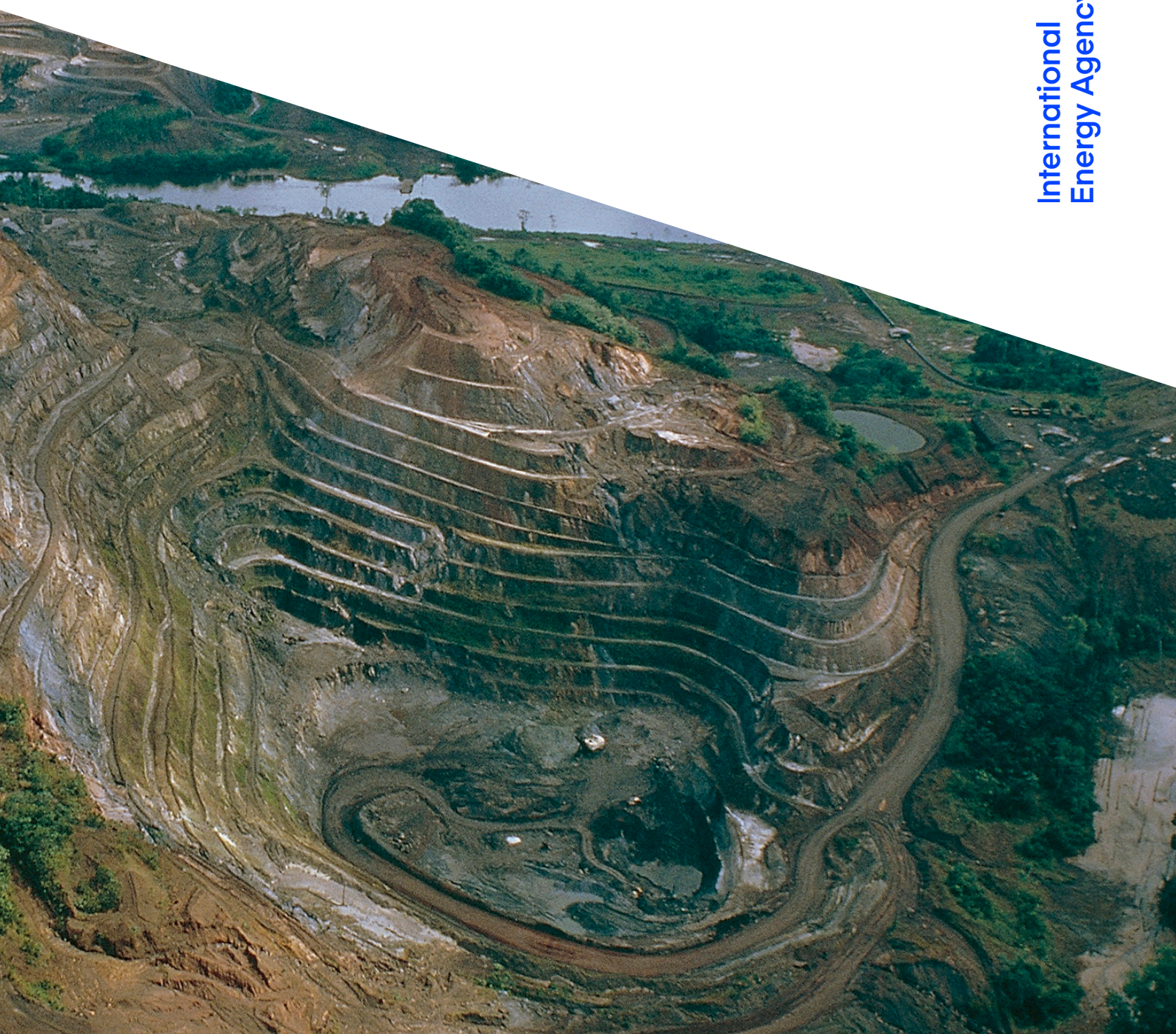
# Sustainable and Responsible Critical Mineral Supply Chains

## Guidance for policy makers



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# Abstract

As demand grows for critical minerals to support clean energy technology deployment, potential new mines and processing facilities will put growing pressure on people, the environment, communities and Indigenous Peoples. This report explores how the environmental, social and governance impacts of mining and processing operations can limit the critical mineral supplies needed for clean energy transitions and outlines five key recommendations for policy makers to ensure that critical mineral supply chains are sustainable and responsible. It also includes deep dives on six priority areas that have important implications for supply security: water, greenhouse gas emissions, biodiversity, human rights, communities and corruption.

