENT

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Lead Authors

Elias T. Ayuk, Antonio M. Pedro, and Paul Ekins

Contributing Authors
Julius Gatune, Ben Milligan, Bruno Oberle, Patrice Christmann, Saleem Ali, S. Vijay Kumar, Stefan Bringezu, Jean Acquatella, Ludovic Bernaudat, Christina Bodouroglou, Sharon Brooks, Elisabeth Buergi Bonanomi, Jessica Clement, Nina Collins, Kenneth Davis, Aidan Davy, Katie Dawkins, Anne Dom, Farnaz Eslamishoar, Daniel Franks, Tamas Hamor, David Jensen, Kuntala Lahiri-Dutt, Inga Petersen, Andreas R.D. Sanders, Philip Nuss, and Lucia Mancini.

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MINERAL RESOURCE GOVERNANCE IN THE 21ST CENTURY

GEARING EXTRACTIVE INDUSTRIES TOWARDS SUSTAINABLE DEVELOPMENT

Coal industry, South Africa. Photo: Jassen Todorov © Getty images

FOREWORD

Well-managed income from extractive resources presents tremendous opportunities for supporting sustainable and inclusive development –particularly for low- and middle-income countries whose economies rely heavily on natural resources. In addition to generating government revenues, extractive projects can create jobs, build infrastructure and transfer technologies.

Yet natural resource extraction and use is not always done wisely, bringing a host of problems. As this report by the International Resource Panel shows, extractive operations can cause extensive and lasting damage.

Aside from such environmental disasters, resource rich nations face other issues when trying to use wealth from their natural resources to drive sustainable development. Volatility in commodity prices, limited national capacities, weak links to the rest of the economy, corruption and social unrest all undermine the transformative potential of extractive activities.

This report shows that good governance is key to managing environmental and social impacts, and unlocking the sector's potential as a catalyst of sustainable growth and development. Many of today's wealthiest countries were built on the back of natural resources. A modern example of a developing country making wise use of resources can be seen in Botswana, which has deployed its diamond deposits to promote broad-based development.

Significant efforts have been made to develop instruments to address governance gaps in the extractive sector. But we need broader and more collaborative governance for the industry to become an enabler of sustainable development. This report sets out principles and policy options that can help consolidate existing instruments, strike fairer deals, promote an equal share of benefits and ensure the protection of nature and people's lives.

I encourage everyone involved in the extractive sector to read this report, apply its recommendations and become part of the movement to create a better future for everyone.

Joyce Msuya
Deputy Executive Director
UN Environment Programme

PREFACE

Extraction of mineral resources has risen markedly in recent decades and will continue to grow to serve the needs of a growing, more affluent and increasingly urban population. Greater resource efficiency and circularity need to be prioritized around the globe to reduce demand for virgin materials, as current trends of resource extraction and processing cause environmental impacts that would exceed the planetary boundaries (GRO 2019). Especially high-income countries must strive for absolute decoupling of virgin resource use from economic growth. Developing countries need to relatively decouple growth from resource use, but will continue to grow demand for virgin resources to develop their basic infrastructure. Therefore, despite decoupling, resource extraction will continue to grow until necessary infrastructures are in place and resource circularity is effective globally. The global transition towards clean energy production will accentuate this pattern as renewable energy sources require much greater amounts of metals, both of the common and rare types, than energy production from fossil fuels.

The future demand outlook for metals and minerals presents notable opportunities for countries endowed with these resources to harness their extractive wealth to advance economic development and human well-being. Nonetheless, for a majority of resource-rich developing countries, mining, oil or gas exploitation has not translated into broad-based economic, human and social development. This is partly owing to the 'enclave' nature of the extractive industry, with few links to the local economy, in most of the developing world. Moreover, the industry is disruptive and can lead to severe environmental degradation and disruption of social fabric, in some cases, even unleashing political dynamics that result in the deterioration of governance and serious conflicts.

In response, mining companies have in the past two decades increasingly sought to secure acceptance of their activities by local communities and other stakeholders, build public trust and prevent social conflict. Such attempts to earn a 'Social License to Operate' are important in recognizing the need for mining companies to bear responsibility for the negative social implications of their practices, and have resulted in an explosion of soft regulation aimed at addressing the adverse consequences of mining. Notwithstanding, the agenda of the social license framework depicts industry's pragmatic, minimum response to business risk arising from public opposition and social conflict. In addition, the report's review of close to 90 existing international instruments governing the mining sector concludes that they tend to present piecemeal efforts and, importantly, often fail to be implemented at the national level.

The report thereby calls for moving beyond the established paradigm of the 'Social License to Operate', towards a new governance reference point that enables public, private and other relevant actors in the extractive sector to make decisions compatible with the 2030 Agenda's vision of sustainable development. The new governance framework put forward in the report is referred to as the 'Sustainable Development License to Operate' which extends the Social License to Operate in several important ways. It is relevant to all actors in the extractive sector, and its implementation is a shared responsibility by 'host' and 'home' countries along the extractive value chain. Importantly, it addresses a broader subject matter integrating all pillars – people, planet, prosperity, peace and partnership – of sustainable development, and sets out principles, policy options and good practices for enhancing the extractive sector's contribution to achieving the Sustainable Development Goals. At national level, the International Resource Panel suggests that countries adopt a Strategic Development Plan with proposed actions by different stakeholders pertaining both to the mining sector as well as other sectors impacted by or impacting on mining, and mapped against the Sustainable Development Goals. The Plan could entail a mining law enshrining the principles of consultation, transparency and reporting, recognising the rights of local populations, and setting performance standards. It should also facilitate the creation of three core public institutions – an Environment Directorate, a Mining Directorate and a Geological Survey – to promote and regulate the development of mines and metals industries.

At the international level, the Panel discusses the creation of an International Minerals Agency, or the signing of an international agreement, to, inter alia, coordinate and share data on economic geology, mineral demand needs, and promote transparency on impacts and benefits. It is hoped that 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 for Sustainable Development could serve as fora for negotiating an international consensus regarding the specific policy options and programmes for the implementation of the new global governance framework for the extractive sector set forth in this report.

Janez Potoçnik
Co-Chair
International
Resource Panel

Izabella Teixeira
Co-Chair
International
Resource Panel

EXECUTIVE SUMMARY

THE 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, which gives rise to significant and wide-ranging landscape impacts that must be managed responsibly (Goals 6 and 15). Mining activities are also energy- and emissions-intensive in terms of 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 (including those 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, their economies are still largely based on the exploitation of extractive resources. Even among developing countries, this path to prosperity is being repeated in 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 amounts of government revenue through taxes, royalties and other levies, extractive projects can also yield benefits by, inter alia, fostering the emergence of competitive small and medium-scale enterprises that 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; and facilitating the transfer of technologies and know-how, thus strengthening local human capital formation (which is the key to structural transformation).

However, mineral resources have attributes that make them difficult to manage and, for most 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, which means missed opportunities to explore multiplier effects and deliver sustainable development by 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 of which lead to severe environmental degradation and disruption of the social fabric, while others unleash political dynamics that can compromise governance and bring about serious conflicts.

Realizing the full potential of the mining sector as a catalyst for growth and development is therefore fraught with many challenges in mineral-rich developing countries. These include: the unevenly distributed and finite nature of mineral deposits; the volatility of commodity prices that 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 that leave 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 of this potentially leads to social conflict; lack of accountability, transparency and risk of corruption; as well as geopolitical and global power asymmetries.

Furthermore, many mineral 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 largely coordinate and govern the value chain. They mediate between mineral production and manufacturing processes, and therefore have 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), which are all aimed at improving governance of the extractive industry for increased economic prosperity and environmental protection. These include many commendable examples such as the Africa Mining Vision, the United Nations 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 wider 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 governing the mining sector represent 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 prevalent in the developing world, whereby the extractive sector is an enclave with few linkages to the local economy.

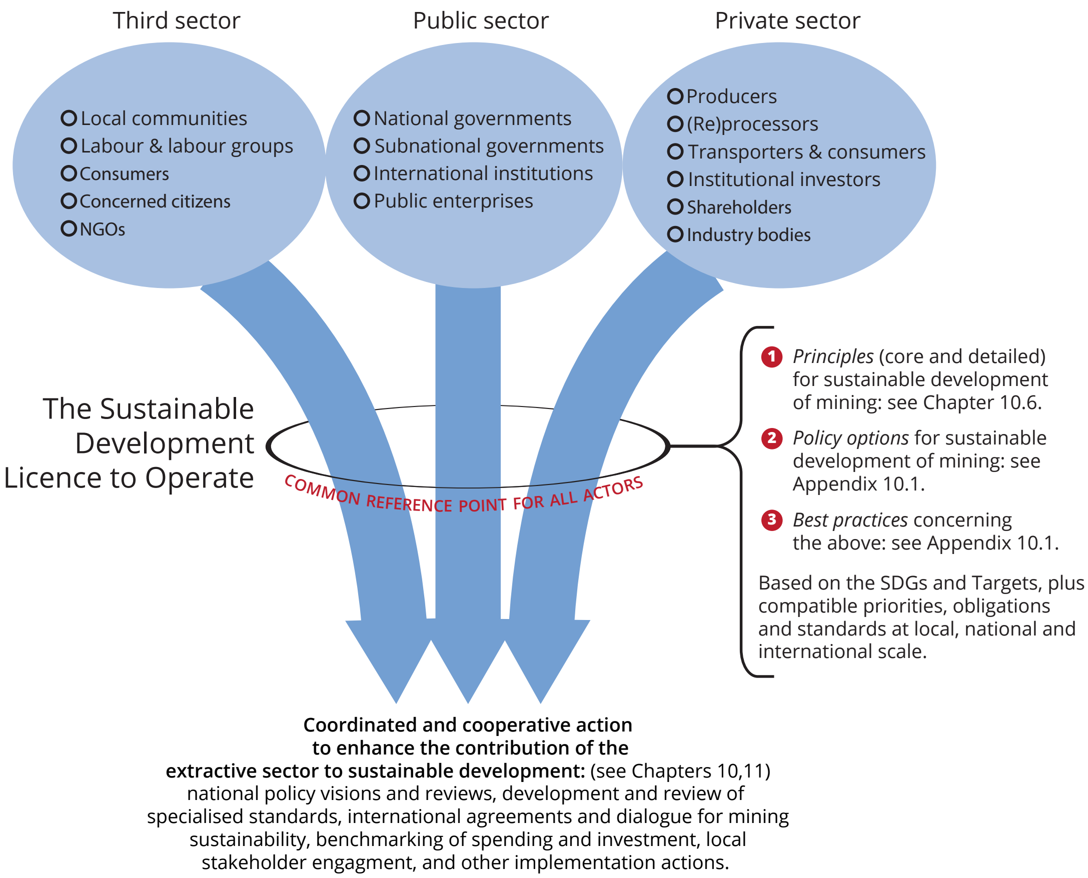
The adoption of the SDGs signalled the need to move beyond the concept of the 'social license to operate', which dominated the development discourse in the extractive industry throughout the end of 1990s and mid-2000s. The need for a new governance reference point arose from the limitations, inadequacy or even obsolescence of existing governance instruments (given their sectorial and one-dimensional nature) and from the necessity to translate the complex array of post-2015 global commitments into a manageable set of requirements to 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 needs to be 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 that are implemented by a range of actors. Such a framework would improve understanding of how mining activities should be regulated and how resource rents could 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 needs a systemic integrated approach 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 ongoing economic development, 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 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 adherence to the highest standards of governance and transparency.

The new framework is the 'Sustainable Development Licence to Operate' (SDLO). The SDLO builds on the Social Licence to Operate (SLO). It is also designed to improve the net societal benefits of mining, and is not necessarily meant 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 remit of the SDGs and related 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

KEY COMPONENTS OF THE SDLO AND ILLUSTRATIVE IMPLEMENTATION ACTIONS



Source: Pedro et al. (2017)

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.

COMPLEX ISSUES, INTRICATE DYNAMICS AND MANY OPPORTUNITIES FOR ACTION

Security of Supply

Extractive resources will continue to play a central role in driving the global economy despite moves to decouple economies and increase recycling. Demand will be largely driven by emerging economies as populations and incomes are growing to form a global middle class that is increasingly living in cities. These trends are going to drive demand for infrastructure and durable goods: the key drivers of demand for minerals. As much as the recent commodity boom has waned, demand for minerals is solid and securing supply remains a major concern going forward.

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

Artisanal and small-scale mining

Export minerals and large-scale mining receive more attention due to their more direct macroeconomic benefits and concerns over security of supply. However, other extractive activities (especially the artisanal and small-scale mining (ASM) and development minerals sectors) are an important form of livelihood for many marginalized poor people. ASM in particular has increasingly become a source of income for many disadvantaged households. Recent years have seen an 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 million to 150 million and growing.

Policymakers equating the expansion of large-scale mining with 'development' have established an extractive model that favours large corporate 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. This activity needs to be recognized as a distinct sector that requires a totally different approach from a policy and governance perspective. Many of the approaches previously taken with ASM treated it as a subset of large-scale formal mining and did not consider its very specific issues.

Moreover, context-specific legal and policy frameworks for ASM are required, and the importance of ASM must be reflected in international, regional, national and local agendas, policies and plans. The private sector and other stakeholders are urged to implement transparent practices across the supply chains and support ASM integration into local, national, regional and international supply chains. Governments are called upon 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, are considered important factors in improving ASM.

Development minerals

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

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 the 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 distri¬buted.

These differences mean that a distinct governance framework is needed for development minerals. However, the lack of attention for this sector has given rise to unsustainable mining practices. For example, uncontrolled sand extraction is already having environmental and economic consequences. Some of the strategic policy directions needed include: (i) policy and legal recognition of its unique contribution to local, domestic and regional economies and the potential for structural transformation of developing nations (the sector is excluded from many mining acts); (ii) the need for concerted action from all stakeholders to overcome the environmental, social, labour and other challenges facing 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

Mineral extraction involves disturbing the environment, and this can disrupt major biodiversity services and associated livelihoods. The frequently severe and enduring impacts of mining activities on the natural environment have been 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 in a number of species. This can in turn alter the structure and function of ecosystems, thereby affecting the provision of a range of ecosystem services (with potential negative impact for 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 when storage facilities fail to contain the waste.

The trend to¬wards mining lower-grade ores increases the potential impacts of extractive activities. Mining lower-grade ores will lead to larger amounts of waste and higher ener¬gy and water demands. These demands increase exponentially with declining ore grades. As easily accessible reserves become de¬pleted, 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 resulted in the launch of a plethora of instruments. However, these have not been able to rise to the challenges involved. The failure to use countries' resource wealth to generate sustainable growth could be seen as the central challenge facing current governance systems. This is being amplified by new additional challenges. Centralized power in the form of national government is being dissipated upwards, downwards and horizontally. New information and communication technologies are leading to increased pressure from informed citizens 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 resource governance.

Some of the challenges with existing instruments include:

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

THE CASE FOR A NEW GOVERNANCE FRAMEWORK

Towards greater and shared value and benefits

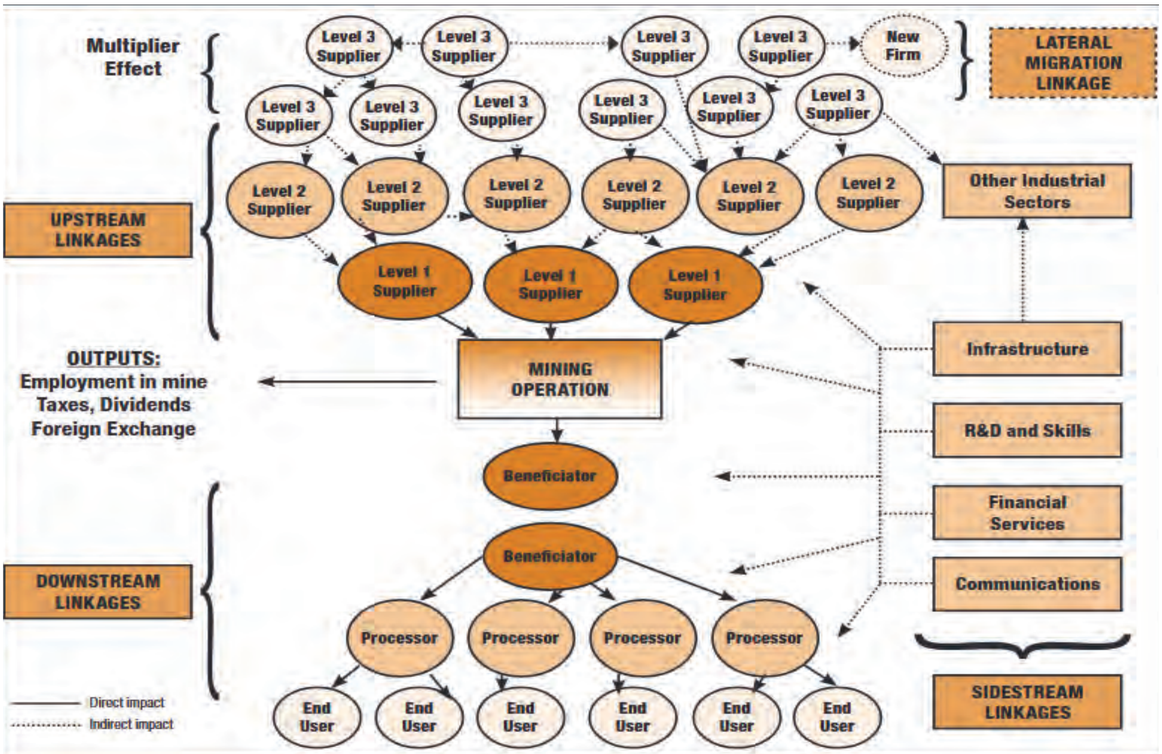
The SDLO is based on an unequivocal recognition of planetary boundaries and the need to align the value and benefits to all stakeholders in host and home countries while delivering a fair share of benefits to everyone. This should support broad development objectives including poverty reduction, economic 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 range of policies to transform mineral resources extraction from an enclave industry by linking it with the wider economy through local content and value addition, among other routes (see below).

How a country benefits from resource extraction crucially depends 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.

LINKAGES IN THE MINERALS INDUSTRY AND THE RELATIONSHIP BETWEEN FIRMS



Source: Lydall (2009).

CONCEPT OF A POLICY VALUE CHAIN

Source: World Bank (2009).

However, decision-making in the extractive sector is a complex global, national, regional and local architecture of relationships among individuals and institutions. Although there is no perfect system of governance, there can nonetheless be an effort to align different interests while respecting the objective limits im¬po¬sed by the physical world and the need for justice and equity that guarantee the an ongoing con¬sensus.

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 a different set 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, as well as a recognition of spatial boundaries, power relationships and normative frameworks. These all play out in the mineral value chain. Increasing consumer demand for sustainable products is moving governance challenges to the customer level and to the full product life cycle (disposal/recycling level). What happens after a resource is extracted, processed and transformed into a product, used and finally disposed are therefore now legitimate governance concerns.

In establishing a new governance framework for mining, it is essential to understand the sector within the broader context of a national economy (and its development objectives and strategies). This means 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 maximizing linkages between the mining sector and other parts of the economy (including through job creation, local procurement of goods and services, downstream use of mined goods and shared infrastructure). This will require a long-term comprehensive, holistic strategy that goes beyond industry regulation to also include investment in education and training, as well as 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 socioeconomic 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, including through reform of the international trade and investment regime that constrains the use of the full range of policy instruments to achieve resource-based industrialization at the local level.

STEPS TO OPERATIONALIZING THE SDLO

Principles and policy options

The SDLO provides guidance on how to enhance the extractive sector's contribution to sustainable development through a set of principles and policy options, anchored in a clear and explicit recognition of planetary boundaries and the need to decouple natural resource use, environmental and social impacts from economic growth in a projected scenario of increased resource intensity up to 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 representation in large-scale mining employment 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 maximize its development contribution, whilst also promoting female empowerment and gender equality that are central to achieving the Sustainable Development Goals. A similar need for differentiated analysis and policies may also arise with respect to other marginalized groups such as indigenous peoples.

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/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 in which 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:

  - the award of exploration and ownership rights;
  - devising 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
  - channelling extractive rents into national and local public investment.

Home countries also have a key role to play by:

- improving regulation of the activities of trans-national corporations (TNCs); making international investment laws fairer;
- tackling illicit financial flows;
- combating commodity price volatility; and
- ensuring a fair deal for host countries (through, inter alia, international transparency and accountability initiatives and the regulation of tax havens).

At the *international level*, policy action is needed to set global standards in a number of areas of the extractive sector – in the form of rules and regulations, voluntary instruments and reporting obligations. These include:

- coordination of policies and instruments and agreement on international standards (for example, on transparency and global codes of conduct);
- influencing incentives and behaviour;
- 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, inter alia, information exchange, media campaigns and collaboration with institutions such as those with oversight roles. Industry should engage in collaborative social dialogue on each extractive project by formulating an agenda that balances its own commercial needs with societal expectations.
- In order to implement laws and policies governing the extractive sector, transparency is a necessary but not sufficient prerequisite. Information on contracts and licenses, social and environmental impacts assessments, royalties, tax payments, revenues and expenditures should be easily accessible. Civil society organizations, labour unions, researchers and other stakeholders can also play an important role in analysing 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 a concerted consolidation of existing relevant instruments, ensuring sustainable development is the overriding objective, as well as pointing to areas where new instruments might be needed and how a particular instrument will interact with others.

The SDLO is a partnership of the key stakeholders in the extractive value chain to ensure mining is carried out sustainably while meeting the twin goals of sustainable development for exporting countries and security of supply for importing countries. Importantly, it is essential to recognize that there is no 'one-size-fits-all' solution, and very different policy solutions may apply to countries with differing industry characteristics, challenges or stages of economic development. Differentiated governance approaches are needed, for instance, in countries where standards and guidelines can be easily implemented, compared with others with a significant artisanal and small-scale mining sector, or those 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 the following three pathways that are not mutually exclusive:

i. a global international agreement that commits countries to a governance framework much like the 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 to reconcile issues of sustainable development and security of supply through regional PACTs such as the Africa Mining Vision and the EU Raw Materials Initiative.

Chuquicamata open pit copper mine, Chile. Photo: roccomontoya © Getty images

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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 (inflation, rising value of the local currency (hampering exports) and surging labour costs) that arose as a consequence of the discovery and the rapid development of the Dutch Groningen gas fields in the early 1960s. The expression was coined by the United Kingdom journal "The Economist".
Extractivism	Activities that remove large quantities of natural resources that are not processed in the countries where they are extracted (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 industrialized and emerging nations. It typically generates few benefits for the countries where 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 that 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 geological stocks have been performed for some metals, such as copper.
Greenfield exploration	In mineral exploitation, "greenfield exploration" designates exploration in areas with no 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 blurred.
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 (United States Bureau of Mines). Note: biological processes such as bacterial leaching may also be used to recover metals from 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 (United States 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 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 speaking, the word denotes underground work aimed at the 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 (United States Bureau of Mines).
Ore	An assemblage of minerals from which at least one economically valuable substance, most frequently a metal (copper, gallium, gold, iron or 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" frequently found in the literature)	Especially for the production of metals, ore processing tends to be 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 ore-processing waste that will have to be disposed in the form of tailings (in specifically engineered reservoirs called 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 (for underground mining) or the pit configuration (for an open pit) has been established and an effective method of mineral processing has been determined. It includes a financial analysis based on reasonable assumptions on the modifying factors and the evaluation of any other relevant factors that 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 (United States Bureau of Mines). This activity is closely related to metallurgy, and aims 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 maximize the value-added generated on their territories. It can also be politically driven 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. Resource 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 a few countries. In these markets, countries can affect global prices for raw materials and have the 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 releases these funds to support the budget when the 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 such as 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, workforces and labour groups.

Acronyms

Acronym	Meaning
AC	Aarhaus Convention
ACET	African Center for Economic Transformation
ACP	African, Caribbean and Pacific Group of States
AFP-JIJI	Joint Activities Of The French "Agence France-Press" And The Japanese "JIJI" Press Agencies
AGAM	An Initiative for Good Governance
AKVG	Akwé: Kon Voluntary Guidelines
ALBA	Ahafo Local Business Association
ALP	Newmont Ghana's Ahafo Linkages Program
AMD	Acid Mine Drainage
AMV	Africa Mining Vision
APR	Annual Performance Report
ARM	Alliance for Responsible Mining
ASGM	Artisanal and Small-Scale Gold Mining
ASI	Aluminium Stewardship Initiative
ASM	Artisanal and Small-Scale Mining
ASX	Australian Security Exchange
AUC	African Union Comission
AZE	Alliance Zero Extinction
BANANA	Build Absolutely Nothing Anywhere Near Anything
BBOP	The Business and Biodiversity Offsets Programme (BBOP)
BEPS	Base Erosion and Profit Shifting
BGS	British Geological Survey
BIG-E	Batumi Initiative on Green Economy
BITs	Bilateral Investment Treaties
BMBF	German Federal Ministry of Education and Research
BRICS	Brazil, Russia, India, People's Republic of China and South Africa - Grouping Of States
CAPEX	Capital Expenditure
CASM	Communities and Small-Scale Mining
CBD	Convention on Biological Diversity
CCCMC	China Chamber of Commerce of Metals, Minerals and Chemicals Importers and Exporters
CCSI	Columbia Center on Sustainable Investment
CCUWL	Convention Concerning the Use of White Lead in Painting
CERCLA	United States Comprehensive Environmental Responsibility Compensation and Liability Act
CFGS	Conflict-Free Gold Standard
CFLs	Compact Fluorescent Lamps
CFSI-CFS	Conflict Free Sourcing Initiative-Conflict Free Smelter
Chinese DD	Chinese Due Diligence Guidelines for Responsible Mineral Supply Chains
CIL	Coal India Limited
CMVs	Country mining Visions

Acronym	Meaning
CMA	Canada Mining Association
CMN	Commonwealth Mining Network
COCHILCO	Chilean Copper Commission
CONNEX	Strenghtening Assistance for Complex Contract Negotiations (Connex Initiative)
COP	Conference of the Parties
CRAFT	Code of Risk-mitigation for ASM Engaging in Formal Trade
CRAMRA	Convention on The Regulation of Antarctic Mineral Resource Activities
CRIRSCO	Committee for Mineral Reserves International Reporting Standards
CSIRO	Commonwealth Scientific and Industrial Research Organisation (Australia)
CSO	Civil Society Organization
CSR	Corporate Social Responsibility
CSS	Country-Specific Sector
CTC	Certified Trading Chains
CWA	Compact With Africa
DAC	Development Assistance Committee Of The OECD
DI	Devonshire Initiative
DDI	Diamond Development Initiative
DDS	Diamond Development Standards
DFID	Department for International Development (United Kingdom)
DoE	United States Department of Energy
DRC	Democratic Republic of Congo
DVC	Downstream Value Chain
ECLAC	United Nations Economic Commission for Latin America and the Caribbean
EEZ	Exclusive Economic Zone
EGRC	Expert Group on Resource Classification
EHS	Environmental Health and Safety
EIAs	Environmental Impact Assessment
EICC	Electronic Industry Citizenship Coalition
EITI	Extractive Industry Transparency Initiative
EICC-ESWG	EICC-Environmental Sustainability Working Group
EIP	European Innovation Partnership on Raw Materials
E-LCA	Environmental Life Cycle Assessment
EMP	Environmental Management Plan
EO	Equitable Origin
EPs	Equator Principles
ETP SMR	European Technology Platform on Sustainable Mineral Resources
EPA	Environmental Protection Agency
EPASL	Sierra Leone's Environmental Protection Agency
EPIFIs	Equator Principles Financial Institutions
EPRP	European Partnership for Responsible Minerals
ERA	European Research Area
ERA-MIN	Research And Innovation Programme on Raw Materials to Foster Circular Economy
ERPM	European Partnership for Responsible Minerals
EU	European Union

Acronym	Meaning
EVC	Extractive Value Chain
Fairmined	Alliance for Responsible Mining (ARM)-Fairmined Standard
Fairtrade	Fairtrade Gold and Precious Metals
FATF	Financial Action Task Force
FDI	Foreign Direct Investment
FDI	Foreign Direct Investment
FET	Fair and Equitable Treatment
FIASMEC	Fraser Institute Annual Survey of Mining and Exploration Companies
FORAM	Towards a World Forum on Raw Materials
FPIC	Free, Prior and Informed Consent
FRP	Framework for Responsible Mining
FST	Future Sustainable Technologies
FTAs	Free Trade Agreements
GBAI	The Global Battery Alliance Initiative
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEF-GOLD	Global Opportunities for the Long-term Development of the Artisanal and Small-Scale Gold Mining Sector
GHG	Greenhouse Gases
GMI	Green Mining Initiative (GMI)
Green Lead	The Green Lead Initiative
GRI	Global Reporting Initiative
GRO	Global Resources Outlook
GSRM	Guidelines for Social Responsibility in Outbound Mining Investments
HDI	Human Development Index
HEI	Health in the Extractive Industries
HIE	High-Income Economies
HRD	Human Resources Development
HREE	Heavy Rare Earth Elements
IC	Integrated Circuits
ICGLR	International Conference on the Great Lakes Region
ICGLR-RINR	ICGLR – Regional Initiative Against The Illegal Exploitation of Natural Resources
ICMC	International Cyanide Management Code for the Manufacture, Transport, and Use of Cyanide in the Production of Gold
ICMM	International Council on Mining and Metals
ICT	Information Communications Technology
IFC	International Finance Corporation
IFC-GPHJCEI	IFC – 'A Strategic Approach to Early Stakeholder Engagement – A Good Practice Handbook for Junior Companies in the Extractive Industries'
IFC-PS	IFC Performance Standards on Environmental and Social Sustainability
IFFs	Illicit Financial Flows
IFRS	International Financial Reporting Standards for Extractive Sector
IGF-MPF	Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development /Mining Policy Framework
IGO	Intergovernmental Organization
IIAS	International Investment Agreements
IIED	International Institute of Environment and Development

Acronym	Meaning
ILO	International Labour Organization
ILO169	ILO169 - Indigenous and Tribal People Convention 1989
ILO176	International Labour Organisation Convention on Mine Safety and Health (1995)
ILOSTAT	United Nations Labour Organisation Department of Statistics
IoT	Internet of Things
IPCC	Intergovernmental Panel on Climate Change
IR	Infrared
IRA	Indigenous Rights in the Arctic
IRCI	Integrated Resource Corridors Initiative
IRMA	Initiative for Responsible Mining Assurance
IRP	International Resource Panel
ISA	International Seabed Authority
ISDS	Investor-State Dispute Settlement
ISO	International Standard Organisation
iTSCi	The International Tin Research Institute (ITRI) Tin Supply Chan Initiative
IUCN	International Union for Conservation of Nature
IWM	International Women in Mining
JEMSE	Jujuy Energía Minería Sociedad del Estado
LBMA-RGG	London Bullion Market Association - Responsible Gold Guidance
LCA	Life Cycle Assessment
LCI	Life-Cycle Inventory
LCSA	Life Cycle Sustainability Assessment
LED	Light Emitting Diode
LIE	Low-Income Economies
LMIE	Lower-Middle-Income Economies
LREE	Light Rare Earth Elements
LPRM	Local Procurement Reporting Mechanism
LSM	Large Scale Mining
MCM	Minamata Convention on Mercury
MCP	Mine Closure Plan
MDAs	Mineral Development Agreements
MEAs	Multilateral Environmental Agreements
MIDAS	Managing Impacts Of Deep Sea Resource Exploitation Project
MInGov	Mining Investment and Governance Review
MMSD	Mining, Minerals and Sustainable Development Project
MNCs	Multinational Corporations
MoM	Ministry of Mining
MOOC	Massive Open Online Courses
MPEPAT	Madrid Protocol on Environmental Protection to the Atlantic Treaty
MPF	Mining Policy Framework
MVM	Mineral Value Management
NBSAPs	National Biodiversity Strategies and Action Plans
NEEI	Non-Energy Extractive Industry
NGO	Non-Governmental Organisation
NIMBY	Not in My Backyard Movement
NOAMI	National Orphaned/Abandoned Mines Initiative
NRC	National Resource Charter

Acronym	Meaning
NRG	Natural Resource Governance
NRGI	Natural Resource Governance Institute
NRRI	Natural Resources Risk Index
ODA	Official Developmnet Assiastance
OECD	Organisation for economic Co-operation and Development
OECD –DD	OECD Due Diligence Guidance for Responsible Supply Chain Management of Minerals for Conflict Affected and High-Risk Areas
OECD-Global Forum	Global Forum on Transparency and Exchange of Information for Tax Purposes
OEMs	Original Equipment Manufacturers
OfD	Oil for Development
OHS	Occupational Health and Safety
PACE	Protected Areas and Critical Ecosystems
PDAC e3Plus	Prospectors And Developers Association of Canada
PES	Payment for Ecosystem Services
PGM	Platinum Group Metals
PIDA	Programme for Infrastructure Development in Africa
PMP	Post-Mining Plan
PPA-RMT	Public-Private Alliance for Responsible Minerals Trade
PSILCA	Product Social Impact Life Cycle Assessment
PVC	Policy Value Chain
PWYP	Publish What You Pay
R&D	Research and Development
RCI	Responsible Cobalt Initiative
RDMI	Responsible Mineral Development Initiative
REEs	Rare Earth Elements
RJC	Responsible Jewellery Council
RFID	Radio frequency identification devices
RMC	Responsible Mining of Cobalt
RMDI	Responsible Mineral Development Initiative
RMF-RMI	Responsible Mining Foundation - Responsible Mining Index
RMI	EU Raw Materias Initiative
RRMI	Responsible Raw Materials Initiative
RRT	Resource Rent Tax
RS	Australian Steel Stewardship Forum/ Steel Stewardship Council Ltd
SAM	Sustainable Artisanal Mining Project
SCS	Sustainability Certification Schemes
SDGs	Sustainable Development Goals
SDLO	Sustainable Development Licence to Operate
SEEA	UN System of Environmental-Economic Accounting
SETAC	Society of Environmental Toxicology and Chemistry
SfH	Solutions for Hope initiative
SIA	Social Impact Assessment
S-LCA	Social - Life Cycle Assessment
SLO	Social Licence to Operate
SMED	Smart Mineral Enterprise Development
SMEs	Small and Medium Sized Enterprises
SMMRP	World Bank Sustainable Management of Mineral Resources Project

Acronym	Meaning
SWFs	Sovereign Wealth Funds
SWIA	Sector-Wide Impact Assesment
TAI	The Access Initiative
Tg	Teragram
TMFs	Tailings Management Facilities
TNCs	Trans-national Corporations
TQEM	Total Quality Environmental Management
TQM	Total Quality Management
TSF	Tailing Storage Facilities
TSM	Towards Sustainable Mining
TSX	Toronto Stock Exchange
UMIE	Upper-middle-income Economies
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNCTAD	United Nations Conference on Trade and Development
UN-DESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNDP-SEMESHD	Sustainable and Equitable Management of the Extractive Sector for Human Development
UNECA	United Nations Economic Commision for Africa
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNEP-WCMC	UNEP World Conservation Monitoring Centre
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNGIWG	United Nations Geographic Information Working Group
UNFC	United Nations Framework Classification for Resources
UNFCC	United Nations Framework Convention on Climate Change
UNGC	United Nations Global Compact
UNGP	United Nations Guiding Principles on Business and Human Rights
UNIDO	United Nations Industrial Development Organization
UNSDSN	United Nations Sustainable Development Solutions Network
UNU-WIDER	United Nations University World Institute For Development Economics Research
USAID	United States Agency for International Development
USGS	National Minerals Information Center
USGS	United States Geological Survey
VPs	Voluntary Principles on Security and Human Rights Guidelines
WEF	World Economic Forum
WLED	White light emitting diodes
WHO	World Health Organization
WSSD	World Summit on Sustainable Development
XTL	Synthetic Liquid Fuels
WTO	World Trade Organization
WWF	World Wide Fund for Nature
3TG	Tin, Tantalum, Tungsten and Gold

Large piles of processed manganese. Photo: Sunshine Seeds © Shutterstock

Mine worker in sulfur mine. Photo: Carlos Amarillo © Shutterstock

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 industrialization - 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, such as those relating to the recycling of some metals and minerals (Reuter *et al.*, 2013). Even though demand will follow economic cycles, with the associated 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 their natural surroundings. 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, thereby setting the stage for conflict.[5] This situation is further aggravated 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 the 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]

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 the sun, plants, animals, soil, wind, air and water, metals, coal, oil, gas and minerals.

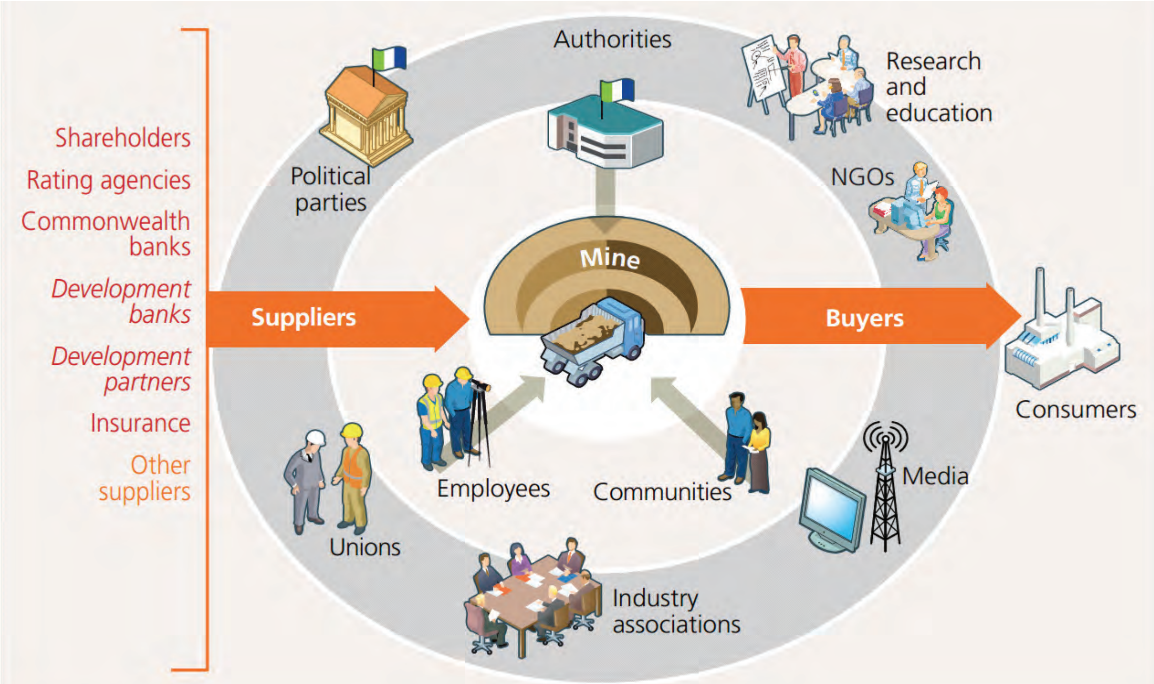
3 The concept of sustainability can be traced to the Brundtland Report, "Our Common Future",' which defined the concept as: "…to ensure that [development] meets the needs of the present without compromising the ability of future generations to meet their own needs.' (World Commission on Environment and 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 rights 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. Generalized 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. This can cause 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 appreciation of the domestic currency, leading to reallocation of resources from sectors such 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* (2015) argue that the phenomenon has been over-simplified and that the conclusions are driven by many factors beyond the control of exporting countries (such as investment cycles, colonial perspectives and so on).

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

7 Indeed, data from the Natural Resource Governance Index (NRGI) shows that less than 20 per cent of the countries studied have satisfactory standards of transparency and accountability. In the rest of the countries, 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 such mines, led to a civil war that killed as many as 20,000 people. The conflict escalated after landowners protested about environmental damage from the mine and the lack of economic benefit to the local people (Adamo, 2018).

capital, without undermining other forms of natural capital such as that provided by biodiversity. Equally, it can engender positive spillovers 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." (United Nations Intellectual History Project, 2009).

The above-mentioned 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. Countries therefore 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. The latter also arise from the fact that endowments of mineral resources have an uneven geographical distribution, with a handful of countries controlling some specific resources. This concern is addressed through markets and geopolitics (in the form of free trade, economic diplomacy, power relations, new discoveries and through resource efficiency to reduce overall dependency (UNEP, 2016a)). Beyond security of supply, companies from importing countries also have to worry about reputational risks that arise from dealing with exporting countries 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. The two sets of concerns are different 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. Women play a very limited leadership role in the formal mining sector globally and, in most mining countries, women are still a minority in the mining industry. However, their number as a proportion of the overall mining workforce continues to rise, and it is expected to increase even further as the global mining industry tackles an ongoing skills shortage. In the past, mining was male-dominated work because physical stamina and endurance were key job requirements. Currently, technology is greatly facilitating the entry of women into the mining industry. This is because mines are now 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 play increasingly 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, n.d.). Global feminist activist organizations such as International Women in Mining (IWIN) continue to encourage the formation of women's mining cooperatives, associations and networks to encourage women's participation, stimulate bargaining power, improve work conditions and promote economic independence in mining countries.

With informal ASM (see Chapter 3), however, gender inequities still emerge as a deepening socioeconomic challenge in mining countries and there remain unequal opportunities between men and women. Africa continues to have the highest proportion of women artisanal miners and they make up about 50 percent of the artisanal mining workforce there, 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 is still limited to more traditional activities including "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, labourers, 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 combined result of decreasing productivity of mainly female subsistence farming and the environmental degradation that comes 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 the 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 key importance 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 resource governance models has seen a plethora of initiatives launched at national and international levels. A mapping of the various governance instruments relating to the mining sector has identified in excess of 80 such initiatives (mainly international and regional). These range from comprehensive policy frameworks to platforms for dialogue; from legally binding initiatives backed by United Nations sanctions and national laws to voluntary initiatives; and from single stakeholder-led to multi-stakeholder platforms that bring together many types of stakeholders. Initiatives range from those that are 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 per cent of the initiatives in question addressed broad sustainable development issues.

The review of the various initiatives paints a mixed picture. Some of the challenges faced by ongoing initiatives include the appearance of unintended consequences, such as conflict-prevention initiatives increasing poverty, job losses 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 requires significant gaps at all levels of natural resource governance to be addressed. Attention must be 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 mapping mining to the SDGs (UNSDSN, CCSI, UNDP and WEF, 2015) 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 periods of time. The desire for mining to contribute to sustainable development resulted in various approaches being adopted in different regions . 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: African and Latin American approaches

Africa Mining Vision (AMV) (African Union, 2009)

The vision calls for:

- A knowledge-driven African mining sector that catalyses and contributes to the broad-based growth and development of, while being fully integrated into, a single African market through:
    - Downstream linkages into mineral beneficiation and manufacturing;
    - Upstream linkages into mining capital goods, consumables and services industries;
    - Side stream linkages into infrastructure (power, logistics, communications and 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 and 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 industrializing African economy;
- A mining sector that has helped establish a competitive African infrastructure platform, through the maximization of its propulsive local and regional economic linkages;
- A mining sector that optimizes 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. Out of the 54 countries in Africa, 24 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 involved 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 lack of focus on marginalized people; as well as a lack of awareness (ActionAid, 2017; Compaoré, 2017).

Latin America

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

- In Chile, in 2014 the Commission for Mining and Development (a multi-stakeholder group set up within the National Innovation and Competitiveness Council) issued the report 'Mining: A Platform for the Future in Chile', which sets the Strategic Agenda for the sector up to 2035. The report outlines a vision for the development of a 'virtuous, inclusive and sustainable' sector, which aims to place 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 the 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 (Plurinational State of): The 2009 constitution mandates adding value to and industrializing 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 the centralized power of national governments is being devolved downwards to local levels, upwards to the international levels and horizontally to regional levels.[9] At the same time, the rise of new powers (BRICS[10] in particular)[11] is shifting global geopolitics.

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 the risk appetite of investors. Moreover, international investment laws have been criticized for leaning 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

9 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.

10 BRICS stands a grouping of five emerging economies: Brazil, Russian Federation, India, People's Republic of China and South Africa.

11 This was a key recommendation of the 2014 document 'Compacts for Equality: Towards a Sustainable Future'. Furthermore, in May 2016 ECLAC published the report 'Towards a New Governance of Natural Resources in Latin America and the Caribbean'.

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) activities.

In addressing these governance challenges, it is crucial to devise innovative ways to govern mineral resources effectively. As we embark on the SDGs path, it is important to revisit the issue of designing 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 Problems", which are 'characterized by complexity and contestation originating from multiple problem causes, divergent problem perspectives and solution strategies and fragmented institutional settings that, in order to be remedied, require institutional adaptation and innovation'.

The development of a new governance framework is crucial. Pedro *et al.* (2017) call 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) summarizes 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, as well as 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. Assessing the impact of an increasing population, rapid urbanization and expanding middle class (especially in developing countries) on global resource use is particularly significant. The chapter features a review of scenario projections of future needs for mineral resources, and an 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 impact 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 how crucial it is to strengthen 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 maps out 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 prerequisites for an effective governance framework. It highlights the key elements and actors of a holistic framework. The chapter presents seven prerequisites that are crucial for an effective governance framework (holistic framework, decoupling economic growth from environmental and social impacts, respect of human rights, greater home country engagement, responsible business practices, balance between security of supply (global north) and sustainable development aspirations (global south) and the need for data, information and knowledge).

Chapter 10 develops the proposal for a Sustainable Development Licence to Operate (SDLO) framework. The chapter places the SDLO centre-stage 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 governance of the extractive industry, as opposed to merely generic recommendations. The elements of the new governance framework are described. These are intended to help set global standards for what is acceptable, for instance, in terms of rent extraction, getting a fair deal and share of profits, profit repatriation, transparency, accountability, expenditure issues, local content and value addition, investing in the future and support for sustainable development objectives.

Chapter 11 examines the implications of the SDLO framework developed in Chapter 10 for policymaking at the local, national, regional and international levels. The framework is intended as a guide for policymakers at these levels to create a new generation of mining policies and development strategies that can help deliver the Sustainable Development Goals. The chapter gives particular consideration to opportunities for 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 summarizes the findings of the report and concludes.

A summary of the report is available on our website, as well as factsheets with the main conclusions of the report, in all six official UN languages.

> ***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 mapping mining to the SDGs (UNSDSN, CCSI, UNDP and WEF, 2015) makes a strong case for linkages between the sector and the SDGs.***

Truck at Chuquicamata, world's biggest open pit copper mine. Photo: Reisegraf © Getty images

Miner holds coal. Photo: Parilov © Shutterstock

PART 1

MINING TODAY

Quarry view of mine, Brazil. Photo: Udo Matiello © Getty images

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; or 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 mechanized and optimized operations where hundreds of thousands of metric tonnes of ore are extracted every day. What all have in common is 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 may also be a metal that needs extracting from its carrier mineral, named “ore mineral”, through a metallurgical process of diverse degrees of complexity.

Large companies with a market value of billions of US dollars 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 and 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 into 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 is unavailable from free-of-charge sources (especially firms in two major mining countries: The People’s Republic of China and the Russian Federation). The dominance of large companies, mostly transnationals, can be explained by:

- The capital intensity of mining or metallurgical operations (it may take over US$10 billion to commission a new large-scale mining operation with its associated facilities including a processing plant, a smelter/refining facility, railroads and 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 to which mining ventures are exposed. At the other end of the range of asset value of individual companies were over 2,000 junior companies, each with an average asset value of US$5 million or less listed either on the Toronto (TSX) or the Sidney (ASX) stock markets.

Table 2.1. Top producers of iron and copper ore and 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	1827	Vale	275
Producer 2	Rio Tinto	271	Freeport McMoran	1696	Norils Nickel	274
Producer 3	BHP Billiton	227	Glencore	1288	BHP Billiton	243
Producer 4	Fortescue metal Group	181	BHP Billiton	1113	Jinchuan Group	128
Producer 5	Anglo American	58	Southern Copper	500	Glencore	101
Producer 6	Arcelor Mittal	55	KGHM	677	Sumitomo Metals & Mining	75
Producer 7	National Mineral Development Corporation	35	Rio Tinto	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	Sherrit International	31
Total 10 listed producers		1239		9448		1281
World Mine Production (USGS)		2350		20100		2000
Share of World Mine production		53%		47%		64%

Note: These lists are only indicative as production data of some important companies is not available from free-of-charge sources. Source: Company Reports (2014,2016); http//www.miming.com/top 10-copper-mining companies-2016; http://www.thebalance.com/the-10-biggest-nickel-producers-2014-2339732.

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, with many selling their assets to larger companies in the event 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 there are even fewer discoveries 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 initial discovery and the formal publication of a resource calculation.