This report is released alongside an update to the Critical Minerals Policy Tracker. The 2023 update includes over 200 new policies, laws and regulations and includes a special focus on policies aimed at environmental, social and governance issues.

# Acknowledgements

This report was prepared by the International Energy Agency (IEA) Office of Legal Counsel (OLC). This report was prepared in close consultation with and with the support of the Environmental, Social and Governance Task Force of the Critical Minerals Working Party (CMWP). The report's principal authors were K.C. Michaels, Alexandra Hegarty and Joyce Raboca, with a major contribution by Tomás de Oliveira Bredariol. Other IEA colleagues who contributed to this work include Eric Buisson, Juliette Denis-Senez, Noah Gipson, Lisa Shakhnazaryan and Sofie Ulrix. Tim Gould, Tae-Yoon Kim and Pascal Laffont provided invaluable comments and feedback. Colleagues from the Organisation for Economic Co-operation and Development (OECD) Centre for Responsible Business Conduct also provided indispensable input and review, including Benjamin Katz, Cäcilie Le Gallic, Louis Maréchal, Ken Menz and Emily Norton.

Valuable comments and feedback were received from external experts, including:

| | |
|---|---|
| Caroline Avan | Business Human Rights Resource Centre |
| Cassie Boggs | Mining law expert |
| Grant Bromhal | United States Department of Energy |
| Oliver Brown | United Nations Environment Programme |
| Elisabeth Caesens | Resource Matters |
| Ellen Carey | Circulor |
| Assheton Carter | Fair Cobalt Alliance |
| Ben Chalmers | The Mining Association of Canada |
| Vincenzo Conforti | Glencore |
| Aidan Davy | International Council on Mining and Metals |
| Pierre De Pascal | The Initiative for Responsible Mining Assurance |
| Stefan Debruyne | SQM |
| Kristi Disney Bruckner | The Initiative for Responsible Mining Assurance |
| Sebastian Dunnett | United Nations Environment Programme |
| Jason Farr | Oxfam |
| Katie Fedosenko | Teck Resources |
| Susannah Fitzgerald | Natural Resource Governance Institute |
| Anne-Marie Fleury | Glencore |
| Diego Francesco Marin | European Environmental Bureau |
| Gudrun Franken | Institute for Geosciences and Natural Resources, Germany |
| Catherine Girard | Renault |

| | |
|---|---|
| Emily Greenspan | Oxfam |
| Solange Harpham | Paris Peace Forum |
| Daniel Hill | Natural Resources Canada |
| Abigail Hunter | SAFE |
| Fred Kabanda | African Development Bank |
| Sophie Lu | HSBC |
| Cecilia Mattea | Transport and Environment |
| Ferdinand Maubry | Tesla |
| Susannah Mclaren | Cobalt Institute |
| Tom Moerenhout | Center on Global Energy Policy at Columbia University |
| Marcella Munro | Teck Resources |
| Zubeyde Oysul | SAFE |
| Laura Platchkov | Federal Office for the Environment, Switzerland |
| Isabelle Ramdoo | The Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development |
| Robin Roels | EU Raw Materials Coalition |
| Yblin Roman Escobar | SIRGE Coalition |
| Sebastian Sahla | Extractive Industries Transparency Initiative |
| Matthieu Salomon | Natural Resource Governance Institute |
| Payal Sampat | Earthworks |
| Katherine Shapiro | Natural Resources Canada |
| Veronika Shime | National Mining Association |
| Matthew Teh | Australian Critical Minerals Office |
| Jim Wormington | Human Rights Watch |

Finally, thanks also to the IEA Communications and Digital Office (CDO) for their help in producing the publication, particularly to Jethro Mullen (*Acting Head*), Aya Abu Shaqra, Poeli Bojorquez, Curtis Brainard, Astrid Dumond, Clara Vallois and Therese Walsh. Erin Crum edited the manuscript.

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# Executive summary

**Critical mineral supply chains cannot be truly secure, reliable and resilient unless they are also sustainable and responsible.** Growing demand for critical minerals arising from the clean energy transition will mean new mines, processing facilities and refineries, which can bring attendant risks of harm to the environment, workers, communities and societies. These harms, if not adequately prevented, reduced or mitigated, can disrupt supply and hinder the rapid scale-up of clean energy technologies.

**The first and foremost reason to address the environmental, social and governance risks in the mineral supply chain is to protect people, communities and the environment.** Addressing these risks allows for the development of sustainable and responsible supply chains, which can help communities more fully capture the benefits of mineral development and ensure that clean energy transitions are people-centred. Growth in the critical minerals sector can lead to investment, tax revenue, and jobs.

**At the same time, adopting sustainable and responsible practices bolsters security of supply.** For example, comprehensively addressing community concerns about water use and biodiversity impacts makes projects less likely to encounter local opposition that can halt project development or disrupt operations. Similarly, eliminating or reducing the incidence of corruption can help avoid delays and increased project costs associated with instances of bribery. On the other end of the supply chain, if companies are unable to demonstrate that they have taken a risk-based approach to prevent human rights violations such as child and forced labour, they may face regulatory barriers or reputational risks.

**Governments and companies alike have a role in driving improvements against environmental, social and governance standards.** Companies are likely in the best position to expand sustainable and responsible practices and to transparently report on progress. In parallel, governments can ensure that companies have the right incentives to act and create an enabling environment that facilitates improved performance.

Considering the available levers for action, we have identified **five key recommendations for policy makers** to ensure that critical minerals value chains are sustainable and responsible:

- **First, ensure robust legal and regulatory protections for the environment, workers and communities.** Most countries have existing regulatory frameworks targeting mining and processing. As the critical minerals landscape changes, there

may be a need to revisit these frameworks to reduce permitting lead times and to ensure adequate regulatory protections are in place. Water and greenhouse gas emissions targets, where they exist, can be made to improve over time. Enhanced requirements for meaningful and continuous engagement with local communities and using free, prior, and informed consent as best practice for Indigenous Peoples can facilitate a social license to operate. Adequate investment in enforcement and implementation is also needed.

- **Second, channel public spending to encourage the development of better practices and to reward good actors.** Initiatives to bolster security of supply are being backed with public money, and governments can tie these expenditures to sustainability and social responsibility requirements. For example, public procurement and investment decisions can be conditioned on high sustainability performance. Innovation funding can be directed towards technologies that improve operational efficiency, reduce emissions, or facilitate mapping and tracing of minerals through the supply chain.
- **Third, strengthen the collection and reporting of granular and standardised data to enable benchmarking and progress tracking across the industry and throughout the supply chain**. Governments have the capacity to influence industry-wide performance by issuing methodological guidelines and recommendations for sustainability and social responsibility metrics drawing on industry best practice. Further, publicly disseminating such data is a critical lever that can equip stakeholders with the requisite information to make sustainability-focused sourcing and investment decisions. For smaller enterprises, technical assistance may be needed to guarantee robustness, accuracy and representativeness of data monitoring.
- **Fourth, encourage or require companies to improve transparency throughout the supply chain, including by undertaking due diligence and reporting publicly on risks and mitigation actions.** Greater transparency, alongside efforts to mitigate identified risks, can alleviate environmental, social and governance risks while ensuring that purchasers, customers and policy makers have better information on potential bottlenecks. Governments can do more to encourage transparency in critical mineral supply chains, including by incorporating due diligence into legal requirements based on responsible business conduct standards such as those published by the Organisation for Economic Co-operation and Development (OECD). Particular attention should be paid to the smelting and refining sector, where greater transparency is needed.
- **Fifth, support the development of credible voluntary sustainability standards and encourage harmonised approaches consistent with international standards.** Sustainability standards and other sustainability initiatives can play a complementary role to legal and regulatory requirements. These systems provide avenues to improve the performance of companies beyond regulatory requirements, provided that they align with international frameworks and credibility criteria. By supporting the adoption and improvement

of standards, governments can help drive up environmental and social performance without displacing the role for legal and regulatory protections.