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

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 (Figure. 2.1):[14]

- 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 resource efficiency and the development of the circular economy. These framework conditions include:
    - Formal strategies and policies related to minerals and metals (see the comparative analysis of the raw materials strategies of the G-20 countries by Hilpert *et al.* (2013) for examples of such national policies and strategies),
    - Mining and environmental laws, as well as other related legal conditions (such as labour or tax laws);
    - Issuing of permits and licensing procedures applied under these laws to mineral exploration and, separately, to mining activities;
    - Commitment to the SDGs and translating them into policies, law and practice.
- Governance, based on adherence to the SDGs and to the principles of transparency and accountability, is an essential component to the framework conditions (as detailed in this report).
- 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 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.[15] These institutions are needed to adequately enforce the above-mentioned policy and legal frameworks.
- Mineral exploration, which can be partly public (early stage exploration to attract investment in later stage exploration) and partly private. This stage aims at identifying mineral concentrations that are sufficiently attractive to justify the effort needed to classify them up to the point of a first resource estimate (based on at least an indicated resource level).[16]
- Mining project planning and development: this stage may comprise several steps, resulting in a definitive feasibility study. Each step will assess (with increasing certainty):
    - The resources and reserves,
    - The best processes to mine the resource and turn it into one or several products,
    - The environmental and social impacts, as well as any necessary prevention / remediation strategies; the production rate and the expected mine life;
    - The capital expenditure needed to launch actual mining operations, the related operating costs and 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 Queen's University MineWiki (Canada) and in the reports produced by mining projects that publicly publish their activities under regulatory obligations or on a voluntary basis.[17] The latter are accessible for free via an online web portal with a geographic navigation interface: http://intel.rscmme.com/#. Figure 2.2 provides an 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

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

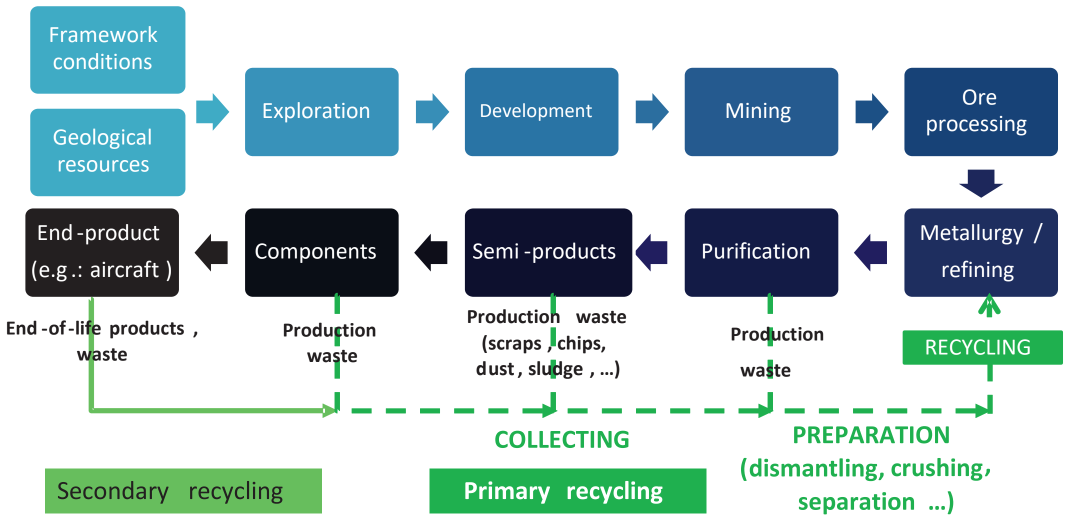
14 The processes are well known and fairly standard, especially for base metals. For more details, see Kesler & Simon (2015).

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.

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



Source: Authors' illustration.

hauling it to the processing plant that may often be 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 grinding the ore to a size smaller than the grain 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 most of the remaining impurities from the metal produced) 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 they are therefore intermediated by trade (See Box 2.1 and Figure 2.6 for the copper example).

Figure 2.1 is simplified, to make it readable and understandable. It should be emphasized 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 the same company does everything from exploration to the production of an end product) are extremely rare and limited to cases where the end product 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, airplane or smartphone. It also cannot reflect the diversity of the geography involved at each stage, which also depends on the mineral or metal concerned.

18 Only exploration, mine development, mining, ore processing, metallurgical / refining and metal purification activities represent 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 come under the activities of the industry.

The case of copper, presented earlier and in Figure 2.6, showed the geographic complexity of copper flows. It also highlights the crucial role of trade. Trading houses and specialized 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 further downstream of the myriad of existing industrial value chains (either as end-use products or for integration into sub-systems and systems). Exchanges are specialized in trading a limited number of metals (aluminium, cobalt, copper, gold, molybdenum, lead, nickel, tin and zinc plus some categories of steel). Trading houses trade in metals that are not managed by the specialized 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

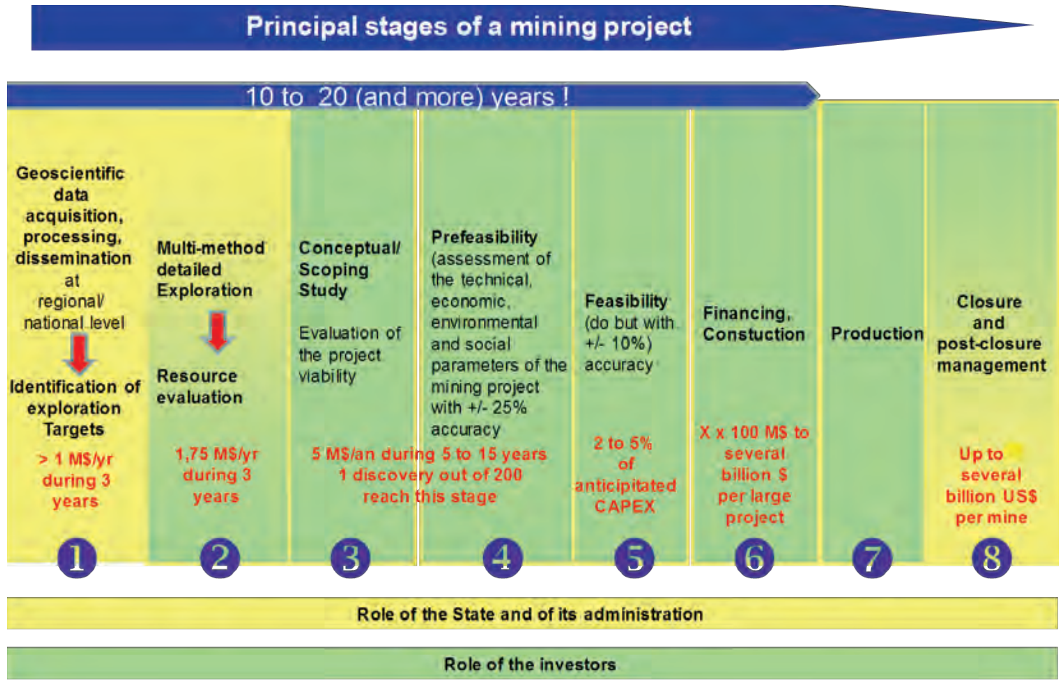
Traders play key roles in the minerals value chain, including the sourcing of commodities from producers, transport and storage. Many trading firms also enter into supply contracts with producing countries and may even make a pre-payment for future supply, an arrangement that is popular in some poor developing countries as pre-payments can be seen as loans. This underscores the power that 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). Furthermore, the fact that many of the governance challenges around extractive resources arise from lack of transparency means that traders can do much to increase transparency of resource flows. Significant efforts continue to be directed at increasing transparency, for instance through instruments as part of the Extractive Industries Transparency Initiative (EITI). This highlights the crucial role of traders in improving the governance of minerals or metals-dependent value chains.

Commodity Hubs

Trading houses tend to be located in certain regions mainly due to geography, historical legacies, communication infrastructure and also proximity to financial centres. The key global commodity centers for extractive resources are in the United Kingdom (London), United States (New York) and Switzerland (Buergi Bonanomi *et al.*, 2015). Switzerland is by far the most important centre 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 (Buergi 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 trade in them physically. Indeed, it is estimated that 70 % of worldwide gold is refined in Switzerland (Buergi 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) argue that the Swiss gov¬ernment 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).

Figure 2.2. Main stages of industrial-scale mining project



Data shown in red, is indicative

Source: *Constructed by authors using information from Canada's Queen University's Mine Design Project Wiki*

2.2. Mineral economics[19]

The minerals and metals industry value chain has special characteristics that make it unique compared with 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 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 locations of these concentrations 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), the minerals and metals industry value chain 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).

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).

20 A mine development project may include additional facilities such an ore processing plant, a smelter a refinery, a powerplant as well as the development of transport infrastructure such as roads, railway lines and/or ports

The capital intensity is compounded by the fact that much risky investment is required to start a new industrial-scale mine. Raising risk capital is therefore extremely important (see next section).

- The global nature of most supply chains, except in the case of construction minerals such as sand and gravel which are mostly produced and used at the national level. In the case of other minerals and in the cases of mines and their related processing plants, smelters and refineries and the manufacturing steps in building 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.

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, and 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 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 mine development means that the underlying economics of a mining project are critical. The 2017 annual survey of the mining industry (PWC, 2017) showed that the average annual return on capital employed of the world 40 top mining companies varied between 2 and 14 per cent per year during the 2012-2016 period, making it one of the worst performances among all industrial sectors with 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 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 in drill-hole 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 of United States dollars 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 than can run into billions of US dollars in the case of 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 stage 2 shown in Figure 2.2 (resource evaluation). Out of the 3,821 public reports on ongoing exploration and mine development projects worldwide reported in 2017 by RSC Mining and Mineral Exploration (http://intel.rscmme.com/)[21], 3,310 related to early exploration results (stage 2 in Figure 2.2) but only 63 were feasibility studies.

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).

Box 2.2. A summary 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 include, in no particular 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 to promote 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;
- Geotechnical (ground stability) and environmental hazards (such as landslides, earthquakes, mechanic activity, extreme climate events and accidental or chronic 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; and 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 per cent 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 down to 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 online sources publish annual rankings of the world mining companies on the basis of their market value.[22]

22 See for instance http://www.mining.com/top-50-biggest-mining-companies/.

Furthermore, due to the need to raise significant capital, many mining companies tend to be listed in the major stock exchanges[23] in developed countries or are State Owned Enterprise (SOEs) in other parts of the world.[24] Due to the different ownership structure, the two types of companies exhibit very divergent risk appetites and tend to operate in varying environments, with SOEs likely to operate in apparently 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 almost have the monopoly. The result is that they are able to dictate terms of engagement with governments in developing countries (that may not have the required negotiating capacity) and even in developed countries.

2.4. Mineral production

As pointed out earlier, minerals are crucial to economies and thus production data are critical for planning. To facilitate data analysis, 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, 2016a). 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. The processing of industrial minerals generally requires slightly more complex operations than construction materials, as the valuable minerals must be separated 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 fertilizers. 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.

23 Metals (aluminium, cobalt, copper, molybdenum, nickel and zinc), for instance, are listed on the London and Shanghai Metals Exchange.

24 The data on the relative shares between private and SOE are hard to determine because private companies listed on stock exchanges have disclosure requirements while SOEs do not, 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.

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 oxides (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 (often called ore minerals)
They contain one or several metals, mostly contained in sulphides, oxides, carbonates and silicates. They are part of a group of minerals called "ores", 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 due to 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 but 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, characterized 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).[25]

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[26], 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 2016, the various segments of the industry extracted at least 65 billion tonnes of minerals and metal contained in ores, including mineral fuels and cement. Table 2.3 shows a minimum estimate of the values of most minerals produced that year, in million nominal United States dollars, based on data from Reichl et al (2018) - covering a wide range of minerals and metals; Van Oss (2019) - cement data based on US average pricing; and the Kimberly Process (2017)- gem quality diamond data. No production or value data is available for many widely-produced construction minerals (sand, aggregates, dimension stone, lime, and clays used for construction). This estimate is given for the individual total production of top-20 producing countries. On this basis, the total value of the minerals and metals produced globally in 2016 can be estimated to be, at least, 3394 billion nominal USD, including mineral fuels and at least 1207 billion USD if mineral fuels are excluded from the calculation. In addition to the above-mentioned limitations, it needs to be noted that 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. Data related to the rarer metals, especially when they are by-products, may be limited, incomplete or simply unavailable.

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 supply 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 –with dimension stone and common clays (used for brickmaking) for instance – is not recorded and therefore data on value of total production are not available. A rough estimate is that 45 billion tonnes of construction materials are produced annually. In 2016, on the basis of the average US price for cement published by the USGS (111 $/ t, (United States Geological Survey (USGS) (2017)), the global cement production is valued at about 460 billion nominal nominal United States dollars. The key construction materials (by value) are aggregate, cement and lime.

25 Diamonds are a mineral but similar in value and appreciation to gold due to use in jewelry, although on a volume basis the majority of mined diamonds are used in industrial applications.

26 Available here: https://minerals.usgs.gov/minerals/pubs/mcs/.

Table 2.3. 2016 minerals, metals and mineral fuels production (in million US$)

	TOTALS		SEGMENTS INCLUDED IN THE CALCULATION OF THE TOTALS						
Country name	**Total with mineral fuels (M US$)**	**Total without mineral fuels (M US$)**	**Cement (M US$)**	**Iron, Ferro-alloys (M US$)**	**Non-Ferrous Metals (M US$)**	**Precious Metals (M US$)**	**Industrial minerals (M US$)**	**Mineral-Fuels (M US$)**	**Diamonds (gem) (M US$)**
China	719,660	416,292	267,510	30,010	77,514	20,162	21,096	303,368	0
South Africa	95,011	77,806	1,443	61,016	1,579	11,894	625	17,205	1,249
India	126,512	65,019	32,190	21,837	6,631	318	4,035	61,493	7
Australia	116,500	63,950	999	38,579	10,323	12,155	1,678	52,550	216
Russia	305,969	48,259	6,216	7,163	10,094	13,798	7,409	257,710	3,579
United States	324,250	39,965	9,452	2,355	10,640	9,951	7,567	284,285	-
Brazil	82,628	38,420	6,389	22,813	3,618	3,351	2,199	44,208	50
Chile	34,318	33,978	555	1,332	27,402	2,690	1,999	340	-
Canada	114,241	32,717	1,318	4,612	9,295	7,583	8,512	81,524	1,397
Peru	29,618	26,199	1,120	678	15,178	8,563	660	3,419	-
Kazakhstan	62,355	24,950	1,022	16,084	3,497	3,657	690	37,406	-
Turkey	24,223	21,918	8,370	8,352	1,121	1,062	3,013	2,305	-
Mexico	64,839	20,692	4,440	981	5,582	8,305	1,385	44,147	-
Indonesia	66,429	17,631	6,882	1,835	4,929	3,725	259	48,799	-
Iran	100,122	12,766	6,105	2,593	2,312	210	1,546	87,356	-
Vietnam	18,528	9,529	8,578	342	249	-	360	8,999	-
Saudi Arabia	206,042	8,774	6,209	15	1,701	284	565	197,268	-
Germany	14,376	8,711	3,552	4	894	-	4,261	5,665	-
Congo, D.R.	8,867	8,525	23	1,948	5,185	1,234	-	342	135
Egypt	22,289	7,748	6,105	54	505	689	395	14,541	-
Sub-total (M $US) >>>	**2,536,777**	**983,848**	**378,478**	**222,602**	**198,250**	**109,631**	**68,253**	**1,552,929**	**6,633**
World total (M $US)	**3,394,245**	**1,206.801**	**459,540**	**254,235**	**237,796**	**154,823**	**88,138**	**2,187,444**	**12,269**
Cumulated share of the world total (%)	75%	82%	82%	88%	83%	71%	77%	71%	54%
China's share of the world total (%)	21%	34%	58%	12%	33%	13%	24%	14%	0%

Source: Authors' calculation derived from Reich et al (2017), Kelly and Matos (2018). Bauxite (aluminium ore) is included as well as aluminium metal, construction minerals with the exception of cement. The countries are ranked accordingly to their total non-fuel mineral production value.

Industrial minerals

On the basis of the data published by Reichl et al. (2018), the value of the 2016 global production of industrial minerals was estimated at around 88 billion nominal US dollars. In 2016, industrial mineral production was recorded in 151 countries (out of 163 countries covered) demonstrating that industrial mineral production is geographically wide-spread. By value, the key industrial materials are bauxite, gypsum and salt.

Metals

In 2016, the total global value of mine production of metals reported by Reichl et al (2018) was about US$647 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 covered in Table 2.3. In 2016, the value of its products is estimated at about US$2,187 billion, which is about 64 % of the total value of all minerals, metals and fossil fuels extracted worldwide in 2016.

2.6. Production distribution

The production of non-energy minerals and metals is highly concentrated, with 10 countries accounting for almost 70 % of the global non-energy mineral, metals and mineral fuels production in 2016. In terms of individual countries, the People's Republic of China is by far the world's largest producer of minerals, metals and mineral fuels. In 2016, in value, it produced about 37 % of total minerals and metals (without mineral fuels) and about 58 % of cement produced world-wide. The dominance is more apparent when looked at a more granular level. In 2016, it produced 54 % of aluminium, 38 % of cobalt, 38 % of primary copper, 50 % of primary lead, 50 per cent of raw steel and 47 % of primary and secondary zinc produced worldwide (Reichl et al., 2018).

The global distribution of mines is shown in Figure 2.3, based on the number of mines located in each 50 km x 50 km grid according to data provided by SNL.[27] It is estimated that there are over 30,000 mines around the world, of which over a third are categorized as 'active'.[28] "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.

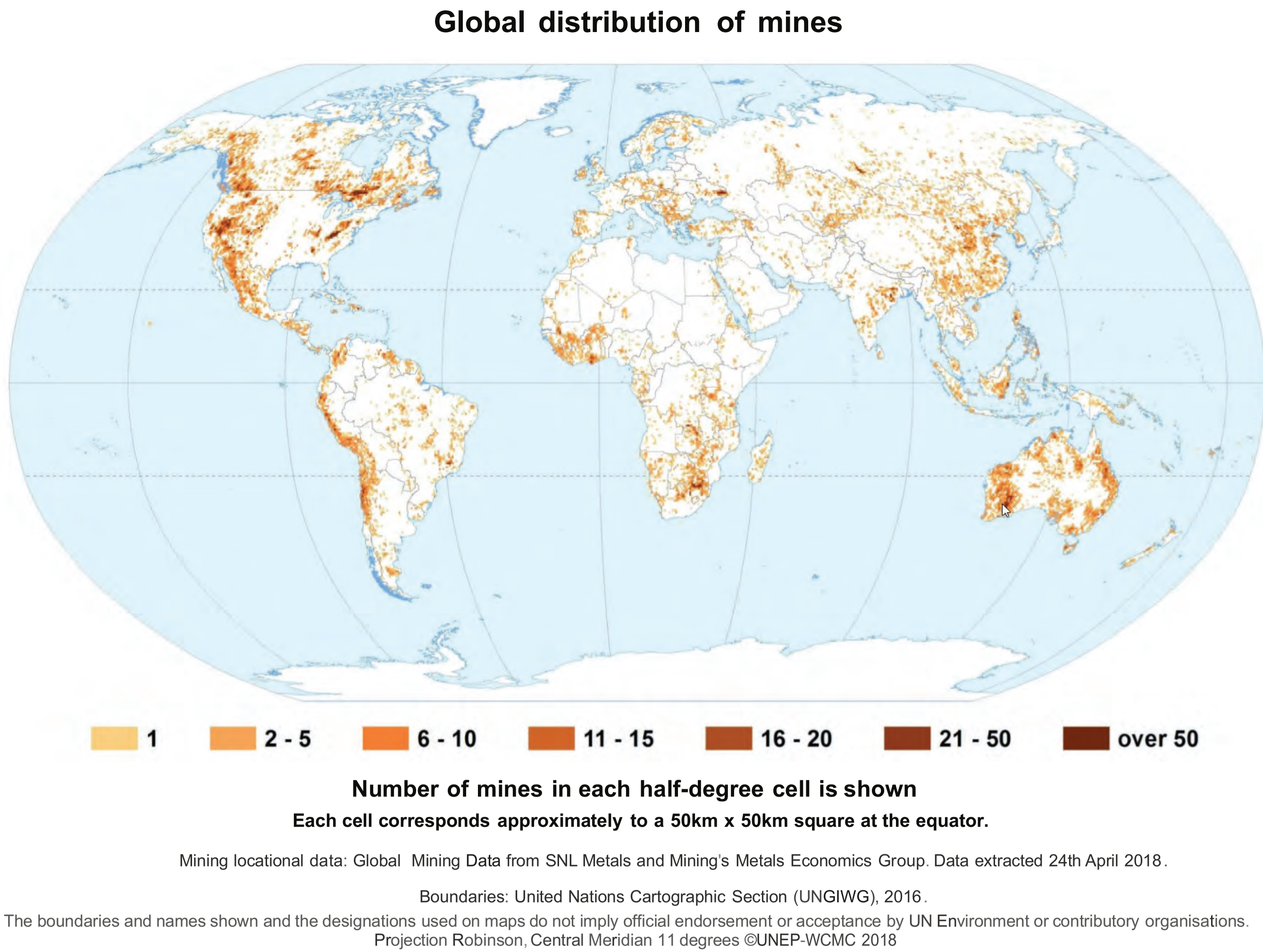
While mining activities are geographically widespread, the amount of land used up by mining activities, current and past, is rather small when compared to other human footprints, such as agriculture. In the United States, a National Research Council study (1996) quotes an estimate stating that, between 1930 and 1980, only 0.25 % of the total land area of the United States was used for surface mining and the disposal of waste from surface mines, underground mines and beneficiation facilities. In comparison, in 2007, 51 % of the country's 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.

Figure 2.4 shows that most of the production is derived from upper or upper middle-income countries (90 % of the total). However, it does not reflect the values of production of several mineral commodities: sand and gravel and cement in aorticular. From 2013 through 2017, according to World Mining data (Reichl and Schatz, 2019) only about 10 % of the total estimated produced minerals, metals and mineral fuels orginitaed 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.

27 Global Mining Data from SNL Metals and Mining's Metals Economics Group. Data extracted 24 April 2018.

28 Defined as currently being explored, developed or mined.

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



Source: Global Mining data from SNL Metals and Mining's Metals Economics Group (Extracted 2018), United Nations Cartographic Section (UNGIWG, 2016).

Figure 2.4. Brekdown of the value of 2016 global production, by income group of the producing countries

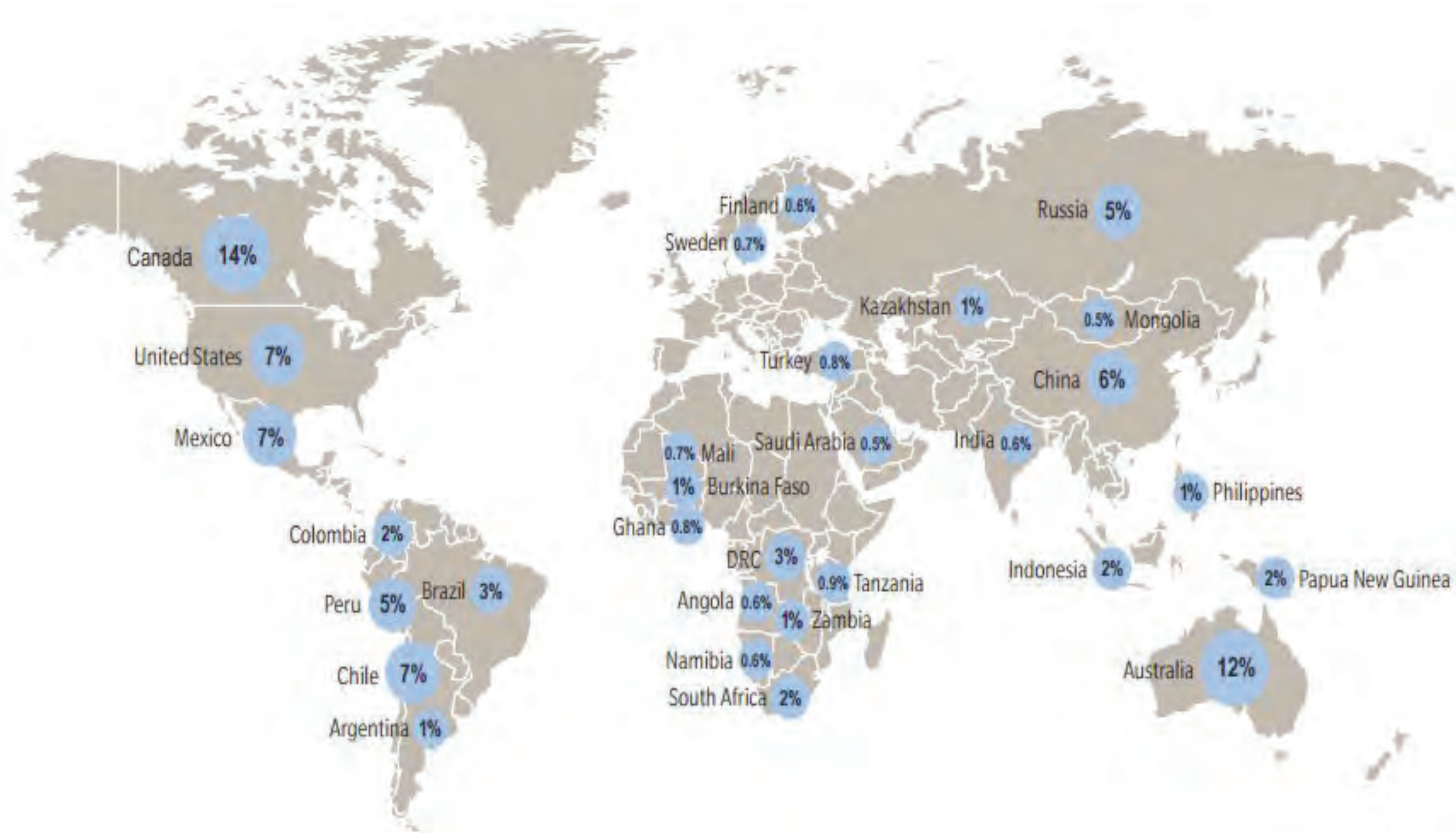
Treamap diagram of the relative share of the world non-energy minerals and metals production, 2016, by value in current $ US, of the 20 largest minerals and metals producing countries; Alltogether the production value of these countries represented 73% of the world production. Source:

The bigger picture reveals the modest current role of low income and lower-middle 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 per cent of the world cobalt mine production (Darton Commodities, 2017). The same year, the DRC and Rwanda were the main sources (68 per cent 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 limited 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

Figure 2.5. Share of exploration expenditures



Source: Ericsson & Olöf (2017).

between land area and mineral endowments.[29] 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 the United States, 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 per cent). Indeed, Australia, Canada and the United States together account for one third of the total global exploration expenditure. Africa, with about 20% of the global land mass area, only attracted about 14 per cent of total global mineral exploration expenditure. Latin America accounts for 12 per cent of land mass and attracted more than 20 per cent of global exploration expenditure.

2.7. Global trade in minerals

As pointed out above, the initial stages of the mineral and metals supply chains up to mining and ore processing do not tend to be located in the same place as 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 mid-twentieth-century development of efficient seaborne bulk transport connecting mineral producing countries to countries carrying out metallurgy/refining, 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 value per ton, 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. In Europe, for instance, the Netherlands and parts of Belgium have very limited resources of the kind of coarse aggregate needed for concrete production. As a result, large 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.

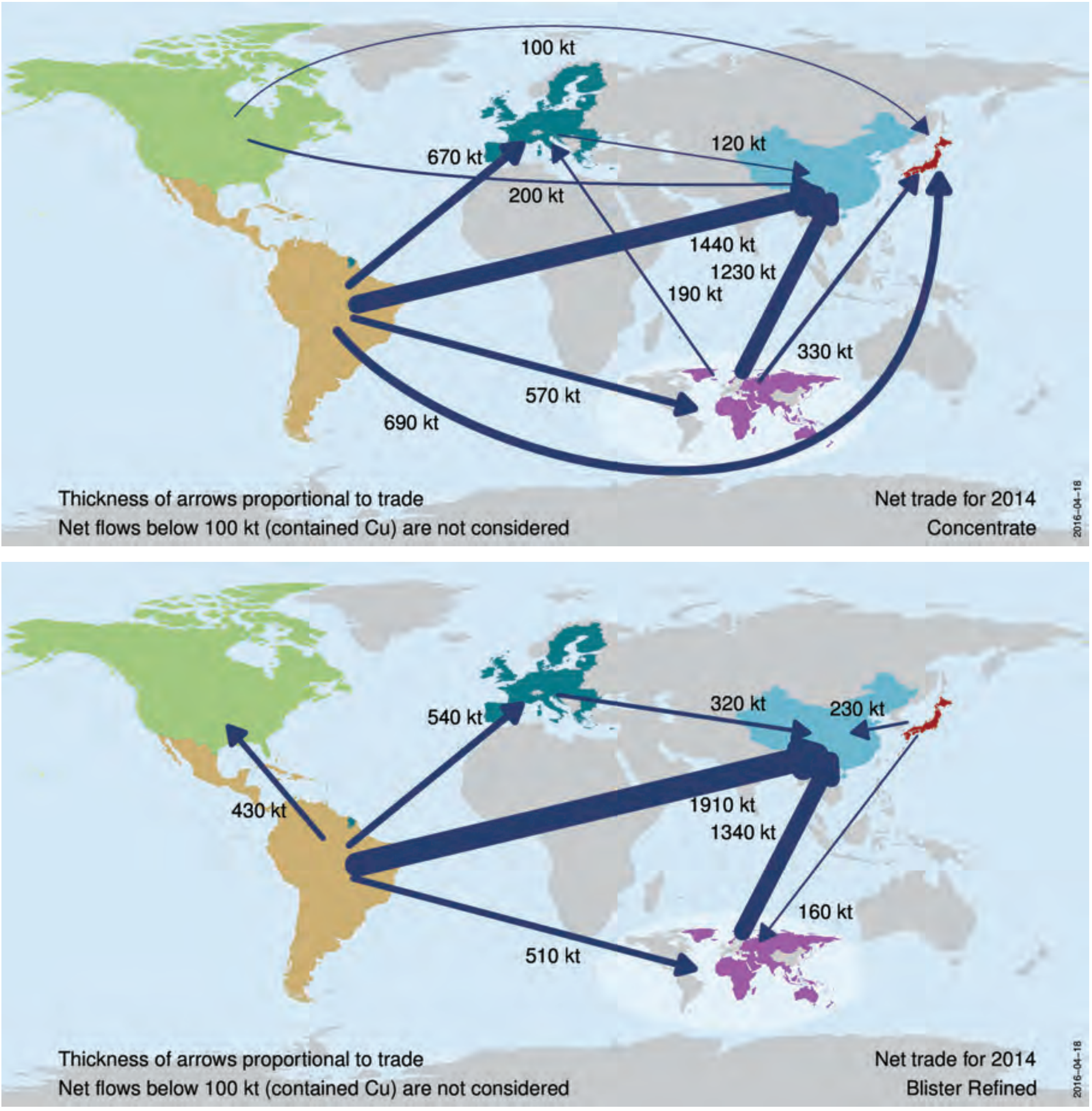
The complexity of minerals and metals-related supply chains is demonstrated by the case of copper, as it is one of the relatively few metals for which sufficient data are available and reliable to facilitate a global trade flow analysis. Figure 2.6, taking copper as an example, illustrates the complexity of supply chains due to the different geographies of mining, smelting/refining and manufacturing.

The upper part illustrates the copper flows in copper concentrates traded from copper mining countries to countries where the metallurgical extraction and refining of copper actually takes place. The lower part describes the trade flows of copper included in finished products such as cars, computers, electric appliances, smartphones, windmills and many more. These are predominantly, and by far, manufactured in China and sold to the world markets, with Europe playing a much lesser role. The size of the arrows is proportional to the tonnage traded. While copper concentrates mainly flow from Latin America (with Norther America and Europe being of lesser importance) to Asia and, to some extent to Europe, it shows the absolute prevalence of China as the world's manufacturing hub.

Documenting such trade flows is of major importance to understanding, 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 globalized economy, environmental and social footprints frequently occur far away from where 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.

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

Figure 2.6. Global copper trade



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

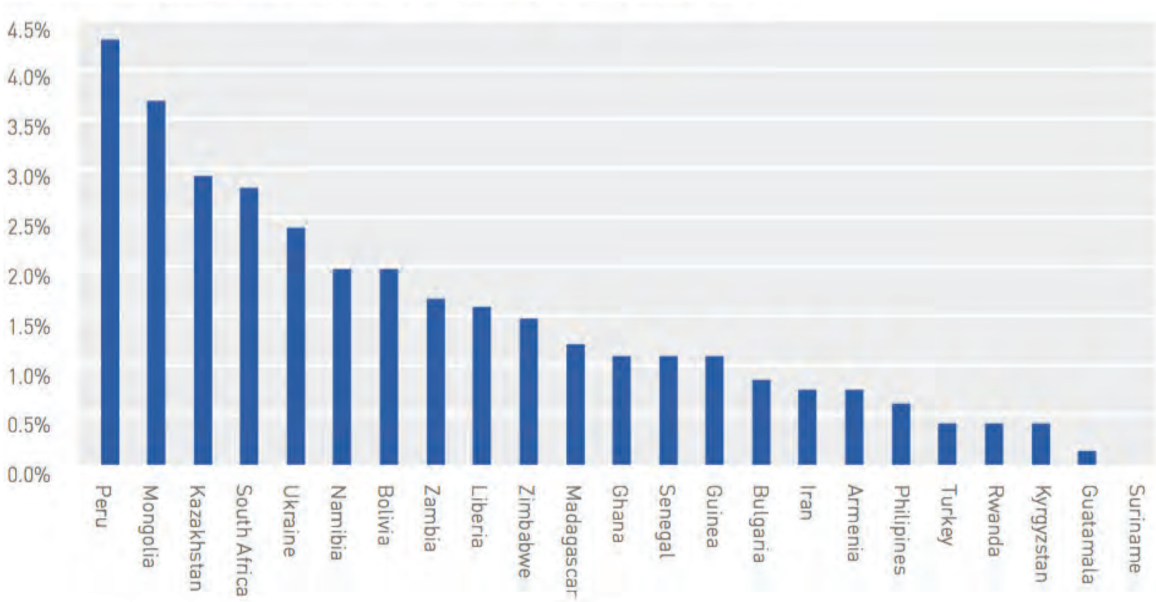
2.8. The importance of mining to economies

The data in Figure 2.5 show 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. However, 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 expenditure.

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

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



Source: ILOSTAT data (2015). http: www.ilo.org/ilostat, (Countries in top 25 for which data is available).

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.

As Ericsson & Olöf's (2017) index does not include oil and gas, 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.

However, many major exporters in the low-income and lower middle-income bracket suffer from poor governance that limits the contribution that minerals and metals production could make to sustainable development. However, as pointed out in chapter 1, governance reforms are taking place. These 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 has done 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 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 there might be limited economic options.

As Figure 2.7 shows, mining's contribution to direct employment ranges from 0.1 to 4.5 per cent of total employment for the 25 top mineral dependent countries. For example, mining contributes 8.8 per cent of Guinea's GDP (Table 2.4) but about 1.1 per cent of total employment (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. The potential for indirect job creation depends largely on local conditions, such as the existence of a well-trained, diversified workforce and local suppliers of the relevant goods and services to the mines and metals industry.

Table 2.4. Mineral contribution for top 25 mineral export dependent countries

Rank	Country	Income Group	Export Value (% of total exports)	Production value (% of GDP)
1	DRC	LI	80.9	14.7
2	Chile	HI	57.0	9.5
3	Australia	HI	56.7	11.9
4	Mongolia	UMI	80.4	16.7
5	Papua New Guinea	LMI	37.9	14
6	Zambia	LMI	75.1	7.6
7	Peru	UMI	53.8	5.8
8	Burkina Faso	LI	49.6	6.0
9	Mali	LI	65.7	5.3
10	Guyana	LMI	61.2	10.5
11	South Africa	UMI	38.2	7.1
12	Botswana	UMI	91.3	12.8
13	Guinea	LI	52.1	8.8
14	Mauritania	LMI	58.1	10.2
15	Eritrea	LI	38.6	9.0
16	Namibia	UMI	50.3	6.9
17	Ghana	LMI	23.0	4.1
18	Lao PDR	LMI	36.5	3.3
19	Sierra Leone	LI	93.6	14.9
20	Uzbekistan	LMI	30.5	3.1
21	Suriname	UMI	33.8	6.0
22	Tanzania	LI	38.1	1.5
23	Kazakhstan	UMI	10.0	4.2
24	Liberia	LI	39.3	11.3
25	Central African Rep.	LI	39.1	N/A

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).

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 of gold (24% of the 3039 t world gold production in 2013). The total operational expenditure of the reporting companies was 47.3 billion nominal US dollars, of which an average of 79 per cent was 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, which include several low-income nations.

Figure 2.9, derived from the same source, provides a detailed breakdown of the average total in-country payments, showing that about two thirds 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 per cent (Mauritania) and 100 per cent (Finland). This is due to the variable national capacity to supply mining industries with the wide range of skilled human resources, services and goods required by the industry. The same can be said for capital expenditure. Equipment needed for mining, ore processing and/or metallurgical plants is mostly provided by a limited number of suppliers from developed countries. Modern equipment needed to ensure resource-efficient and economically competitive operations tends to be 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.

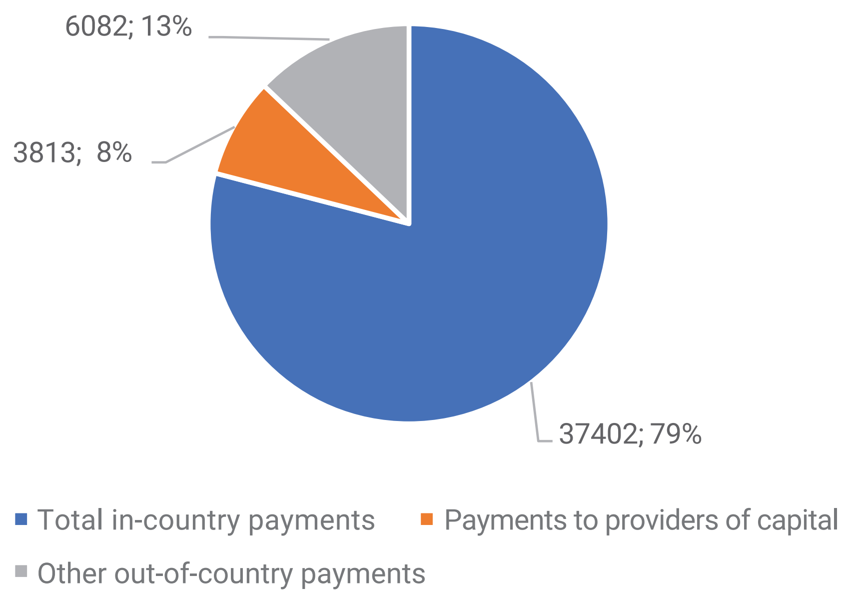
Therefore, one way to make the minerals and metals industry contribute more to broad-based development is through creating opportunities for increased local content and local participation, especially in the provision of goods and services. This is because, in many mining operations, procurement in the 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 that can 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 largely depends on having the right conditions for developing 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 the year 2012 in terms of the value added and the direct employment in the EU mining industry, the downstream manufacturing of basic metals and then the industries depending on minerals and metals - with huge multiplier effects (Vidal-Legaz *et al.*, 2016). These reflect the current outcome of more than 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 needed to reach comparable multiplier effects. Nevertheless, a few decades may still be needed to achieve such development levels (and the progress might even prove environmentally unsustainable).

Stockpiles at Sundown. Photo: mabus13 © Getty images

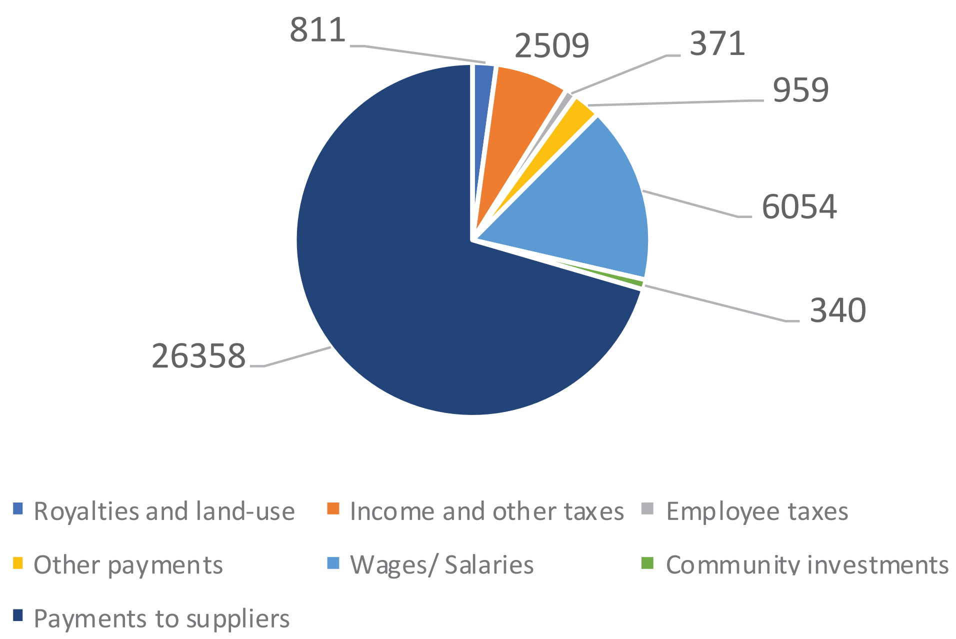
[...] one way to make the minerals and metals industry contribute more to broad-based development is through creating opportunities for increased local content and local participation, especially in the provision of goods and services

Figure 2.8. Breakdown of the economic value created and distributed by gold mining companies, in nominal $US million as percentages



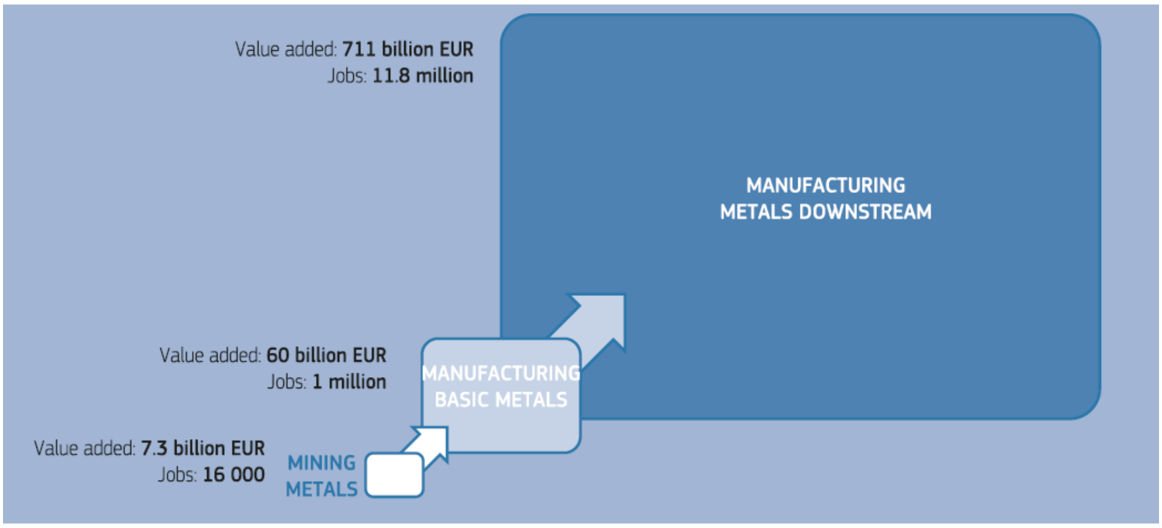
Source: Authors using data World Gold Council (2015).

Figure 2.9. Detailed breakdown of the in-country payments made by the gold mining companies in nominal million US$



Source: Authors using data from World Gold Council (2015).

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 categorizes construction and industrial minerals as development minerals (Franks, 2020). These minerals are not usually traded but are crucial for the domestic economy. Franks *et al.* (2016) define development minerals as those 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:

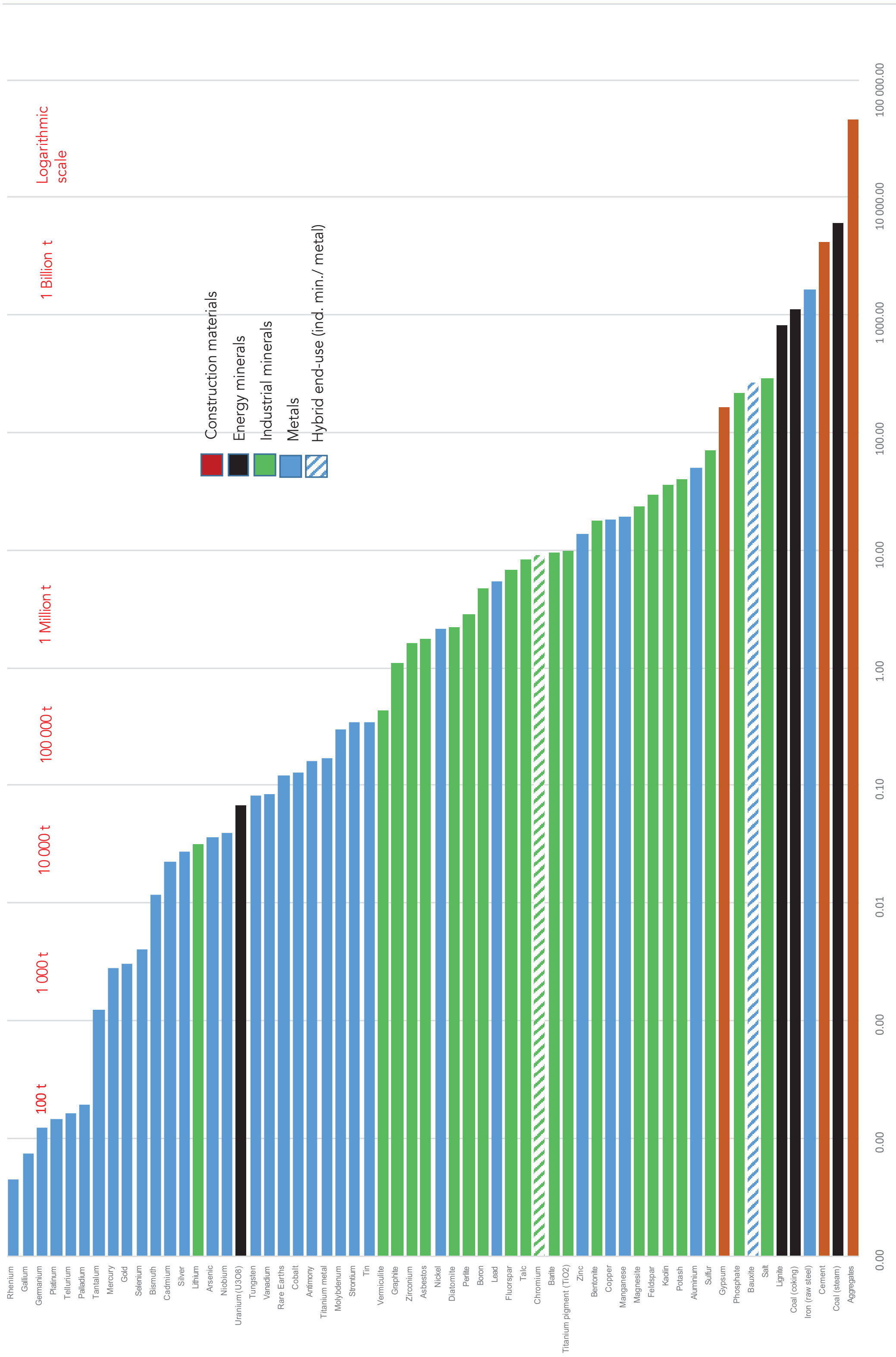
- **Construction materials**: These are minerals used by the construction industry, for example in road making, in concrete in-house construction and as railway ballast, the largest component being 'aggregates' used on their own or in concrete, mortar, roadstone or asphalt.
- **Dimension stones**: These are natural rocks quarried for the purpose of cutting and (or) shaping to a specific size. The main rock types used for dimension stone are granite, limestone and marble.
- **Industrial minerals**: 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 are given in Table 2.2.
- **Semi-precious stones**: These are mineral crystals or rocks that are generally cut and polished to make jewellery. Examples include quartz, amethyst, garnet, aquamarine, 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 tourism industry.