These five recommendations are cross-cutting and apply to all types of environmental, social and governance risks. Some of these risks are especially likely to hinder supply, with implications for the viability of realising clean energy transitions. In this report, we have identified six priority areas that have important implications for supply security: **water**, **greenhouse gas emissions**, **biodiversity human rights**, **communities**, and **corruption**.

- **Improving water stewardship can reduce supply risks, especially for critical minerals with high water requirements.** Lithium and copper mines are often situated in regions characterised by elevated water stress, necessitating a heightened commitment to water stewardship. Developing infrastructure that ensures secure water access for local communities can help companies prevent conflicts where water access is limited. Policy responses that can encourage better water stewardship include conditioning public investment on achieving specific targets for water use efficiency and quality and supporting research and development on water-efficient technologies.
- **Reducing greenhouse gas emissions from mineral development activities can increase social acceptability of mining projects and prepare the industry for the proliferation of carbon pricing.** Mining emissions are likely to be increasingly scrutinised and companies that do not reduce and publicly report on supply-chain emissions are likely to face market access and reputational risks. Governments can incentivise emissions reductions by improving or expanding greenhouse gas reporting requirements to ensure that data on emissions is publicly available, while supporting industry initiatives that seek to harmonise reporting methodologies.
- **Addressing impacts to biodiversity can help mining operations meet increasingly stringent regulatory requirements.** Operations that fail to address these impacts may face regulatory barriers and reputational and investment risks as more attention is paid to the increasing loss of biodiversity due from new mining projects in undisturbed areas – especially for mineral deposits located in key biodiversity areas. To encourage improved biodiversity practices along the supply chain, governments can strengthen biodiversity protections in mining regulations and permits and improve monitoring and disclosure of biodiversity data.
- **Enhancing the implementation of human rights standards in mining operations can mitigate operational disruptions and reduce divestment that can result from human rights violations, including child labour and forced labour.** Critical mineral suppliers with inadequate human rights records may face reputational damage and legal consequences as well as community opposition in the form of labour strikes, protests and blockades. To foster responsible critical mineral operations governments can develop legal and other regulatory frameworks that enable supply chain transparency by embedding human rights risks in due diligence systems, while supporting the continued implementation and enforcement of

regulatory protections. Governments can also develop metrics to assess human rights risks and integrate transparency requirements into trade and investment agreements.

- **Meaningful engagement with local communities and Indigenous Peoples can help projects obtain and maintain a social license to operate.** Local communities and Indigenous Peoples are directly impacted by mining, with much of the world's production, reserves and resources located on or near Indigenous land. Opposition from these communities can lead to protests, litigation, and permit denials, which can hinder new developments and disrupt operations at existing facilities. Governments can facilitate meaningful consultation by supporting the monitoring and reporting of site-level data on engagement and using consultation processes based on free, prior and informed consent of Indigenous Peoples as a best practice.
- **Reducing corruption and governance risks can facilitate investment and improve public confidence in mining operations.** The growing demand for critical minerals could exacerbate incentives for corrupt practices, which can lead to legal liability for companies, introduce permitting or operational delays, and contribute to instability and lead to long-term disruptions. Governments can improve governance and reduce corruption risks by, for example, ensuring that transparency provisions in mining codes in line with the Extractive Industries Transparency Initiative Standard that require disclosure of public permits, licenses, and contracts, company beneficial ownership, and payments to governments are effectively enforced.

**It is imperative for governments and industry alike to do more to avoid the mistakes of this past**. There are myriad examples where development of resources has not led to sustainable economic growth or has caused corresponding environmental and social harm. Mitigating these pitfalls of the past will be necessary to ensure that clean energy transitions are equitable and people-centred and to avoid supply disruptions that can slow clean energy deployment. As consumers and investors are increasingly demanding that companies take these issues seriously, industry has a clear business case to pursue better environmental and social performance to maintain a social licence to operate. Governments can play an important role in promoting improvements by incorporating the recommendations of this guidance into their policy and investment decisions.