Though the export of traded minerals receives 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 countrywide censuses commissioned by ACP-EU Development Minerals Programme[30] provide interesting insights. For example, the Uganda study revealed that, of the 390,000people employed in the development minerals sector workforce, 44 per cent are women.

However, outside the male dominated clay-brick sector, women make up 69 per cent 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% (Hilton *et al.* 2018).

30 http://www.developmentminerals.org/index.php/en/.

Figure 2.11. Tonnages of minerals and metals produced in 2014



Sources: Freedonia Group, USGS, World Mining Data (2014)

The study for Jamaica (Lewis *et al*, 2017) found that the level of wages in the sector is 20-25 per cent higher than the minimum wage. Development minerals are also vital for the construction of housing, road building, agriculture (fertilizers) and a range of processing industries on the island (such as paint manufacture, cement, plaster and fertilizer).

Nonetheless, this sector straddling the formal and informal sectors is neglected. It does not create the huge pollution and conflict challenges of traditional ASM with its focus on high value minerals. It does not generate huge export revenues, and is not critical for the function of global manufacturing supply chains. Its importance is not well documented. Studies on minerals or metals tend to be focused on ASM in terms of high-value minerals /metals (such as gold, diamonds, and tin, tantalum and tungsten (3Ts)) or on the formal sector in relation to globally traded 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 in certain cases there may be regional value chains)
- Export minerals are traded in global commodity markets that tend to be very volatile with boom and bust cycles that 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 to 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. This 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 therefore produced by a handful of countries. They are also much more finite. In contrast, development minerals are more abundant and widely distributed.
- Due to uneven distribution and the resulting 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. This can therefore give rise to geopolitical considerations. The high dependence of many countries on exports revenues and domestic resources means that they may become key issues within local politics. Therefore, export minerals are likely to raise political issues, while development minerals do not.

These differences mean that a distinct governance framework is needed for development minerals. Lack of attention to this sector has given rise to unsustainable mining practices, with uncontrolled sand extraction already having environmental and economic consequences (see Box 2.3). The ACP-EU programme[31] on development minerals seeks to provide much needed support to this sector, which is frequently neglected in national development strategies and policies. Some of the strategic policy directions advocated by the programme 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.

31 Programme website: http://www.developmentminerals.org/index.php/en/.

Box 2.3. Towards sustainable sand extraction

Sand and gravel are mined worldwide and account for the largest volume of solid materials extracted globally, mainly for construction. Rising demand has seen a huge surge in extraction in recent years. Sands are now being extracted at a much faster pace than their renewal rate. For example, building and land-reclamation projects exhausted marine sand resources in Dubai, and the country now imports its 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 therefore water tables. This has increased the incidence and severity of droughts, as tributaries of major rivers dry up when sand extraction reaches certain thresholds. Sand extraction has also increased river pollution. Marine mining has resulted in beach erosion. In Morocco, for example, sand extraction has transformed a large beach between Safi and Essaouira into a rocky landscape. This is despite the fact that beaches are crucial in protecting land, especially given rising sea levels. The 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 to reduce sand extraction (UNEP, 2014):

- *Strengthen governance and regulation of sand extraction.*
  Large-scale mining, quarrying and reclamation activities should only be authorized once 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 optimize 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, as this results in higher compressive strength than with regular cement mortars. Some desert sand can be used, if mixed with other material. There are also alternatives for house building, 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 the context of demographic growth coupled with rapid urbanization, many developing countries will find it hard to reduce their construction minerals consumption. This is because alternatives such as the use of wood or other biomaterials are limited to avoid further deforestation (which is already a major issue in a number of developing countries).

2.10. Conclusion

Minerals and metals are important inputs to industry and manufacturing for more advanced developed countries, as well as being key sources of development funding for many resource-rich developing countries. Every country needs minerals and metals for a number of purposes, even if they are mainly hidden in imported goods. Therefore, the unfettered 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 for countries to sign up to. Given the stakes involved –the need for unfettered trade in minerals and metals and to protect 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 companies' mining investment decisions 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 the SDGs, providing long-term benefits to society without harming the environment upon which society depends. Enhancing governance will also help to improve the business environment needed to attract investment in downstream added-value manufacturing, while a number of additional conditions need to be fulfilled to achieve broad-based development (such as access to know-how, intellectual property, competitively priced energy, water, transport infrastructure and a skilled workforce).

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 local producers (SMEs). Consequently, they do not relate to geopolitics like export minerals or generate the conflict dynamics of ASM (the subject of the next chapter). Data on production are patchy, and the role of development minerals in the economy therefore tends to be overlooked. The result is that they do not get the needed attention of policymakers 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, including the need for its own specialized governance framework. The focus of this report is on export minerals, and this specialized framework will therefore not be addressed herein.

The next chapter examines the artisanal and small-scale (ASM) mining sector. This is the other end of the mining landscape, where entry and exit are 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 characterized by very different dynamics, and thus merits some dedicated analysis.

Site of Artisanal and Small-Scale Mining in Tamiougou, Burkina Faso. Photo: Ollivier Girard for Center for International Forestry Research (CIFOR) © Flickr

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, which is characterized by low technology and informality, while being mainly carried out largely by individuals and small groups. We call it the informal, artisanal and small-scale mining. The acronym ASM is widely used to refer to this type of mining practices, and will be used throughout 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 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 individualized, 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 gold-rush mining, it would be wrong to equate contemporary mineral rushes with those of the past because today's miners operate in different political, economic and legal contexts. Although the frontier democracy model (self-regulation) might have worked in the past, such governance is unlikely to be effective in today's more complex sociopolitical environment. ASM therefore requires a governance structure that will protect the environment and the communities involved, 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 mineralized 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 for this mass exodus from agriculture are complex, and the process has far-reaching implications for the governance of extractive industries. Lahiri-Dutt (2018b) identifies six overlapping drivers among the compelling factors forcing this unprecedented and widespread shift from agrarian to informal mineral extractive economies. The first is the unsustainability and low 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 aimed to liberalize land markets and to help Foreign Direct Investment (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 that 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 fact that policymakers equate development with the expansion of extractive industries, thereby creating an extractive model that favours large corporatized operators while 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 rising commodity prices have incentivized not only the large-scale corporations but also the rural poor to earn additional cash incomes or 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 organized 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, mechanization/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 (for instance, 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 according to different criteria in their legislation. 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 mechanization 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 (which 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 does not provide for any separate dispensation for minerals or small deposits generally mined in the ASM sector, though the National Mineral Policy 2008[32] does recognize the need for a separate approach for managing small deposits.

32 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." (Government of India, Ministry of Mines (2008). National Mineral Policy (For non-fuel and non-coal minerals)

Many countries have legal provisions to allow ASM for nationals only and to 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 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 mechanization of ASM (Hilson & Hilson, 2015). Similarly, Verbrugge and Besmanos (2016, p. 137) argue that the legal definition of ASM 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, for 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);
- 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,[33] gravel, gypsum, kaolin, limestone, sandstone, marble, quartz, sand and talc)

3.2. ASM and the economy

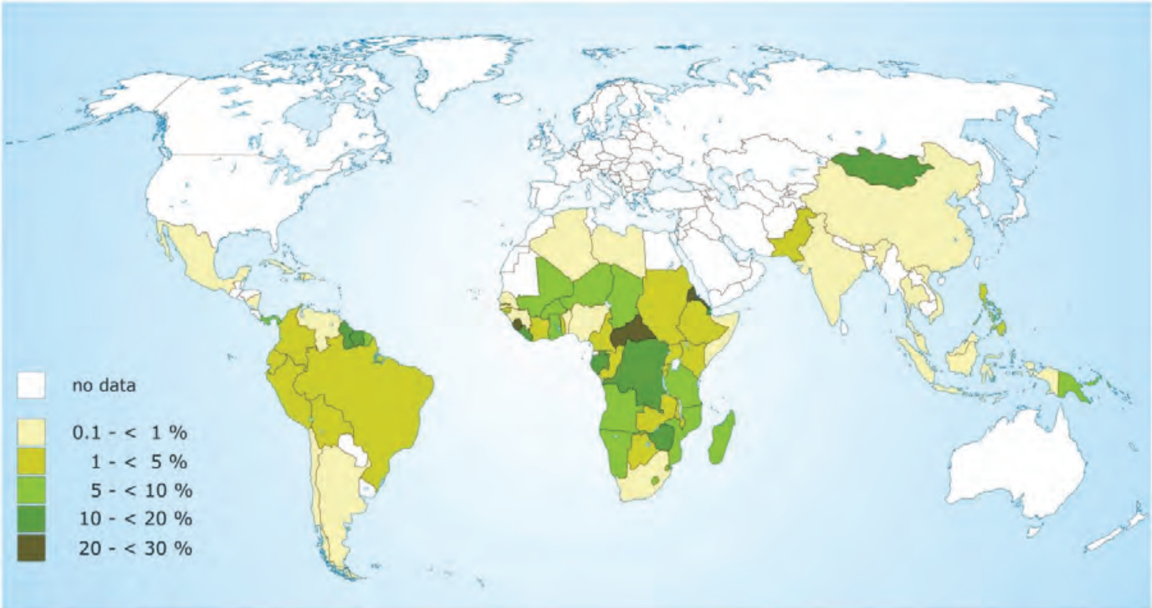
The Artisanal and Small-scale Mining in Protected Areas and Critical Ecosystems (ASM-PACE) project[34] estimates that ASM produces approximately 10 per cent of the word's gold, 15-20 per cent of its diamonds, 20 to 25 per cent of its tin and tantalum and 80 per cent of coloured gemstones (Villegas *et al.*, 2012; World Bank, 2012). Other estimates provide higher figures for the amount of gold produced globally by ASM to 20 - 30 per cent (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 accounted for about 12 per cent 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 livelihoods. 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.

33 'Granite' is used to refer to hard stone that may be crushed for aggregate or used for armouring, 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 used, as the key feature is rock that is hard-wearing (like roadstone) and available locally.

34 ASM-PACE is a joint initiative by the international conservation organization (WWF) and specialist development consultancy firm, Levin Sources that 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 policymakers 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). It 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 (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 consistently argued that ASM complements and supports agriculture by providing income in the off-season for the purchase of fertilizers and other agricultural inputs. However, this complementarity is being broken (see Box 3.1). This box shows that ASM dynamics are changing as itinerant entrepreneurs displace farmer-miners.

Perhaps where ASM has a bigger impact on the economy is in the provision of non-farm livelihoods

Box 3.1. Agriculture and ASM

Agriculture and ASM are key means of improving rural livelihoods. They tend to coexist in the same space, competing at times and sometimes complementing each other. 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 is the second main source of 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 an overwhelmingly negative impact of ASM activities on smallholder agriculture. These include:

- Growing imbalance in the power relations between the itinerant ASM entrepreneurs/workers on the one hand and settled smallholder farmers on the other;
- Growing overvaluation of assets in resource-rich rural communities, which increases the vulnerability of rural households and undermines 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 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 facing smallholder agriculture (such as low productivity and inadequate financial, logistical and technical support).

Land Use

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 studied 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. ASM is already 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.

Employment

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 can learn from both Sierra Leone and Burkina Faso, which have clear regulatory distinctions between artisanal mining and small-scale mining.

Regulations

New regulations will be extremely difficult to enforce and unlikely to achieve intended outcomes in the countries concerned (particularly in Ghana, where there appears to be signs of regulatory capture). 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.

Source: ACET, 2017

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 programmes of the 1980s. Several authors have argued that structural adjustment programmes (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 privatization 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'état in Mali, which led to the State's withdrawal of financial support from the commune governments 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, which is 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. By 1995, this support had resulted in 35 of sub-Saharan Africa's countries revising their mining codes, which increased large-scale private investment in mineral exploration and extraction. However, this reform also resulted in large tracts of mineralised land being granted as exploration/mining concessions to foreign multinationals in many countries (including Ghana and Tanzania), which has resulted in lack of availability of viable land for legal ASM activities and has encouraged informality in the sector (Fold, Jønsson, & Yankson, 2014; Hilson *et al.*, 2016). In Mongolia, Lahiri-Dutt & Dondov (2016) have described the links between the liberalization 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[35] 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/transient and may be linked to illegal activities, which makes it harder for researchers to gain access (Heemskerk, 2005). Production levels are also hugely variable and dependent on context, making it difficult to generalize (Heemskerk, 2005).[36]

> ***Many ASM activities occur on global commons of forested lands in critical ecosystems that were not previously used [...] Attention is now focused on the environmental degradation caused by ASM***

3.4.2. Environmental degradation and safety

Many ASM activities occur on global commons of forested lands in critical ecosystems that were not previously used (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) and

35 The price of gold rose from US$255.95 per ounce in 2001 to US$1,746 per ounce in 2012, a 582 per cent rise. See trends in gold price on the World Gold Council website, https://www.gold.org/data/gold-price.

36 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.

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 environmental impacts can be short or long term in nature. A number of non-governmental organizations are now working in this area, although their scope varies. For instance, the Global Environment Facility (GEF) focuses on preventing the use of mercury in gold mining (see Box 3.2), while the primary objective of the Artisanal and Small-Scale Mining in Protected Areas and Critical Ecosystems (ASM-PACE) Programme is to characterize 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, particularly those contributing to climate change (and more specifically the impact of ASM on forest degradation).

3.4.3. Use of technologies

ASM remains low-tech, irrespective of efforts to introduce appropriate technologies. This is partly due to laws that define similar forms of mining as low technology and family-oriented affairs (such as the 'People's mining' of Indonesia). So far, interventions such as capacity building and technology transfer programmes implemented by intergovernmental organizations and multilateral lending agencies have focused on environmentally friendly mining processing methods, particularly reducing mercury use and pollution in relation to 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 providing training and introducing mercury-free processing methods in several countries in Asia, Africa and Latin America.
- The IGoli process, developed by Mintek, has been piloted in a number of countries (ECA, 2002; Mintek, 2011).
- The use of metal detectors has proven to be problematic in alleviating the drudgery of miners' labour, due to the restrictions imposed by individual countries regarding the use of technology in ASM.

The 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, all of whom are illegal miners as the law restricts ASM to nationals. Ghana is currently grappling with the challenge of illegal mining, as ASM there has attracted international criminal networks from all over the world (Aido, 2016; Crawford *et al.*, 2015; Hirons, 2013).

Box 3.2. Minamata Convention & Artisanal and Small-scale Gold Mining (ASGM)[37]

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 worth mentioning 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 to the Minamata Convention.

The Convention states that each party that determines that ASGM using mercury is "more than insignificant" on 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 Global Mercury Partnership of UN Environment is supporting many of these countries by developing tools and methodologies (such as the ASGM Baseline Estimates toolkit) and providing technical assistance and opportunities to share information and lessons learned.

37 http://mercuryconvention.org

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 characterized by lack of access to essential facilities such as health care, water and sanitation. Unemployment and alcoholism compound these problems. A tradition of significant female migrant workers 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 the 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). Gender-based violence is less frequently discussed, and often takes the form of sexual and physical harassment from the male dominated labour force. There are also residency problems for the female migrant workforce providing support services 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 policymaking (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 African countries, traditional authorities (such as chiefs) still assert authority and control over rural lands. However, customary land tenure practices frequently clash 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 decentralization reforms is essential 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 formalize 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 discourages ASM operators from investing in their operations or responsibly managing the land. The USAID Property Rights and Artisanal Diamond Development (PRADD) project in Liberia aimed to address weak property rights that lead to conflicts, while creating positive incentives for ASM operators to practice good stewardship of land (USAID, 2013). Similarly, Verbrugge & Besmanos (2016) evaluate a policy programme 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 resource-rich land and other productive resources, licences, finance and geological data. Due to the traditional and patriarchal legal constraints on owning or inheriting land and mineral rights, many women end up operating in an unregistered way, thereby increasing their vulnerability in the current global efforts at formalization (which itself features stringent requirements that 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). In some cultures, such as in Sierra Leone, Botswana and Lesotho, even when a woman is the family head and owner of land, 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 relationships 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 the lack of access to mineralized lands and lack of geological information and analysis, which represent other key barriers for ASM operators (observed by O'Faircheallaigh & Corbett, 2016).

> *Women face different participation challenges as a result of the lack of access to, use of and control over resource-rich land and other productive resources, licences, finance and geological data*

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 emphasize 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 Guianas where a company relinquished a section of their concession to a 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

Aluminium is recycled by hand in Ambatolampy, Madagascar. Photo: Dennisvdw © Getty images

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, risk factors include "illegality" and the possibility of encouraging an influx of miners (Verbrugge, 2017).

3.4.8. ASM and conflict

The fact that ASM largely focuses on high value minerals that are easy to extract means that criminal networks are attracted to having control of such sites in order to capture and control the resources themselves. 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 may be used to finance this kind of conflict and are known as conflict minerals. Diamonds have also fuelled deadly conflicts, which was the reason for setting up the Kimberley Process to ensure that diamonds in the market are not fuelling conflict.[38] In recent years, tin, tantalum, tungsten and gold (3TG) have been the key focus due to conflicts 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 led to the establishment of a number of schemes around due diligence and certification (See Chapter 7).

3.4.9. Child labour

One of the major challenges of ASM is child labour. Poverty is the main reason why 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 to be higher, as ASM has been growing steadily since 2006 (when this estimate was made). Child labour can constitute a significant part of the labour force. For instance, 20 per cent of all miners in Mali and 30-50 per cent 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 out that mining often takes place in remote areas where the law, schools and social services are non-existent; 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 harm.

Donors and environmental agencies consider child labour in the mining sector as the worst form of child labour that needs to be outlawed (O' Driscoll, 2017). This remains a contentious issue, however, as there are those who argue that not working will drive these already poor families into further poverty. These proponents argue that it is participation in these activities that enables some children to go to school (O' Driscoll, 2017), and that a ban may harm the children (Faber *et al.*, 2017). Nevertheless, there have been efforts to prohibit child labour in ASM, mainly by means of certification schemes that guarantee supply chains to be 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' to improve prospects for smallholder farmers, these programmes were largely symbolic 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 towards livelihood diversification in the 1980s, 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 to encourage 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 programmes tended 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). Furthermore, 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

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

Worker in a small-scale gold mine in Camarines, Philippines. Photo: Minette Rimando © ILO / Creative Commons Attribution-NonCommercial-NoDerivs 3.0 IGO License.

equipment was not accompanied by appropriate awareness-raising and training programmes. 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 an effort 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 summarized as follows (table 3.1):

Table 3.1. Approaches for dealing with ASM

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

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 literature review on 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 formalization of ASM
    - Putting legislation in place
    - Enforcement
    - Incentives and strategies for overcoming obstacles to formalization
    - Cooperatives and associations
- Training / capacity building programmes
    - Technical support and assistance
    - Assistance centres
- Strategies focused on mercury
    - Minamata Convention on Mercury
    - Centralized processing centres
    - Mercury retorts
    - Clean/no-mercury technologies
- Financial assistance
- Fair trade, standards and 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 female miners
    - Gender sensitive access to microcredit
- Alternative livelihoods approaches / livelihood diversification

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

- From 2000-2011, the World Bank hosted CASM (Communities and Small-Scale Mining) to serve as a global initiative/dialogue on ASM to coordinate knowledge sharing. CASM was sponsored by a number of international organizations including the International Labour Organization (ILO), the United Nations Department of Economic and Social Affairs (UN-DESA), Conservation International and the United Kingdom's 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 and Small-scale Mining in Africa: Identifying Best Practices and Building the Sustainable Livelihoods of Communities held in 2002 adopted the "Yaoundé Vision on ASM", which recognized the poverty-driven nature of the activity as well as its poverty-reduction potential (ECA, 2002: 92-101). It called for greater alignment 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 mobilized 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 the programme 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) formalization of the sector, 2) access to finance and to global gold markets for ASM communities, 3) reduction of mercury use and 4) a knowledge management and information exchange mechanism (see Box 3.3).
- In 2002, the United Nations Economic Commission for Africa (ECA) produced a Compendium on Best Practices in Small-scale Mining in Africa, which was one of the first attempts to document 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 across several jurisdictions on the continent, (ECA, 2002).
- In 2018, 547 delegates, representing 72 nations assembled in Livingstone, Zambia between 11-13 September, for the International Conference on Artisanal and Small-scale Mining and Quarrying to chart a vision for sustainable development. The conference was convened by the African Caribbean and Pacific Group of States, European Union, United Nations Development Programme, and The Government of Zambia, with the support of The World Bank, The African Union, Organisation for Economic Co-operation and Development, International Conference on the Great Lakes Region, The Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development, and German Development Cooperation. An historic outcome of the conference was the adoption of the 'Mosi-oa-Tunya Declaration,' the first declaration of its kind since the Yaoundé Declaration in 2002 (Franks et al., 2020).

Box 3.3. GEF GOLD Programme

The GEF-GOLD programme (GEF, 2016) is a US$45 million investment from the Global Environment Facility, which was approved in 2016 as the first major intervention under the Minamata Convention on Mercury to address the 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 eight projects that will address:

- Formalization of the sector. The Convention recognizes that formalization is the first step towards implementing sustainable solutions and it requires that each party for which ASGM mercury use is "more than insignificant" to develop a strategy for formalization of the sector (among other measures).
- Improving access to finance and the international gold market. The programme will educate investors on the potential of the sector and enable miners to apply for funding to procure the necessary equipment, which will ensure more efficient and cleaner gold extraction (mercury free). At the same time, the project will work on the gold value chain to ensure more direct access (and therefore more income) to international gold markets with a growing appetite for responsible ASM gold.
- Technology transfer to demonstrate the applicability of non-mercury gold extraction methods that are more efficient and lead to reduced impacts 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 based on their particular conditions. This component will also collect information and lessons learned from the implementation in the eight countries and build up the database of experiences. 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.

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 formalization), 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 ASM depended on the quality of baseline studies aimed at identifying user needs and profiling these at a disaggregated level (ECA, 2011).

3.6.2. Bottom-up approach

Experts are increasingly advocating 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 organizational 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. Formalization

While formalization is not a silver bullet, there is generally a consensus that it forms the cornerstone of effective management of the sector. Much of the literature on ASM points to formalization

Gold miners of the Kédougou region, Senegal Photo: Carsten ten Brink © Flickr / Creative Commons Attribution-NonCommercial-NoDerivs 3.0 IGO License.

as a key strategy for regulation, increasing the sustainability of activities, creating benefits for communities and minimizing 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). Formalization 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 programme (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). 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 formalization efforts in its report *Analysis of formalization approaches in the artisanal and small-scale gold mining sector* (UN Environment, 2012). Many countries formalized their ASM sector in the last few years (see Box 3.4 below). More recently, there has been a re-focus on formalization through organizations 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 formalization or regulation of the sector (see Box 3.2).

An analysis of the institutional frameworks governing ASM in Zimbabwe undertaken by Dube *et al.* (2016) identified some common barriers to miners' formalization 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 formalization and potential strategies or incentives to encourage formalization.

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

Although Mongolia is traditionally a pastoralist society, artisanal mining is now one of the key sectors of the economy. Unofficial estimates suggest that the number of people involved in ASM is close to 100,000 (one third women and two thirds men). This is the equivalent to about 25 per cent of the rural workforce (400,000 people) who depend indirectly on this activity. The shift towards ASM was triggered by three disasters that hit 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 livelihood. 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 subjected to discrimination and human rights violations'.

The Sustainable Artisanal Mining Project (SAM) 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 a transparent and straightforward legal system; formalization of institutional structures and organization within ASM; enhancing skills development and transfer of know-how; and establishment of a knowledge base for integrated natural resource management and rural development.

SAM has had a 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 (MoM), and there are strong commitments to ASM in ministries responsible for labour, social protection and health. 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. It has already had an 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 that led to the Minamata Convention (a Multilateral Environment Agreement (MEA) of UN Environment).

Source: SDC (2017). http://sam.mn/sustainable-artisanal-mining-project/

Table 3.2. Obstacles and incentives (strategies) for formalization

Obstacles	Incentives/strategies to encourage formalization
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, such as 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 organizations 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 reducing the costs of licensing, royalties, taxes and fees.
Miners' fear of having to pay taxes, royalties and fees, if legalized	• Tax incentives. • Incentives that provide direct access to markets paying higher prices for commodities than the informal market. • Capacity building and training programmes linked to formalization.
Complex and bureaucratic process to formalize	• Simplifying licensing procedures. • Providing decentralized support to miners in the formalization process.
Miners have to travel to large centres to apply for licence	• Decentralizing 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 licence reapplication.
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 that pay higher prices for commodities than the informal market such as the 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	• Decentralization of offices to mining areas. • Decentralizing monitoring responsibilities. • Up-skilling miners to monitor health, safety and environmental practices.
Limited danger of sanctions combined with the ease of evading law enforcement	• 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 emphasize "'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 organizing 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. Decentralization

While many donor projects focus on different aspects of formalization for ASM, they often prioritize 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, legitimizing further coercive control tactics (Mabhena, 2012; Spiegel, 2015a; Spiegel, 2015b).

Decentralization of licensing processes and regulation of ASM to local levels of government is seen as a (theoretically) effective way of facilitating formalization of ASM and managing its impacts. However, decentralization 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 an analysis of their strengths and weaknesses. He found that these schemes face enforcement challenges and are reliant on inputs from 'Western' organizations (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 criticized 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 marginalized 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 marginalize 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 formalize 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 the '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.[39] See also chapter 7 for an assessment of governance instruments.

39 Other relevant research on the theme includes Childs (2014a), Childs (2008), Childs (2014b) and Imparato (2010).

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 programme 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 above-mentioned actions to upgrade or improve the governance of ASM will have to be carried out 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 just associating ASM 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 up' artisanal supply chains must consider the political economy that is driving decisions by miners, buyers, traders and other key stakeholders. IGF (n.d.) points out 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 non-digging activities such 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). However, what is 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, as well as caring for and nurturing 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 organizations. 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 an average of about 71 per cent 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, the figure is 10-50 per cent in Asia; 10-30 per cent in Latin America; and 40-100 per cent 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 per cent in Guinea, and 50 per cent 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 per cent to as high as 50 per cent.

Women are more heavily represented in lower value industrial mineral sectors, with the proportion rising to over 75 per cent 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 per cent to 30 per cent depending on the context (Purevjav, 2011). In general, studies of women's involvement in ASM reinforce the conclusion that globalized gender inequality exists in ASM (see also Tallichet *et al.*, 2003, Bashwira *et al.*, 2014, Huesca, 2013, Rustad, Østby, & Nordås, 2016).

Compared to formal, industrial and larger-scale mining, many more women are involved in ASM [...] Women are more heavily represented in lower value industrial mineral sectors, with the proportion rising to over 75 per cent in salt mining.

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 to ensure 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 improve 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 jewellery making).
- Mining site support services (such as childcare services).
- Alternative livelihood programmes.

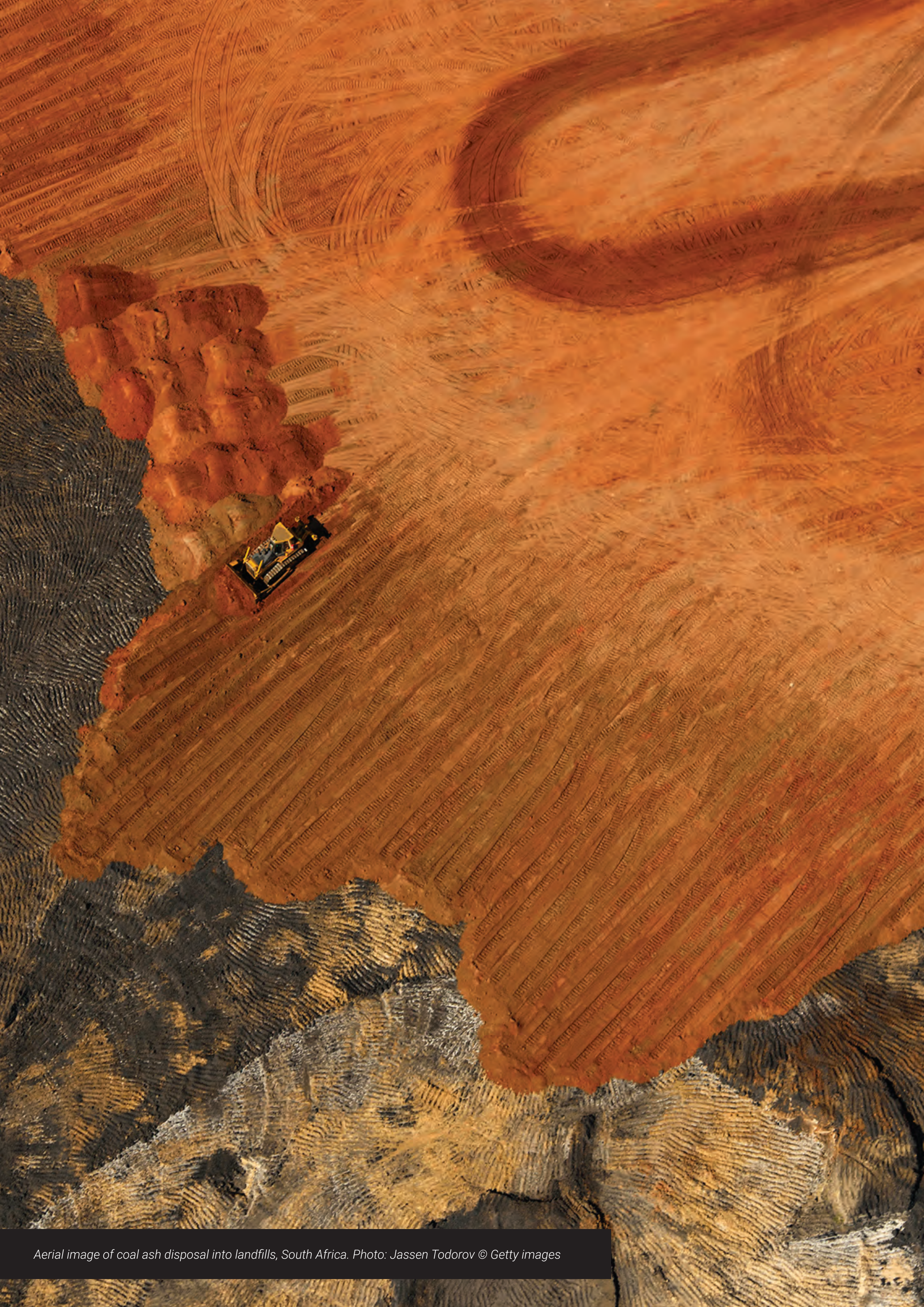
Additional potential, positive gender-focused governance instruments include initiatives that integrate women and gender considerations in the development of ASM legislation; policies and support for women to acquire mineral titles/licences and understanding of the legislative environment of ASM; and 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 a one-size-fits-all 'solution' (Lahiri-Dutt, 2016). As compared to larger-scale, formal and industrialized mining - in terms of the diverse extractive practices, processes and regimes - many more people are involved in ASM and deriving livelihoods from it. However, ASM also poses serious environmental, social and regulatory challenges. These include serious environmental damage, 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 certain globally important sectors (especially electronics), with consumers demanding that minerals do not fuel conflicts, their governance has also become a major global concern. In some regions, the criminalization 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 part of the informal economies of the countries where it occurs (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 that can guarantee sustainable practices in return for a premium in prices received by the ASM miners might also become popular in future (see chapter 7). However, the conceptualization and design of certification schemes may need to be reviewed to reduce unintended impacts on poverty and gender, which can render such schemes ineffective as tools in breaking the links between mineral resource dependence, poverty, environmental degradation and conflict.



Aerial image of coal ash disposal into landfills, South Africa. Photo: Jassen Todorov © Getty images

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 are based (USGS, 2015).[40] It follows that population growth and affluence 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. As a result, metals that were hardly in demand a few years ago, such as indium, are now critical as they are used in smart phones with touch screens (which have become ubiquitous). Therefore, new technologies are creating fresh vulnerabilities in economic systems (European Commission, 2014).

Minerals and metals markets have always been marked by supply and demand imbalances, as it takes 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 1970s, rare earth crisis of 2010-11), social tensions (such as strikes in major mines and/or smelters) or natural catastrophes (droughts, floods, landslides or earthquakes impacting 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 speed and magnitude (due to the size of its population), led to significant price hikes of many minerals since 2002.

40 Examples of minerals used in common applications include iron to produce steel; aluminium used in the energy, infrastructure and transport sectors; copper used in the energy sector and plumbing; and phosphorus and potash used for the production of fertilizers.

Technological shifts can impact both sides of the demand and supply balance. Some rare metals may have just one specific industrial use, and demand for them can rapidly dwindle due to a technology shift. Examples of this include europium and terbium, two very scarce rare earth metals that were in high demand in the first part of the decade from 2010 due to their use for the production of phosphor powder needed to produce compact fluorescent lamps (CFLs) (which were a very successful energy-efficient lighting technology at the time). At the time of print, some years later, even more energy efficient LEDs have widely replaced CFLs. LEDs require no, or little, europium and terbium.

> *[...] the rapid economic emergence of highly populated countries and the development of the global middle class have major impacts [...] The rapid economic development of China, a phenomenon unprecedented in recorded history by its speed and magnitude led to significant price hikes of many minerals since 2002.*

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 that may lead to major overcapacities when, years later, their production starts. Demand may have fallen by that time, for instance due to an economic slowdown. The overcapacity issue is one of the nagging problems of several global minerals and metals industries, such as the aluminium industry

(Aluminium Association, European Aluminium, Aluminium Association of Canada, Japan Aluminium Association, 2018) and the steel industry (McKinsey & Company, 2018). Overcapacities depress the minerals and metals sector.

Metal prices reflect changes in the supply and demand balance, and also reflect market anticipation. Rapid changes in the factors impacting on demand or supply lead to price volatility, which can be exacerbated by speculation. Speculation on many minerals and metals is facilitated by the existence of unregulated financial instruments (many of them being internet-based) that make 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 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[41] 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 exhaustion of materials in the face of a projected population explosion[42] and the economist Julian Simon, who argued that growing population was not a catastrophic problem as higher demand would lead to higher prices and there would be an incentive to find more materials or alternatives (and that prices would thus remain low). The economist won the bet.[43] 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 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 that 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

41 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 per cent of the world's rare earth metals, estimates that its mines might run dry in just 15-20 years (Nuwer, 2014).

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

43 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. However, 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 per cent. Therefore, Julian Simon won the bet.

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 criticality 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 in industrialized countries where 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 (or none) of its needs for 27 critical minerals and metals from within its borders (EC, 2017). For 14 countries, their dependence on imports from beyond their borders is higher than 90%. The United States 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 United States 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 countries and regions dependent on minerals and/or metals imports. Researchers recognize that criticality does not just depend 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 created an impetus for improving our understanding of future minerals and metals demand and thus for devising 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 en¬vironmental 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, urbanization, geopolitical risks, possible evolution of mineral/metal-dependent technologies, potential increase minerals and metals recycling rates and eventual substitutions of rare minerals and metals in their main uses (Graedel *et al.*, 2013).

The following section discusses a number of initiatives to determine 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 for mining companies and policies for policymakers, with the aim of ensuring future global security of supply of minerals and metals.

According to WEF, 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 shared 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, inter alia, 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 who are not involved 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 (European Commission, 2017c)

As indicated above, in 2013 the EU imported about 91 per cent of the minerals and metals needed (Ad-hoc Working Group on defining critical raw materials, 2014). The 2017 assessment of the raw materials critical to the EU (European Commission – 2017a, 2017b, 2017 c) identified 26 critical minerals and metals, with import reliance rates varying between 0 and 100 Per cent. 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 per cent by 2020.

The resulting analysis identified 27 critical raw materials from a list of 54 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 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 by the United States National Research Council (NRC, 2008). The NRC study developed a two-dimensional "criticality matrix" to aid in assessing the degree of criticality of a mineral or metal. The matrix is based on the finding that a mineral or metal is critical if it is important in use and 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 criticality.

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 also the 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. As for vulnerability in terms of unavailability of suitable substitutes, magnesium, chromium, manganese, rhodium, yttrium and several rare earth elements are critical.
- From an environmental implications' perspective, precious metals, particularly gold and the platinum metal group are of most concern– because of the adverse environmental impacts related to their extraction and processing.

Some important conclusions based on the findings include:

- An assessment of the criticality of metals should not be regarded as static, but as one 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. However, 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 policymakers 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.[44] Key highlights of the 2015 risk list include:

- The ongoing 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

44 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.

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.

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 that enable the implementation of closed-loop recycling systems for critical metals.

The analytical framework included criteria to assess demand/supply and 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 11 'green minor metals', considered key to future sustainable technologies (FST).[45] The study found that, in the short run (next 5 years), tellurium, indium and gallium will become critical due to rapid demand growth, and there will also be 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 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).

45 The term 'sustainable technologies' has no official definition; it rather describes technologies that result in positive environmental impacts. Examples include future sustainable technologies that replace an obsolete technology and thereby 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).

Table 4.1. Estimates of the share of the 2013 world production of mostly rare metals needed to meet 2035 demand

Metal	Demand 2013 / Production 2013	Demand 2035 / Production 2013	Related Innovative technologies
Lithium	2%	385%	Lithium-ion batteries, lightweight airframes
HREE (Dy/ Tb)	85%	313%	Magnets, e-cars, wind power
Rhenium	98%	250%	Superalloy
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, Synthetic liquid fuels
Germanium	39%	81%	Fibre optic, Infrared technology
Platinum	0%	60^	Fuel cells, catalysts
Tin	50%	42%	Lead-free solders, wind mills
Palladium	8%	47%	Catalysts, seawater desalination
Indium	29%	45%	Displays, thin layer photovoltaics
Gallium	25%	37%	Thin layer photovoltaics, Integrated Circuits, White LEDs
Silver	22%	32%	Lead-free solder, nanosilver, Radio Frequency Identification Devices, 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 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 per cent of the 2013 primary production, while it is expected to rise to 385 per cent of 2013 production in 2035.

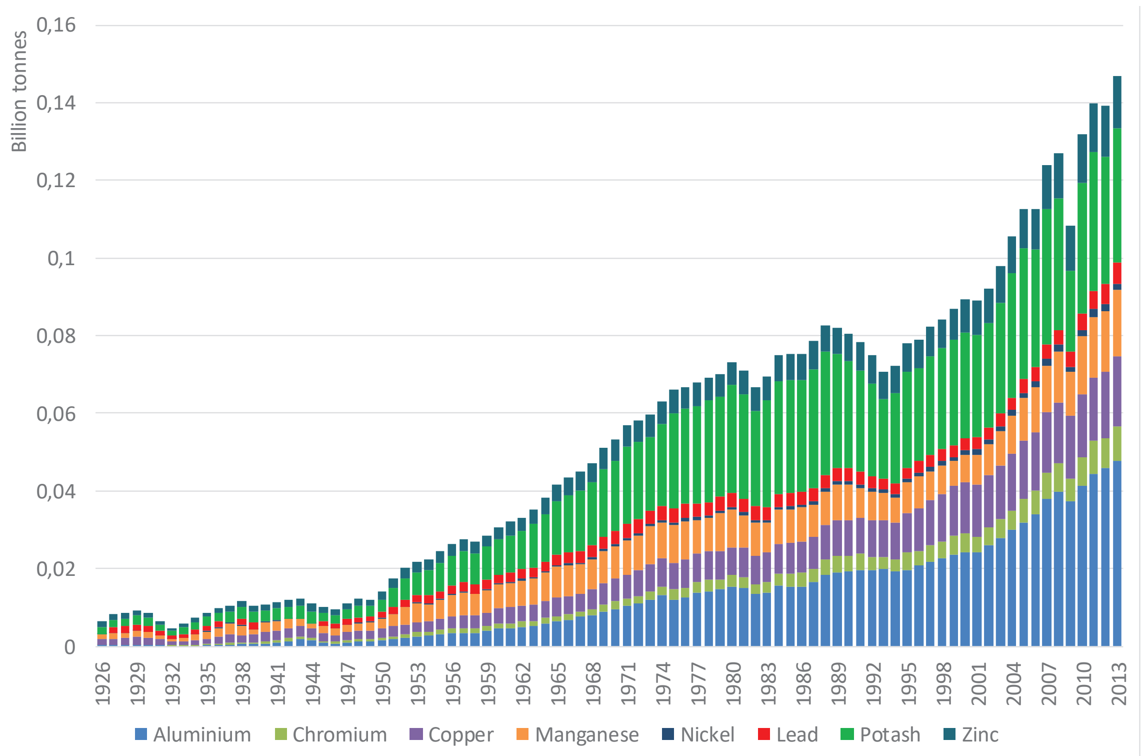
4.1.7. Forecasting demand and supply of key minerals (Christmann, 2017)

The six studies reviewed above focused on what are considered as strategic minerals and metals mainly driven by emerging technologies in the wake of the fourth industrial revolution.[46] They also largely reflect security of supply concerns of the more industrialized countries, which rely on raw material imports for their industries. For many countries, and especially the emerging economies, the supply of commonly used minerals and metals will continue to be important (and the security of supply is a particular concern).

Christmann (2017) constructed a baseline scenario. The baseline model is based on the following assumptions:

46 The fourth industrial revolution is characterized by the intensified use of information and communication technologies and a shift towards renewables.

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



Source: Christmann (2017), using data from Kelly & Matos (2018).

(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 per cent) by 2050, and 3.9 billion by 2100 (an increase of 53 per cent).
- Urbanization: In 2000, almost 2.9 billion people lived in urban areas (United Nations, 2014). By 2050, 6.3 billion people, or 66 per cent of the word population, may live in cities.
- Middle class:[47] Kaufman *et al.* (2012) developed country-level scenarios up to 2030. Their estimate is that, in 2000, the global middle class accounted for 1.33 billion people, while in 2030, the global middle-class may comprise 4.7 billion people;

(ii) Demand growth

Primary production of minerals and metals (through mining rather than secondary production from recycling) will remain a necessity, at least as long as the world population continues to grow and there is no saturation of per capita needs in terms of minerals and metals. That perspective 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 observed during the twentieth

47 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

Table 4.2. Average annual growth rates of selected metals

Metal	1926 – 2013	Period (growth in %) 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 (2018).

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 fertilizers) (Figure 4.1).

To model future growth in demand, the following three growth trends are considered:

- 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 reflects the rapid development of China.

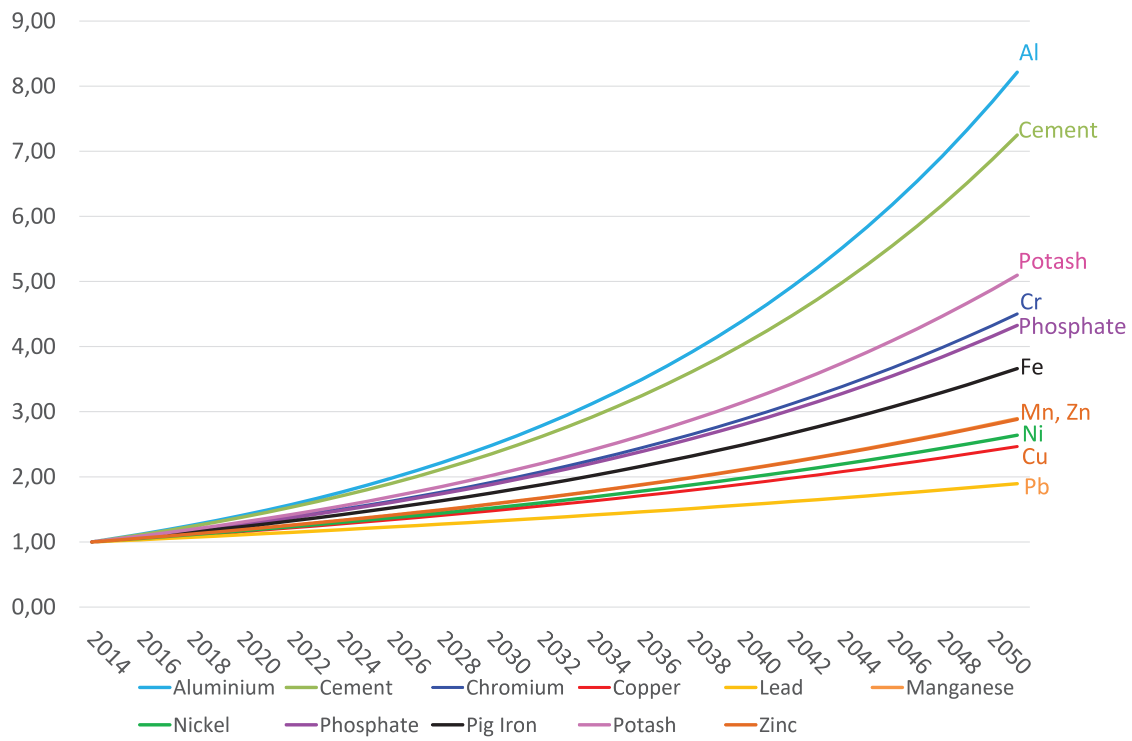
The lowest growth rate over the three periods is used to project metal demand forward to 2050.[48] Table 4.2 shows the average annual growth rates of selected metals for the three periods. The lowest growth rates are highlighted for each metal. As the table shows, demand growth will range from 1.8 per cent for lead to 6.0 per cent for aluminium. The average of the lowest growth rates is 3.9 per cent for all selected minerals and metals, and 3.8 per cent for metals only.

The growth rate for metals is a conservative estimate compared to the OECD's 5 per cent up to 2030 (APR, 2013).

Demand for these minerals and metals up to 2050 was estimated on the basis of the demographic and demand growth assumptions used as a baseline. 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 materializes, the production of the various key commodities rises significantly, ranging from 750 per cent for bauxite aluminium ore to 114 per cent for lead between 2013 and 2050. An important question is whether the resources available can meet this demand. Using data from the United States 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 per cent of the anticipated needs.

48 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 uses the lowest growth rate of previous spurts, this is a very conservative projection.

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



Source: Christmann (2017), using data from Kelly & Matos (2018).

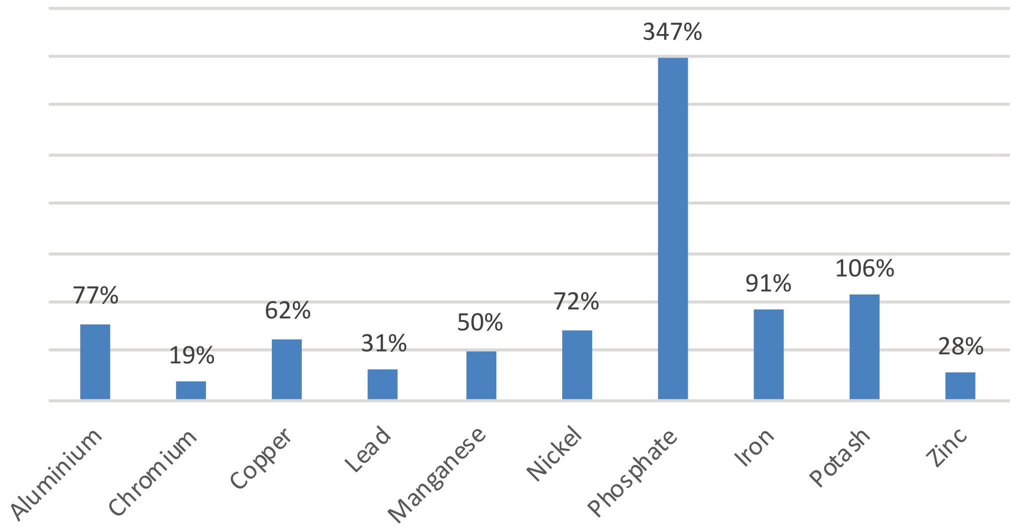
Figure 4.3 does not imply that the world is running out of any of these minerals and metals, because as-yet-undiscovered resources are huge (see, for instance, the copper example in Johnson *et al.*, 2014 and Kessler & Wilkinson, 2008). However, this does mean that major exploration efforts are needed to find yet-undiscovered resources and turn them into mineable reserves.

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 copper consumption continues to grow exponentially. This underlines the need for a massive exploration effort to reduce copper use (which is 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 materializes.

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 for houses and infrastructure, energy production and distribution systems. Demand for lead may follow a very different pattern (probably with much lower demand) 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).

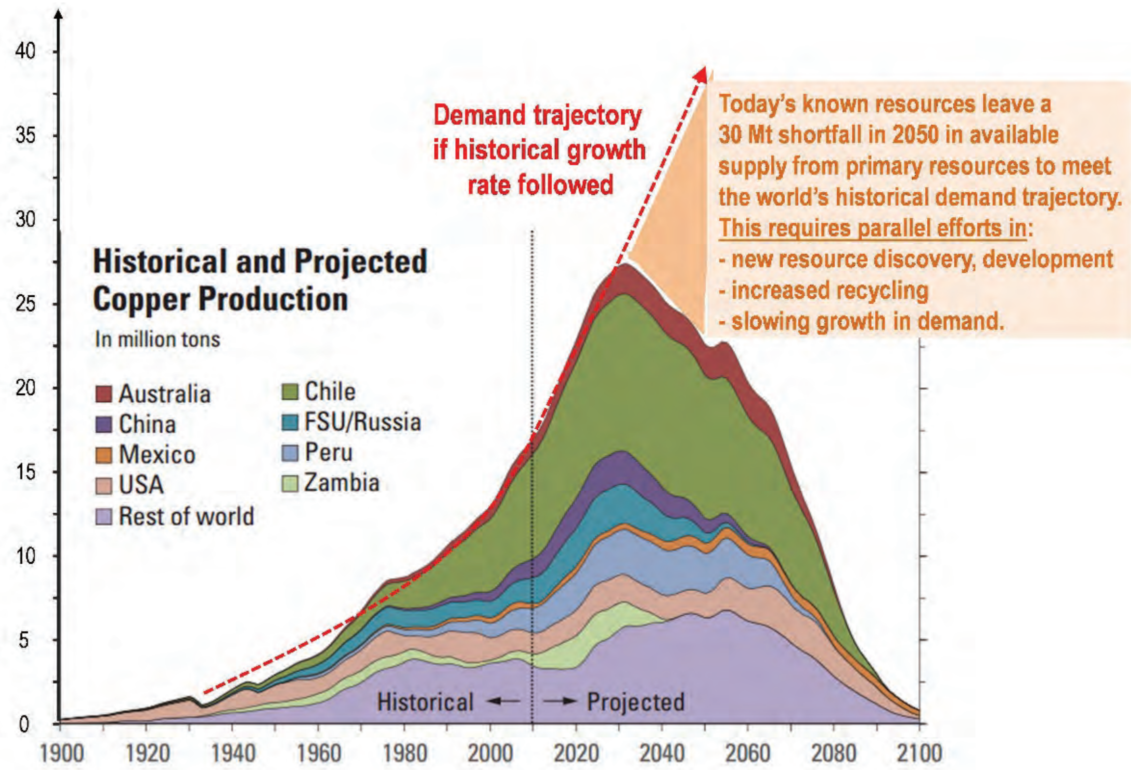
Using this baseline forecast, it is clear that more mineral deposits will need to be found. There is a high likelihood that there are still substantial quantities to be discovered, as much of the earth's crust is yet to be explored. As mentioned earlier, exploration is skewed towards a few countries,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

Figure 4.3. Share of projected 2050 demand that can be met by reserves as estimated by USGS for 2016 (USGS,2016)



Source: Calculated from Christmann (2017) results.

Figure 4.4. Historical and projected primary demand of copper



Source: Northey et al. (2014).

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 time frame is likely to expand as projects have to consider environmental and social issues (which were widely ignored in the past). With ongoing concerns 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 per cent increase in copper production in 2025 (from 2015 levels). However, the demand for water and energy will rise by 22 per cent[49] and 34 per cent, 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 water users. 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 therefore provide 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.

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

- The United States National Research Council (NRC, 2008) maintains that, over the long term (more than ten years), availability of mineral resources[50] depends on 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 groups drivers of change in the minerals and metals industry into 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 for evaluating supply risk. Domestic reserves and resources, governance risk, and trade restrictions are additional factors that should be considered when calculating supply risk and developing mitigation strategies.
- Macpherson and 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 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.

49 Chile plans to overcome this challenge by using seawater; it foresees the share of desalinated water in its mining operations rising from 21 per cent to 46 per cent (Chilco, 2016, cited in Christmann, 2017).

50 The term "mineral resources" used in this study encompasses minerals as well as metals.

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 above.

- 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 below.

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 United Nations 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. As a result, many certification standards are emerging to provide this guarantee. Despite the voluntary nature of many such 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 mindset, strategies and activities. According to WEF (2015), 80 per cent of senior mining executives believe that sustainability-oriented strategies are essential for current and future competitive advantage, while 63 per cent 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 European Commission trade strategy, 'Trade for All,' reflects European consumers' concerns about 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 – ranging from spaces (homes) to objects. One product is owned and shared by many users. Higher utilization means less demand. One example is several tenants sharing one vacuum cleaner. The use of social media is also creating global movements that can influence policy consumption and 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 with their growing 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 –could combine to generate as much as US$2.6 trillion in revenue annually by 2020, or US$1 trillion more than today.[51]

However, future demand may be different from past patterns. Studies on the resource intensity of the economic process suggest 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 towards the service sector in developed countries, improve the prospects for further dematerialization of the economic process. However, having an alternative indicator for evaluating the resource requirements of the economy such as resources used to one unit of GDP per capita (income), 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, despite the many uncharacterized and unexplored deposits in the European Union, their exploitation is limited by the existing economic and regulatory climate, widespread NIMBY and BANANA syndromes (and resulting activism) and growing land use competition (EU, 2015). The result is that the EU can only supply a small part of its needs for many minerals and metals. Similarly, some have suggested that the dominance of China in the crucial REEs may be partly attributed to less stringent environmental standards, as opposed to the United States, which was the major supplier in the past and holds around 38 per cent 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 gases (GHGs) are driving new demand for many metals as green technologies emerge.

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

51 See http://www.mckinsey.com/global-themes/middle-east-and-africa/lions-on-the-move.

zinc mines, as indium is a core product from zinc ore. There are no dedicated indium mines because it occurs in such small amounts that mining is uneconomical. Therefore, 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 United States, the material with one of the highest rates of recovery is lead-acid batteries, used primarily in cars. Their recovery rate is 98 per cent, compared to about 50 per cent 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).[52]

4.2.4. Governance/Political stability

Changes in the quality of governance may impact reserve availability. Mineral reserves are usually a small percentage 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 and reserves to be found. For example, Africa is considered rich in natural resources, with a geology as favourable to the existence of mineral deposits as Canada or Australia. However, whereas Canada and Australia respectively attracted an average of US$118 and US$125 per km2 per year in exploration investment over the 1991-2015 period, Africa only attracted US$36 per km2 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 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, combined with the higher costs of finding (Schodde, 2017) and putting into production new deposits, does not bode well for future minerals and metals supply for 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 locations 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 per cent of the world's phosphorus reserves. South Africa, Zimbabwe and the Russian Federation control nearly all of the world's platinum reserves. The Democratic Republic of Congo (DRC) has 40 per cent of its cobalt, while China has a near monopoly of REEs.

> *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, thereby reducing future supply*

52 A highly effective incentive is one that 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 resource-rich countries or countries that control a significant share of the global production via their investments abroad can use their control over producing companies as leverage in international negotiations. Their dominance enables them to distort the market through restrictive or dumping measures. In September 2010, for instance 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, thereby 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, global supply may be disrupted as some countries seek to limit exports while they develop their own industries. For example, in 2012 Indonesia announced 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, securing supply of materials is a national security issue for many countries. This means significant funds will continue to be spent on securing supply chains and finding alternatives to reduce dependence. For instance, Japan stockpiles minerals and metals, which it considers as strategic resources (ECA, 2011), while the fear of a future REE shortage has prompted the United States to invest millions of dollars 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

Ongoing trade liberalization has seen a 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 somehow limits countries' ability to use their possession of critical minerals 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). However, there remain numerous ways and means to distort free trade through tariff and non-tariff measures, as detailed in the OECD Inventory of Restrictions on Exports of Industrial Raw Materials,[53] (which describes the trade restrictions for a wide range of traded minerals and metals at country level as of 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.

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

> ***As emerging countries grow and industrialize, global supply may be disrupted as some countries seek to limit exports while they develop their own industries***

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

Box 4.1. Globalization - retreat and rearrangement?

Global trade is undergoing some re-arrangements. On the 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 United States has recently pulled out of the proposed Trans-Pacific Trade Partnership and has questioned and called for a review of some existing trade agreements. On the other hand, China is laying the ground for an acceleration of global trade.

In terms of impact on national politics, the most significant development is the United Kingdom's exit 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 United States. This has seen the United States 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. As manufacturing is 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 global infrastructure that includes roads, railways and ports to 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, as well as demand for minerals and metals.

The retreat seen in the west could be temporary, as such phenomena are driven by political cycles that are short term. However, the continuous loss of jobs 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 therefore likely to persist and could well lead to a re-arrangement of global trade.

4.2.7. Mining and metals, research, innovation and evolution

4.2.7.1. Innovation in mining & metals industry

As the mining and metals industry is facing challenges and opportunities, research and innovation are important for addressing them. Research and innovation are critical to developing some of the solutions needed to address the challenges of the exponential increases in demand 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 terms of technologies used and business models adopted, and there are many developments worldwide such as the creation of United States Critical Metals Institute,[54] 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 European Union Knowledge and Innovation Community on Raw Materials (which 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:

54 Website: https://cmi.ameslab.gov.

- Technologies such as in-situ mining, autonomous haulage and drilling and rapid tunnelling are changing the process of mining. In-situ leaching technologies can significantly extend the 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 waste.
- The use of information technology is also important. The United States 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 per cent to 75 per cent (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 or exploration guides 50 years ago (such as porphyry deposits) are now the principal source of copper. Within minerals exploration, R&D is very active internationally in sectors such as:

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

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

c) Extending the frontiers of mining

Mining is extending to new frontiers. Seabed 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.

Although commercial deep-sea mining has yet to begin, corporations and governments have been driven by markets and technology to increase the pace of exploration for mineral deposits in the deep ocean seabed. Many of these deposits are found at depths of between 1,000 and 6,000 metres 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 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, and the first industrial production project of copper-zinc-gold ore may start in the coming years off the coast of Papuasia (New Guinea). In addition, numerous contracts (with governments and companies) have been signed for exploration of the international seabed, governed by the International Seabed Authority,[55] which is the body responsible for 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 turn their attention to urban mining or recycling as part of their business and rethink their business models (FOM, 2016).

We are also witnessing the arrival of new players in the minerals value chain in the form of high-tech and big brand technology firms who acquire diversified mining portfolios with a view to securing access to vital inputs and taking full control of their supply chains. These include the electric carmaker, Tesla, which acquired lithium assets: a key ingredient for their batteries (PWC, n.d.). 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. However, a product-centric approach can change the economics of recycling. Binnemans and Jones (2014) point to the recovery of rare earth elements from end-of-life fluorescent lamps as an example of product-centric recycling. Rather than targeting just the rare-earth content of lamp phosphor powder, the recycling of all the different waste fractions (glass, metals, plastics and phosphor powders) can be economical. This then involves rethinking the business model from the metal supplier to the material supplier. This transition has the prospect of 100 per cent re-use and zero waste production through reorganization (the emerging circular economy paradigm).

55 See https://www.isa.org.jm.

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 per cent, compared to 50 per cent in the previous model (Boeing 777). In contrast, carbon fibre–reinforced polymeric composites are 50 per cent by weight in the Boeing 787, up from 12 per cent 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 versatility. 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, while also increasing the versatility of traditional materials and 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 solutions that are suitable for the process are then developed (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 per cent 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 per cent (Herzog, 2016). Such 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. Therefore, 3D printing not only saves materials (this translates into a lighter environmental footprint) but, depending on the use of the items (for example, as parts in a car), the weight reduction also translates into energy savings and further reductions in the ecological footprint (Lee, 2016).

Growth in 3D printing may bring down 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 about 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 monitored maintenance of records from the moment of extraction and throughout the lifetime of minerals and metals. However, this will only be meaningful as long as material flows coming from separate sources 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 the origins all the original materials that entered a specific recycling plant. The records, called blocks, include information on ownership and authenticity, exact location of ore extraction and the quality of production process from an ethical, social and environmental perspective.[56]

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.[57]

These technological transformations and disruptions have required organizational changes and a review of business models. Fully integrated real-time data visualization and mapping, predictive modelling and cognitive analytics are contributing to efficiency gains, waste reduction and improved 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 or not have faded into oblivion by 2050. 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 nineteenth century. It was later substituted by LEDs (which use gallium).

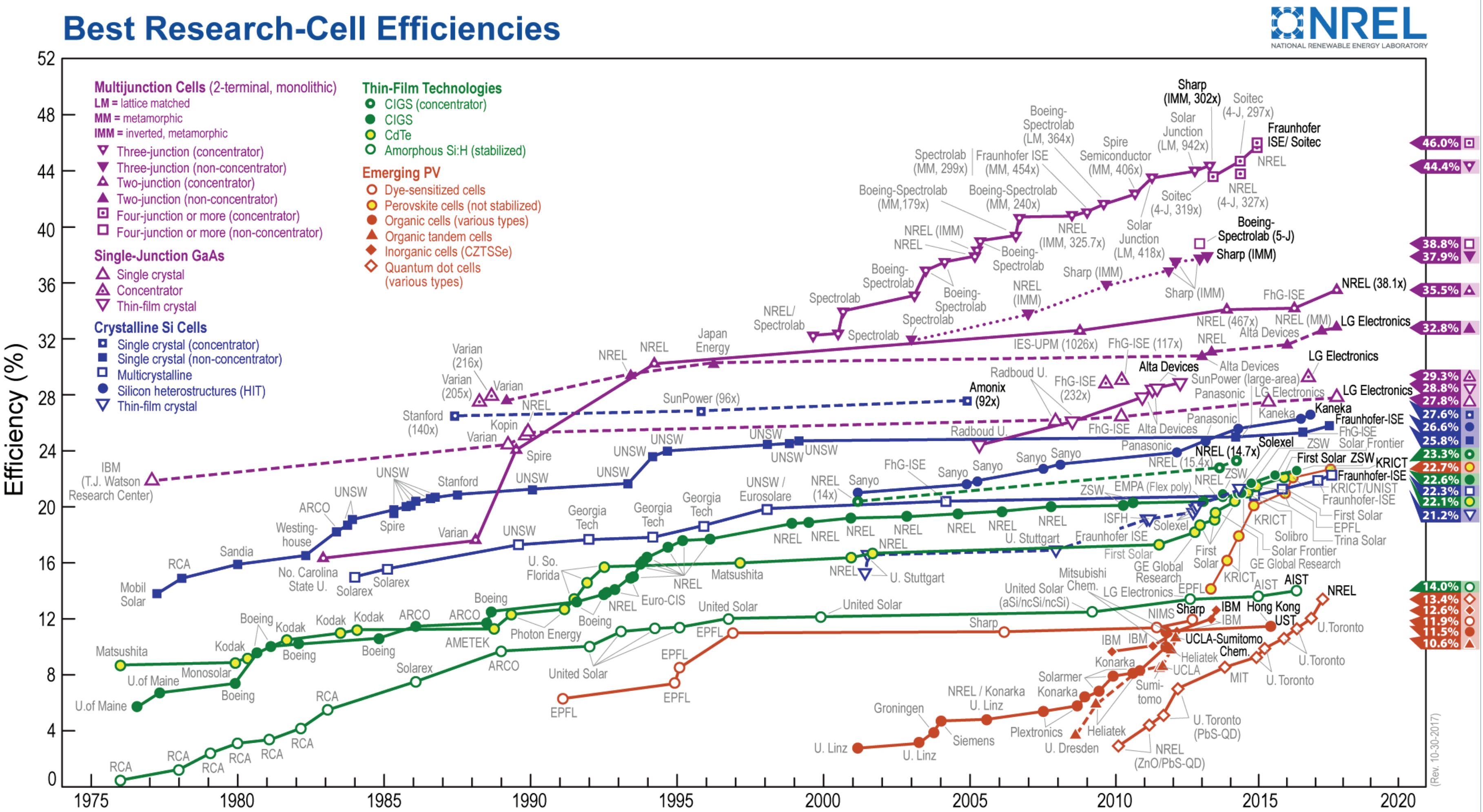
Such rapid, sweeping technology shifts make forecasting demand fairly complex. Although in 2013 only about 2 per cent of lithium production was used for the production of lithium batteries, in 2035 the lithium demand for battery production may nearly four times higher than the total 2013 world production. However, by then other battery technologies may have also been developed and industrialized.

Figure 4.5 produced by the United States 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 is 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 therefore which raw materials may also be in high demand.

56 See https://www.pwc.com/gx/en/energy-utilities-mining/assets/pwc-mining-transformation-final.pdf.

57 See 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: United States 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 [58]

The WEF (2015) scenario analysis of circular use of commodities and metals reaches 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 focus of the International Resource Panel's activities is 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 to humanity. Several threats are putting humanity's future in doubt. These concerns have resulted in a strong push for a green, 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), which commits participating countries to curbing their greenhouse gas emissions in order to keep the average global temperature well below +2° C as compared to pre-industrial levels. Other important examples are the Minamata 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.

Inputs[59] (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 United States mining industry (US Department of Energy, 2007) showed that the country could save over 20% of the energy used in mining and ore processing 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.

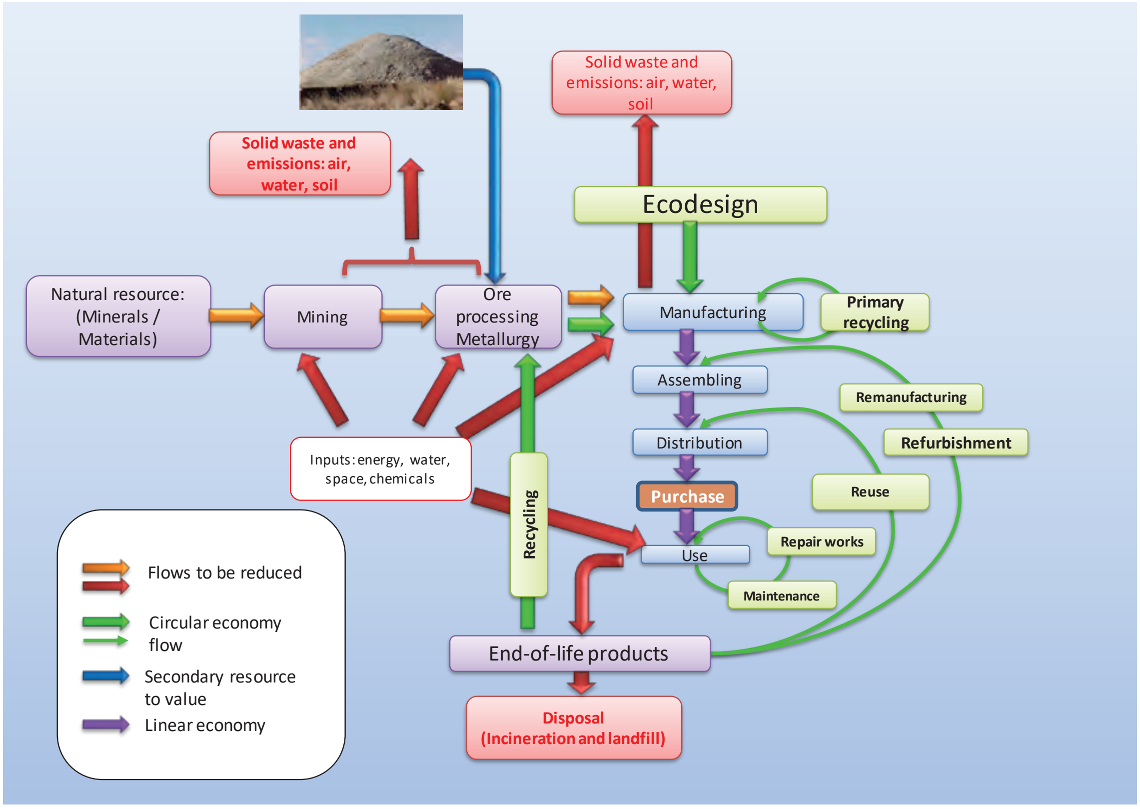
The demand for primary minerals and metals (from a mine) could be significant if all the possibilities offered by the circular economy concept, shown as green arrows in Figure 4.6, were used to the fullest. However, there are many obstacles in the way.

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 very low, sometimes less than 1 per cent (UNEP, 2011 and Figure 4.7).

58 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 and zinc. However, other materials acknowledged as 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 and vanadium.

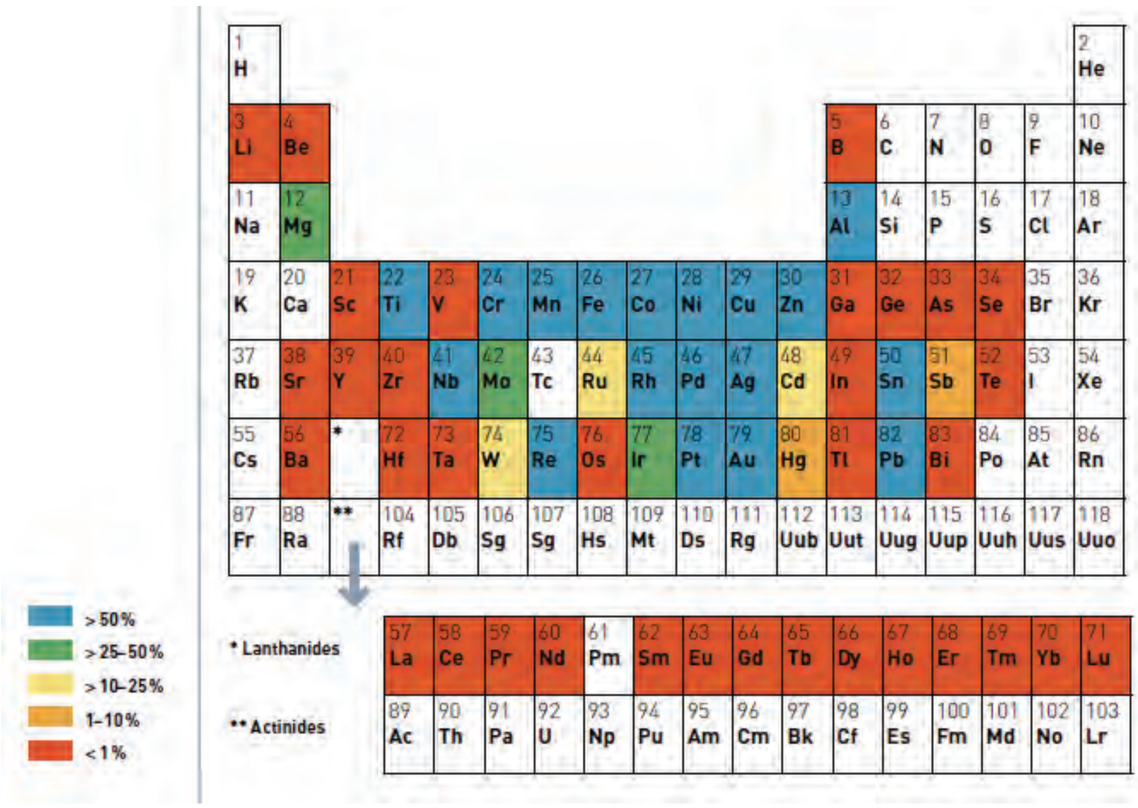
59 Shown as red rectangles in figure 4.5.

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



Source: Christmann, unpublished work.

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



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

Recycling of minerals and metals provides many benefits such as reduced primary demand, as well as reduced energy and water demand for the production of recycled metals. However, 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 volume of potentially recyclable minerals and metals available from end-of-use products. To illustrate this, figure 4.8 shows the reduction in demand for a given mineral or metal that would result if 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 per cent 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, the production of secondary (from recycling) copper was 4.03 Mt, which is 20 per cent of the world copper metal production (Brininstool & Flanagan, 2018). As a result, 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 twenty-first century, due to the above-mentioned drivers.

4.2.8.1. 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. (Jones, 2013).
- 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 per cent less energy and save up to 87 per cent 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 recycle easily, as products are returned to the seller once the lease comes to an end (Wäger *et al.*, 2012).

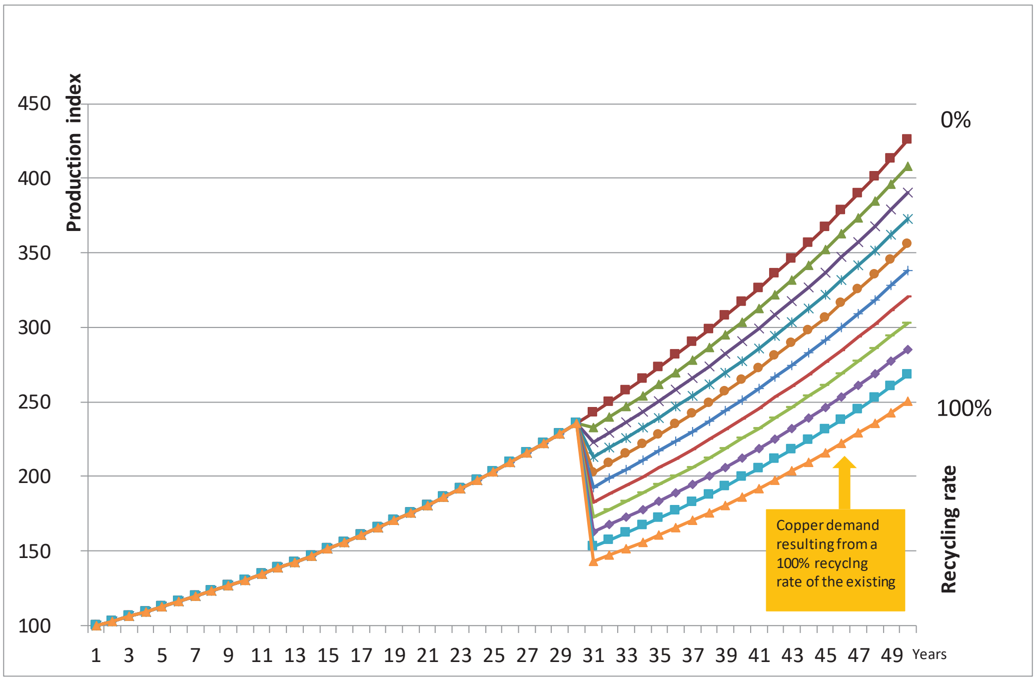
The shift to a more circular economy is also creating demand for new materials as shown in table 4.1. Materials that were not previously in demand are now considered critical materials, and significant efforts are being made to ensure their supply.[60] For instance, the demand for cobalt and lithium is soaring due to the rapid development of battery-operated electric cars, and the demand for gallium is sustained by the rapid development of LED lighting.

4.2.8.2. Substitution of rare minerals and metals

Substituting the use of scarce and expensive minerals or metals is one of the various 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 another in some uses (for instance aluminium can replace copper in high-voltage overland electricity supply lines) or a technology using a different metal can substitute an older technology that used

60 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. These critical metals are used in batteries, wind turbines, solar panels and electronics systems in all kinds of controls.

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



Source: Christmann, unpublished work.

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 long qualification processes, for instance in aeronautics. See, for instance, Graedel *et al.*, 2013;[61] Halme *et al.*, 2012; Vidal *et al.*, 2013; Tercero Espinoza *et al.*, 2015; and European Commission 2017a & b for detailed insights into the substitutionability of individual minerals and metals and related research topics.

The shift to a green economy is also creating a 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.[62]

4.2.8.3. Shift to renewable energy

The global transition towards carbon-clean energy production technologies will also be an important driver of the demand for minerals and metals.[63] Energy production from renewable energy sources requires much higher amounts of - common and rare - metals than energy production from fossil fuels (Baldwin *et al.*, 2015).

61 The supplementary information includes a detailed database covering 62 elements, mostly metals, and their main uses.

62 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. These critical metals are used in batteries, wind turbines, solar panels and electronics systems in all kinds of controls.

63 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 and tin (United States Department of Energy, 2011; Vidal *et al.*, 2013; Baldwin *et al.*, 2015; UNEP, 2016b; Arrobas *et al.*, 2017).

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, 2016b). Environmental damage and associated biodiversity loss 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 based on metal, or that use rare metals (with a low known reserve) have a substantial impact on metal depletion. The ongoing 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 the 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.

4.2.8.4. Rise of green investment

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

Worldwide, sustainability is becoming an essential investment criterion. These types of investments accounted for US$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 (Netherlands giant healthcare pension fund) has announced its intention to quadruple sustainable investments to a value of US$16 billion by 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 and 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 gain momentum (especially among millennial, value and impact investors). This is the case of the Church of England National Investment Bodies (NIBs), which 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 safeguarding of operating standards). This 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).[64]

4.3. Conclusion

Ali *et al.* (2017) point out that the successful delivery of the United Nations Sustainable Development Goals and implementation of the Paris Agreement require technologies that use a wide range of minerals and metals in vast quantities. While mineral and metal recycling plus technological change will contribute to sustaining supply, mining must continue and grow for the foreseeable future if we are to ensure that minerals and metals remain available to industry. New links are needed between existing institutional frameworks to oversee 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 the following six measures to ensure the ecologically

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

viable continuity of global mineral supply over the coming decades (thereby averting the looming crisis): (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 minerals and metals supply and demand is fairly complex, as the respective 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 mineral commodities of 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 the one hand, creating demand for minerals and metals that were previously in more limited demand and, on the other hand, 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.

The way in which minerals are mined, 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 emerging as ore grades are deteriorating, thereby creating higher demand for water and energy. At the same time, consumers (mainly in developing countries) 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 regulation of mining companies 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 the 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 the required investments. This could lead to new areas being opened up for exploration and development.

The complexity of the aforementioned issues points to the need for a governance framework that can accommodate a supply and demand landscape that will be in 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 requires a sharper focus on mitigating the impact of mining, especially as extraction moves towards new frontiers where past experience in managing these externalities may not suffice.

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

Mine tailings reservoir in Magadascar, receiving slurry through a pipeline from an ore processing plant. Photo: Roel Slootweg © Shutterstock

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, inter alia, population growth, rising urbanization and an expanding middle class - especially in the developing countries (Chapter 4). This trend is expected to continue, albeit 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 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 mining's potential impacts 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, the need to invest resource wealth in sustainable development goes hand in hand with the imperative to manage resource development in a way that does not undermine other economic sectors.

There is the potential for the impacts of extractive activities to become more severe in the future, given the 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, as well as higher energy and water demands. 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[65] 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 United States 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.

This chapter outlines key environmental and social impacts associated with mining activities. Please note that the focus is 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.

65 Mine closure is discussed in Chapter 6 (section 6.1.11).

5.1. Extractive industry and the environment

The frequently severe and enduring impacts of mining activities on the natural environment are widely reported. For instance, surface mining often cuts back forest and other vegetation cover, removes topsoil[66] 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 Figure 5.1). In addition, mining does not happen in isolation. There are a range of ancillary activities to support operations, including 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 depend on 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 the potential to cause environmental damage as well as posing a risk to safety. Therefore, the potential impacts throughout the whole life cycle 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 a view to outlining 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

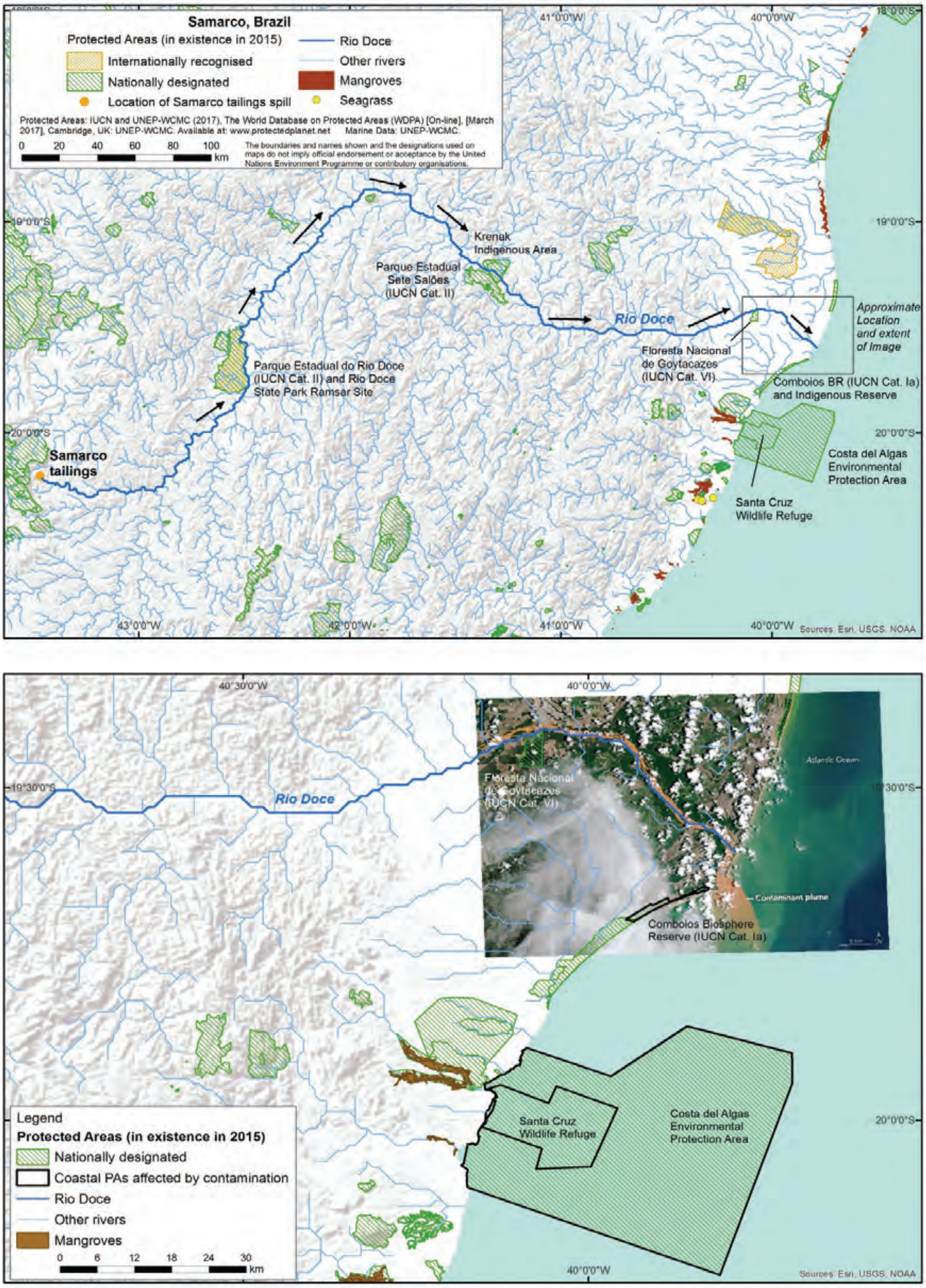
A number of environmental problems associated with mining stem from contamination and competition in relation to surface water and groundwater. The mining industry is a heavy user of water. It has been estimated that 1,600 litres of water are used to obtain 19 kgs of copper (CSIRO, 2016). This demand creates competition for water between mining and other uses, especially agriculture. Groundwater lowering for mining further aggravates water stress. According to ICMM/IFC (2016), 70 per cent of mining operations of the six largest mining companies are located in water-stressed countries.

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

> ***The extent and severity of mining impacts on the environment depend on the type of operation and the sensitivity of the environment [...] The impacts of mining can extend beyond the operations of the mine.***

66 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).

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 that 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 agricultural soil (via irrigation).
- Leakages and collapse from Tailing Storage Facilities (TSF):[67] 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.[68]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. Figure 5.1gives 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 watercourses 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 water extraction can reduce the availability of water for animals and birds at crucial times and locations. In extreme cases, long-term changes in the 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 plant and animal assemblages over time. Factors such as changes in sedimentation or silt can also impact the way ecosystems function and may disrupt the environmental, social and economic services they provide. 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 Figure 5.1, 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.

67 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).

68 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 greatly exceed tolerable levels. The river's toxic water composition now renders it useless for irrigation or consumption.

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 life cycle. Migratory routes may be also be disrupted and cause long-term impacts on migratory patterns. In a similar way to impacts on freshwater habitats, potential contamination from discharge, 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, localized and particularly vulnerable to external impacts;
- 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.

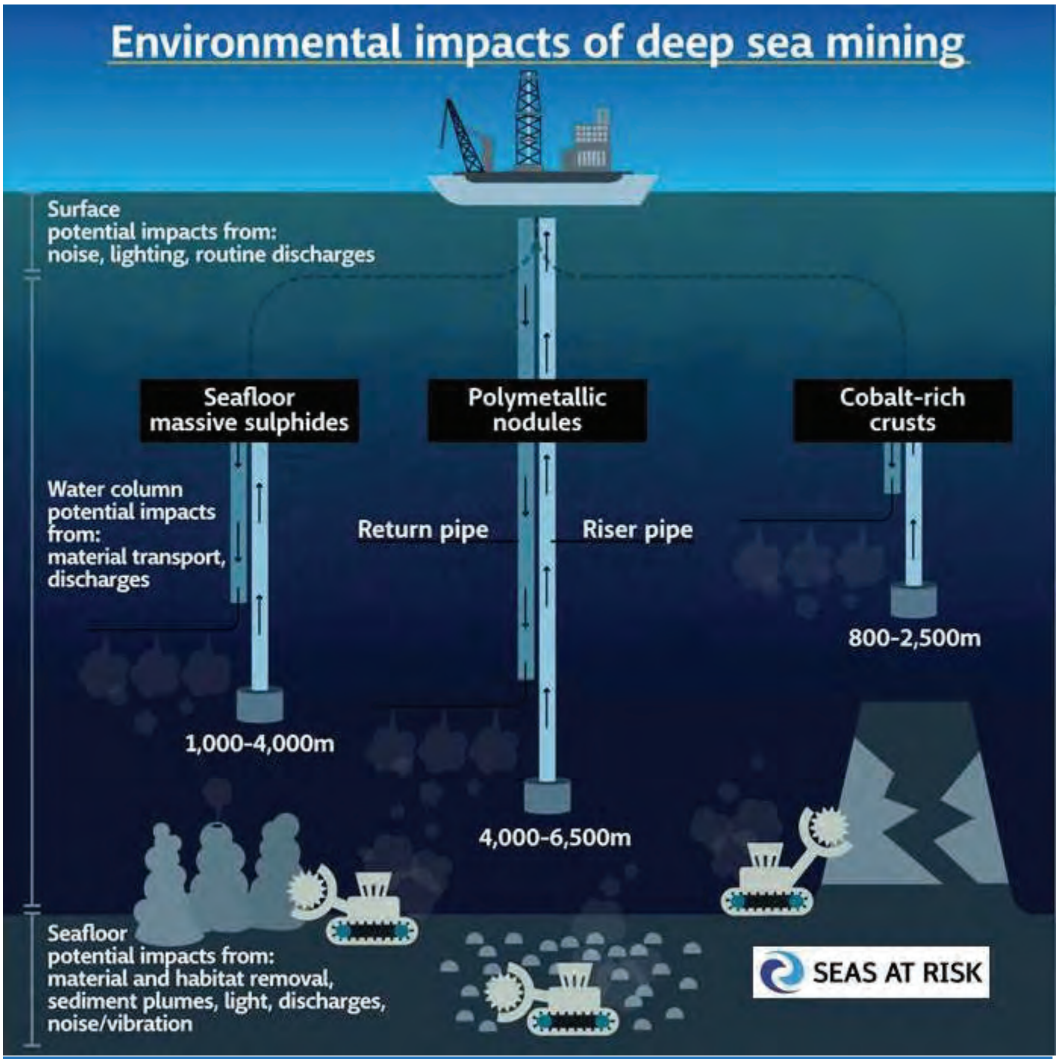
Source (Ali, 2017).

- 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 - like in Indonesia, the Philippines, Papua New Guinea and Norway - often dispose of tailings directly into rivers or the sea. Currently, sixteen 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 that deep-sea disposal is associated with a 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.

Recent research has shown that deep seabed mining is likely to cause many adverse impacts on deep-sea ecosystems, including a loss of habitat and biodiversity

Figure 5.2. Environmental impacts of deep-sea mining



Source: Ali, 2017.

5.1.3. Solid waste production[69]

Depending on the specific ore grades and 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 that, as earlier noted, are a major hazard.

Box 5.2 presents how UNECE is supporting member countries to address this concern.

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.

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

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 in which UNECE provides good practice guidance. 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 the event of 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. Effluent from mining tailing (particularly from coal, iron and uranium ore mines) is 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.

Source: UNECE (2014)

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, and this in turn can 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 photosynthesize 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, significantly reduce soil particle sizes, thereby aggravating 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 above). The overall impacts on soil health and biodiversity can be very significant in terms of 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.

Producing one tonne of usable uranium oxide requires processing 3,000 tonnes of waste, which often contain elevated levels of radioactivity (ECA, 2011). In addition to 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, thereby 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).

A study by Murguia (2015) showed that large-scale metal mining activities exert or may intensify pressures on bio-diversity by directly and/or indirectly changing habitats in an adverse way. 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 (especially bauxite and silver) 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 are 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 required that projects achieve '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 blueprint for best practice in a number of industries, including mining and oil and gas.

Habitat removal can lead to population declines in 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, thereby 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.

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, and is located 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).

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 49 billion euros and employs close to 287,000 people. The potential impact of this industry on biodiversity has been acknowledged. In response, Europe has implemented actions to address the loss of biodiversity resulting from extractive activities (EU, 2010). Natura 2000 is the centrepiece of the EU nature and biodiversity policy. This is an EU-wide ecological network of nearly 26,000 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 minimized 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 high-quality ecological niches (European Comission, 2010).

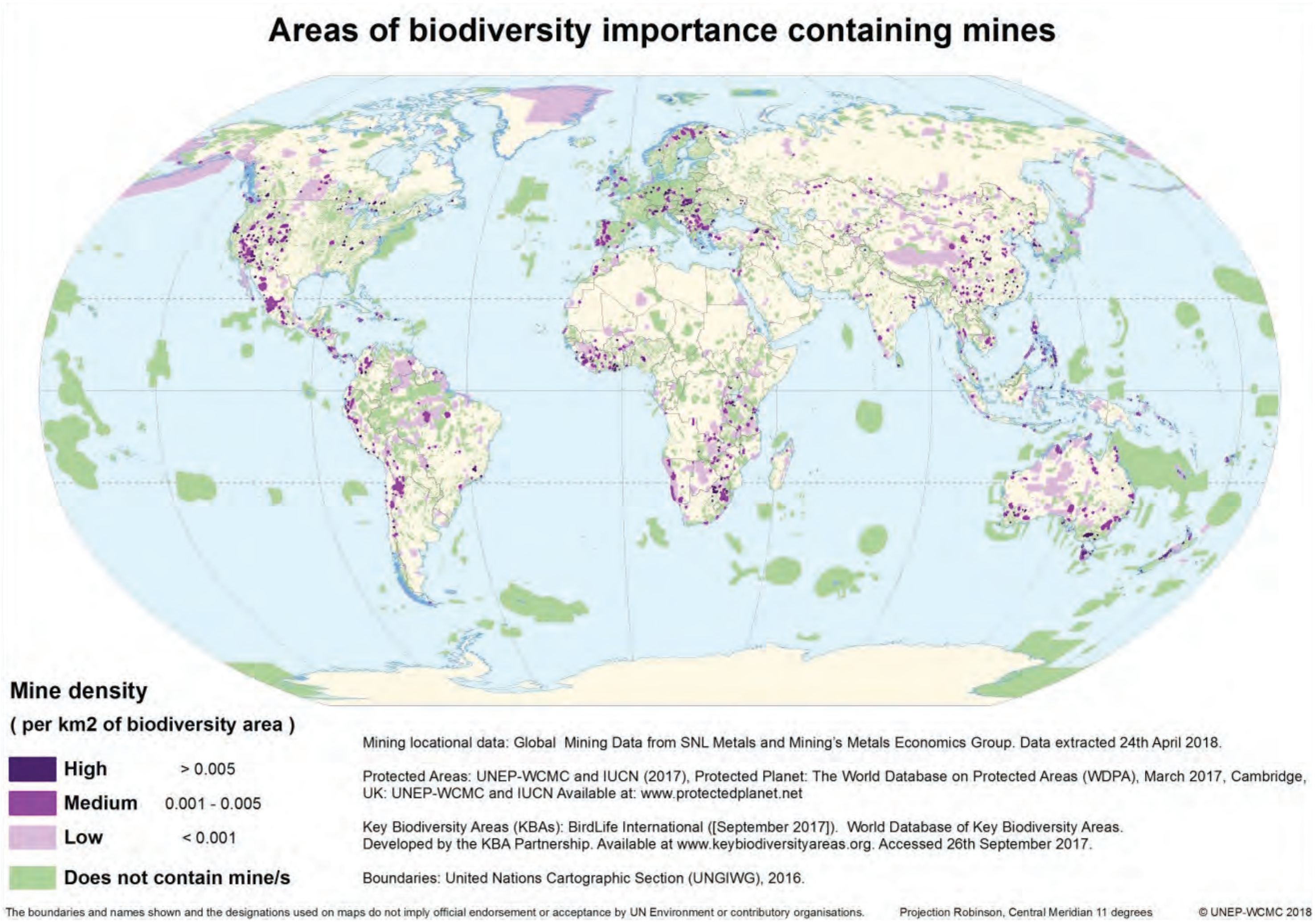
Europe also regularly assesses the guidelines to determine if they are still relevant. The REFIT Fitness Check Tool is a comprehensive policy evaluation of the Birds and Habitats Directives. The evaluation assesses if the Directives are fit for purpose by examining their performance against five criteria: 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 the EU's nature policies.

In a recent evaluation (European Commission, 2016), several industry stakeholders referred to the overly restrictive application of the provisions of the Nature Directives by the authorities, which has led to a de facto ban on activities in the Natura 2000 protected areas in some parts of the EU. 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 implementation and contribute to reaching the EU's biodiversity targets for 2020. The Action Plan, which 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. Aims include identifying best practices on investment for extractive operations and for land rehabilitation and restoration by non-energy mineral extractive industry with Member States and other stakeholders, in order to complement the existing guidance on non-energy mineral extractive industry (European Comission, 2017d).

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

Figure 5.3. Areas of biodiversity importance containing mines



Source: UNEP-WCMC & IUCN (2017).

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 United States, China, Australia, Brazil and Canada. These areas of biodiversity importance vary in their size and degree of vulnerability and irreplaceability. World Heritage sites are designated based on 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 the impacts of mining can therefore be particularly severe and could contribute to a global extinction of species if not managed properly.

Figure 5.3 shows areas of biodiversity importance (Key Biodiversity Areas and Protected Areas) globally, highlighting those that contain mines. These are categorized according to the number of mines per km2 of biodiversity area.

Areas of biodiversity importance with relatively higher numbers of mines (proportional to the designated area) have a greater the potential for negative impacts from mining. 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, there have also been 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 affects 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.

It is also now widely recognized that available mineral deposits are increasingly deeper and of lower ore grades, and that this will lead to growing demand for water as well as greater mine waste. This raises energy consumption and increases the industry's climate footprint (Rüttinger & Sharma, 2016; Dolega *et al.*, 2016). This close connection between extractive industries and climate change is further complicated by some of the following factors:

- Most mine infrastructure was designed on the assumption 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.

Box 5.5. Methane management

Coal production, transportation, storage and use account for approximately 40 per cent 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 CO2. For the top three world producers of coal, total coal mine methane is estimated to range from 5.5 billion cubic metres to 19.3 billion cubic meters (289.8 Tg CO2e or 289.8 Tg of carbon dioxide) (United States EPA, 2009). The health, safety and environmental impacts of methane released during coal mining also need to be addressed. In many underground coalmines, methane creates unsafe working conditions that can result in human fatalities. At the same time, the safe extraction of methane saves the lives of miners (even though methane extraction has its own risks), while 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 significantly reduced methane emissions from even the gassiest mines, deployment of these technologies and movement towards zero methane-related fatalities and lowered methane emissions 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 coalmine 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.

- 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 recognized as 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 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 occur 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 required by an operation (such as health care). 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 and diversification of livelihoods. If not properly planned 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 per cent, 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.*, 2013; Laurance *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 so forth. 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.

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 so forth.

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 represented up to 40 per cent of households in 2015 (World Bank, 2015). Migration of mine workers also leads to an increased prevalence of HIV due to prostitution around mining sites (Hargrove, 2008; Sagaon-Teyssier *et al.*, 2017). HIV/AIDS has a 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 caregivers 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 who not integrated into the local community or subject to its social constraints means a breakdown of norms that keep order and harmony, thereby creating tensions that can lead to violence.

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

> *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.*

Box 5.6. Displacement from the Thach Khe iron ore mine

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 per cent of Viet Nam'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 per cent 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 who had not been resettled on time were exposed to water shortages 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 relocation are common features of mining operations. This is a serious human rights violation, especially for indigenous people whose livelihoods are closely intertwined with the land. They derive much of their livelihoods from biodiversity services, and they have accumulated significant relevant knowledge for their sustainable use. 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 society. The competition for resources (land, water and revenues derived from extractives activities) can lead to serious conflicts that can lead to parties taking up arms. Mining companies can arm themselves to protect their properties; local people can form militias to protest 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 may pay wages that are barely above the poverty line.

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 result 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 represent 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 on new dimensions. Local militias can easily morph into 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, or directly operating mineral extraction sites.

Conflict situations are more likely to attract extractive firms that have higher risk tolerance and lower reputation concerns. Such firms are much more likely to have poor industry practice in terms of the environment, human rights and fiscal performance. Conflicts then exacerbate all the other challenges, and mining can become a "threat multiplier." Conflict driven by minerals is now a major item on the global agenda and 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 the potential to create serious health and safety challenges 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 into human health challenges. For instance, an environmental assessment of the Democratic Republic of the Congo found extremely significant 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 (Schuler *et al.*, 2016a). Furthermore, underground mining has specific risks such as subsidence, slopes collapse and methane leaks. The extent of these impacts is recognized in some regulatory systems in the form of specialized agencies such as the Mine Safety and Health Administration (MSHA) in the United States.

5.3. Application of S-LCA to assessing social and environmental impacts[70]

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 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,[71] Europe,[72] and China.[73]

Recent years have seen a tremendous increase in the literature related to environmental LCAs (E-LCA) of the mining and metals production sector.[74] 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, alongside a variety of processing routes (Chapman & Roberts, 1983; Gupta ,2004).

Common environmental impact categories include, 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), as well as water use and land use related indicators. The metal and mining industry also routinely conducts LCA studies using industry data (Baitz, Bayliss, & Russell-Vaccari, 2016). However, studies are often conducted independently leading to potential inconsistencies, for example in the system boundaries and background data sources used.

Social LCA (S-LCA) integrates traditional LCA methodology with additional social and socioeconomic aspects. Unlike traditional LCA that focuses 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 of several approaches to evaluating 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.

70 Other approaches include 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.

71 https://www.nrel.gov/lci/.

72 http://ec.europa.eu/environment/ipp/lca.htm.

73 http://www.ike-global.com/products-2/chinese-lca-database-clcd.

74 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.

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 initiative 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 methodological reference framework for S-LCA, especially for the first two phases of S-LCA (goal and scope definition and life cycle inventory). As 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 lacking. 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 (Sala *et al.*, 2016).[75]

Use of S-LCA database for preliminary screening of social risk in raw materials industries

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) [76]
- A social risk assessment module (for each indicator, risk levels are assigned and converted into characterization factors).

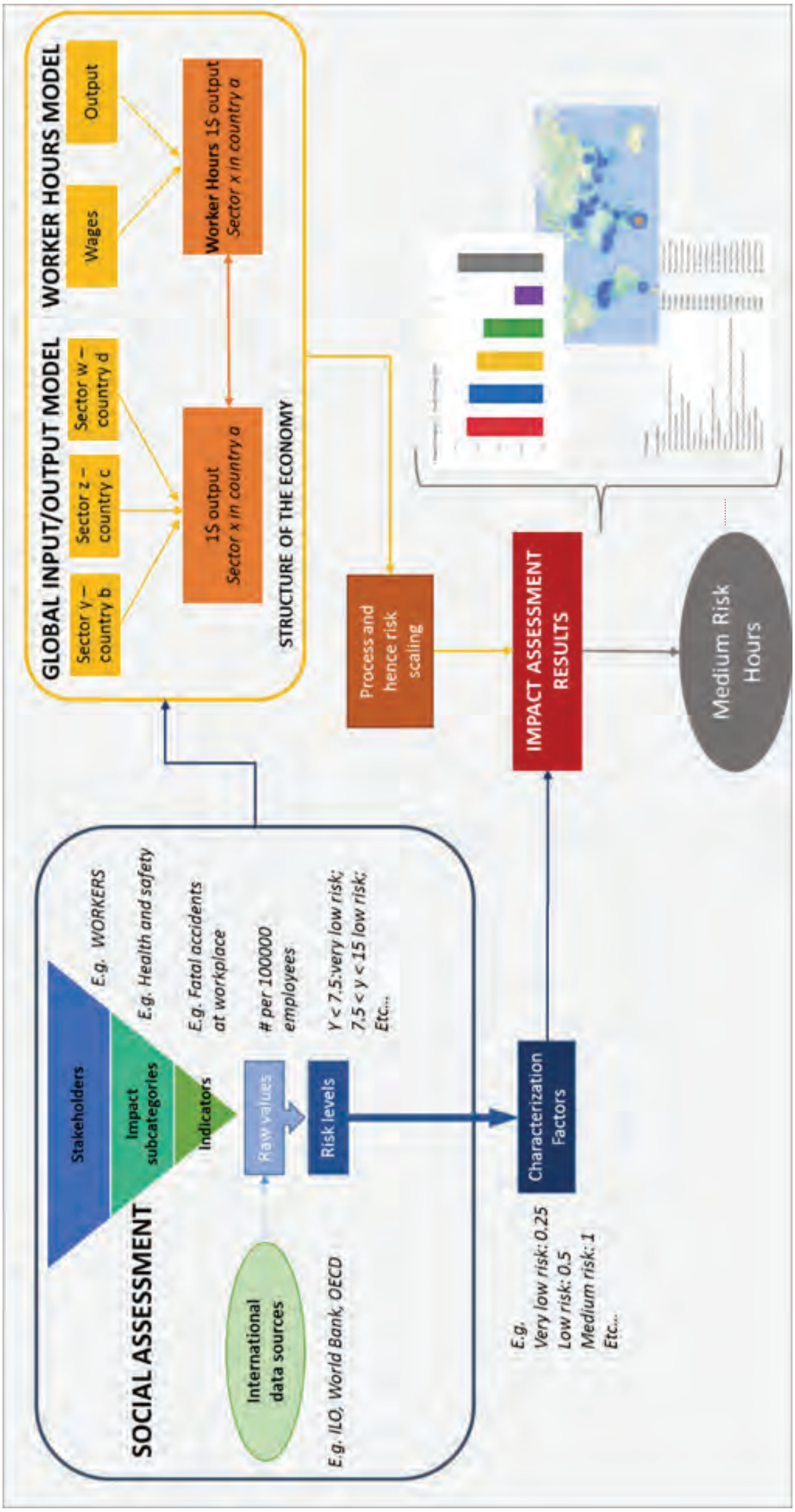
By multiplying the level of social risk in country-specific sectors by the worker hours per dollar of output in each sector, the S-LCA database quantifies (in an additive manner) the distribution of potential social risk along product supply chains. Risks are quantified in "medium risk hours", which 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 (Appendix 5).

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.

75 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/).

76 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.

Figure 5.4. General structure of social life cycle assessment databases



Source: Authors' representation

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).

Uncertainty and data quality

Data quality is a critical issue in 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 above. 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 were 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 due diligence implementation in supply chains. 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 are unavailable, regionally representative countries are used as proxies); and
- The different reporting schemes used in data collection by different countries (for instance data, for the same indicator on labour accident can come from insurance records, labour inspectorate records and so on).

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.[77] The European Union 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 analyses the EU supply of aluminium and the social impacts related to the import of this material from different countries. The entire EU supply of Al is composed of 36 per cent of domestic production (mainly from Germany, France and Spain) and 64 per cent imports from extra-EU countries (mainly Norway, Russian Federation, Mozambique and Iceland).

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

In this report, we calculate the social risk of metal production sectors in producing countries using the PSILCA database and weight them according to their share in EU supply. Figure 5.6 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 the Russian Federation contributing the most to these impacts.

Figure 5.7 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 per cent of the total, its contribution to social impacts is generally lower. Similarly, Norway's share of aluminium supply to the EU is 14 per cent, 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 consider the shifting of burdens due to international trade and imports.

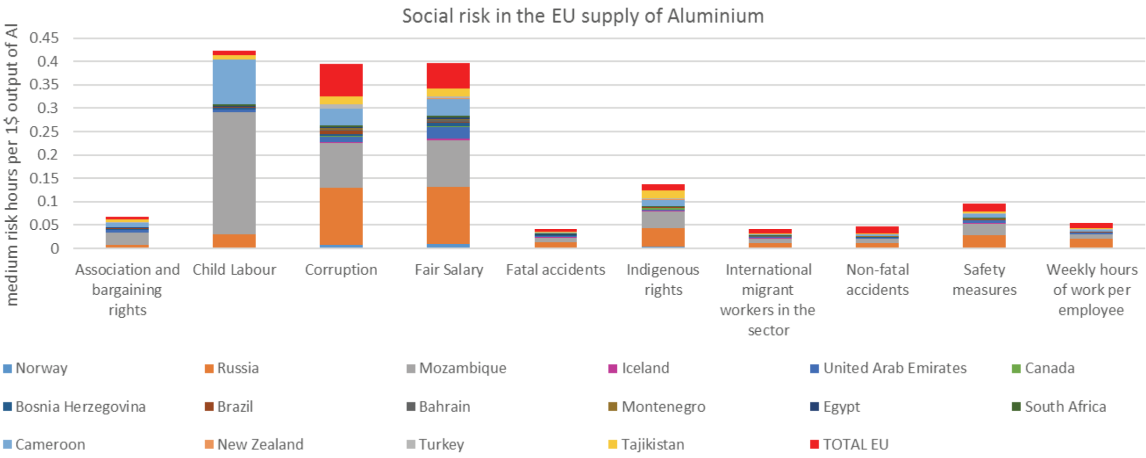
While the assessment of environmental impacts can benefit from more established techniques (E-LCA), the quantitative assessment of social impacts along the supply chain is still in its early stages. S-LCA databases offer a wide spectrum of information on global supply chain working conditions and human rights that could be used for a 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, the fact that the analysis is at the level of country-sectors means that possible regional differences within the country or company behaviour might not be fully taken into account. Further refinement of these metrics can, however, be undertaken at the sub-national level, particularly with the assistance of the corporate sector (see Appendix 5.1 for examples of applications of S-LCA).

5.3.2. Tracking impacts at the corporate level through improved governance

The United States 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 1990s, 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.

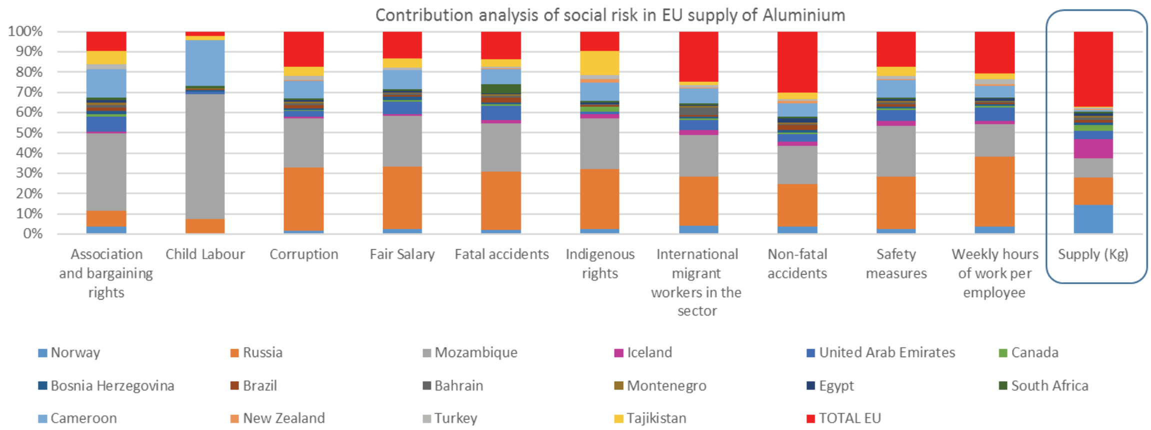
Design should be geared toward quality and must anticipate problems, as opposed to reacting to mistakes. From an environmental standpoint, this may be achieved through management changes, technological improvements and the establishment of self-correction mechanisms. There is a need for corporations to institute this management mechanism and for governments to encourage its establishment through institutional cooperation. TQEM programmes 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 United States corporations have developed TQEM programmes that have also been embraced by the larger mining companies. However, 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 non-linear material flows.

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



Source: Authors' preliminary assessment calculated using PSILCA database.

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



Source: Authors' preliminary assessment calculated using PSILCA database.

Industrial ecologists suggest that a product remains the responsibility of the producer until it is actually absorbed by the system 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 that accrue from the creation and distribution of wealth (Shrivastava, 1995). His analysis is based on 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

Stockpiles at Sundown. Photo: mabus13 © Getty images

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 per cent of our economy is now in the service sector and hence many of the changes recommended for the manufacturing sector will inevitably need to be reinforced in the service sector.

The measures described above are by no means an exhaustive listing, but provide a skeletal set of points to consider when reconfiguring a corporation to account for material cycles. These measures also attempt to bear in mind that manufacturing does indeed provide many jobs, but that services associated with product repair and recycling can provide comparable impacts when 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 often linked to conflict and can prove to be less amenable to formal regulatory reform.

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, 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 the 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-take back by offering incentives for recycling and return of products.
- Provide services for product repair or telephone guidance for home repairs with modest fees as a revenue stream, rather than encouraging obsolescence.

Box 5.7. Information deficits on impacts and conflict escalation[78]

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 the 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 US$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.[79] 80 per cent of conflicts were related to the environmental impacts of mining operations, above all the availability and quality of water resources. The International Finance Corporation and the International Council of Mining and Metals have found that 70 per cent 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 (EITI, 2017). 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 US$1.9 billion worth of government revenues from oil, gas and minerals have been disclosed so far. [80]

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 the 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. Excluding this data from public disclosure creates 'information asymmetries', where stakeholders have unequal access to information. So far, efforts to increase 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 life cycle.

There are also large risks of corruption during procurement, such as companies being forced to procure from businesses connected to political elites.[81]This needs to be addressed.

78 Contributed by: David Jensen and Inga Petersen – UN Environment, Post-Conflict and Disaster Management Branch.

79 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.

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

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

5.4. Conclusion

Environmental and social impacts are the main factors leading to a lack of public acceptance in the extractive sector. The fact that even closed mines can have a 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, 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 within the second part of this report, examines governance challenges of the extractive sector.

Appendix 5. 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 the 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 represent top-down approaches collecting data from international sources and input/output models. The main criteria applied for country selection is international coverage (at least one country for each region) and the relevance of the mining sector in the national 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, also includes 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 5.1 shows the set of stakeholders, impact subcategories, indicators and data sources used for the assessment. This is drawn from the PSILCA database.

Figure 5.8 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 based on a preliminary elaboration of data from PSILCA database. Considerable uncertainties might exist (as discussed earlier).

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 and C have a Human Development Index (HDI) higher than 0.85; D, E and F have an HDI between 0.75 and 0.85; and 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 the exception of the corruption category). Stronger legislation on labour rights and better governance may be some of the underlying reasons for this difference in social risk results.

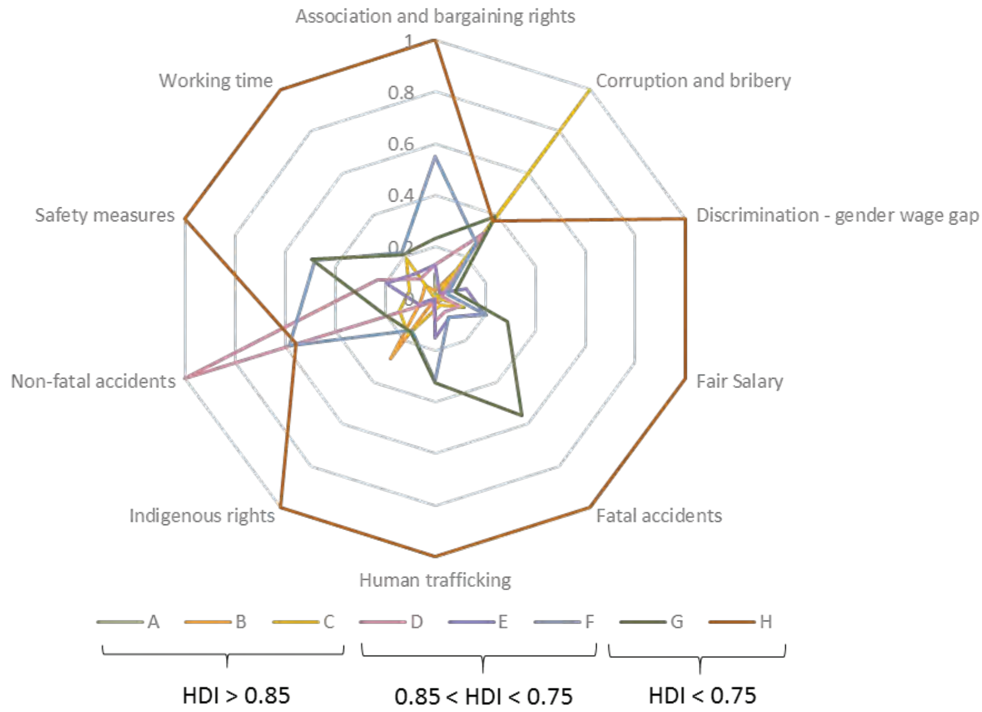
When comparing countries with similar development status, more nuances in social risks are visible. Figure 5.9 shows the relative social risk results of countries having a Human Development Index higher than 0.8, which corresponds to countries A, B, C, D, E from the original set shown in Figure 5.8. Some social risk 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).

Table 5.1. An example of indicators and data sources used in social LCA

Stakeholder	Subcategory	Indicator	Unit of measurement	Data Source	Specific Sector
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	Accidents rate at workplace	Cases per 100,000 employees and year	ILOSTAT	Yes
	Safety measures	Presence of sufficient safety measures	OSHA case 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 Characteristic 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 faced by indigenous people	Score		No

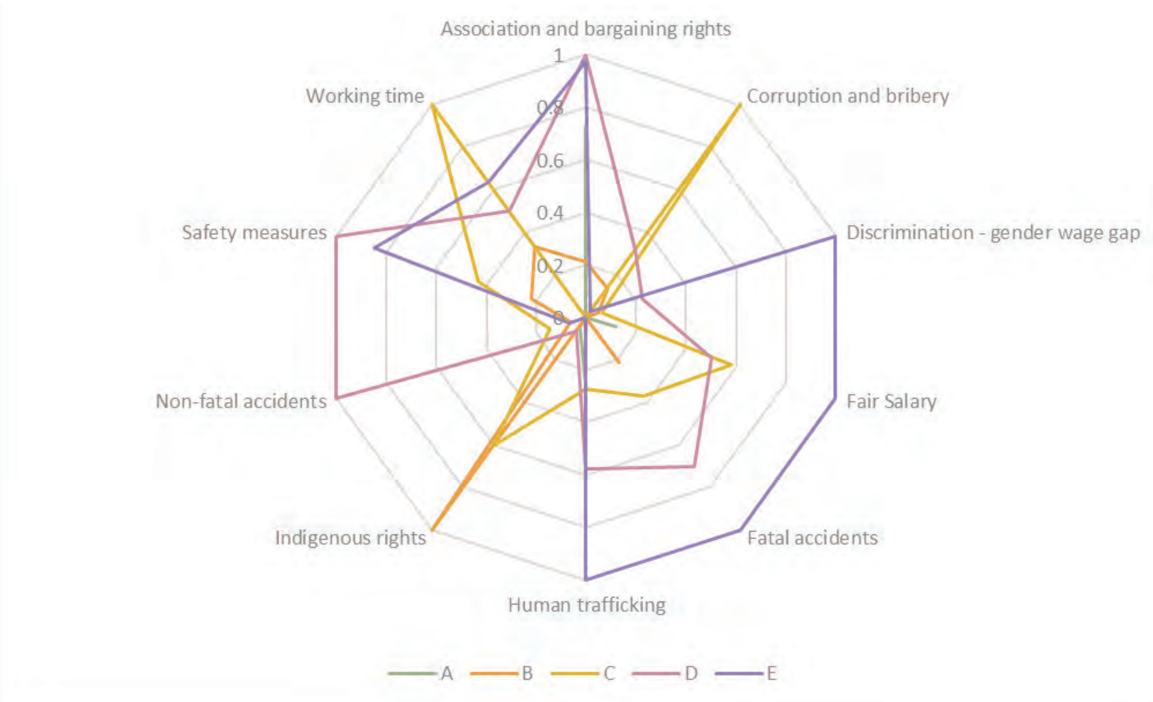
Source: Authors'compilation

Figure 5.8. Illustration of possible social risk in the mining sector - country comparison



Source: Authors' analysis

Figure 5.9. Illustration of possible social risk in the mining sector - most developed countries.



Source: Authors' analysis

Yellow truck drives along a winding path inside an open cast mine in New South Wales, Australia. Photo: Jason Benz Bennee © Shutterstock

PART 2

MINERAL RESOURCE GOVERNANCE TODAY

Mining cart in silver, gold, copper mine. Photo: TTstudio © Shutterstock

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, this contribution 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, realizing 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[82].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. This is difficult, and poor handling of it 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 into lasting benefits (Pedro, 2006).[83] Doshi *et al.* (2015) make the point that 'governments in many resource-rich countries face two important 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?' These questions involve facing macroeconomic management challenges of risks and absorptive capacity:
    - 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.
    - 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 policy would therefore 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 resource

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

83 Two underlying principles here are the 'common good' nature of extractive resources and the desire for 'intergenerational equity'(see chapter 9).

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)[84] However, 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 USD 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 hunting and fishing livelihoods 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 just as long.
- Sustainable development requires mineral assets to generate material benefits for the future generations that are deprived of them. This introduces accountability issues in terms of how much wealth is generated and how it should be distributed (ECA, 2011).

84 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.

- Capturing a fair share of income flows that from 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 unfavourable 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 US$300 to US$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 US$10 billion but the government revenue was only US$240 million or 2.4 per cent of the export revenue (APR, 2013). It is a challenge to ensure that governments receive a fair share of mining revenues in a competitive yet dynamic world. 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 socioeconomic development. A properly structured fiscal regime seeks to balance these objectives.

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 the latter's stronger negotiating 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 just a few multinationals control production and thus have significant leverage in negotiation; and

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 (mostly foreign) investors 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; and 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 a 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 at short notice (if necessary), 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 multidisciplinary 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 to 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 the actions to implement the Initiative is the CONNEX Support Unit, which provides independent, high-quality, demand-oriented, multidisciplinary and rapid support and expertise during the negotiation of large-scale, complex investment contracts in the resource sector. Government bodies of developing countries can request support: (see http://connex-unit.org/).

- 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 briefly described in Box 6.1 above).

Sustainable development requires mineral assets to generate material benefits for the future generations that are deprived of them.

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 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. According to UNEP estimates (2009), as much as 40 per cent of intrastate conflicts are linked to or fuelled 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 demonstrated in the use of international conventions, and downwards to sub-national and local scales via the devolution of central government's 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) argues 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.[85] For instance, legislation on CSR reporting is also being debated in the European Union (GIZ, 2003).

Globalization is changing the global governance landscape. As globalization progresses, new challenges and actors are coming into play. 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 part of a general trend towards natural resource investments moving into countries from 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 more sustainably produced products and requiring that global supply chains provide these guarantees. This is resulting in a re-arrangement of global supply chains. Thus, actors at different points along the supply chain are starting to request information about sustainability 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 consumer demand is also providing a business opportunity for some to charge a premium under various ethical labels such as Fairmined gold.
- Investors are increasingly seeking to invest in businesses that support sustainability, leading to a rise of sustainability-driven investments such as the Dow Jones Sustainability Index. Consequently, companies that seek 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 changing the investment grade depending on level of compliance to the Extractive Industry Transparency Initiative (EITI) standard could arguably be an effective way of enforcing transparency (Acosta, 2013a).

The changing governance landscape has outstripped the abilities of central governments and international bodies to develop effective regulatory frameworks and institutions (Darby, 2010). To respond to the changing landscape, new governance frameworks are needed. Some actions are proposed below. Governance tools need to be more flexible and anticipatory. Such adaptive governance also calls for

85 CSR is a continuum going from charity to responsible business conduct. Thus, CSR may or may not include environmental aspects or considerations. Scrupulous companies may abuse CSR by providing charity while polluting the environment. Ghana (ACET, 2017) and India are introducing CSR into legislation.

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 (on the basis 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 and 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 a 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 programmes (Darby, 2010). Particular attention should be given to traditional authorities, as they often grant social licence to operate.[86] Box 6.2 on the next page presents a case study in Ghana where a mining company undertakes activities as part of its social licence to operate. State and provincial governments, as well as traditional authorities, also play a crucial role in managing conflicts between resource users. They also play a critical role in ensuring that revenues generated by major natural resource projects are converted into sustainable development in the communities where those resources are located.

The role of governments vis-à-vis corporations delivering development outcomes needs to be 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 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, policymakers and academics to: (1) focus, refine and expand the concept of governance to inform analysis of socioecological 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 the 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 a need for a reconceptualization of the State towards a more practice-oriented perspective that seeks new entry points for natural resource governance in fragile States. Atanasijevic (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).

Effective solutions to natural resource management challenges demand working across jurisdictional and sectoral boundaries; that is, a networked system of governance.

86 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 (in the form of asocial licence to operate).[87] In Ghana, the formal gold mining sector has been particularly active with some ambitious CSR programmes. 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; and (5) business-to-business encounters - this is supplier–buyer matchmaking where potential clients are paired with ALP businesses for commercial relationships 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 US$14.5 million. The company contracted business worth US$272 million with Ghanaian businesses in 2008. The businesses under the Ahafo Linkages Program also accessed US$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 US$144.3 million, accounting for over 60 per cent of the Newmont Ghana's total purchases in 2009.

Source: IFC (undated).

87 Some see CSR as way to salve or soften the concerns of local communities.

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

In addition, there is a need to shift from a Western-centric[88] governance model and engage emerging countries as co-creators of global governance. A serious and long-term diplomatic commitment is urgently needed to improve the quality of the dialogue on these issues with governments, companies and civil society groups in emerging countries. Darby (2010) argues that inviting these countries to participate in existing international standards will continue to fail. Enrico and 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 is to explore how instruments from emerging countries can be leveraged; for example, China's Due Diligence Guidelines,[89] 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).

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88 The Western-centric governance model puts great emphasis democratic institutions, transparency and accountability, respect for individual human rights and a limited government role.

89 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 that 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 such as 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[90]

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 Lapland 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 per cent of the voting share power from obtaining new properties with forests, mines, hydropower or peat.

In Norway, 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 government refused 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 provisioning from 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 because of a political desire to regulate all private resource industries). Publicly 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: First, resource nationalism was messy. Even in fairly stable and almost religiously and ethnically 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 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 foreign companies were allowed to retain resources they already owned unimpeded. This likely reduced the level of conflict between the Scandinavian governments and private business, as well as foreign investors' home governments.

90 Contribution by Andreas R.D. Sanders.

Third, 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 sets of national resource policies.

Fourth, building independent State capacity was vital. For the resource nationalist policies to work, they had to be devised in such a way that did not 'throw the baby out with the bath water'. In order to avoid unintended 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 much influence over the shape and form of regulations. The two countries tried to solve this in 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.

In conclusion, the results varied considerably. 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. However, it is also possible that the resource nationalist interventions also mollified the public's uncertainties around economic globalization. The retention of some control over politically sensitive sectors may explain part of the foundation for the broad and stable support for a pragmatic open economy in both countries.

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 [...] more research is needed to better understand how financialization impacts the more fundamental aspects of commodity markets.

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 such as 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 and 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 the 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 US$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 is 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 and 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 more shared 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.

According to Tang and Xiong (2010), however, 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, the same authors 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 spillover effect.

In addition, more research is needed to better understand how financialization impacts the more fundamental aspects of commodity markets.[91] Cheng and Xiong (2013) investigate whether financialization has affected commodity markets through the mechanisms that underpin the functioning of these markets (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 modelling of the various 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 affect the real economy and the global financial markets.

91 Research can then be used to support better regulation of commodity markets. As pointed out in chapter 2 (Box 2.1) traders already had a stranglehold on commodity trade and traders do tend to be located in the global financial centres. For resource-rich countries, one avenue is therefore to lobby for countries hosting commodity trading hubs to better regulate commodity trading and their financialization. CSOs in Switzerland (which is one of the most important trading hubs) are already 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 traders (although this is a much more difficult route).

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 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, inter alia, 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 into increased flows of foreign direct investment. It calls for a balance between the need to protect investors and the importance of providing developing countries with the policy space 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 on 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 be to the detriment of the human or collective rights of the population affected by extractive activities, as well as to 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 spirit of a narrow investment protection clause'.
- Foreign investors can directly bring a claim against the host State (without the need to fully exhaust domestic remedies) before an international arbitral tribunal set up 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 per cent 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 an environmental permit based on an impact assessment. Disturbingly, 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 are granted (for example, a permit to explore or an environmental permit)'.

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 and Viñuales (2014) argue that investment arbitration is just 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 a requirement that local remedies be exhausted first.
- 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 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 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.

> *Arbitration and foreign investment agreements seem to be trampling on the principle that peoples and nations have sovereignty over their resources.*

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 governments should use the following checklist before negotiating a new IIA to attract foreign mining companies. The government should:

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

6.1.7. Ilicit financial flows (IFFs) and sustainable development

As indicated previously, one of the key prerequisites to converting extractive wealth into sustainable development is capturing a fair share of revenues that come from the 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 are hard to collect. Nonetheless, APR (2013) estimates that Africa annually loses close to US$38 billion due to mispricing, an amount equivalent to total ODA received by African countries. The continent also loses an additional amount of US$25 billion annually through other illicit flows. At a global level, Kar and Curcio (2011 cited in Le Billon,

2011) estimate a total of US$1.2 trillion in illicit flows globally in 2008. This was ten 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 US$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 that were then used to finance conflicts led to an international outcry that resulted in 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.[92]

92 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).

The common thread in illicit financial flows is the use of tax havens to channel the flows. However, 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. Tackling such flows is now a topic on the global governance agenda. Some global initiatives such as OECD guidelines (anti-bribery convention, corporate governance) and 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 state the price quantity, quality or other aspect of trade in goods and services incorrectly or inaccurately, 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 a need for comprehensive databases and benchmarks on prices of goods and services that can support tax authorities to analyse imports and exports. There should 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 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 reaching full disclosure by 2020. The early EITI pilot mapping beneficial ownership in 11 countries points to a number of gaps and difficulties in getting to the bottom of complex corporate structures, thereby highlighting the fact that significant work is needed at the technical and 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.[93] 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 to expand their relevance to efforts to reduce illicit financial flows. Countries should connect anti-corruption, illegal exploitation and tax agendas. They should also foster dialogue between policymakers in these different areas. Identify options for synergies between increased revenues from taxation, formalization 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 maximize tax payments in the poorest countries. While companies would still aim to minimize global tax payments, such a standard would also encourage maximization of taxes in the poorest countries.

6.1.8. From the formal versus 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 carry out extraction. However, on the ground, there are many entities that extract natural resources under what would be called "informal" arrangements.

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 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 (Lahiri-Dutt, 2014). They point to four economies: the State-owned enterprise, Coal India Limited (CIL), representing the 'national coal' economy; the private entrepreneur-owned collieries producing coal that is captive to power plants represent a 'neo-liberal coal' economy; then non-legal small-scale mines produce 'statecraft coal'; and the innumerable poor, spread throughout India's coal-bearing tracts, illegally produce 'subsistence coal'. They argue that, although the economies may look superficially different, the various production regimes create several sub-economies that interact in interesting ways. They show that, instead of a clear-cut formal-informal division, .it is more like 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

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

violate human rights and undermine sustainable development by essentially subcontracting poor practices informally. For instance, company may claim compliance with best practices while it sources minerals and metals from informal suppliers who are not observing them. More importantly, the formal company can be a shell for money laundering from illegal and informal mining activities (as 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 listed in the next few paragraphs (see also Chapter 3).

With regard to informal mining, it would be helpful to re-consider current mindsets and legal frameworks altogether. The formal and the informal domains intersect, overlap and interact with each other instead of existing in a binary relationship. However, this interdependence is rarely acknowledged in policymaking. Lahiri-Dutt (2014) argues that, to deal with the diverse worlds that recognize the informal-formal continuum, we should 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 livelihood for many, whereas formal extractive activities destroy other sources of livelihoods – thereby forcing people to go into artisanal mining like 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 laws (Minerals Law, Land Law and Personal Income Tax Law), which have made it possible to "formalize" 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 needs to be a better understanding of the overlap between formal and informal mining and the need for ways to address this. 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. Furthermore, demand for minerals and metals will 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 during their operational lifespan and through decommissioning. Climate change may 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 dam 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 improved understanding of climate-change risks and for mitigation and adaptation strategies to be developed. 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). Greater collaboration is also needed 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 demanded that EITI modify the standard to ensure that fossil fuel companies disclose whether or not their projects can proceed in a 1.5 or 2-degree C world (Peters, 2016).

Policymakers 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 socioecological 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 face due to weak capacity and institutions. Host governments 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 the 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 to manage the "Dutch Disease". Developing countries, however, and particularly those with high levels of international debt, may be cautioned against

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 such as infrastructure.
- A heritage fund, which captures the resources and saves them for future generations. These funds are long-term investments to be drawn on by future generations.

By their nature, 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 macroeconomy by keeping some assets offshore. It can smooth resource revenues to make budget allocations more predictable. In addition, 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, some of the skills and functions associated with SWFs (relating to asset management) are not traditional government functions. This implies that new skills and new institutional set-ups would be required. Governing, managing and operating an SWF can be inordinately challenging, as these are organizations modelled on high-performance Western institutional investors (Clark & Monk, 2012). For SWFs 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 are no substitute for good governance. In fact, they make the need for good governance even more crucial.

Furthermore, 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).

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. According to APR (2013), such funds have returns of 1 per cent while investments in infrastructure have returns of 15-20 per cent and can add about 2 per cent 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 programmes can be integrated with public works programmes 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.

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, by 2010, the Ahafo linkages project implemented by Neumont Mining in Ghana had assisted in the development of 125 local suppliers with business valued at US$4.7 million. The Ghana Chamber of Commerce, the mining commission and the International Finance Corporation (IFC) are building on this and 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, there is also a 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 by impacting the 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 there is therefore often a need for greater technical capacity in 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 governments further constrain their ability to place demands on corporations. Ensuring that resource wealth is channelled into building effective government institutions to regulate the mining sector will be an important component of this sector's ability to contribute to sustainable development.

> ***In addition to the capacity of host countries to manage resource wealth for sustainable development, there is also a need for capacity to regulate the mining sector [...] Impacts arising from this sector either directly or through associated activities can undermine sustainable development.***

6.1.11. Planning for mine closure

If mine closure is not considered at the design of the mine, the impact of the mine closure can be very costly. Fixing this tends to fall to 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. Furthermore, the plan must be reviewed periodically'. ICMM points out 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 ongoing concern and a work in progress. Even in countries like Canada, which have put much effort into this, a NOAMI (2010) survey found that some risks are not addressed (such as third-party interference, catastrophic events or contingency planning for worst case scenarios). Besides this, most agencies managing mine closure lack consistent ways to store data and information, which is critical when addressing emergencies.

It is advisable 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.
- More appropriate technological alternatives for implementing a mine closure plan should be considered.
- More economically appropriate alternatives for carrying out mine closure should be researched.
- 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 with 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).

If mine closure is not considered at the design of the mine, the impact of the mine closure can be very costly.

Box 6.6. Almadén mine closure – an example of good practice

Mine closure usually poses two challenges. On the one hand, closed mines can pose environmental hazards as pointed out above and, on the other hand, 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 crucial that measures to mitigate potential environmental threats are accompanied by consideration of how the economic challenges can be addressed. Almadén 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 story of mercury mining. This has made it a global tourist attraction.

Source: UNESCO (2012) 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 at a slow pace. Nowadays, with technology maturing, and amidst 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 risk being significant and possibly irreversible, and are juxtaposed with short-term socioeconomic benefits. This poses an important sustainability question and a complex governance challenge. Governance of deep-sea mining in particular needs 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 authorize or even encourage deep seabed mining, as well as how to ensure that any deep seabed mining contributes to fulfilling societal needs (including economic development). This section provides a case study of future impact governance challenges relating to deep-sea mining and draws extensively on the final report of the MIDAS project [94] [95]and on a briefing paper by the Deep-Sea Conservation Coalition.[96]

6.1.12.1. Environmental governance of submarine deposits [97]

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 for exploration of mineral deposits with Member States and their contractors[98] (private or State-owned companies or agencies). 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 (thereby calling into question the application of the precautionary principle).

Under international law (UNCLOS), deep-sea mineral exploitation must be governed "to ensure effective

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

95 MIDAS D9.6: Report on the implications of MIDAS results for policymakers with recommendations for future regulations to be adopted by the EU and the ISA, 2016, http://www.eu-midas.net/library.

96 Deep Sea Conservation Coalition, 2017, Deep-sea mining: briefing paper, http://www.savethehighseas.org/resources/publications/deep-sea-mining-briefing-paper/.

97 http://eu-midas.net/legal_framework.

98 For an overview of contractors and exploration areas: see https://www.isa.org.jm/maps.

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 finalize 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 a few years later (assuming that 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"; and fundamental principles such as the "precautionary approach", "common heritage of mankind" and transparency. In relation to mining activities that may cause serious harm, the ISA has a 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.[99] The report concluded that the Authority is not yet fulfilling its obligations to ensure that activities in the area are carried out for the benefit of humankind. Outside the realm of ISA, individual countries can also authorize 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, where the Canadian company Nautilus Minerals is due to start mining for gold, silver and copper from hydrothermal vent zones.[100]

The economic implications of deep-sea mining are also still debated, and this is closely linked 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 to be questionable.[102] The social implications of deep-sea mining also remain to be considered. Local communities in places such as Papua New Guinea are campaigning for a ban, fearing deep-sea mining places their food resources and livelihoods at risk, and emphasising that they are the custodians of the world's largest ocean. At the same time, new technologies could emerge to make such mining more environmentally tolerable, while 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 and supply sides is likely to continue, and a clear understanding and governance path for the impacts of such frontier resources therefore becomes more urgent.

6.1.12.2. Deep-sea mining and Sustainable Development Goals

Clearly there is a need to reframe deep-sea mining governance in the 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[103] If deep seabed mining is allowed to

99 Seascape consultants, 2016, Periodic Review of the International Seabed Authority pursuant to UNCLOS Article 154, final report.

100 http://www.huffingtonpost.com/entry/deep-sea-mining-and-the-controversial-solwara-1-in_us_5964dbe9e4b0deab7c646bb5

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 Deep sea mining: Charting the risks of a new frontier.

take place, then governments must ensure that the ISA regulations include robust requirements for:[104]

- Strict limits on 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;
- Liability provisions, insurance and bonds, a redress and liability fund and a sustainability fund; and
- Transparency, including provisions to ensure public accountability and reporting, as well as 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, as well as 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 underline 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 the product 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 require 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 increasingly being explored as a metric to understand 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. Although energy and exergy have the same measurement units (Joules), exergy is a more useful concept for understanding material usage and sustainability and could usefully 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 the 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

http://www.dw.com/en/deep-sea-mining-charting-the-risks-of-a-new-frontier/a-42258847.

104 Deep Sea Conservation Coalition, 2017, Deep-sea mining: briefing paper, http://www.savethehighseas.org/resources/publications/deep-sea-mining-briefing-paper/.

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 fresh 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/ photochemical smog and various forms of toxicity). For further details on the ecological impacts of renewable technologies' (see the IRP Report (UNEP, 2016b)). It is also essential to track the energy-material flow relationship. Substituting certain minerals for use in green technologies will likely have an 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). Post-consumer resource usage is also changing 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 (involving rough and heavy work of which women are physically incapable and in places where women 'should not be'). These cultural and ideological representations of the formal, industrialized extractive operations and their managerial masculinity 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, wives sustaining and supporting the households' well-being, builders of 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 resulting gender-segregated labour regimes in these operations strip women of their autonomy and render their political agency invisible (Alexander, 2009; Gier & Mercier, 2006; Horowitz, 2017; Jenkins, 2014; Lahiri-Dutt, 2012; Loeb, 2007; Murray & Peetz, 2010). Second, such masculinity 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 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, discusses policy issues and offers 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 used to mainstream gender in the sector.

The Sustainable Development Goals (SDGs), established 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 inherent biases and identifying strategies to ensure equal benefits for women and men in mining communities.

The gendered sustainable development targets are relevant to improving 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 disproportionately large 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 industry 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; extractive operations undermine women's ability to provide food and clean water for their family and can increase their workload by damaging the environment; compensation and benefits are paid to men who are seen as the heads of households denying women access to mining's financial benefits, thereby increasing their economic dependence on men; and 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 (thereby affecting the women's safety). 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 that carried out 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 extractive industry governance (Gibson and Kemp, 2008). It would therefore be reasonable to consider if 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 instead of enhancing economic disparities between those who benefit from mining and those who do not (thereby creating intergenerational poverty or entrenching vulnerabilities around their operations) (Cane 2015). Discrimination against women can be an impediment to successful business development that can, in turn, 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 minimize 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 their 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 manifold, and 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 better well-being than in households where women have less 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, which 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 a 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 also ensure that women are a part of community consultations and livelihood projects.

Historically, women have directly and indirectly contributed to extractive industries. However, sex-based discrimination has forced women to stay out of the workplace in the extractive industries, without being able to claim the economic benefits.

Historically, women have directly and indirectly contributed to extractive industries. However, 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 their operations in order to promote 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 that is flexible enough to address both current and emerging challenges.

All stakeholders in the extractive value chain have a role to play.

- Host countries: Host country 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.
- Home countries: Home 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 the international trade and investment regimes that constrain the use of the full range of policy instruments to achieve resource-based industrialization at the local level).[105]
- 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 organizations play a key role in 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 improve understanding of how existing frameworks can become more responsive. In the next chapter, the report discusses the current governance architecture in the mining sector and also undertakes an assessment of existing governance instruments. Insights from these two chapters will be useful in developing the key prerequisites for effective governance of the sector, which is the subject of Chapter 8.

105 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.

Mining trucks at gold mine. Photo: travfoto © Shutterstock

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).

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 organizations (IGOs), private commercial entities and 'third' sector actors such as non-governmental organizations (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 on different spatial and temporal scales and 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). Conflicting interests and asymmetries of information, negotiating skills, leverage and power between governments, TNCs and communities represent major 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 become 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 the local, national, regional and international levels. 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. However, many activities in the extractive sector and their impacts straddle, migrate across or biophysically impact on assets located beyond jurisdictional boundaries. A recent example of such impacts is the collapse of a mine-tailing dam in Brazil in November 2015, 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, seabed mining.

Table 7.1. Dimensions of natural resource governance

Dimension	Description
Stakeholders (Figure 1.1)	Governments (home and host nations), intergovernmental organizations (IGOs), development and investment banks, insurance companies, investors, shareholders and diverse communities within civil society (consumers, workers, local populations, trade unions and the 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/cultural practices and interpersonal relationships.

Source: Authors' compilation

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. The sector therefore tends to be dominated by powerful MNCs, which creates significant asymmetry in power and information. This is particularly relevant in the geographical south, where governments lack skills and knowledge about 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 underdeveloped (forcing them to rely on foreign capital).

7.1.4. Relevant normative frameworks

Decision-making by different actors in 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, international finance standards and voluntary standards of practice.

Less formal normative frameworks include administrative, commercial, professional, voluntary agreements and cultural or 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. 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) was on the agenda of the 14th Conference of the Parties (COP-14) to the Convention on Biological Diversity held 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 by taking into account impacts on the environment and other economic sectors, as well as 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 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);
- 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.

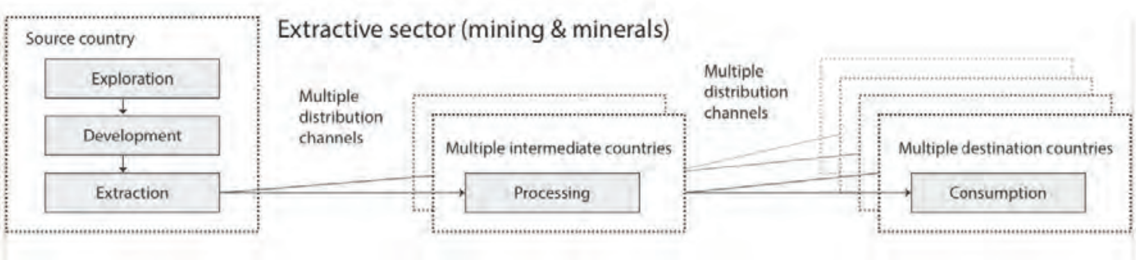
A suite of national laws and policies is likely to play an important role in the governance of the mining sector, including those relating to protected areas and, fundamentally, those that enshrine human rights in decision-making processes. However, a lack of capacity at the national and subnational 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 organizations 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 devised 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 blueprint 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 '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 was 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 more detail 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 CO2 emissions), poverty and

Figure 7.1. Supply and value chain in the extractive sector



Source: Adapted from Dicken (2011).

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 Jewellery 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 jewellery.
- Responsible SteelTM 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.

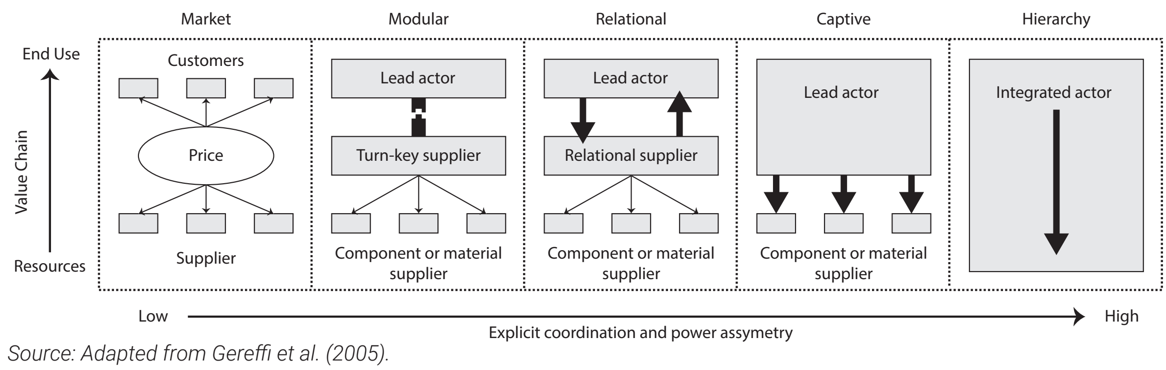
As shown above, the governance space is made up of actors, spatial boundaries, power relationships and normative frameworks. These all play out in the mineral value chain, which is discussed below.

7.2. Value chain governance

The movement of extractive resources across national boundaries is driven by the organization of production, trade and investment into globalized supply and value chains (Kaplinsky & Morris, 2002) These chains have diverse characteristics – including various degrees of complexity, fragmentation, interconnectedness and resource intensity, as well as 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 characterized by interactions among multiple actors across multiple countries.

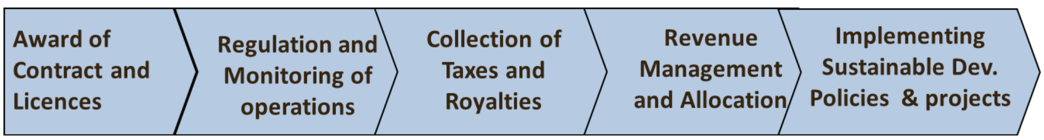
Relationships – Actors and normative frameworks are influenced and shaped by relationships of power, authority, cooperation or influence at multiple levels. These relationships can be hierarchical, or cooperative and voluntary. The prominent and influential role of private transnational entities, including transnational corporations (TNCs), not-for-profit organizations and other formalized partnerships and associations, is a defining feature of extractive sector governance in recent decades. The ability of TNCs to influence extractive-sector

Figure 7.2. Interaction between private sector actors within global value chains



Source: Adapted from Gereffi et al. (2005).

Figure 7.3. The concept of a policy value chain



Source: World Bank (2009).

decision-making across globalized value chains depends on the governance structure of the chain in question.[106] 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 problematic to draw the attention of the OECD, which has put in place a work programme to address this problem.[107]

Figure 7.2 presents five well-known illustrative modes of interaction between different private sector actors within globalized value chains, as well as the corresponding degrees of power asymmetry and coordination. Extractive sector value chains tend to be characterized 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. In 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.

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 the performance of these value chains that determines the quality of governance.

Finding, extracting natural resources and transporting them to the market is 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 is 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 into a

106 There are few cases where a TNC would carry out all activities in the value chain. Many just carry out mining and processing, while others perform smelting, refining and manufacturing.

107 OECD web pages on base erosion and profit shifting: http://www.oecd.org/tax/beps/.

product, used and finally disposed of 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 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.

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 give the host country a fair share of revenues. Beyond this central governance issue, however, 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 longer - 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[108]

At present, a plethora of instruments are in operation (see Appendix 7 for a list of almost 90 identified natural resource governance instruments).[109] It is possible that some have been missed. We have treated multilateral environmental agreements (MEAs) with caution - 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.

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 it 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 extraction, ore processing, metallurgy and refining (Chapters 5 & 6 above), and

108 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 dialogue 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 are largely driven by extractive activities. For example, while Illicit Funds Flows (IFFs) and biodiversity protection challenges are impacted by many sectors, extractive activities tend to be the major culprit.

109 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).

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 519 environmental treaties in total (Kanie, 2018);
- The International Environmental Agreements (IEA) database includes over 1,300 historic and current IEAs.[110] The IEA website categorizes MEAs as: Energy; Freshwater Resources; Habitat; Nature; Ocean; Pollution (air, land, marine and waste); 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 the 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 the potential to disrupt biodiversity. However, the disturbance of biodiversity goes beyond extractive activities. In this regard, it is hard to say which MEA is relevant to extractive activity and which is not. Although many MEAs have implications for extractive activities, the authors feel that including all MEAs as potential governance instrument muddles the governance landscape and we have been selective on which MEAs to include (Morin & Bialais, 2018).

110 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")

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, such as 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 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)[111] 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. However, pressure from consumers and CSOs are also important drivers.

The stakeholders that are targeted by any given initiative are equally important. Therefore, 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 its members specifically. The implication is that attention should be given to the lead stakeholder(s), the motivation of the stakeholder and which stakeholder(s) is targeted by the initiative.

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 yet others are global.

Compliance requirements constitute another significant aspect. The law (local and international) backs some instruments, and thus compliance is mandatory. Some are voluntary, but even voluntary compliance requirements 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, 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.

111 Website: https://eiti.org/.

Table 7.2. Key NRG instruments mapping dimensions

Dimension	
Sustainable development issue of focus	Traditionally, companies have focused on issues related to responsible mining, such as CSR and environment, and the corresponding instruments will be broadly classified as Sustainable Development-Responsible mining (SD-Responsible mining). Some issues that fall within 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 such as industrialization, local content, taxation and so forth 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 dialogue, 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 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.

Source: Authors' classification

Ore crushing. Photo: Alf Manciagli © Shutterstock.

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 searches, 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. Appendix 7 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.

As Figure 7.4 shows, the bulk of NRG instruments examined in this report (61 per cent) 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

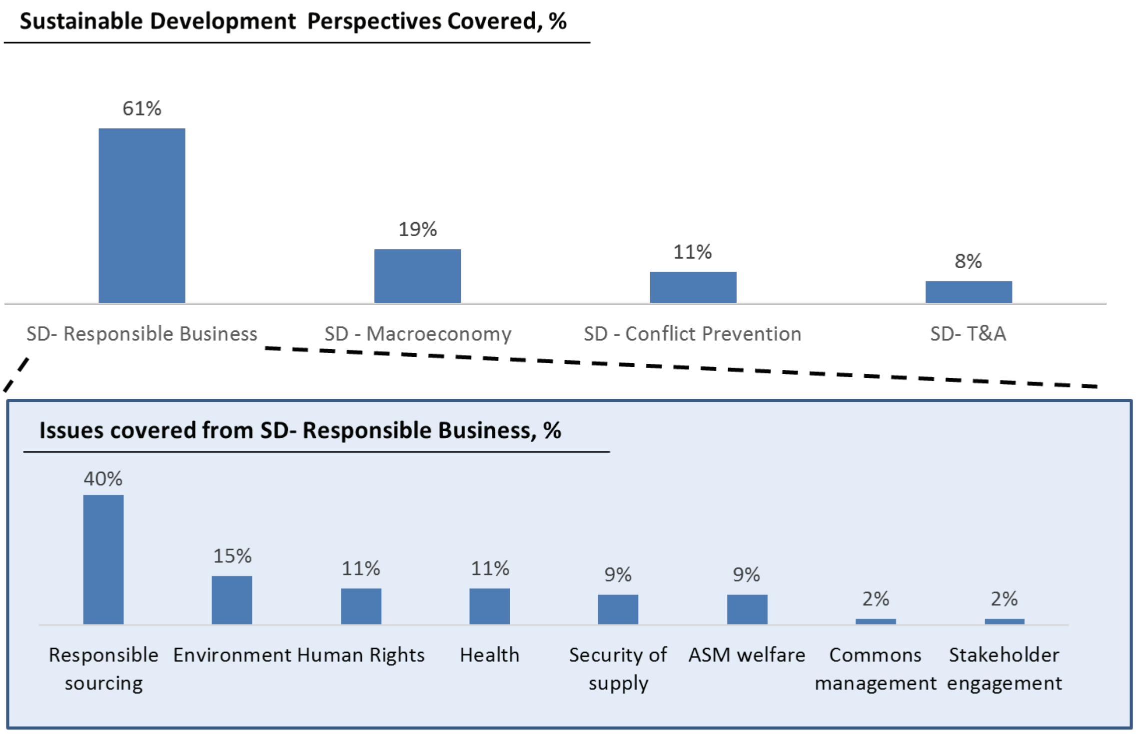
Table 7.3. Initiatives by sustainable development perspective

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				

Source: Authors' classification

business. Most of the instruments cover the issue of sourcing sustainably and this covers many aspects of supply chains. Several issues may therefore be covered, such as human rights, environmental concerns, mining practices and so forth. Other instruments tend to focus on a single issue. The issue that most single-issue instruments tend to focus on is the environment. Although 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 per cent of responsible business practices instruments focus on this.

Figure 7.4. NRG instruments



Source: Authors' analysis

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 governments. Although about one third of the instruments are multi-stakeholder driven, only about 40 per cent of the multi-stakeholder instruments are formal public-private partnerships (indicating that 60 per cent cannot be fully described as multi-stakeholder as they are led by industry (32 per cent) or CSO (29 per cent)).

7.3.2.3. Mapping by extractive resource addressed

About a quarter of the initiatives/instruments address extractives (metals and minerals, while another 18 per cent address the extractives in general (metals and minerals plus oil and gas). Only two instruments address oil and gas exclusively (Figure 7.6 and Table 7.5). An estimated 18 per cent are focused on a single mineral resource, with gold being the mineral targeted by most instruments. About 11 per cent 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.

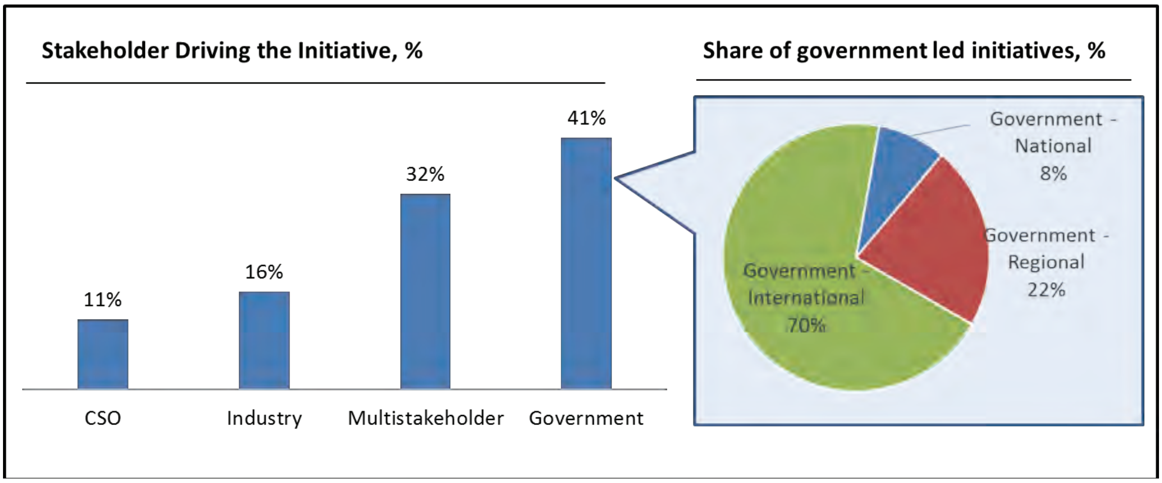
Concern for welfare of Artisanal Small-scale Mining (ASM) is also becoming an important concern and about 10 per cent of responsible business practices instruments focus on this.

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			

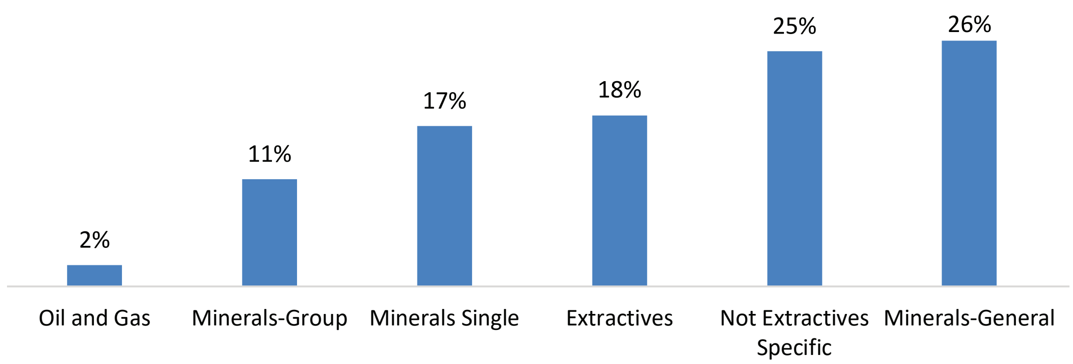
Source: Authors' classification

Figure 7.5. Analysis by lead stakeholder



Source: Authors' analysis

Figure 7.6. Analysis by extractive resource covered



Source: Authors' analysis

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 extractives, while the International Financial Reporting Standards (IFRS) is in the process of producing a reporting standard focused on extractives.

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 13 per cent of the instruments have a regional focus, and these are mainly instruments targeting conflict minerals in the Great Lakes region (Figure 7.7).

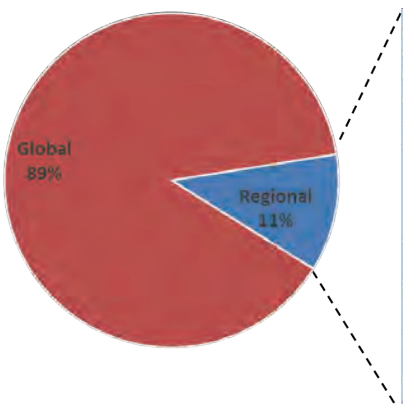
Only 13 per cent of the instruments have a regional focus, and these are mainly instruments targeting conflict minerals in the Great Lakes region

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

Source: Authors classification

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)

Source: Authors' illustration

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. Twenty-three per cent of the instruments have a focus on ASM sector (See Table 7.6). Half of these focus on developing conflict-free supply chains as the industry sought to comply with regulations or manage its public image. Twelve per cent of the instruments have the improvement of the ASM sector as part of their objectives, even if the main objective is 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 per cent 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.

7.3.2.7. Mapping by type of Initiative

Forty-five per cent of the instruments are platforms for standard setting or assessment/indexes or guidance, namely benchmarking tools. This is followed by 16 per cent of instruments that are platforms for capacity-building (this includes networking and knowledge sharing). Fifteen per cent are platforms for advocacy (including dialogue and coordinating activities). Nine per cent of the instruments are policy frameworks and 15 per cent are legal frameworks (Figure 7.9).

From the perspective of participation, 48 per cent of the instruments are purely voluntary. Seventeen per cent 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 20 per cent of the instruments, formal certification or audit by a third party is required to demonstrate compliance, while 15 per cent of the 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 per cent) of the instruments have a relationship with other instruments: 10 per cent implement other instruments, 10 per cent complement others, and 9 per cent adapt or adopt other instruments.[112] 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.

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).

Out of all the instruments, 34 per cent address the extractive value chain only, 24 percent address both extractive and the policy value chains, while 31 per cent address the downstream value chain (Figure 7.11). Then, 11 per cent address issues across the three value chains. It should be mentioned 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 develop downstream activities.

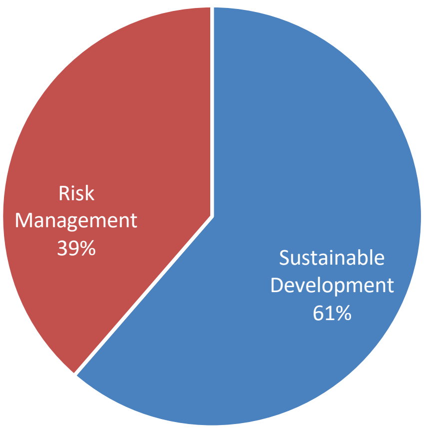
112 Please note that a neat classification is hard. For example, RMF-RMI maps its indicators to a wide range of related initiatives (i.e. implements) and also seeks to complement and amplify the work of other initiatives (see the RMI Methodology report 2017 at https://responsibleminingindex.org/en/methodology). In classifying, we have tired to capture the key objective.

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

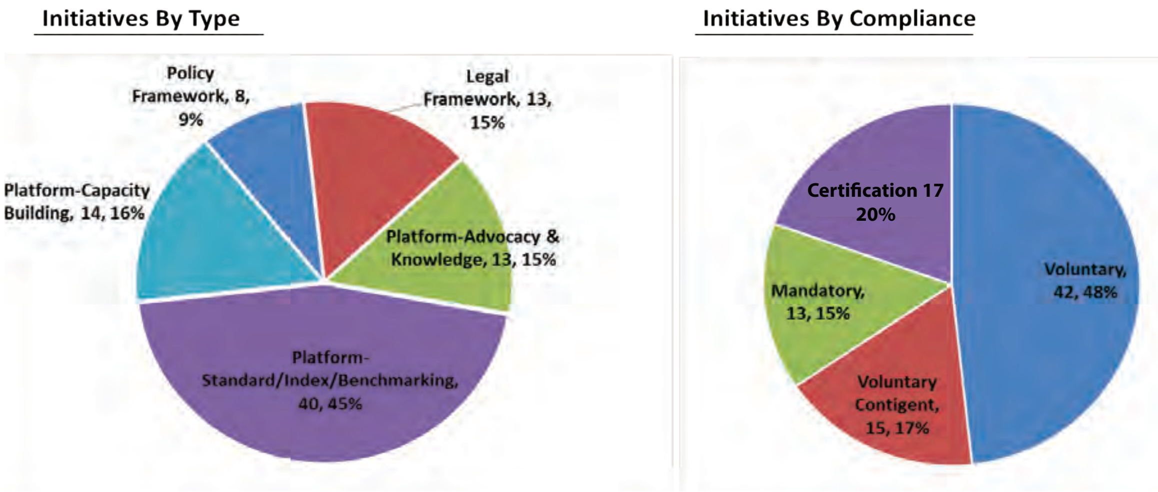
Source: Authors' classification

Figure 7.8. Instruments by driving motivation



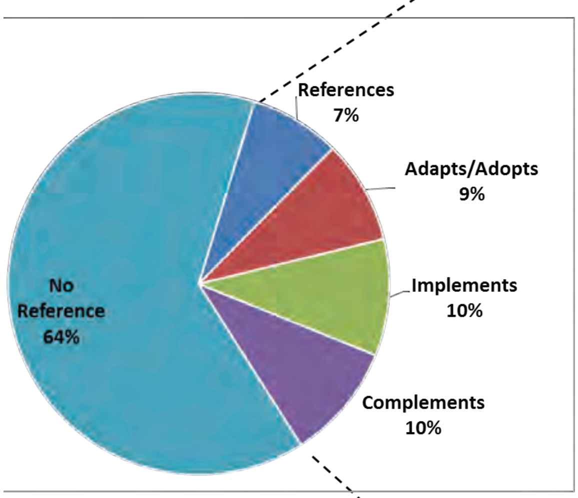
Source: Authors' classification

Figure 7.9. Instruments by type and by compliance/participation



Source: Authors' classification

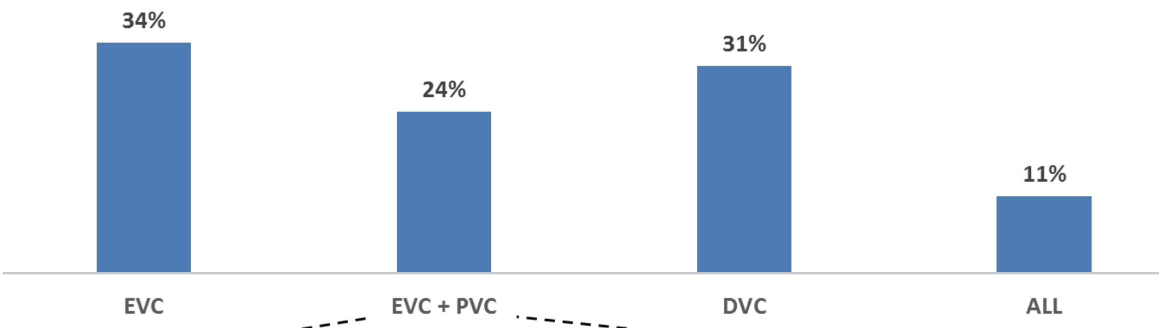
Figure 7.10. Instruments in relation to others



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

Source: Authors' classification

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			

Source: Authors' classification

7.4. 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 (see Table 7.7 for the list of instruments). 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 have a 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 they narrow or broad. The next chapter discusses the effectiveness of the various instruments.

[...] few initiatives explicitly address the SDG. Perhaps a more important question is whether they are effective in their defined domains, be they narrow or broad. The next chapter discusses the effectiveness of the various instruments.

Appendix 7

Table 7.7. 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

Manganese mining and processing. Photo: Sunshine Seeds © Shutterstock

8 EFFECTIVENESS OF MINERAL RESOURCE GOVERNANCE INSTRUMENTS

8.0. Introduction[113]

Although 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, some serious accidents have nonetheless occurred (such as the Brazil tailing dam accident). Building on these instruments will be an important part of any attempt to ensure that the sector optimizes its contribution to sustainable development. For this to materialize, it is key to understand how effective they have been. That is the subject of this chapter.

8.1. Effectiveness of MRG instruments

In Chapter 7, 89 governance instruments were listed. 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 key 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.[114] Furthermore, Lujala *et al.* (2017) point that a review of 50 evaluations concludes that the EITI has succeeded in disseminating the norm of transparency, establishing the EITI standard and institutionalizing transparency practices.

The MMSD initiative that was the precursor of the 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 out 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 maximize its contribution to sustainable development. This success launched the CEO-led International Council on Mining and Metals (ICMM) initiative that outlines values its members 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 successes in steering its members towards responsible practices, while also contributing to national development (see Box 9.7).

- United Nations General Assembly Resolution 64/109 adopted at its 64th session notes that the implementation of the KPCS has had a positive impact in reducing the opportunity for conflict diamonds to play a role in fuelling armed conflict. It further notes that the KPCS would help to protect legitimate trade and ensure the effective implementation of the relevant resolutions on trade in conflict diamonds. [115]

113 There is no attempt in this chapter to assess the instruments legally.

114 https://eiti.org/outcomes-impact-of-eitihttps://eiti.org/outcomes-impact-of-eitihttps://eiti.org/outcomes-impact-of-eiti.

115 United Nations 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.

Much of the impact assessments of these instruments have, however, been anecdotal or taken the form of self-assessments. It is difficult to gauge their success rates. It is unfortunate - but perhaps unsurprising given the complexities involved - that the impact of many of the MRG instruments is not known. Miller and Bush (2014) highlight the importance of collating evidence to back up rhetorical claims over instruments, especially certification schemes. Schiavi and Solomon (2007) argue that, for schemes to achieve their full potential, they should include monitoring mechanisms to assess performance claims. However, Stark and 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 assessing some aspects of certain instruments. For instance, Mori *et al.* (2016) reviewed several natural resource Sustainability Certification Schemes (SCS), while Stark and Levin (2011) assessed eight standards that are considered optimal for improving governance. Darby (2010) and Acosta (2013a) assessed transparency and accountability instruments. Atanasijevic (2016) and ECA (2013) evaluated efforts at managing conflict minerals in the Great Lakes region. Lipschutz and Henstridge (2013) also assessed a number of mineral resource governance programmes. Le Billon (2012) 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 summarized and some ideas presented on how performance challenges can be addressed. Each of the initiatives discussed in chapter 7 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 have had unintended impacts that have undermined their effectiveness:

- They arguably distract from the pressing need to build effective global governance institutions to regulate multinational organizations. Furthermore, they undermine the regulatory role of governments 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 United States 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 ended up 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 ensuing spike in violence. Parker and Vadheim (2015 cited in Atanasijevic 2016) estimate that violence in the DRC increased by almost 150 per cent and looting by nearly 300 per cent 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 maximize benefits for themselves.
  - The OECD Due Diligence Guidance created unfair competitive advantage for manufacturers and exporters that operate in non-OECD States that do not apply the rules vis-à-vis companies based in OECD countries (Carisch & Rickard-Mathew, 2013). This could be generalized as some countries enjoy a massive but unsustainable competitive advantage from having low environmental and social standards in addition to being non-transparent.

Some proposals to address these shortcomings have been proposed. First, MRG instruments are no substitute for governments. They should seek to empower governments by building skills and institutional capacity of the various relevant bodies, such as a functional Directorate of Mines, Environmental Agencies and Geological Surveys, in order to deliver sustainable development. This also means building capacity of bodies designed to hold governments to account, such as an 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 workers in artisanal and small-scale mining (ASM) 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) 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. According to ECA (2013), 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 and 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, Atanasijevic (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 competed for among 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 among different actors. He argues that this hybrid governance poses significant problems to the implementation of ongoing State-centred and business-oriented instruments that seek to combat informal trade mainly through strengthening State capacity. This, according to him, is because 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 (investment and development of skills) and to demonstrate compliance (the assurance process) (Mori *et al.* 2016, Barry *et al.*, 2012, ITC, 2010). Komives and 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 to 'rubber stamp' a consultation when it is a box-ticking exercise. 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 requesting 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 among the G20 states.

Buy-in can be improved through a number of actions. Mineral resources are not all alike, as sustainability issues vary according the specific resource exploited and the methods used to extract and process the minerals 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 to learn 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 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, including via a national repository where all the reports are stored and can be retrieved by anyone worldwide.[116] 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 achieving buy-in.

> ***Building credible information systems that can deliver accurate and accessible information is critical in building trust.***

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. Being able to claim compliance to the UN Global Compact, for example, can confer a

116 However, it is important to note most mining companies – as well as minerals traders, and processing and financing companies– - are not listed

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. In other words, there is no requirement for 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 and Levin (2011; cited in Mori *et al.*, 2016) assessed different certification schemes and found that violations do not carry consequences. Acosta (2014) asserts that the lack of sanctions for non-compliance impacts 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 include domestic sanctions imposed by citizens; informal industry sanctions (peer mechanisms); 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 the positive side-benefits of compliance. Companies that adopt certification standards experience improvements in their management systems and employee satisfaction, thereby 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 based on best practices,[117] organisations seeking compliance certification need to improve their management systems or develop them based on best practices in order to comply. This leads to positive changes in management and production practices, which can improve performance, quality and productivity. This side-effect 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

117 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).

society engagement represent the large share of existing instruments (Acosta, 2010).

- Within programmes 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).
- 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 adequately address 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.

The following actions have been proposed that can help make governance instruments more balanced and relevant:

- While ensuring governments capture a fair share of extractive rents, they must also focus attention on the allocation of mineral resource wealth to ensure it is invested to enhance 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 in resource-rich countries.
- There is a need for greater focus on sharing relevant and accessible data, information and thus knowledge. They should be presented in plain and understandable language, and in a timely and accurate way (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. As a result, the right kind of freely flowing information, together with effective cross-cultural communication, can stimulate the creativity that is crucial to solving the various natural resource governance challenges (Lockwood *et al.* 2010).
- Comprehensiveness can be improved by supporting and stimulating the market for 'information intermediaries' (the organizations that can then use various media to repackage information in specific ways for different audiences).
- 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 public reporting of technical and economic project data compulsory, along the lines of the Canadian NI 43-101 standard. This standard is a major contribution towards transparency and better governance, and is compulsory for any company publicly listed on the 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. At the same time, these technologies make information publicly available and easily accessible, thus empowering local communities to monitor 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 and monitoring project development. The 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 the weak regulatory capacity of resource-rich countries, there has been a proliferation of standards (many of which are voluntary). Such 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.
- Stakeholders struggling to decide which instruments to adopt. Indeed, many mining companies report uncertainty about the value of particular upstream instruments, even when they are currently investing significant resources (WEF, 2015b).
- To distract consumers from the real impact of their operations, companies can use the instruments as public relations exercises. Indeed, Darby (2010) argues that the proliferation of instruments, allows companies and countries to search for the lowest-common denominator in terms 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.
- It can be difficult to identify key messages and send appropriate signals to important stakeholders and supply chain partners.
- The sector as a whole finds it challenging to cooperate and identify common goals and strategies. 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, although 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 back during financial slowdowns (which is when help may be needed the most).

The potential for integration and coordination among instruments, government regulations/laws and industry/corporate standards should be considered in the design, implementation, operation and revision processes of voluntary instruments. Some ways to improve standard setting are discussed below.

There is a need for unified systems or at least a core set of cross-cutting 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 feed into regulation, thereby helping to design and pilot "smart regulation".***

Greater efforts are needed to find synergies between voluntary instruments and regulatory (mandatory) ones. As soft law, voluntary instruments can feed into regulation, thereby helping to 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 that 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. Examples include 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[118] among the different instruments. Interoperability has the potential to reduce the costs of assurance and avoid duplication, as the latter 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 among instruments, government regulations/laws and industry/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 out that achieving interoperability is easier said than done, as standards/organizations 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, as well as providing scope for sharing and learning across initiatives.

Moreover, standards should be developed in such a way that actors can graduate as they learn. Towards Sustainable Mining (TSM) is a supportive approach for integrating mining companies with different performance levels that allows members with low environmental performance to join the initiative and gradually improve. TSM statistics show that this top-runner 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 to deliver 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 into strengthened governance (Acosta, 2010, 2013). For example, proponents of EITI assume that government and corporate accountability can be improved if data about extractive sector revenues are published and publicly debated. Furthermore, this is expected to empower 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 more skilled in digesting the information to better position themselves (as pointed out previously in the case of EITI in Nigeria (See Box 8.1)).

118 ISEAL (2018) defines interoperability as the degree to which diverse systems, organizations 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 (recognizing/referencing other schemes) but also leveraging the diversity of stakeholders, expertise, coverage and approaches of the individual standards to create a more responsible sector.

Box 8.1. Transparency – progress but still room for improvement

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 emphasizes the need for citizens to have appropriate access to information on the environment that is held by public authorities, as well as 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.

While initiatives such as EITI do 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. Although financial transparency is critically important, 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. Excluding these data from public disclosure creates 'information asymmetries', whereby stakeholders have unequal access to information. Current efforts to increase transparency in the sector do not go far enough to address these information asymmetries or to help citizens understand the distribution of benefits and risks across a project life cycle.

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 seek process-oriented outcomes. These include increasing participation of CSOs, promoting disclosure of contracts and/or demanding increased revenue transparency. The underlying assumption is that such outcomes would have a direct impact on wider 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. Furthermore, there is a wide variation in the critical aspects that define development outcomes.

It is vital to develop an explicit theory of change that identifies the different roles, political motivations and mechanisms that allow different stakeholders to oversee a 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. It would be important to construct and maintain 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).

It is essential 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. Some attempts have been made to identify the impact of intervening factors in the fight against corruption (Acosta, 2010). These highlight the importance of broader political institutions, and particularly the

Machine and Truck in Coal Mining. Photo: Framenism © Shutterstock

need for a separation of powers and a stronger judiciary.

While many existing initiatives have faced challenges, some researchers (such as Le Billon, 2012) point to the fact that many 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;
- A 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 of the 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). According to GIZ (2003), their crucial role emerges from the fact that actions of stakeholders (particularly governments and mining companies): (i) 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, this can 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. Their actions are, however, largely 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, as is the case with the Africa Mining Vision (see Box 1.2) and the National Resource Charter (NRC).
- Business organizations are not, by nature, 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 with them. Extractives corporations therefore 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 the 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, as well as in implementing instruments to improve governance of mineral resources. However, they tend to be issue-oriented and thus may miss the bigger picture. Some tend to partially duplicate 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 may even radicalize the population so that positions become too entrenched for negotiations to be possible.
- Forming partnerships can also be challenged by the different approaches adopted by stakeholders. 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 approaches specific nodes by specializing in one or more themes in resource governance that they consider crucial and feasible to have a meaningful impact (usually on such nodes along the value chain) (GIZ, 2003). See Box 8.2 for the challenges of stakeholder participation.

> *Effective engagement of stakeholders is central to successful stewardship of mineral resources [...] According to GIZ (2003), their crucial role emerges from the fact that actions of stakeholders are the sources of governance problems; tend to advocate for a particular solution; are the objects of governance instruments; and are joint co-producers of governance.*

Box 8.2. Challenges for stakeholder participation

Although stakeholder participation is now often claimed, and may indeed be required by project financiers, it can risk becoming a tick-box exercise. Szablowski (2007) pays particular attention to a World Bank process that has been revamped in the wake of complaint that the Bank had funded projects that displaced people. This has led to the inclusion of social specialists in the World Bank technocracy, as well as participatory processes as a way of establishing legitimacy. However, Szablowski argues that the participatory development has been mere rhetoric. The policy largely neglects participation, as it does not require basic measures to facilitate 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" - the community does not ultimately have the right to refuse development. Bastida and Bustos (2017) examine the mining legislation development process in the Plurinational State of Bolivia. The authors observe that it is vital to strengthen the capacities of institutions and actors that participate in decision making is needed to foster sustainable mineral resources management. This challenge needs to be addressed.

Some approaches to improve stakeholder engagement include:

- Collaborative efforts need careful thought. Actors that pursue a whole value chain approach should ideally develop close forms of collaboration. They will pool their efforts and resources as much as possible to increase the effectiveness of their interventions and avoid duplicating each other's efforts. It may prove beneficial to establish a 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 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 parties 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 that are fraught with reputational risk) could be to have independent third parties agreed on by all stakeholders to conduct the consultation process (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 establishing the most appropriate occasion to engage with stakeholders to avoid engaging them unnecessarily at the expense of efficiency.

- It is also necessary to understand underlying social structures in stakeholder engagement. Diversity alone is not enough in this context. Crona & Hubacek (2010) argue that bringing together diverse views and opinions by selecting stakeholders from different organizations and sectors is not enough. They assert that individuals are embedded in social ties, and these ties constrain and influence peoples' perceptions about management practices. The examination of social structures (formal or informal) therefore offers many new insights that are relevant to mineral resource governance.

Coal mining from above. Photo: Mark Agnor © Shutterstock.

8.3. Conclusion

Addressing the above-mentioned issues and shortcomings will be crucial in formulating a mineral resource governance framework in line with sustainable development imperatives. While 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 specific challenges associated with minerals management issues, it will likely be excessively complex. Therefore, a suitable framework should capitalize on the positive aspects of existing instruments and provide means to address current knowledge gaps, whilst reconciling the potential unintended consequences if instruments are not well designed. This is the topic of the next chapter, which looks at prerequisites of an effective governance framework. In Part III of the report, the structure of such a more holistic governance framework will be explored.

Aerial view to the iron ore open mine. Photo: M.Khebra © Shutterstock

9 PREREQUISITES OF AN EFFECTIVE MINERAL RESOURCE GOVERNANCE FRAMEWORK

9.0. Introduction

Chapter 8 assessed various mineral resource governance instruments by highlighting their strengths and weaknesses and suggesting approaches to enhance their effectiveness 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 a lack of understanding of how natural systems work. Rather, the problem is primarily political and behavioural in nature, related to governance and human failures 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" [119]that calls for novel policy and institutional responses.

The current global policy context provides new momentum and opportunities 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 mineral resource governance is how the exploitation of these resources can contribute to achieving the SDGs. This will require the capture of a fair share of mineral resource rents, equitable distribution and sensible investment of the rents, as well as a mitigation of the negative impacts of mining activities discussed in Chapter 5. The remainder of this report tackles the subject of how this can be achieved.

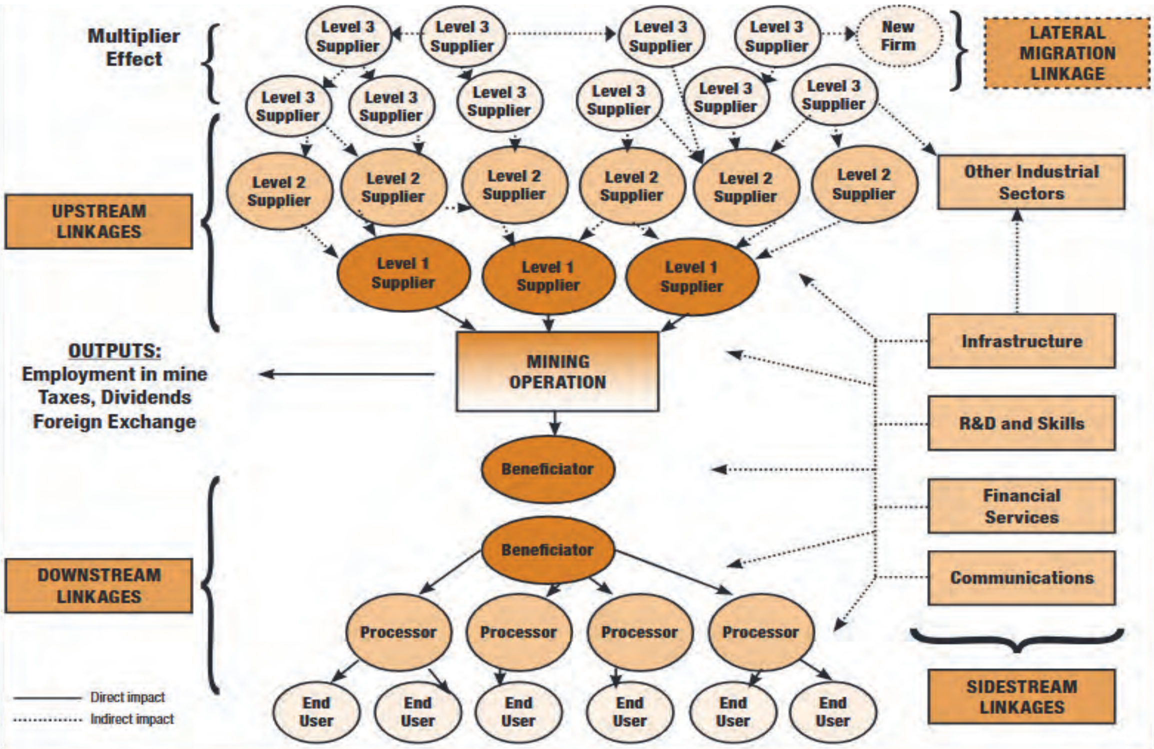
119 As pointed in chapter 1, challenges that are classified as a "wicked problem" are characterized by complexity and contestation originating from multiple problem causes, divergent problem perspectives/solution strategies and fragmented institutional settings that would require institutional adaptation and innovation to be resolved.

9.1. The need for a holistic framework

Chapter 7 identified the following three fundamental characteristics of mineral resource extraction: 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 promote trust among competing interests and align understanding about shared value; and protect all parties from the corrosive effects of corruption. Translating mineral wealth into lasting economic gains will further require a broad range of policies that transform extraction from an enclave industry and link it to the 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, careful investment in physical and social infrastructure and provision of public goods, while also addressing the externalities of mineral resource extraction (economic, social and environmental damage).

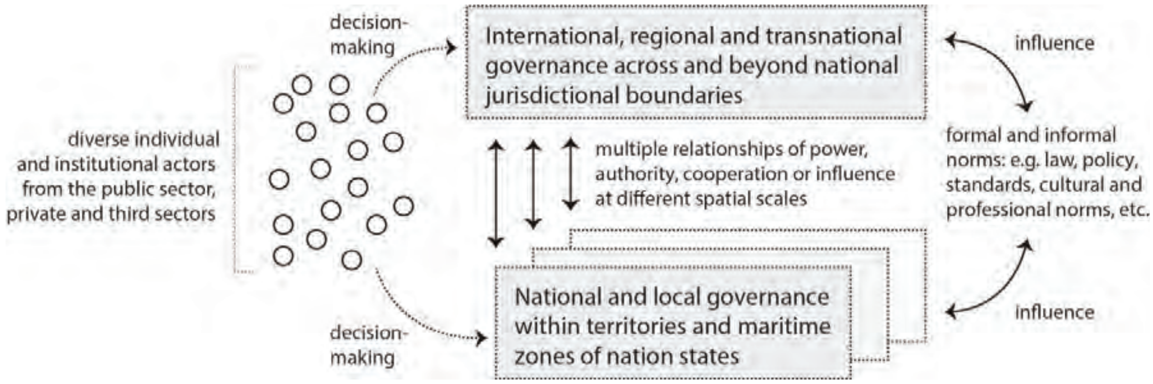
As already discussed in Chapter 8, decision-making in the extractive sector is shaped by a complex global, regional, national and local architecture of relationships among individuals and institutions. The term governance (Box 1.1) refers to the many ways in which individuals and institutions manage their common affairs in this context. Governance of the extractive sector is a process characterized by diverse actors, normative frameworks, hierarchical relationships and spatial/temporal boundaries. These components are illustrated in Figure 9.2 on the next page.

Figure 9.1. Linkages in the mineral resources sector



Source: Lydall, 2009

Figure 9.2. Key components of extractive sector governance



Source: Pedro et al., 2017

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 that are local in nature, while at the same time governed by global instruments and subject to 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 out one key actor who is also impacted (maybe even more so). 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 calls 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 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 is how the currently unsustainable extraction of mineral resources can be decreased to safeguard them for future generations. It is admittedly unlikely that market forces alone will sufficiently impact the prices of minerals to resolve the unsustainable use of certain minerals in a timely way. 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 mining may not seem sustainable as 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. Even in the absence of physical depletion, economic depletion may therefore occur as 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), as well as new substitutes and so on. The long-term availability of mineral commodities is therefore determined by a race between the cost-raising effects of depletion and the cost-decreasing effects of new technology. He argues that, if society can continue past trends of creating new technologies to offset the cost-increasing effects of depletion, mining can be indefinitely sustainable. This favourable future, however, is not assured. It requires economic geologists, mining engineers, metallurgists and others in the mining sector to 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 this will 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/environmental issues and advancing scientific knowledge. Predicting future sustainability is therefore not a simple task.

Gold mining place in Guyana Photo: kakteen © Shutterstock

9.2. The need to decouple economic growth from environmental and social impacts

Caring for 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 well-being (as discussed in Chapter 4). Therefore, mining activities must be conducted with due care for the associated environmental and social impacts if it is to deliver sustainable development. The World Summit on Sustainable Development outlines the thinking that should guide the mining sector. 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 emphasize actions and partnerships at all levels to address the issues and concerns (including environmental impacts) throughout the life cycle of mining operations. There was also an 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 that have not done so to make concrete efforts towards the internationally agreed ODA targets (0.7 per cent 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 industry recommendations from the Mining, Minerals and Sustainable Development Project (MMSD). 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, consultations were 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 maximizing 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. Nonetheless, 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.

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), as well as significant environmental hazards (Lei *et al.*, 2016). Sustainable development, and mitigating environmental degradation in particular, is an issue that is at the top of China's agenda (thereby bringing about a determined shift to reduce the environmental impact of mines).

In 2010, the Ministry of Land and Resources launched the "green mines" standard. The standard concerns the implementation of management systems in terms of 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 top priority to the ecological protection of Chinese mines and aims to establish model 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 the 'Guidance to Facilitate Development of Green Mines' initiative (Dolega & Schüler, 2018). The new guidelines call for more support, particularly 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; encourage the technical upgrading of existing mines; and facilitate the building of a more effective/powerful system to support green mining development.

It is difficult to achieve the crucial balance to ensure that mining delivers economic and social benefits while not causing irreparable damage to the environment, and indeed economic benefits tend to trump environmental concerns. China is facing the challenge and is paying more attention to the environmental impact of mining by trying to promote a more sustainable path (see Box 9.3).

9.3. The need to protect human rights

As discussed in Chapter 6, extractive resources generate conflict that leads to human rights violations. 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, government unwillingness may be the 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 prioritizes human rights.

Extractive resources generate conflict that leads to human rights violations [...] Government unwillingness [to protect human rights] may be the result of undue influence by unscrupulous mining companies

Box 9.4. ILO 169 Convention - Advancing the Rights of Indigenous Peoples

Although indigenous people constitute about 5 per cent of the world's population, they account for 15 per cent of the poor. Furthermore, where economic growth has resulted in overall decreasing inequality, indigenous and tribal peoples tend not to benefit from such progress; poverty among indigenous peoples is often increasing (ILO, 2015). They are particularly impacted by mining activities, as their livelihoods are more tied to the land and rely on biodiversity services. They are also much less exposed to modern life. They therefore 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, 2016a).

The rights of indigenous people have been recognized as a major concern, and this prompted the adoption of ILO convention 169. This Convention 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, as well as 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.

Nevertheless, as of 2015, only 22 countries had ratified Convention No. 169, ILO (2015) points out 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. However, 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 and its strategy seeks in to further intensify dissemination of Convention 169, including by promoting dialogue 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. 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 prevent and tackle gender-based violence.

From a conceptual point of view, the debate on due diligence in terms of human rights revolves around a central question that is equally relevant to environmental considerations: to what extent should enterprises – or their CEOs – be held accountable for common goods or public interests that 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. One 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 way of thinking about this lies in 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, multilateral human rights treaties have so far failed 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 the "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 stop short of establishing a clear "extraterritorial" duty, but they do 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.[120] Moreover, in recent years, 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[121].

120 Ref. S. qil, s. Antwerp; ICESCR Art 2.

121 Verweis auf Maastricht Principles, s. auch Buch, QIL.

Some have also claimed that it is not a question of "extraterritoriality", but rather falls under the scope of application of domestic law.[122] The emerging principle of common concern,[123] 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 an obligation to act beyond the scope of territorial application of their national laws as a matter of principle, in order to ensure the 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).

122 Noch bei SKMR nachschauen, wie genau formuliert? CK s. Krajewski. Swiss Centre of Expertise in Human Rights (n 21).

123 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 that 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" (Buergi Bonanomi, 2018).

Box 9.5. United Nations 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 of 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.

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 harmonized legal basis for implementing the 2011 UN Guiding Principles 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 a performance assessment, Ruggie (2017) finds that - although 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 have already 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 issued 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 its processes with UNGPs in the furor after awarding successive World Cups to the Russian Federation and Qatar (countries that are seen as not respecting human rights).[124] The International Olympic Committee is considering a similar move.

UNGPs are becoming entrenched in the public domain and in UN processes for uptake. For example, a white paper issued by a group of major investment banks in early 2017 claimed that, under the UNGPs, investment banks have very limited responsibility for what their clients do with loans or advice provided by banks. This generated widespread push-back from civil society, thereby forcing the group to issue several clarifications. [125]

124 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 labour, exploited by recruitment firms and contractors (and even more so by subcontractors) building stadiums and other infrastructure.

125 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.

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. Furthermore, 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), 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, as well as the other challenges associated with extractive activities. Each actor has a different task in fulfilling those responsibilities.

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, as they causally linked to the impacts through their supply chain (Buergi *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 (Buergi, 2015a; Buergi, 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 section 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

Open-cast mine, general view. Photo: Dmitriy Kuzmichev © Shutterstock

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 over the extent to which 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 it 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 (such as Publish What You Pay (PWYP) and the Extractive Industries Transparency Initiative (EITI)). Compelling home countries and their 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 largely the result of efforts by civil society organizations (CSOs) – including Public, Eye, Alliance Sud and Bread for All. The CSOs managed to raise the interest of public opinion in Switzerland on the business and human rights agenda. As a result, the implications of the 2011 UN Guiding Principles are widely discussed, not only in the executive and legislative branches of the Swiss government, but also in business forums and in the media.

The Responsible Business Initiative 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 introduce legislation on "mandatory due diligence". This includes a legal obligation for Swiss business enterprises to incorporate processes to ensure 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, carrying 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 introduction 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 going 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, thereby avoiding reputational risks.

These developments have fostered innovative legislative processes in Switzerland that will remain ongoing for the foreseeable future. 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 clearly explain 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 centre 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 under way (OECD, 2017; Mugglin, 2017). Furthermore, the Swiss Government has supported sector-driven private initiatives – from the banking sector, for instance – 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 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 realized. Mining companies have tried to mitigate these through CSR activities at local levels and greater transparency through platforms like EITI at the national level. These efforts have been inadequate, however, and this has led to calls 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 its members in this direction, and many members are now part of the GRI that keeps track of responsible practices (see Box 9.7).

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).

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 largely the result of efforts by civil society organizations [...] These managed to raise the interest of public opinion in Switzerland on the business and human rights agenda.

Box 9.7. ICMM and Sustainable Development

ICMM is a CEO-led international organization 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 minimize the impacts of mining and maximize its benefits, thereby enhancing mining's contribution to society by strengthening the industry's environmental, social and economic performance, and championing the responsible production of materials

ICMM's work on sustainability is organized 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 well-being: Responsible mining and metals production puts people first. This means a firm commitment to the safety, well-being and social development of the communities of operation. Despite the hazards of the industry, workplace accidents and occupational diseases are preventable through effective risk management. This involves constantly looking at ways to help raise health and safety standards in the sector.

ICMM aims to achieve change through a number of avenues including:

Partnerships: ICMM has sustained engagement with international organizations such as the United Nations, OECD, World Bank, the International Maritime Organization and leading civil society organizations such as Amnesty International, GRI, Oxfam and WWF.

Training and toolkits: ICMM has developed toolkits and best practice guidance in partnership with other stakeholders. Examples include guidance on water reporting guidance and 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 to which members must adhere. 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; and (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.

Fonseca *et al.* (2012) summarizes some of the criticisms of GRI reporting as follows:

- The 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, thereby 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 programme 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.

In the light of this problem, ICMM launched an Assurance Procedure that is helping to promote third-party auditing in mining companies' reporting practices. However, 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 the gold standard of sustainability reporting – the Bellagio Principles. They point out that the GRI approach to assessing and communicating mining contributions to sustainability has gaps within each analysed principle.

> ***ICMM seeks to minimize the impacts of mining and maximize its benefits, thereby enhancing mining's contribution to society.***

Box 9.8. The case for the 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) stakeholder access to remedies in to the event of breaches of such 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 the 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 derived 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 and 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 rightful use of one's own property cannot be a legal wrong to another). The prohibition of causing transboundary pollution is recognized as a rule of customary international law. It is further submitted that this prohibition or 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 that 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 (Buergi, 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 relevant business community and civil society accept the specific rules as adequate.

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 that is reflected in a number of international agreements.

As pointed out in Chapter 1, extractive resources have the potential to deliver on the SDGs. This will require responsible business practices to be woven into all aspects of extractive activities. This topic is addressed in the next chapter.

9.6. The need for balance between security of supply concerns versus sustainable development aspirations

Although much of the extractive industry is located in OECD countries and emerging economies, extractive industries are also important to the economies of many developing countries.[126]However, output from developing countries is largely used in the more developed countries as inputs to key industries, and these imports are therefore also crucial to the economies of importing countries. This means that, for developed countries, security of supply is of utmost 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), which can dampen investment and deny people their 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, indigenization 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 out that today's resource nationalism 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 prerequisite for an effective governance system is that it fulfills both requirements, thereby creating a symbiotic relationship. The European Union Raw Material Initiative aims to strike this balance (see Box 9.10).

126 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, 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). Countries that fall into this category are usually considered emerging because of their developments and reforms. The IMF, the International Monetary Fund, classifies 23 countries as emerging markets. These are: Argentina, Bangladesh, Brazil, Bulgaria, Chile, China, Colombia, Hungary, Indonesia, India and 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 are used to categorize countries, although it seems likely to be GNI per capita.

Box 9.10. EU-Raw Materials Initiative (RMI)

Given the continued and growing strategic importance of raw materials for the 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 ensure their secure, sustainable, responsible and affordable supply (European Commission, 2008a).

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.

Raw materials, in particular Critical Raw Materials, are important for the competitiveness of key European industrial value chains, including automobile, machinery, electrical engineering, ICT and 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 also features prominently in the renewed EU industrial policy strategy adopted in September 2017.

Global demand for raw materials will increase as a result of growth in developing countries. It is important to bear in mind that the United Nations projects that world population will 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, stabilization of labour markets, migration levels and limiting poverty in numerous resource-rich countries are all largely dependent on income from the extraction of mineral resources. Therefore, increasing attention must be paid to the environmental and social impacts of production, both in EU and non-EU countries.

The traditional approach to ensuring the economic security of raw materials supply has been increasingly complemented by responsible and sustainable governance, sourcing and extraction of raw materials. This evolution has the potential to become a driver for responsible and sustainable growth and jobs 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 and the European Partnership for Responsible Minerals.

The latest important EU policy linked to raw materials was published on 17 May 2018. The European Commission adopted the agenda for safe, clean and connected mobility along with the Strategic Action Plan for Batteries. The Action Plan aims, inter alia, to facilitate access to European sources of raw materials and to secure access to raw materials from resource-rich countries outside the EU. The Action Plan announced:

1. The use of all appropriate trade policy instruments, such as Free Trade Agreements, to ensure fair and sustainable access to raw materials in third countries and promotion of socially responsible mining.
2. The promotion of the ethical sourcing of raw materials for the batteries industry.

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 a disproportionate share of extracted resources, thereby 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 prerequisite 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 obligations regarding access to information on parties and public authorities. The obligations imposed on Parties include the need to: make environmental information available within no more than two months of a request; ensure that public institutions have and updated relevant environmental information; encourage operators to inform the public regularly of the environmental impact of their activities; provide for public participation procedures that 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 penalized, 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 civil society, which has prompted the establishment of initiatives that focus on this (such as EITI, StAR, PWYP, as shown in Chapter 7). Transparency alone is not enough, as actors can suffer from information overload. This underscores the need for capacity to process the data and make it relevant to various stakeholders. Equipping stakeholders, especially the public, with ICT tools and the knowledge to use the tools and make sense of the outputs is therefore vital. On the government side, effective communication for policymaking needs to go beyond simple disclosures and develop a practice of two-way communication and careful explanation of government decisions (as well as the reasons behind them). Information and effective communication are particularly key for meeting the threshold of Free, Prior and informed Consent (especially with respect to indigenous peoples) (see Box 9.12).

The challenge around data relates not only to the mineral resource data, but also to 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 9.13 and Figure 9.3).

> *Equipping stakeholders, especially the public, with ICT tools and the knowledge to use the tools and make sense of the outputs is vital.*

Box 9.12. Free, Prior and Informed Consent (FPIC)

The ILO convention 169 discussed in Box 9.4 was further strengthened by the United Nations Declaration on the Rights of Indigenous Peoples adopted by the UN General Assembly in 2007to recognize their rights and mention Free, Prior and Informed Consent (FPIC) as a prerequisite 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 (2016b) points out 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 young people) are all essential. A thorough and well-executed FPIC process helps guarantee everyone's right to self-determination, allowing them to participate in decisions that affect their lives. FAO (2016b) also points out that, in the last two or three years, development experts have recognized that FPIC is not only important for indigenous peoples but 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.

Box 9.13. MapX case study – Mapping and monitoring the sustainable use of natural resources[127]

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 mentioned in chapter 6, there are many initiatives 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 when they are 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 being killed and more than 1,500 injured over the past 15 years. An estimated 80 per cent of conflicts in the country were related to the environmental impacts of mining operations (mainly relating to availability and quality of water resources). The International Finance Corporation and the International Council of Mining and Metals have found that 70 per cent of the 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 on the environment that is held by public authorities, as well as the opportunity to participate in decision-making processes.

While 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 more on transparency in relation to revenues and contracts, as in the case of EITI. While financial transparency is critically important, the 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 life cycle.

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 they also allow them to access information generated and also new data to reduce the 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 levels, and then 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 and improve the uptake of data within decision-making, performance monitoring and dialogue processes.

127 Contributed by David Jensen and Inga Petersen.

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 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 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 socioeconomic indicators to determine important correlations such as human development indicators.

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 from platform users for this functionality.

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 that display key information such as ownership, annual production, workforce statistics and so forth. This enables 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 such embedding, 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, visualized 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. Customized tools are required to utilize transparency and access to information as effective instruments 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 socioeconomic 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 takeaway messages are relayed in appropriate formats both online and offline.

Figure 9.3. Screenshots of MapX[128]

Figure 9.3.1. *MapX implementation of the data integrity framework (composite score for one of the data layers in DR Congo)*

128 Contributed by David Jensen and Inga Petersen. (More information on the MapX website is available at www.mapx.org)

***Figure 9.3.2**. Example of a heat map – The map shows how high concessions payments contrast with high poverty rates in Eastern DR Congo. (the example is for demonstration purposes only and does not show authenticated data)*

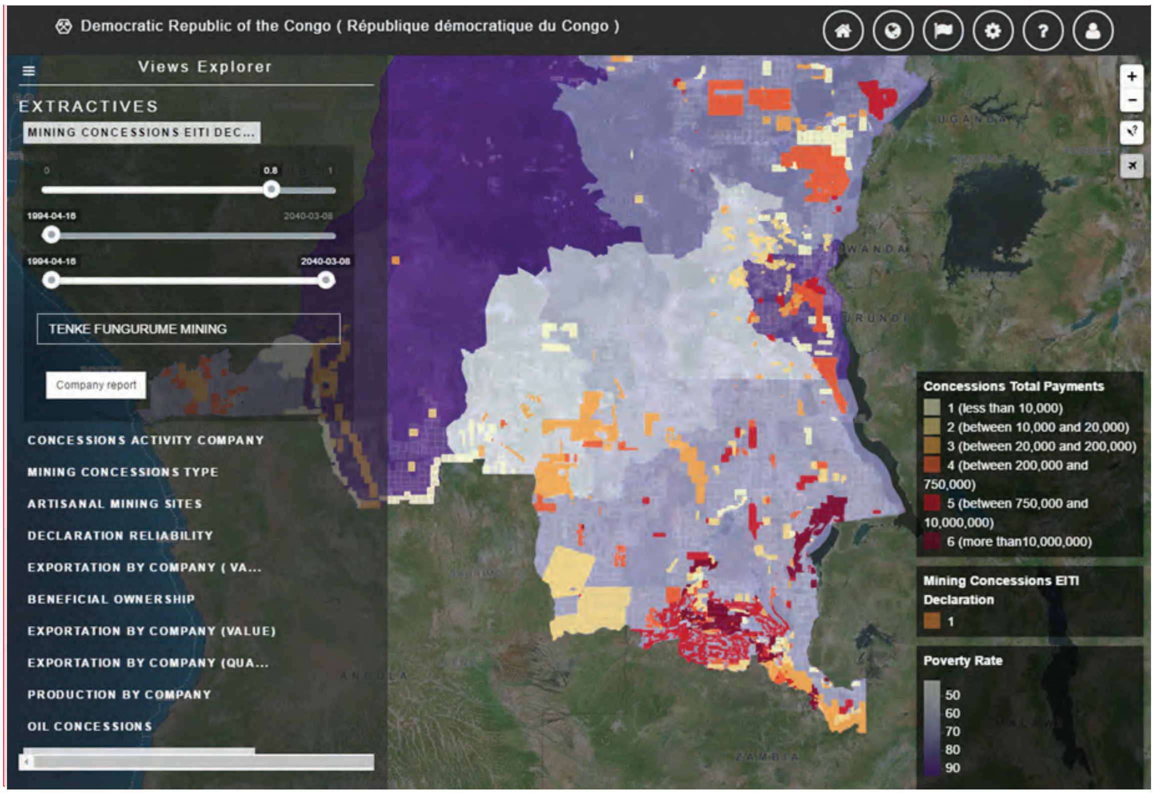


***Figure 9.3.3**. Satellite image of Tenke Fungurume mining operations in DR Congo.*

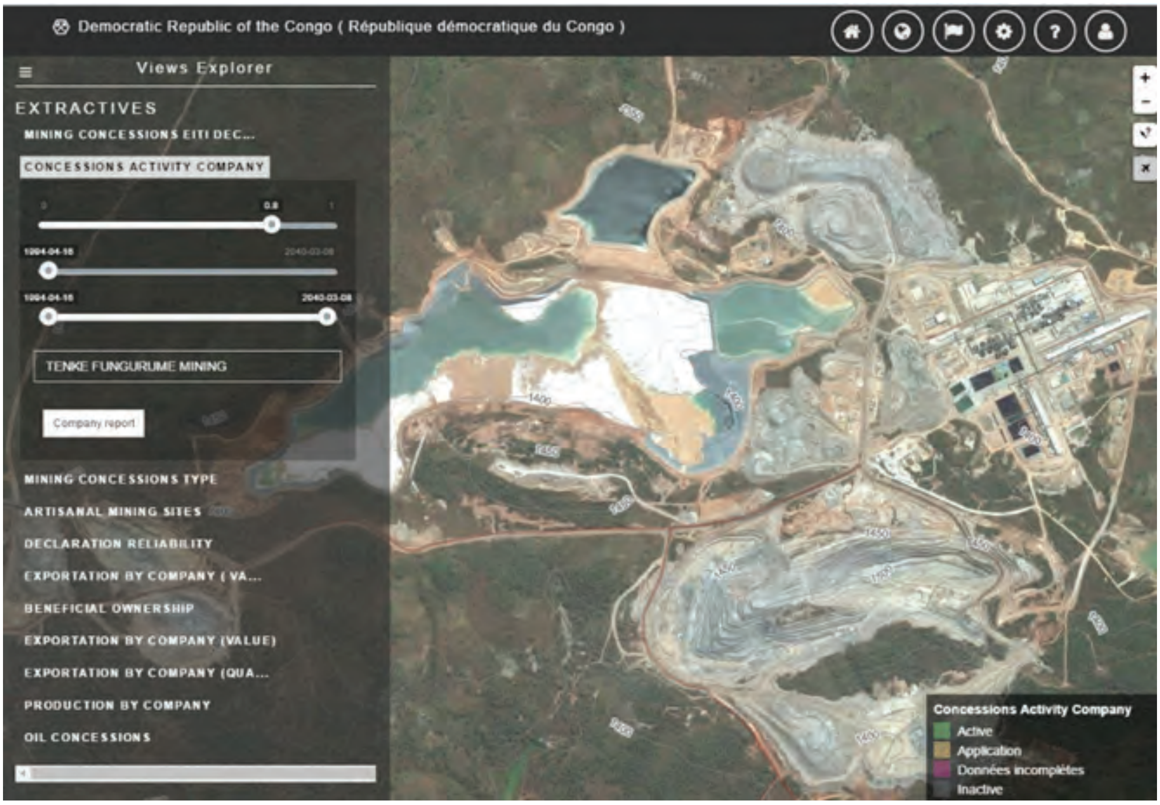
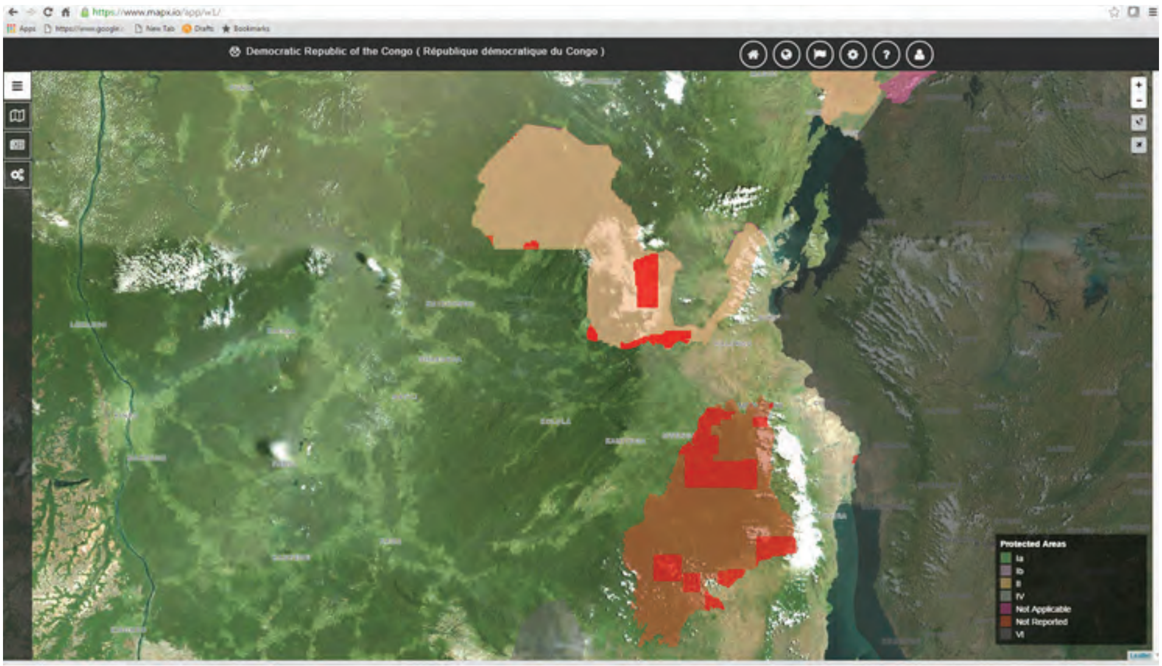


Figure 9.3.4. Corresponding company specific performance dashboard of Tenke Fungurume mining.

Figure 9.3.5. Overlap analysis of protected areas and expired mining exploration licences in North Eastern DR Congo.



9.8. Conclusion and way forward

The discussion in this chapter provides the context within which a governance framework must work. It outlines seven prerequisites that are crucial for an effective governance framework (holistic framework, decoupling economic growth from environmental and social impacts, respect for human rights, greater home country engagement, responsible business practices, balance between security of supply (global north) and sustainable development aspirations (global south) and data, information and knowledge). Also, as discussed in previous chapters, there are several instruments that usefully address the challenges of governance from different perspectives.

Lockwood *et al.* (2010; citing Howlett & Rayner, 2006) point out 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 put forward. The next two chapters seek to flesh out these approaches in much more detail.

Aerial view of deforested area of the Amazon rainforest caused by illegal mining activities in Brazil. Photo: Paralaxis © Shutterstock

Aerial view of recultivated landscape after mining. Photo: Kletr © Shutterstock

PART 3

MINERAL RESOURCE GOVERNANCE FOR SUSTAINABLE DEVELOPMENT

Aerial view of an abandoned open pit mine. Photo: Wollertz © Shutterstock

10 Towards a Sustainable Development Licence to Operate[131]

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[130] 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.[131] 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

129 This chapter draws extensively and, in some places, verbatim from a publication by the authors (Pedro et al, 2017).

130 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).

131 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.

have been mixed and the key motives for their establishment, namely (i) securing intergenerational transfers, (ii) sterilising or parking 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.

10.1. 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).

A critique of SLO

Since the introduction of the concept of the SLO in the late 1990s[132], 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 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.

132 Ibid.

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[133] 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

133 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.

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[134] 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 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.

134 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

In essence, a new framework that makes the delivery of sustainable development as the basic minimum for mining activities is required.

10.2. 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[135]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 and align it more closely to the Sustainable Development objectives, 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.

> *[...] effective governance of extractive resources so that they can deliver the sustainable development promise remains a challenge [...]n order to articulate a broader and more collaborative agenda for the mining industry and align it more closely to the Sustainable Development objectives, 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.*

135 '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].

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.

10.3. 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[136] 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 non-transparent negotiation of extensive and complex individual mining contracts. It seeks to standardize contracting laws through a generalized legislative framework that includes standardized forms that recognize that these aspects are related to the nature of the specific minerals, the level of knowledge of their occurrence, and the current capacity to manage their extraction in a manner that aligns with sustainable development. Unlike the award of petroleum exploration rights which is done through competitive tenders, the award of mining licenses in most jurisdictions is done on a first-come-first-served basis and through other discretionary procedures. However, the use of auctioning (in the solid mineral sector) to achieve host country specific policy objectives have been advocated in specific contexts, namely in areas with very good geological information and knowledge of the mineral potential, when the costs associated with implementing an

136 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/.

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.
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.
Role of Sub-national and local governments and community organisations	Passive role of acquiescing in mining on promise of social safeguards.	• Ability to collaborate in local development planning, and negotiating tradeoffs between environmental, economic and social issues arising from mining operations.

Dimension	SLO	SDLO
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.

Source: Authors' analysis

auction process can be justified and the probability of securing a large enough number of interested participants is high (UNECA, 2011: 206-210). In such cases, it is particularly important to clarify the government policy objectives well in advance of the auction and make the information publicly available to all interested parties. In addition, the biddable factors need to be clearly articulated and the assessment criteria must be objective. The biddable factors can include level of resource rent tax, capacity to promote infrastructure investment for multiple use, degree of mining linkages and value addition, extent of local content, training opportunities, to name a few. Capacity to administer the auctioning process with transparency must not be in doubt.

Figure 10.1 gives an overview of the available options in specific contexts. The decision flowchart shows the parameters to be considered in making the decision to award mineral rights on an open access basis or via a tender award. It also displays options to be considered with regard to mining infrastructure development.

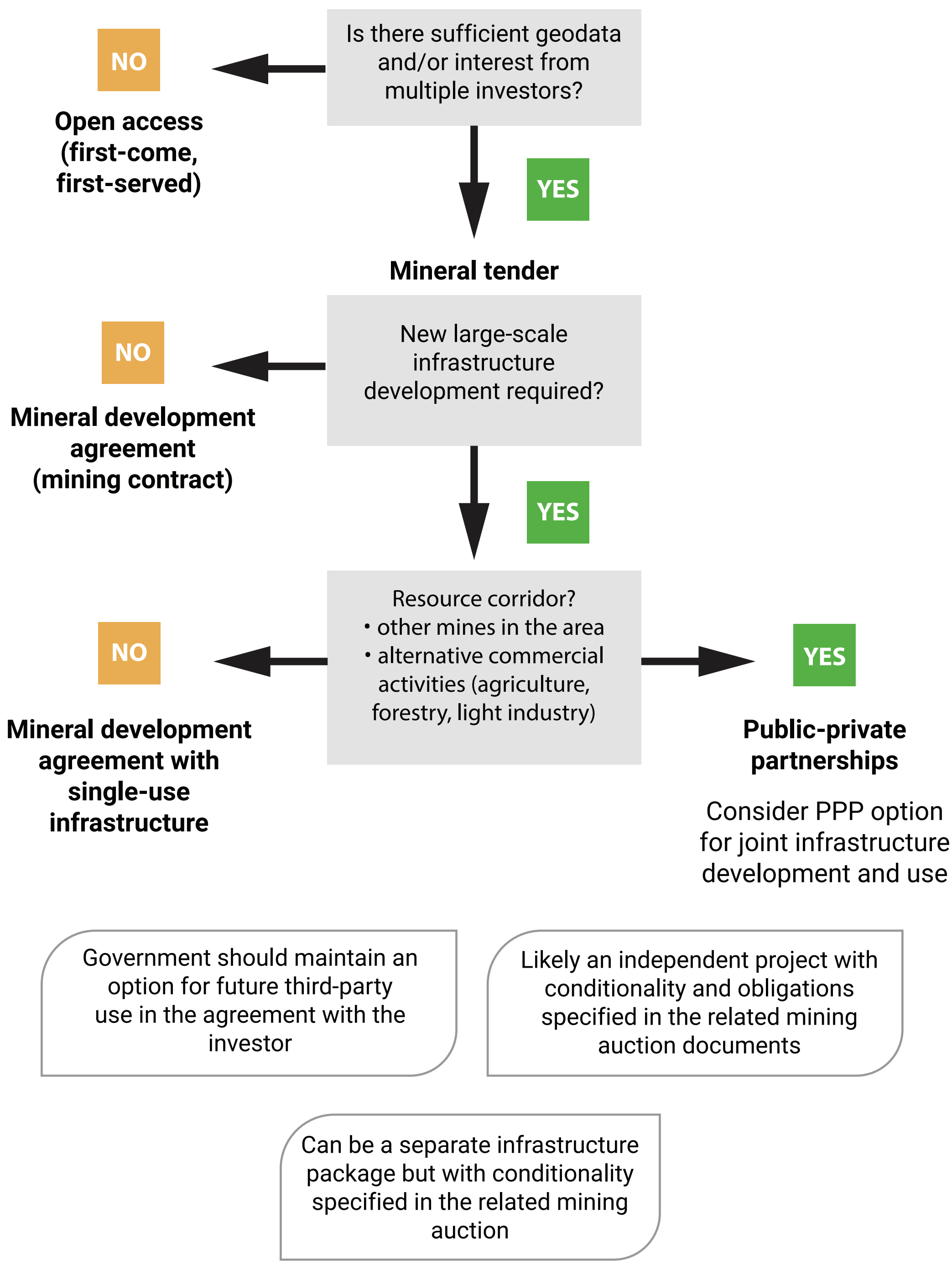
Mining can be a generator for national socio-economic growth through planned investment of royalties and other mining revenues; it can also be an "engine of growth" for the economy, by facilitating and incentivizing the development of downstream value addition in metal making and manufacturing.

Nations at different stages of development need to arrive at an optimum mix of the two approaches by appropriately devising the mineral development and regulation framework to address their needs.

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.

Figure 10.1. Decision flowchart for determining type of granting method to use



Source: Extracted from "Mineral Resource Tenders and Mining Infrastructure Projects: Guiding Principles"; By Michael Stanley and Ekaterina Mikhaylova, Extractive Industries for Development Series #22 September 2011, World Bank.

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)[137] 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.

137 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.

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 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 in full consultation with local communities through iterative dialogues that enable better management of tradeoff between environmental and social issues with a bias towards sustainable development;
- 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,[138]

138 *Avoid* - Avoid creating impacts from the outset; *Mitigate* - measures taken to reduce the duration, intensity

- 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[139] 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 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 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

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.

139 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

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.

Home country level (downstream value chain)

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[140]. 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);
- 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[141] (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.

International level

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

140 See EU External Investment Plan, https://ec.europa.eu/europeaid/eu-external-investment-plan-factsheet_en

141 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

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 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; proactively disclose information; producing integrated social and environmental impact assessments; participating in local area assessments and local area development plans, 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.

> ***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.***

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, usually the result of a lack of technical and management capacity caused by low priority accorded by governments to these essential housekeeping tasks. In order to implement laws and policies governing the mining sector, technical and management capacity is an essential, even if not a sufficient, prerequisite. Strengthening domestic accountability is also equally important.

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[142].By clarifying the pathways and articulating at each level what needs to be done it points to where an instrument can be plugged in.

10.4. Operationalizing the SDLO

10.4.1. 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:

142 See "What is Theory of Change?" http://www.theoryofchange.org/what-is-theory-of-change/

(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 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 and also overcome vested interest in home countries.

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.

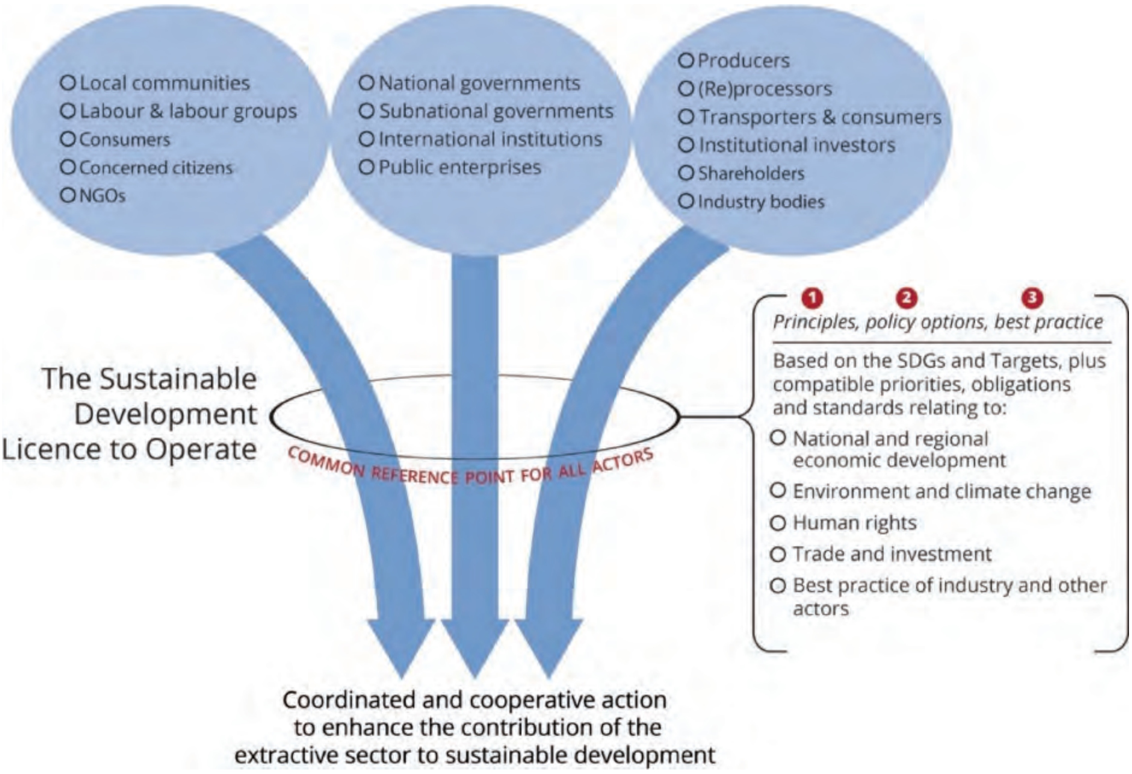
Like the CWA, the agenda undertaken by such a platform to operationalize the SDLO should seek to be comprehensive and seek to commit both host countries and home countries to specific reforms.

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

Figure 10.2. Framework of the Sustainable Development Licence to Operate



Source: Pedro et al. (2017).

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.

10.4.2. 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 10.2). The key stakeholders have shared responsibilities in delivering the key pre-requisites of mining governance. This is shown in Table 10.2.

> ***The G20 platform [...] can be an appropriate forum as both issues of security of supply and issues of sustainable development are pertinent.***

Table 10.2. Stakeholder's responsibilities

Key Pre-requisites	Local level	National Level (Host Country)
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 • Independent impact assessment management and regulation laws • New mineral resource assessment methodologies
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 • -Develop conflict resolution mechanisms	• Domesticate UN Guidance on human rights in local laws
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
The need for responsible business practices	• Shift from charity-driven CSR to Inclusive Business (IB) models	• Make IB part of the contracting agreements
Security of Supply + Sustainable development	• Promote sustainable management of raw materials • Develop SDG targets at local level • Development plans around SDGs targets.	• 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 (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

Home Country	International Level	Mining Industry	CSOs and Research Community
• 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
• 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 guarantee human rights	• Research and advocacy with special attention to indigenous peoples
• 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
		• Adoption of sustainable business practice e.g. ICMM's 10 principles	• More research on Inclusive IB models • Advocacy on IB models
• 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
• 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

10.5. 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.[143] 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.

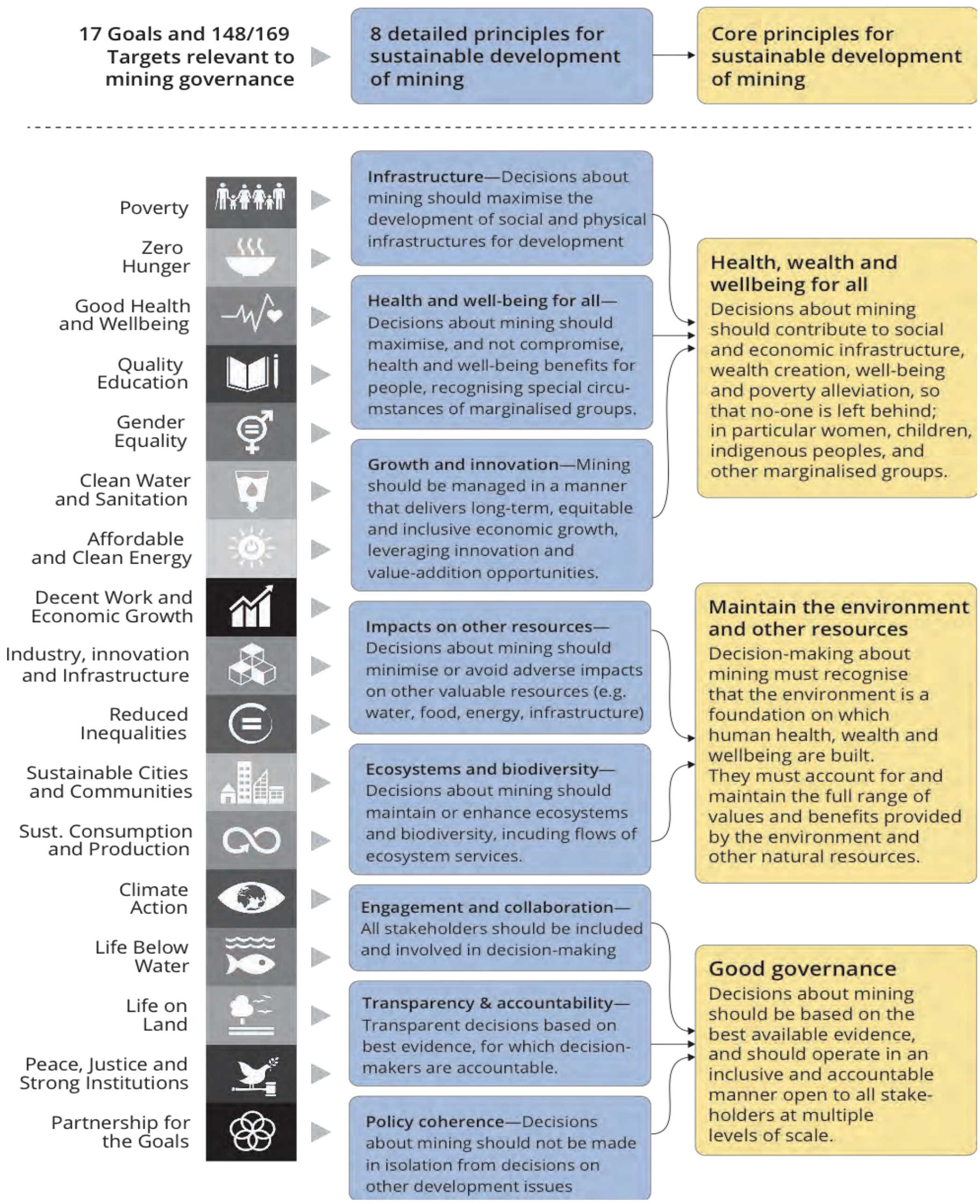
The dominant theme, as far as trade-offs are concerned, was the potential adverse impacts of mining on local communities, health, and the natural environment including ecosystems and biodiversity.

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 10.3 provides some principles that could be taken forward to advance the SDGs (Appendix 10 provides a detailed analysis of policy options under each of these eight identified principles).

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.

143 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 10.3. Illustrative principles for sustainable development of the extractive sector



Source: Authors' illustration

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[144]– 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. [145]
- 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

144 See, e.g.: https://www.iucn.org/content/good-practice-guidance-mining-and-biodiversity

145 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

for stakeholders to select a parsimonious set of instruments that fit a particular mineral value chain. The framework can also point to areas where new instruments might be needed and how a particular instrument will interact with others instruments.

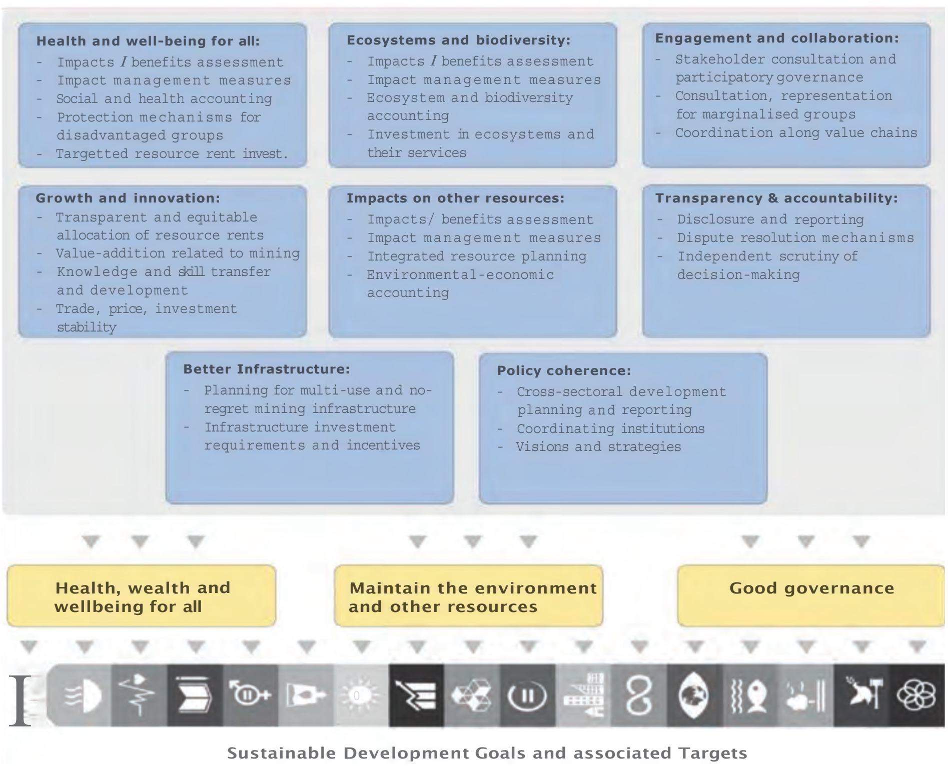
The chapter also points to how the SDLO can drive sustainable development by linking the SDLO to SDGs. It points to the principles and policies that will be needed to make mining an enabler of SDGs. Illustrative policy options for sustainable development of mining are shown in the appendix.

Appendix 10. 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 10.4) 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 10.4 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 10.4. Illustrative policy options for sustainable development of the extractive sector



Source: Authors' illustration

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).[148] • Impact and Benefits Agreements (IBAs). [149]
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. [150] • Couple SIAs with related assessments: health, occupational risk, human rights, and other well-being factors. [151] • 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. [152] • 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. [153] • IFC Performance Standard 1 on Assessment and Management of Environmental and Social Risks and Impacts. [154] • UNEP Guidelines for Social Lifecycle Assessment of Products. [155] • ICMM Guidance on Health Impact Assessment and Occupational Risk Assessment. [156] • EU Raw Materials Information System. [157] • Myanmar Centre for Responsible Business SWIA for Myanmar. [158] • International Labour Organisation Fundamental Principles and Rights at Work. [159]
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. [160] • ICMM Guidance on Health Impact Assessment and Occupational Risk Assessment. [161] • IFC Performance Standard 1 on Assessment and Management of Environmental and Social Risks and Impacts. [162] • 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).[163] • Responsible Mining Index. [164]
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. [165] • BSR Recommendations for the Mining Sector on Women's Economic Empowerment in Sub-Saharan Africa. [166] • ICMM Good Practice Guide on Indigenous Peoples and Mining. [167]
Targeted investment of resource rents to address health and wellbeing impacts of mining	• Ring-fence appropriate share of mining revenues for social and health purposes including poverty reduction (e.g. social and health management funds).	• Mining community development agreements.[168] • Conduct and compensation agreements. [169]

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.[170] • OECD Guiding Principles for Durable Extractive Contacts.[171] • World Bank Guidance on Promoting Transparent Access to Mineral Resources. [172] • Financial Action Task Force Recommendations. [173] • Publish What You Pay. [174] • Extractive Industries Transparency Initiative. [175] • Formalisation programmes for artisanal and small-scale mining. [176] • 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. [177] • Establish strategies and policies for improving standardisation and quality control of support sectors for mining.	• Local procurement initiatives. [178] • Mining Shared Value. [179] • Mineral Beneficiation Policies in South Africa, and Indonesia, [180] and elsewhere. • Small grants and equipment leasing schemes (e.g. in Tanzania) through World Bank SMMRP project. [181]
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. [182] • Local Content Legislation in Ghana. [183] • 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. [184] • 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 strategies and policies for shared use of 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. [185] • Beria Corridor in Mozambique, Lamu Port-South Sudan-Ethiopia Transport Corridor. [186] • African Mining Vision • Integrated Resource Corridors Initiative (IRCI) Scoping & Business Plan. [187]
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 [188] • Programme for Infrastructure Development in Africa (PIDA). [189] • A Framework to Approach Shared Use of Mining-related Infrastructure. [190] • District Mineral Funds in India, funded by mineral royalties. [191]

Aerial photo of gold mining in the rainforest, Guyana, South America. Photo: kakteen © Shutterstock

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).[192] • Ensure that mitigation-hierarchy approaches (avoid, mitigate, restore, offset) are applied by relevant decision-makers. • Ensure use and appropriate resourcing for environmental management systems. • Ring-fence appropriate share of mining revenues for ecosystem and biodiversity management.	• Biodiversity offsetting policies for mining.[193] • Guidance on developing biodiversity offsets in Andean ecosystems. [194] • ICMM Good Practice Guidance for Mining and Biodiversity.[195] • Responsible Jewellery Guidance on Biodiversity. [196] • ISO 14001: Environmental Management.[197] • Guidance Natura2000 and extractive industries [198]
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.[199] • UN Framework for Development of Environment Statistics.[200] • UN System of Environmental-Economic Accounting (Ecosystem Accounts).[201] • Natural Capital Protocol.[202]
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. [203] • Global Environment Facility investments in PES schemes. [204]

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. [205] • UNECE Convention on Environmental Impact Assessment in a Transboundary Context, and Protocol on SEA. • European Commission 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. [206]
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. [207] • EU Natura2000 Guidance concerningextractive industries. [208] • 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 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.[209] • Land use planning legal and policy frameworks in Brazil, Chile, Colombia, Mexico and Peru.[210] • Integrated Resource Corridors Initiative (IRCI) Scoping & Business Plan.[211]
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.[212]
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. [213] • Participatory land use planning in the United Kingdom. • See Chapter 3 above on ASM.
Establish consultation and representation requirements for marginalised 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.	• Legal requirements concerning free prior and informed consent in Colombia. [214] • 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.[215] • 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 are 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.[216] • The Mining Local Procurement Reporting Mechanism. [217] • OECD Base Erosion and Profit-Sharing project (home countries).[218] • Responsible Mining Index.[219] • Global Reporting Initiative (GRI) G4 Mining and Metals Sector Disclosures.[220] • EU Non-Financial Reporting Directive.[221] • EU Directives concerning Transparency and Accounting.[222]
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.[223] • 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.[224]

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.[225] • UN Economic Commission for Europe Pan-European Strategic Framework for Greening the Economy.[226] • Country Mining Vision (CMV) Guidebook.[227] • OECD Guiding Principles for Durable Extractive Contacts.[228]
Establish integrated planning and reporting frameworks for mining and other sectors contributing to sustainable development	• 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. • 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.[229] • Kenya Mining and Minerals Policy and Mining Act 2016.[230] • 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.[231] 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 (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 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.[232]

Transparency and accountability[233]

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*'.[234] 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.[235] 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.

> ***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).***

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.[236] 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.[237] 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 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.[238]

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 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.[239] 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[240]

146 http://www.oecd.org/dev/guiding-principles-durable-extractive-contracts-pd-nr.htm

147 http://www.infomine.com/library/publications/docs/Fidler2007.pdf

148 See, e.g.: https://www.iaia.org/uploads/pdf/SIA_Guidance_Document_IAIA.pdf.

149 See, e.g.: http://www.tandfonline.com/doi/abs/10.1080/14615517.2013.782978.

150 See, e.g: https://www.sciencedirect.com/science/article/pii/S0301420713000536.

151 See e.g.: http://www.planning.nsw.gov.au/Policy-and-Legislation/~/media/8B6753256417468F80E11708762DA11D.ashx

152 http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/performance-standards

153 http://www.unep.fr/shared/publications/pdf/dtix1164xpa-guidelines_slca.pdf

154 https://www.icmm.com/en-gb/publications/health-and-safety/good-practice-guidance-on-health-impact-assessment

155 http://rmis.jrc.ec.europa.eu

156 http://www.myanmar-responsiblebusiness.org/swia/mining.html

157 http://www.ilo.org/declaration/lang--en/index.htm

158 http://www.infomine.com/library/publications/docs/Fidler2007.pdf;

159 https://www.icmm.com/en-gb/publications/health-and-safety/good-practice-guidance-on-health-impact-assessment

160 http://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/performance-standards

161 http://www.who.int/classifications/icf/en/

162 https://responsibleminingindex.org

163 http://www.infomine.com/library/publications/docs/Fidler2007.pdf;

164 https://www.bsr.org/reports/BSR_Womens_Empowerment_Africa_Mining_Brief.pdf

165 https://www.icmm.com/en-gb/publications/mining-and-communities/indigenous-peoples-and-mining-good-practice-guide

166 https://openknowledge.worldbank.org/handle/10986/12641

167 https://www.dnrm.qld.gov.au/__data/assets/pdf_file/0004/480388/guide-land-access.pdf

168 https://resourcegovernance.org/sites/default/files/documents/natural-resource-charter-benchmarking-framework-report-2017-web_0.pdf

169 http://www.oecd.org/dev/guiding-principles-durable-extractive-contracts-pd-nr.htm

170 https://openknowledge.worldbank.org/handle/10986/18399

171 http://www.fatf-gafi.org/publications/fatfrecommendations/documents/fatf-recommendations.html

172 http://www.publishwhatyoupay.org/resources/

173 https://eiti.org

174 Analysis of formalization approaches in the artisanal and small-scale gold mining sector (UN Environment, 2012)

175 http://includeplatform.net/wp-content/uploads/2015/03/GTF-Local-Content-MOG-in-Ghana-SR-formatted.compressed.pdf

176 http://www.csrm.uq.edu.au/docs/4361%20CSRM%20SME%20Report%20Email%20V2.pdf

177 http://miningsharedvalue.org

178 http://unctad.org/meetings/en/Presentation/SUC%20GCF2015%20Sujatmiko.pdf

179 https://www.eunomix.com/cmsAdmin/uploads/eunomix-africa-mineral-&-beneficiation-policy-quarterly-monitor-no-2-final-4dec2015_001.pdf

180 https://www.csrm.uq.edu.au/docs/CSRM%20Report_FINAL%20TO%20PRINT_singles.pdf.

181 http://includeplatform.net/wp-content/uploads/2015/03/GTF-Local-Content-MOG-in-Ghana-SR-formatted.compressed.pdf

182 https://resourcegovernance.org/sites/default/files/documents/natural-resource-charter-benchmarking-framework-report-2017-web_0.pdf

183 http://pubs.iied.org/pdfs/17439IIED.pdf

184 http://pubs.iied.org/pdfs/12606IIED.pdf

185 https://www.adamsmithinternational.com/documents/resource-uploads/IRCI_Scoping_Report_Business_Plan.pdf

186 http://pubs.iied.org/pdfs/12606IIED.pdf

187 https://au.int/en/ie/pida

188 http://ccsi.columbia.edu/files/2014/05/A-Framework-for-Shared-use_March-2014.pdf

189 http://mines.gov.in/writereaddata/UploadFile/PMKKKY%20Guidelines.pdf

190 See: www.cbd.int

191 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

192 www.forest-trends.org

193 https://www.cbd.int/development/doc/Minining-and-Biodiversity.pdf

194 https://www.responsiblejewellery.com/files/Biodiversity-RJC-Guidance-draftv1.pdf

195 https://www.iso.org/iso-14001-environmental-management.html

196 http://ec.europa.eu/environment/nature/natura2000/management/docs/neei_n2000_guidance.pdf

197 https://www.wavespartnership.org

198 https://unstats.un.org/unsd/envstats/fdes.cshtml

199 https://unstats.un.org/unsd/envaccounting/seea.asp

200 https://naturalcapitalcoalition.org/protocol/

201 www.nature.org/ourinitiatives/

202 www.thegef.org/sites/default/files/publications/28252nomarks_0.pdf

203 www.cao-ombudsman.org/howwework/advisor/documents/watermoneng.pdf

204 http://www3.weforum.org/docs/WEF_Blueprint_for_a_Greener.pdf

205 http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52008DC0699

206 http://ec.europa.eu/environment/nature/natura2000/management/docs/neei_n2000_guidance.pdf

207 UNCCD Global Land Outlook Working Paper: https://static1.squarespace.com/static/5694c48bd82d5e9597570999/t/593a42d7197aea88458703df/1496990441721/Land+Use+Planning+__G_Metternicht.pdf

208 ELLA, Practical Action, DFID: Policy Brief: Land Use Planning for Extractive Industries.

209 https://www.adamsmithinternational.com/documents/resource-uploads/IRCI_Scoping_Report_Business_Plan.pdf

210 http://www3.weforum.org/docs/WEF_RMDI_Implementation_Manual_2017.pdf

211 http://pubs.iied.org/pdfs/16635IIED.pdf

212 http://pubs.iied.org/pdfs/12606IIED.pdf

213 www.oecd.org/corporate/mne/artisanal-small-scale-miner-hub.htm

214 eiti.org.

215 miningsharedvalue.org/mininglprm/.

216 www.oecd.org/tax/beps/.

217 https://responsibleminingindex.org/index/.

218 https://www.globalreporting.org/resourcelibrary/GRI-G4-Mining-and-Metals-Sector-Disclosures.pdf.

219 https://ec.europa.eu/info/business-economy-euro/company-reporting-and-auditing/company-reporting/non-financial-reporting_en

220 http://lexicon.ft.com/Term?term=EU-accounting-and-transparency-directives.

221 resourcegovernance.org/sites/default/files/documents/natural-resource-charter-benchmarking-framework-report-2017-web_0.pdf.

222 resourcegovernance.org/sites/default/files/documents/natural-resource-charter-benchmarking-framework-report-2017-web_0.pdf.

223 http://mines.gov.in/writereaddata/UploadFile/Sustainable_Development_Framework.pdf

224 www.unece.org/fileadmin/DAM/env/documents/2016/ece/ece.batumi.conf.2016.6.e.pdf

225 https://www.uneca.org/sites/default/files/PublicationFiles/country_mining_vision_guidebook.pdf

226 www.oecd.org/dev/guiding-principles-durable-extractive-contracts-pd-nr.htm

227 https://resourcegovernance.org/sites/default/files/documents/natural-resource-charter-benchmarking-framework-report-2017-web_0.pdf

228 https://www.idlo.int/sites/default/files/pdfs/highlights/Kenya%20Mining%20Policy%20Popular%20Version-LowRes.pdf

229 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.

230 http://www.jm.undp.org/content/jamaica/en/home/operations/projects/poverty_reduction/acp-eu-development-minerals-programme-.html

231 David Jensen and Inga Petersen — UN Environment, Post-Conflict and Disaster Management Branch

232 Definition of 'Information Age' https://www.merriam-webster.com/dictionary/Information%20Age

233 The World Bank '#GenderMatters: From digital divides to digital dividends'. January 13, 2016. http://blogs.worldbank.org/developmenttalk/where-are-women

234 See: http://data.europa.eu/eli/reg/2017/821/oj

235 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

236 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.

237 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

238 For further discussion see IIED's work on formalization of mining rights in Tanzania, Madagascar and elsewhere.

Big mining dumping truck. Photo: Rattanapon Ninlapoom © Shutterstock

Conveyor loading the barge with black coal. Photo: hilmawan nurhatmadi © Shutterstock

11 Implications and implementation of the SDLO

11.0. Introduction

In an era characterized by unprecedented governance complexity and an urgent imperative for sustainable development,[239] current modes of governance for mining are not fit-for-purpose. The SDLO framework presented in chapter 10 is advocated as a flexible means of enabling different actors to highlight 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 therefore 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 realize 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, as well as 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) has 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.[240]

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 have varying 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 of finance and information, and through shared concerns, and (2) SDLO implementation might emphasize different subsets of governance issues concerning mining.

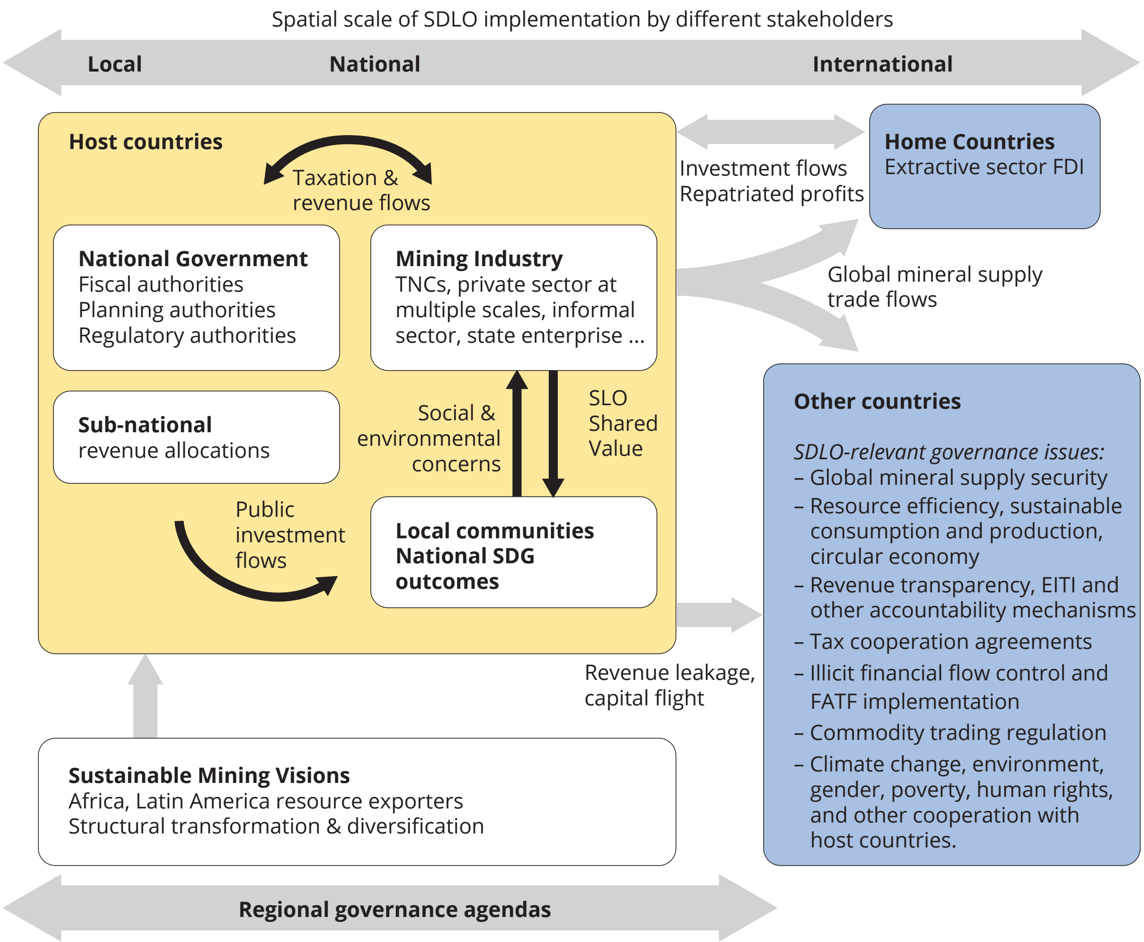
Many of the policy implications of the SDLO are also analysed in the 2016 Atlas Mapping Mining to the SDGs[241] published by the World Economic Forum and partners. Figure 11.2 below, reproduced from the Atlas, illustrates a series of SDGs implications for mining companies (emphasizing issues relevant to larger and/or transnational companies), and their connections to public policy agendas

239 See Jeffrey Sachs, The Age of Sustainable Development (Columbia University Press, 2015).

240 See 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.

241 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 11.1. International governance context for SDLO implementation



Source: Acquatella (2016)

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'.[242] 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 the extractive sector or whose work is affected by it 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 visions that are sensitive to the need for global collaboration (such as the Africa Mining Vision, discussed previously). 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 to balance synergies and trade-offs across well-being, infrastructure and the environment in specific settings.

242 For comparable observations in the energy sector—see FF Nerini et al, (2018) Energy.

Figure 11.2. Issues concerning mining and sustainable development.

Source: 2016 Atlas Mapping Mining to the SDGs[245]

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 where appropriate. In many legal frameworks relating to mining, there is a complete absence of priority setting concerning the merits of mining in the context of other activities and interests (although this broader perspective is often 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.[243]

Another significant implication is that, in many countries, impact assessment and permitting processes for mining need to change from siloed and specialized activities (such as EIA) to holistic and inclusive processes grounded in the aforementioned principles. In many countries, environmental impact assessment processes focus predominantly on site-specific biophysical impacts on the environment,[244] without consideration of how such impacts might affect flows of valuable goods

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 example, habitat loss and site-specific pollution levels.

Open cast gold mining operation in remote Australia showing pit and spoil piles. Photo: Symbiosis Australia © Shutterstock

and services beyond the site in question[245]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 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".

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.

245 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 (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 to far exceed the economic returns associated with mining. For further discussion, see the Synthesis Reports of the TEEB Initiative.

Box 11.1. Mining and the SDLO: some legal perspectives from India[246]

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 (public and private) that have integrated operations to produce steel, aluminium, copper and so on. Most mineral production is for domestic consumption. Federal laws on granting concessions and regulating issues relating to environmental impacts, involuntary displacements and so on provide a comprehensive framework for mining.

In India, approaches towards increasing sustainability in mining related operations have taken the form of creating a generic "Sustainable Development Framework",[247]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 strike the right balance. Below are three landmark cases that were ruled on by the Indian Supreme Court. In the first one, the Court points out that revenue maximization (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 tangibly involved in devising a framework to mitigate regional level impacts and develop physical and social infrastructure in mining regions by mandating contributions over and above the statutory payments on account of royalty and compensatory afforestation (Comprehensive Environment Plan for the Mining Impact Zone or CEPMIZ). In the third case, the Court is again mandating an additional payment of 20 per cent of profits for the socioeconomic development of indigenous populations on the basis of Constitutional principles.

Case 1: The public trust doctrine in extraction of natural resources[248]

The President of India had made Reference to the Supreme Court seeking its Opinion on the permissible methods for disposal of natural resources across all sectors (including minerals). The Court, via its Judgement dated 27 September 2012, discussed the matter in depth and underlined several principles that have recently emerged based 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.

246 By S. Vijay Kumar, Distinguished Fellow TERI, New Delhi, India.

247 http://mines.nic.in/writereaddata/UploadFile/Sustainable_Development_Framework.pdf.

248 Special Reference No.1 of 2012 under Article 143(1) of the Constitution of India. Judgement dated September 27, 2012.

The Supreme Court also cited 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[249]

There are 266 iron ore mines in Karnataka, of which 134 are located in forest areas. In Bellary District, 148 mines (with 98 in forest areas) cover 10,598 hectares of land. In 2005, the Indian Bureau of Mines 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 in 2000 when the Karnataka State Mining Policy adopted "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 grounds that the mining practices were environmentally damaging, requesting a halt to all mining and other related activities in forest areas of the State. The Court, besides other directions, ordered the establishment 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 and 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) 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 so on in the project area should also be made.

Case 3: The Samatha Case[250]*— protecting tribal rights and customs and ensuring sharing mining revenues with local tribal communities.*

In the early 1990s, *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 that provided for the protection of tribal rights and customs, and which sought to provide for their planned development consistent with their culture.

249 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.

250 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).

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 bound 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 groundbreaking move, 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.

The Supreme Court also mandated that at least 20 per cent of the net profits should be set aside 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, as well as peace and good government in Scheduled Areas. This 20 per cent allocation would be over and above the expenditure for re-forestation and maintenance of ecology statutorily already required.

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

Regional political integration platforms have a role in establishing initiatives for harmonized policies.

Box 11.2. Latin America experience in 2003-2012 suggests upgrade in mining regimes[251]

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[252] more than tripled from 0.6 per cent to 2.0 per cent of regional GDP. Countries with a longer mining tradition (Argentina, Chile, Colombia, Peru and Mexico) succeeded in appropriating approximately 20-30 per cent share of these rents[253]annually during the period, whereas smaller countries with incipient mining sectors and weaker fiscal capacity (Guatemala and Honduras) appropriated only 10 per cent 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.[254]

251 Contribution from Jean Acquatella, Working Group Member.

252 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 mine head. Basket includes tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite and phosphate.

253 States' share in rent refers to the ratio of State mining revenues divided by the mineral rent WDI statistic.

254 Only Peru and Honduras have implemented EITI; Colombia and Guatemala are pending assessment; and Mexico, Guyana and Suriname signed up in 2017.

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 during the boom period (approximating 70 per cent of estimated total mining rent), 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, Plurinational State of Bolivia, Colombia, Ecuador, Mexico and the Bolivarian Republic of Venezuela) appropriating 60-75 per cent share of 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.[257]

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, thereby 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 also apply to home country governments. See also the comments on international cooperation to deliver the SDLO in section 11.1. 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,[256] 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 result 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:

255 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 up-cycles. Direct participation of the State, either through public enterprises or through shareholdings, is also the general rule.

256 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.

Strengthening host countries' fiscal, revenue management and public investment capacities

Sustainable mining initiatives (SLO, shared-value and so on) have so far 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, with a view to turning mineral wealth into a driver for structural transformation and diversification.[257] These governance challenges extend beyond mining industry actors, and concern host government capacity to perform core fiscal, budgetary and public investment functions 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 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 to close loopholes and reduce revenue leakage away from resource-exporting countries.[258]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.

257 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.

258 Refer to Figure 11.1, other countries SDLO relevant governance issues.

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. According to ECA (2016), African countries should consider regional approaches when developing a legal framework for foreign investment (rather than relying exclusively on Bilateral Investment Treaties).

Coordinating implementation of transparency and accountability agendas at the national and international levels

International political attention to transparency and accountability agendas has grown to encompass an increasing number of issues. This ranges 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. The initial EITI coverage of resource revenue payments is now extending to beneficial ownership disclosure and commodity trading transparency.[259]As international pressures for transparency initiatives continue to extend their reach, they offer opportunities to strengthen parallel national initiatives for increased civil society oversight and democratic accountability of resource rent allocation and use by governments and industry in extractive regions. For instance, an increasing trend towards more formal and periodic civil society monitoring of national government resource-revenue allocation and its local development impacts took hold in several Latin American countries during the last resource boom (Peru, Colombia, Ecuador and the Plurinational State of Bolivia). Another target area for international cooperation and training in support of SDLO is the strengthening of third sector monitoring and civil society capacity to use information disclosure for public accountability in resource-exporting countries. 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 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 the national and sub-national levels is characterized by the widespread absence of planning of mining. This planning could be underpinned by a 'nexus' approach that attempts to optimize flows of benefits from both minerals and other stocks of natural capital (especially ecosystems and biodiversity). Institutional structures for deliberative dialogue among different stakeholders are an important component of such planning. These enable consensus-building on issues where views might diverge (such as appropriate or acceptable resource rents, development importance of mining versus other sectors and conceptions of development benefits), and place less reliance on the role of "strong government" as the top-down arbiter of planning decisions.

There is also a need to establish frameworks to facilitate natural resource accounting, monitoring and reporting as inputs to more holistic and inclusive planning processes. In this context, policy reform 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 the UN System for Environmental-Economic Accounting (SEEA).[260] 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.[261]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 and Guatemala) have undertaken work to compile subsoil resources accounts in accordance with SEEA standards.[262]

> *Mineral resources governance around the world at the national and sub-national levels is characterized by the widespread absence of planning of mining [...] There is also a need to establish frameworks to facilitate natural resource accounting, monitoring and reporting as inputs to more holistic and inclusive planning processes.*

Figure 11.3. Structure and uses of the System for Environmental-Economic Accounting

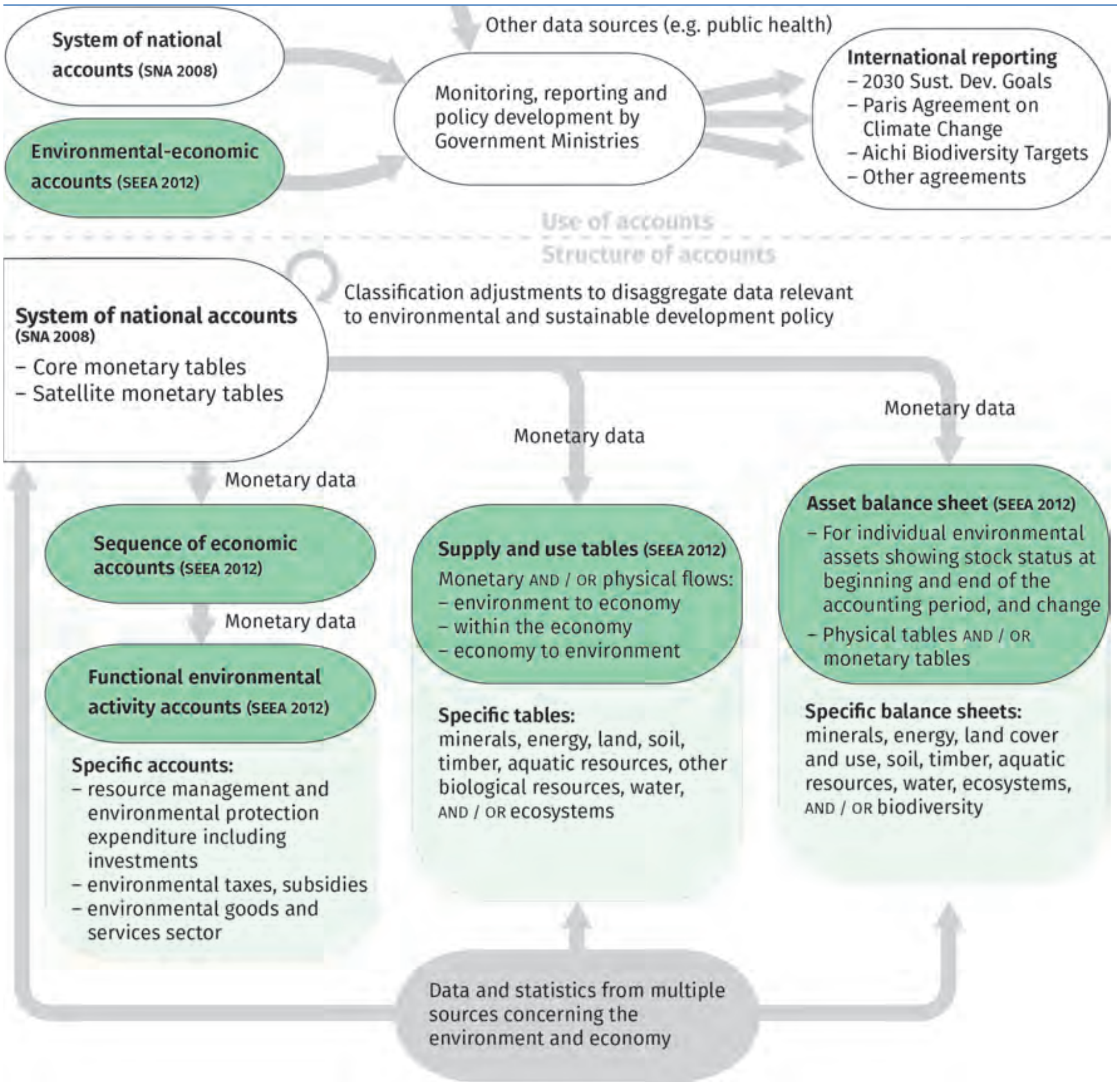
Exploring opportunities to bolster long-term resource supply stability through innovative cooperation between resource-exporters and the

260 See for example: United Nations, European Commission, FAO, OECD Group. (2015). System of Environmental-Economic Accounting 2012 Experimental Ecosystem Accounting (pp. 1–198); United Nations (2014), System of Environmental-Economic Accounting 2012 Central Framework (pp. 1–378).

261 See https://unstats.un.org/unsd/nationalaccount/sna.asp.

262 See: https://www.wavespartnership.org/en/knowledge-center

international community



Source: United Nations, European Commission, FAO, OECD Group. (2015); United Nations (2014)

International cooperation to bolster long-term global resource-supply security offers mutual benefit opportunities. Resource-intensive economies like OECD countries and China are paying increasing attention to long-term supply stability scenarios for key industrial metals, as well as 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-term global mineral supply security (as they also hurt the development and SDG prospects of resource-exporting countries). 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 (in the interests of balanced global supply/ demand expansion with increased price stability). Options to stabilize investment flows for extractive exploration and development in host countries, strengthen global supply security and reduce the risks of volatility can only be explored through broad multilateral and regional-level platforms. Promoting renewed discussion of such options in line with the development aspirations resource-exporting countries and the long-term supply-security prerogatives of industrial economies, should form part of the aims of the SDLO.

Resource supply security is closely linked with resource efficiency, recycling and re-use alongside other green and circular economy agendas gaining increased political attention in OECD countries, as well as 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. This would also create synergies and avoid duplication. The paragraphs below consider specific implications of the SDLO for three broad sets of actors: policymakers at various levels, the private sector and third sector actors including non-governmental organizations and civil society.

11.4.1. Policymakers

There is a 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 is less about the lack of appropriate constitutional provisions, legislation, regulations, contracts and licences, and more about the challenge of their enforcement. 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 of more holistic standardized protocols and indicators. Box 11.3 summarizes existing standards that could be supplemented to that end.

Box 11.3. Towards a standard protocol for planning and monitoring of mining operations[263]

International guidelines on which features 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 the 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 are scattered among public and private institutions, often remain undisclosed and are mostly incomparable. What is needed is a standard protocol for assessing the compatibility of mining with sustainable development, which can then be applied worldwide for every industrial mining operation. This could be 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
- 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 that is evaporated, in other words 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 from 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 involved, 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 that will affect the amount of land rehabilitated, for example. 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 in advance (such as on water and biodiversity); support the search for less burdensome options; prepare licenses to operate; and feed monitoring of resource flows at the regional and national levels.

263 Contribution from Stefan Bringezu *(presentation at FORAM pilot event, 27 June 2018, Nancy, France).*

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. Rules and institutions then need to be supported by a critical mass of citizen understanding and engagement (Collier, 2013).

As stated earlier, however, there are no universal solutions. Very different governance solutions may apply to countries featuring specific industry characteristics, particular challenges or varying stages of economic development. For instance, differentiated governance approaches are needed for countries where standards and guidelines can be easily implemented, compared to others where a large artisanal and small-scale mining sector, high levels of corruption or conflict and war are relevant. Governance strategies therefore 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 myriad private-sector initiatives focusing on mining and sustainable development. In this context, the main purpose 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 to identify options, gaps and strategic opportunities. One example would be identifying the most relevant indicators from instruments including the Global Reporting Initiative; Global Compact; and the Voluntary Principles on Security and Human Rights.
- 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 the national development aspirations of host countries and improve stakeholder engagement towards a shared understanding of what constitutes value.

Many of the implications of the SDLO for private actors are analysed in the 2016 Atlas Mapping Mining to the SDGs,[264] 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 (as it is intended to be relevant across organizations 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 characterized by informality, complexity and decentralization (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.

> ***Governance strategies therefore need to be tailored to a particular country's socioeconomic, geopolitical, historical and cultural background […] There are myriad private sector initiatives focusing on mining and sustainable development.***

11.4.3. Third sector actors

Third sector actors — including civil society organizations, research institutions and non-governmental organizations — can and must play crucial and influential roles in extractive sector governance. Key implications for such organizations

264 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.

Landscape caused by open pit coal mining activity in Sangatta, Indonesia. Photo hilmawan nurhatmadi © Shutterstock

include the following:

- As discussed in Chapter 10, there are complex synergies and trade-offs 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 extend this evidence — and the SDLO provides an organizing framework for research-focused third sector organizations to address this need by working beyond disciplinary silos.
- The SDLO can also be operationalized by third sector organizations as a normative framework to support the representation of marginalized stakeholders in governance processes and to 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 that it can use SDGs to combine 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 in a way that can help require or encourage 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 characterized by governments and project proponents as "inevitable" or "essential" for national development in the light of macro-level opportunity costs and wider benefits of not proceeding. In this context, dialogue with local communities can be shaped by the premise that it contains "an offer they cannot refuse". Such an approach starts 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 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 ended conclusively.

Box 11.4. Community consent to mining[265] — Bauxite mining and the licence to mine in forest areas inhabited by indigenous communities [266]

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 tonne 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 grounds that the Refinery would be totally dependent on mining of bauxite from Niyamgiri Hills (situated in Lanjigarh), which was a vital wildlife habitat that included an elephant corridor, and also on the grounds that the project would disturb local tribes (indigenous peoples) like the *Dongaria Kondh*.

The case was heard by the Supreme Court. Although the state of Odisha had informed the Court the lack of basic infrastructure facilities in the Tribal areas of both 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, the Court did not agree to endorse 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 development plan. The Court also suggested that M/s SIIL should deposit, every year, 5 per cent of its annual profits before tax and interest from the Lanjigarh Project to be spent on the development of health, education, communication, irrigation and agriculture of the scheduled area within a radius of 50 km.

Local opposition continued, however, 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*, depended. The Report also pointed out that the narrow definition of the "Project Affected People" adopted by the company for the 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, this 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 concerning 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, maintenance of ecological balance and strengthening of the forest conservation regime. The Act also noted that tribal rights to 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.

265 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.

266 By S. Vijay Kumar, Distinguished Fellow TERI, New Delhi, India.

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 – has 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.

The outcome was that 2013 saw India's first referendum on the development narrative that had been previously 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 would destroy their god Niyam-Raja and their source of sustenance — over 100 perennial streams, as well as 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 management of the mineral concession framework. In 2011, the Ministry issued a "National Sustainable Development Framework". It was clear, however, that a framework 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",[269] which are expected to develop and implement plans for the socioeconomic 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.

11.5. Conclusions[267]

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 industrialization 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, inter alia, information exchange, media or 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 within affected communities (including alternative and marginalized voices) (Owen & Kemp, 2013). It is therefore 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 assessments. In doing so, industry 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.

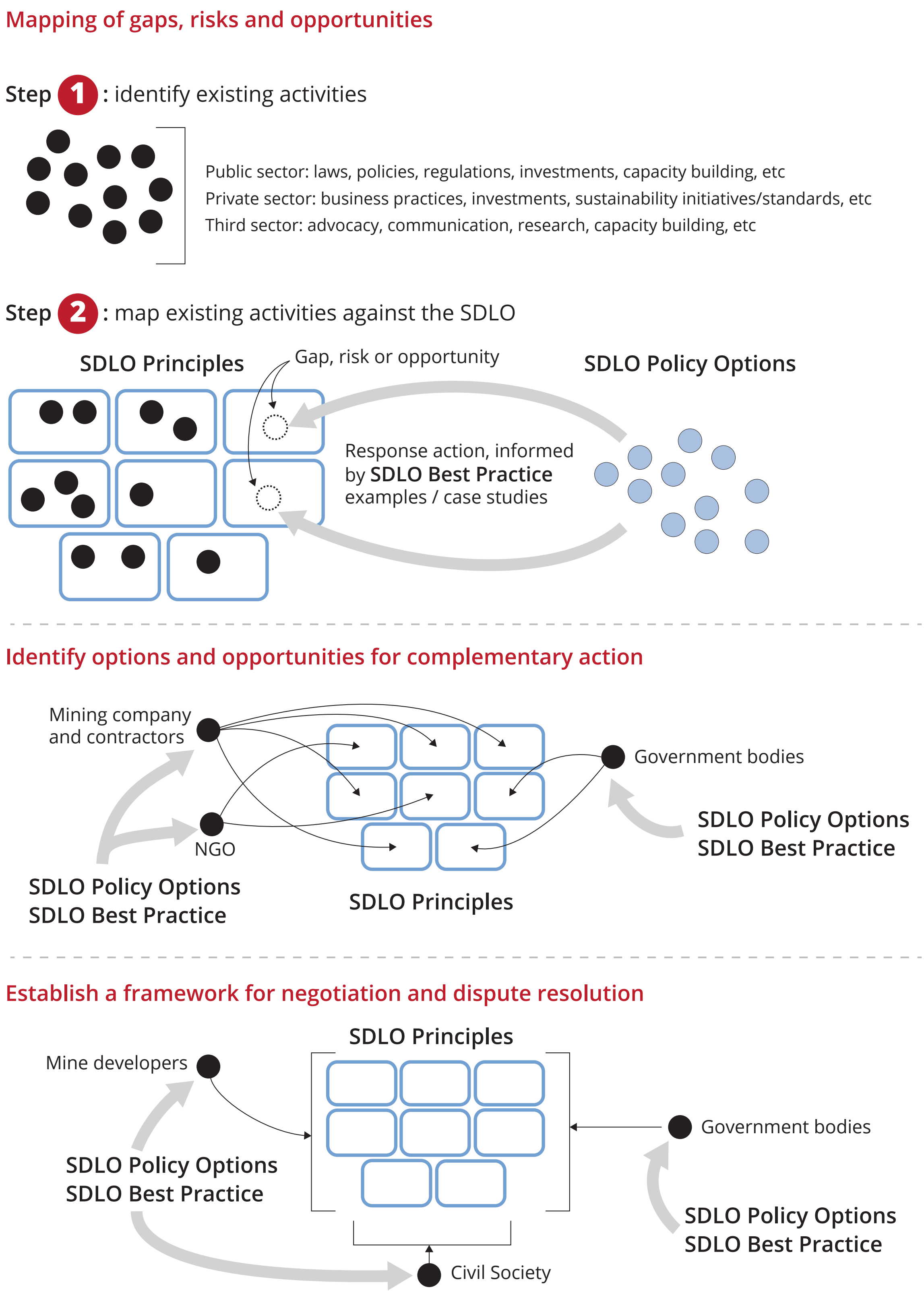
Figure 11.4 below provides some illustrative process examples of how different actors might use the SDLO to align their activities with the 2030 Sustainable Development Agenda. These include use of the SDLO principles to:

- Map gaps, risks and opportunities relevant to sustainable development, and respond through implementation of SDLO policy options as appropriate (for example, a private sector organization's review by a of its own 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.

> *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.*

267 https://mines.gov.in/writereaddata/UploadFile/Sustainable_Development_Framework.pdf.

Figure 11.4. Illustrative examples of SDLO implementation



Source: Authors' illustration

In practical terms, these examples of SDLO uses could be embedded into mining sector governance at 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 programmes relevant to the mining sector and sustainable development. For example, the SDLO could:
    - 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.[268]
    - 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.[269] 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.
    - Bilateral 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. There is a longstanding precedent for this approach 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. Examples include the Voluntary Guidelines on Responsible

268 See: https://ec.europa.eu/growth/sectors/raw-materials/policy-strategy_en.

269 See: http://igfmining.org/mining-policy-assessment/.

Rainforest destruction. Gold mining place in Guyana, South America. Photo: kakteen © Shutterstock.

> 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.[270]

Implementing 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, which is set against the backdrop of key conclusions that emerge from the report as a whole.

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.

270 See: http://www.fao.org/tenure/voluntary-guidelines/en/.

Recultivated landscape after mining. Photo: Kletr © Shutterstock

12 Summary and conclusions

12.0. Introduction

In this report, the International Resource Panel has sought to: (1) *summarize* current evidence on the 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 describe* 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 summarized 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 various initiatives that have been established to address them. However, at present these initiatives remain too 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 this has risen 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.

Although demand for minerals will follow economic cycles, the overall demand trajectory remains upward as economies grow, technological innovation continues and resource intensity deepens as developing countries catch up.[271] In recent years, existing mining companies and investors have reduced exploration budgets in response to a cycle of declining commodity prices,[272] 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 (as a result of growing risk aversion among 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 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) which was just one of 140 major tailing dam failures reported 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 realized.[273 274]

271 See 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.

272 See S&P Global. Worldwide Mining Exploration Trends. March 2017, marketintelligence.spglobal.com.

273 See: Antonio Pedro *et al.* (2017).

274 See: African Union, ECA (2011).

These include: the volatility of commodity prices that have left resource-exporting developing countries particularly exposed to external shocks (triggering macroeconomic instability) (Alba, 2009); illicit financial flows and other difficulties of managing large and volatile inflows of foreign capital;[275] lack of transparency and accountability and the associated risk of corruption; technical complexities of large-scale projects that 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.[276]

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 facing humanity. This makes it an absolute necessity to decouple economic growth from its negative impacts on the global and local ecosystems on which human well-being depends.

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 lend an inevitable geopolitical dimension to the future of the extractive sector.

Another important issue for several countries is the discrepancy between formally recognized rights to mineral resources, and the expectations and dependencies of local communities. Policies in some developing countries have 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 maximizes 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 environment (World Bank, 2011).[277] Many 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.[278] *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 and Olof (2017) mineral-rich countries experienced up to 70

275 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.

276 See: Africa Progress Panel. Africa Progress Report (2013):

277 World Bank. 2011. The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium. Environment and Development. World Bank. © World Bank. https://openknowledge.worldbank.org/handle/10986/2252 License: CC BY 3.0 IGO.

278 For an early example of efforts to internalize these externalities in commercial decision-making, see: Natural Capital Protocol: Case Study for Tata Group, 25 September 2017, www.naturalcapitalcoalition.org.

per cent 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. The centrality of good governance in unlocking the benefit of mineral wealth is therefore 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 US$1 bn).

The purpose of this report has been to describe efforts being made to improve the governance of resource extraction and combine them with other ideas, with a view to reaping the benefits of resource extraction in practice. In this report, the result is termed 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 globalized mineral value chains, which are characterized by the involvement of diverse stakeholders. As discussed earlier in this report, the many initiatives to have adopted different approaches to certain resource governance challenges have undoubtedly brought benefits and improved resource governance over what it might otherwise be; yet they remain fragmented. Overall, as all countries strive to achieve sustainable development, there needs to be a framework that enables all actors at each level of globalized value chains to assess the compatibility of their decision-making with overarching global commitments to sustainable development (including efforts to address the specific above-mentioned governance challenges).

The impetus to reform and harmonize this governance landscape stems from 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 fulfil their own needs.[279] These commitments include the 2030 Agenda for Sustainable Development, the Paris Agreement on Climate Change, the Addis Ababa Action Agenda on Finance for Sustainable Development and the 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 to transformative change in a world facing grave social, economic, political and environmental challenges, and they 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 (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 recognized 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 organizing framework for global development cooperation and is key to framing discussions about the extractive sector's future. As already noted, a growing number 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.

279 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.

As stated above, the need 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 self-assessment or regulation, 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 recognizes that all parties (governments, mining companies and local communities) have rights and responsibilities, and need to discharge them in a collaborative way to further sustainable development as a practical solution in local and global contexts.

The SDLO is an aspirational goal and a framework of rules and principles applicable to all stakeholders, rather than a mere "licence" to one or more of the parties. It requires all parties to continually take steps in a synergistic manner to improve social, environmental and economic outcomes generally, while ensuring better implementation of the 2030 Agenda of Sustainable Development in particular.

12.4. Making the SDLO operational

Operationalizing and mainstreaming the SDLO (and consequently the SDGs) throughout the complex and multilevel global governance architecture for the minerals and metals industry will depend on sustained and long-term commitment from various actors working amidst of the many governance challenges outlined 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 carry out granular assessments of the compatibility of public policy, regulation and stakeholder engagement with the SDGs and update those instruments accordingly to deliver better development outcomes at the 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 way that is 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 endeavour to decouple economic growth from environmental degradation), SDG 9.2 (promote inclusive and sustainable industrialization) and SDGs of a cross-sectoral nature such as removal of poverty, gender equality, inclusivity, climate change actions and 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 to other regulatory instruments applicable to the sector such as education, environmental protection, human health industrial policy, investment, labour, research and trade.
- 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 that 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, 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 are 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.

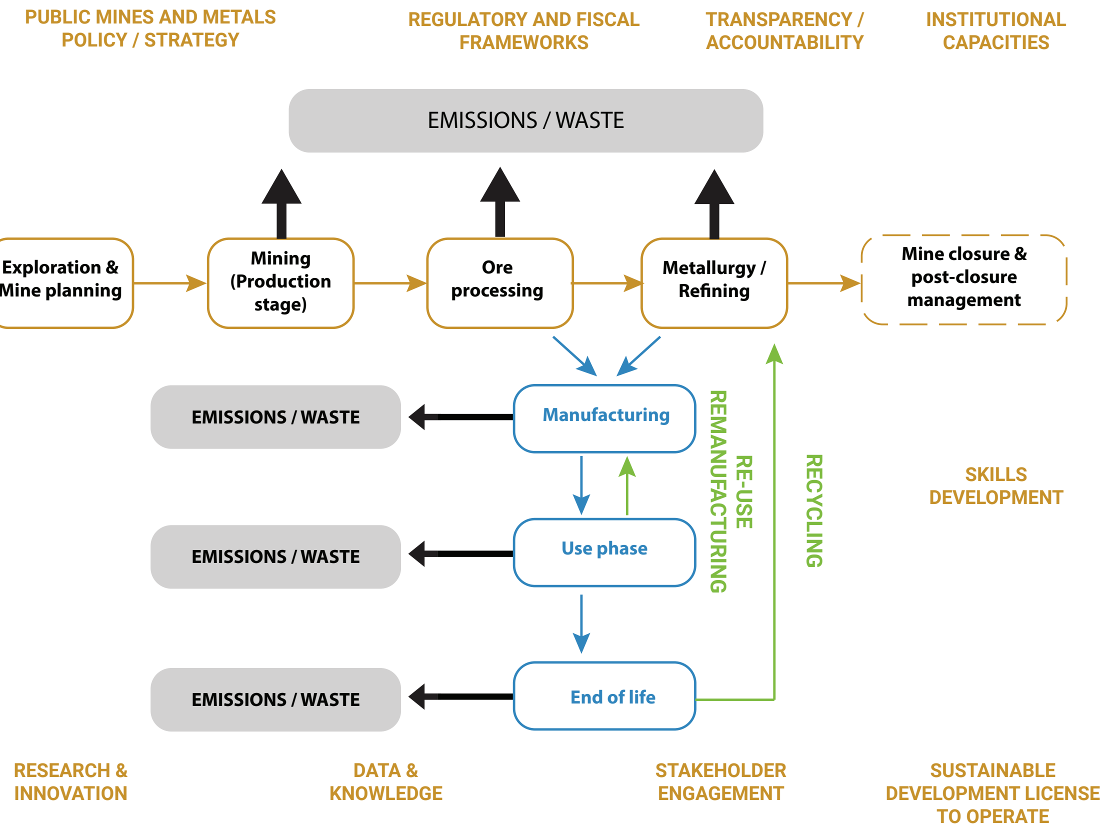
This summary is structured according to the life cycle of the minerals and metals industries, as shown in Figure 12.2, which builds upon Figures 2.1 and 2.2. The boxes with a plain border represent the main stages of the life cycle of minerals and metals and of the related materials flows:

- 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 operationalized, 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 to re-use or remanufacture specific components and/to recycle metals and minerals from end-of life products, or the fight against planned obsolescence. However, whichever developments towards a circular economy are most urgently needed, there will doubtlessly be a continued need for the extraction of minerals and metals into the foreseeable future.

Figure 12.1. The main stages of the minerals and metals life cycle 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 on important initiatives to help initiate the process. However, there are a number of themes that are important at all levels of government.

12.4.1. 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 investors and operators agree to transparency and quadruple bottom-line accountability as 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[280] to improve compliance and traceability towards better governance in the extractive sector should be scaled-up.

280 https://www.weforum.org/agenda/2018/07/4-ways-blockchain-will-transform-the-mining-and-metals-industry/.

12.4.2. Institutional capacities

Governments need to ensure that they have the core institutions needed to promote and regulate the minerals and metals industry. These include a Geological Survey, a Mining Directorate and an Environmental Directorate/ Agency (see below for details on their respective roles. Such institutions need to be functional and equipped with proper staff, budgets and material resources, as well as having the 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 of sharing some key resources/expertise at the regional level with the support of regional institutions.

12.4.3. 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 (often intercultural), 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 the regional scale, is needed to progressively secure greater returns to national economies.

12.4.4. 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;
- 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 mineral-importing nations in their efforts to engage in research and innovation.

12.4.5. Data and knowledge

Environmental, geological, market, life cycle, material science and technological data and information, as well as any resulting knowledge, are of critical importance to policymaking, 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 for developing and informing 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.

12.4.6. Stakeholder engagement

If a government decides to foster the development of national/ regional minerals and metals industries, every effort should be undertaken 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 to 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, while relevant collaborative strategies for shared value creation should also be formulated.[281] Active stakeholder engagement from the onset of a potential mining project is a key factor towards its success, potentially saving many 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 investors are often from cultures that are 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 will need to include:

- 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 social and environmental impact management, including impact mitigation plans, environmental management plans, mine closure plans and so on. This will ensure that the transparency and accountability requirements placed on companies are adequately leveraged, while Social Audits will continually improve developmental outcomes.
- Internalization within mining companies of 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 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 procurement typically constitutes 60 per cent of a mining project's operating costs. National suppliers' development programmes[282] jointly implemented 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 industry activities will benefit 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 needs laws and regulations to foster:

- The emergence 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, thereby facilitating planned management of known mineral resources for optimal developmental outcomes.
- Capacity development of sectoral institutions to adequately address not only normal management tasks, but also to ensure incorporation of sustainable development practices into 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.

281 http://www3.weforum.org/docs/WEF_RMDI_Implementation_Manual_2017.pdf; https://www.oecd.org/dev/Framework_Public-Private_Collaboration_FINAL.pdf.

282 https://www.uneca.org/sites/default/files/PublicationFiles/scaling_up_value_creation_ghana_report_final_version.pdf.

In order for this to happen, host countries may make a start by laying out a Strategic Plan and/or Country Mining Vision[283] up to 2030 and 2050, respectively (as well as a Vision up to 2050) to identify targets, measurable indicators, milestones and the financial, human and material resources in terms of the above-mentioned actions. The Vision and/or Strategic Plan 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 assess the situation and capacity to move forward along the sustainability path. It would need to consist of proposed actions within the sector, as well as a set of actions in other sectors impacted by or impacting on mining, along with the stakeholders. Mapping 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 step-by-step guidance on formulation and implementation. 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, as this provides a detailed insight of the strategies of all G-20-member countries (Hilpert & Mildner, 2013). The recently adopted 2018South African Minerals Charter[284] gazetted on 27 September 2018 reveals how painfully difficult it is to narrow the perception gaps on what should be the core content of national Visions and/or Strategic Plans, especially where they include mandatory requirements.

The Vision 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 or Prime Minister), in order to obtain the support of all relevant ministries (Mines, Trade and Industry, Public Works, Environment, Finance, Labour, Education and Research). It should recognize 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 stage to the feasibility (inclusive) stages, as well as making the formal consultations with populations 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 research and innovation should be recognized, as well as the establishment of a sovereign wealth fund that could manage most of the public revenue 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",[285] an important element of the Strategic Plan should be a Mining Law that should describe and make the consultation of populations impacted by the development of new projects compulsory and verifiable. As such, relevant information on such consultations should be included in the reports prepared for exploration or mining projects for 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.

> ***Particular attention is required to overcome the complexity of intercultural dialogue, as investors are often from cultures that are very different of the cultures of the countries/ regions where their intended investment will be made.***

283 https://www.uneca.org/sites/default/files/PublicationFiles/country_mining_vision_guidebook.pdf

284 http://www.dmr,gov.za/resources

285 https://www.unece.org/fileadmin/DAM/env/pp/documents/cep43e.pdf.

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.

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 stipulate that all applicants seeking a mining permit must prepare a bankable feasibility study as a core component of the documentation required by the Environmental and Mining Directorates for the mine permitting process. The Mining Law should also make annual reporting on the sustainability performance of mining and related processing/ metallurgical/ refining operations into a requirement. This should at least comply with 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 of developing environmental policies, laws and regulations for consideration by the government, in close coordination with other ministerial departments, , and responsible for evaluating mandatory EIAs and 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 of developing mines and metals-related policies, laws and regulations for consideration by the government, in close coordination with other ministerial departments, and responsible for promoting and regulating the mining sector, 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 policymaking 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 (such as 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 off by Qualified Persons, as defined in the NI 43-101 Standard. They should include environmental and social baseline studies describing the initial conditions of air quality, fauna, flora, surface and groundwater (qualitative and quantitative assessment, hydrodynamic regime in the case of groundwater), of soil, natural hazards, cultural heritage and initial social conditions in the area that will be impacted by mining. 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 characterization (major/trace elements and mineralogy) of the minerals/ ore to be extracted and the processes to extract and process the minerals/ore into 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 and 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 how the identified or potential impacts will be mitigated, how performance will be publicly reported with measurable/ verifiable indicators on at least an annual basis over the lifetime of the planned operations.
- *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 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, which will remain legally liable in case of non-compliance. It should provide for the production of a public annual report 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.
- *Guarantees* that the mining permit applicant will deliver to the national/regional government to ensure proper implementation of the MCP and PMP.
- A report that integrates the outcomes of public consultations held during their preparation, with detailed provisions for the resolution of conflicts with 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 the light of the size of the planned production rates and 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[286] 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 should also have a number the following characteristics:

- Exclusion of the use of transfer pricing by companies or individuals investing in the development of mining and related activities, and of the use of tax havens to avoid national taxes;
- Practical measures to prevent taxation base erosion, alongside the guidance developed by OECD[287] 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;
- 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 facing humanity in the twenty-first century and the threats to our own future existence are such that a deep re-thinking of investment conditions, supply chain management and 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

286 https://www.oecd.org/dev/Guiding-Principles-public-consultation.pdf.

287 See http://www.oecd.org/tax/beps/.

be further aggravated due to global demographics, urbanization and rapid growth in the resource intensive global middle class described in Chapter 4.

Minerals and metals are unique resources of strategic importance to humanity and, as such, they 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 should 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 toolkits 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.

The work of 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), is of significant importance to mineral resources governance. The current UNFC version (2009) does not make disclosure of technical data 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.[288]The projects listed are only those that report their activities on a voluntary basis or further to national reporting obligations.

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), is 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 on the one hand, and the extractive enterprises that will supply them, on the other. Although a stakeholder-driven Geological Programme Board (including geological surveys, mining/recycling companies and public-private partnerships in relation to exploration) would address this issue, 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)"[289] and several NGOs such as the World Resources Forum[290], the World Materials Forum[291] and the World Circular Economy Forum[292] may play a role in fostering such an international mechanism. Currently, there are only ad-hoc arrangements and contracts between particular demand firms

288 Online interactive map- based information service: RSC Mining and Mineral Exploration Services.

289 http://www.foramproject.net/index.php/project/.

290 https://www.wrforum.org/.

291 https://worldmaterialsforum.com.

292 https://www.sitra.fi/.

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 developing countries on the one hand, and on the other on informal small-scale activities. Collecting available existing documented best practices and making them 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.

Human skills, material and financial resources are required for: capacity-building and training; institutional strengthening; data acquisition, conservation, management and modelling; research and innovation; the development of web-based multilingual access to data; and information, and knowledge (including above mentioned best practice reference documents and MOOCs) . Mobilizing these resources at the international level through a special Facility or Trust Fund of several US$ billion (to be managed by an international body such as UN Environment, the UN Development Programme or the World Bank) should not be beyond an industry that 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 summarized 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 organizations such as the UN Regional Commissions, other UN bodies such as UN Environment and the UN Development Programme, the European Union, the African Union Commission, the ASEAN, OECD, the World Bank, the G20 UN 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 achieved 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, as well as specific policy options and programmes for its implementation.
- Ongoing bilateral and plurilateral discussions among governments on 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 members of the Africa, Caribbean and Pacific Group of States, linked to the European

Union by the Cotonou Agreement.[293] Africa, 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.

- Mineral security has become an urgent policy priority for the United States. The United States Department of Commerce published a critical metals strategy for the first time in June, 2019, which lays forward 24 goals to safeguard access for crucial commodities. Pursuant to this effort the United States Department of State launched an effort to coordinate mineral supply governance particularly for crucial energy-related minerals through the "Energy Resource Governance Initiative" with founding partners Australia, Botswana and Peru. In September 2019, the State Department further announced that Argentina, Brazil, Democratic Republic of the Congo, Namibia, the Philippines, the Holy See and Zambia were also participating in the initiative. The Holy See's involvement in this effort is particularly focused on ensuring that minerals come from well-governed parts of the world with adequate protection of human rights, environmental conservation and social development. This initiative may lead to separate mineral supply coordination blocs led by China or Russia but there may be opportunities for convergence if common standards of governance and supply security are considered as put forward in this report.
- The 80+ 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 Institutions (EPFIs) GRI and the Responsible Mining Index, to name but a few, should jointly explore the opportunities for harmonization of global standards of good practices 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, 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.
- 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 SDLO paths, updating and adapting existing national visions, policies, strategies, laws, regulations and practice to the requirements of the Agenda 2030 and the quadruple bottom line principles articulated in this report. There is a vital need to reduce the perception gaps on what constitutes benefit in the extractive sector among relevant stakeholders, and to generate development outcomes based on the concept of shared value.

Given the urgency and enormity of gearing the extractive sector towards sustainable development, we encourage all stakeholders to build on the foundation presented here in this report, to enable the metals and minerals sector to realize its contribution to sustainable development by 2030, and beyond. The Investing in Africa Mining Indaba (4-7 February 2019), the Prospectors and 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 up the momentum, disseminate the report and articulate further pathways to the operationalization of the SDLO.

293 www.acp.int.

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ABOUT THE INTERNATIONAL RESOURCE PANEL

The International Resource Panel was established to provide independent, coherent and authoritative scientific assessments on the use of natural resources and their environmental impacts over the full life cycle. The Panel aims to contribute to a better understanding of how to decouple economic growth from environmental degradation while enhancing well-being.

Benefiting from the broad support of governments and scientific communities, the Panel is constituted of eminent scientists and experts from all parts of the world, bringing their multidisciplinary expertise to address resource management issues. The information contained in the International Resource Panel's reports is intended to be evidence based and policy relevant, informing policy framing and development and supporting evaluation and monitoring of policy effectiveness.

The Secretariat is hosted by the United Nations Environment Programme (UN Environment). Since the International Resource Panel's launch in 2007, twenty-six assessments have been published. The assessments of the Panel to date demonstrate the numerous opportunities for governments, businesses and wider society to work together to create and implement policies that ultimately lead to sustainable resource management, including through better planning, technological innovation and strategic incentives and investments.

Following its establishment, the Panel first devoted much of its research to issues related to the use, stocks and scarcities of individual resources, as well as to the development and application of the perspective of 'decoupling' economic growth from natural resource use and environmental degradation. These reports include resource-specific studies on biofuels, water and the use and recycling of metal stocks in society.

Building upon this knowledge base, the Panel moved into examining systematic approaches to resource use. These include looking into the direct and indirect impacts of trade on natural resource use; issues of sustainable land and food system management; priority economic sectors and materials for sustainable resource management; benefits, risks and trade-offs of Low-Carbon Technologies for electricity production; city-level decoupling; and the untapped potential for decoupling resource use and related environmental impacts from economic growth.

Upcoming work by the International Resource Panel will focus on governance of the extractive sectors, the impacts of land-based activities on marine and coastal resources, land restoration, scenario modelling of natural resource use and resource efficiency links to climate change.

More information about the Panel and its research can be found at:
http://www.resourcepanel.org/.

For more information, contact:

International Resource Panel (IRP) Secretariat
Economy Division
United Nations Environment Programme
1 Rue Miollis
Building VII
75015 Paris, France
Tel: +33 1 44 37 30 09
Fax: +33 1 44 37 14 74
Email: unep-irpsecretariat@un.org
Website: www.resourcepanel.org

Mineral Resource Governance in the 21st Century

Minerals and metals underpin national economies, provide crucial raw materials for industrial activities, and are inputs to almost every sector of the global economy. Demand for extractive resources will continue to grow on the back of emerging economies with expanding and increasingly affluent and urban populations and a global transition towards low-carbon but metal-intensive energy production technologies. This is despite efforts to decouple economies from resource use and towards greater recycling.

The frequently severe and enduring environmental impacts of mining highlight the need to carefully balance such activities with stewardship of other valuable natural resources and the environment including ecosystems and biodiversity, and the rights of local people and communities.

Decision-making in the extractive sector is shaped by a complex array of governance frameworks and initiatives operating along highly globalized mineral value chains. There is an urgent need to coordinate and reform this governance landscape to address enduring challenges such as commodity price volatility, lack of linkages between mining and other economic sectors, inadequate management of environmental impact, and socio- and geopolitical risks of mining.

The report maps over 80 existing international governance frameworks and initiatives which focus on delivering overlapping subsets of the 2030 Global Agenda for Sustainable Development, but do not currently operate in a sufficiently coordinated or integrated manner. In this context, the report calls for a new governance framework for the extractive sector referred to as the "Sustainable Development Licence to Operate" and includes consensus-based principles, policy options and best practices that are compatible with the Sustainable Development Goals and other international policy commitments.

The report discusses practical actions to improve the international governance architecture for mining to enhance its contribution towards sustainable development. The proposals include reaching an international consensus regarding the normative content and structure of the Sustainable Development Licence to Operate informed by expert inputs from a "High-level Panel on Mining for Sustainable Development". It further considers the creation of an International Mineral Agency to share relevant information and data. Governments could also reach bilateral and plurilateral agreements regarding security of supply of raw materials and resource-driven development. Periodical reporting of progress towards sustainable development could be enabled through a Global "State of the Extractive Sector" review or equivalent process.

UN environment programme

For more information, contact:
United Nations Environment Programme
1 rue Miollis - Building VII - 75015 Paris, France
Tel: +33 1 44 37 30 09 - Fax: +33 1 44 37 14 74
Email: unep-irpsecretariat@un.org
Website: www.resourcepanel.org

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