# Introduction

## Growing demand for critical minerals will put increasing pressure on the environment, workers and communities

As the world transitions towards net zero emissions, the rapid scale-up of clean energy technologies is expected to boost demand for many minerals and metals, including lithium, nickel, cobalt, graphite, copper, aluminium and rare earth elements. Under the IEA's Stated Policies Scenario, demand for critical minerals for clean energy technologies is set to grow by just over two times. In the IEA's Net Zero Emissions by 2050 Scenario (NZE Scenario), which limits global warming to 1.5°C, faster deployment of clean energy technologies implies a nearly fourfold increase in demand for critical minerals in 2030 from today's level. As the market responds to growing demand, this will mean new mines, processing facilities and refineries. In the NZE Scenario, development of 164 new mines producing lithium, nickel and cobalt is needed.

This expansion can create jobs and generate revenue for governments and communities in producer economies. However, these economic benefits can be realised only if sustainable and responsible practices are integrated throughout the supply chain. Despite the progress made in the mining industry, significant concerns remain. Mining is associated with a host of negative consequences to the **environment** from high levels of water use, greenhouse gas emissions, loss of biodiversity, and increased water, land and air pollution; to **workers** through safety incidents and human rights abuses; to **local communities and Indigenous Peoples** due to displacement, failure to engage and failure to respect rights, damages caused by tailings dam failures and local air, human rights abuses, water and noise pollution; and to **societies** from instances of corruption, diversion of public resources, corrosion of governance and the rule of law, contributions to armed conflict, and adverse impacts on women.

## Environmental, social and governance impacts of mining may limit progress on climate

It is imperative to improve the environmental, social and governance performance of mining and processing operations to protect people, communities and the environment. But in addition, failure to address these consequences can hinder the supply of minerals needed for the clean energy transition. Poor performance can:

- **limit market access** or **create legal barriers** for materials or operations that cannot meet regulatory requirements

- discourage **investment** by increasing the cost of capital, diminishing returns and introducing risks such as potential legal liability for individual incidents
- **damage reputation**, deterring investors and buyers
- increase the likelihood of **opposition** from local communities and other stakeholders where companies fail to obtain and maintain a social licence to operate
- **physically prevent mines and processing facilities from operating** following incidents of environmental degradation, safety failures, human rights abuses or corruption.

Without serious efforts to mitigate the environmental, social and governance risks associated with mineral supply chains, there may not be sufficient supplies to support the rapid scale-up of clean energy technologies that are needed to reach net zero goals and avert the worst effects of climate change. Inadequate supplies may also hinder efforts to broaden energy access and the facilitation of sustainable economic development.

This also has important implications for energy security. As we move towards a world where minerals are increasingly important for energy uses, disruptions of mineral supplies will have a larger material impact on energy supply chains than they currently do. This risk is exacerbated where supply is concentrated in high-risk areas and where environmental, social and governance impacts are unmitigated, particularly in areas where local regulations are insufficiently robust or lacking sufficient means of enforcement. Further, these impacts can complicate efforts to improve supply chain security to the extent that barriers to developing new facilities hinder efforts to diversify supply, which is an important condition for supply chain security.

As a result, mineral supply chains cannot be truly secure, reliable and resilient unless they are also sustainable and responsible. Without stronger action to ensure all mining and processing activity is undertaken in a responsible manner that mitigates, minimises or prevents the negative consequences of mining together with actions to reduce demand and enhance circularity, it will not be possible to transition to clean energy technologies quickly enough to meet global climate goals.

## Sustainable and responsible supply chains are essential to realising socio-economic benefits and ensuring that clean energy transitions are people-centred

The role of minerals in the clean energy transition presents a major opportunity to capture socio-economic benefits for people, communities and countries. These benefits include investment, tax revenue and jobs directly associated with mineral supply chain projects as well as indirect benefits arising from the development of supporting industries and infrastructure in areas that might otherwise lack these resources.

On a macroeconomic scale, the mining sector requires large amounts of investment, and this can increase the money flowing into the economy. In the IEA's NZE Scenario, from 2022 to 2030 mining production requires USD 360 billion to USD 450 billion (in real 2021 dollars) in investment to reach the projected required level of production. Most of the current anticipated mining investments required to reach the production requirements in the NZE Scenario are in Africa, Central and South America, and Asia Pacific. For the processing segment of the value chain, between USD 90 billion and USD 210 billion is needed over the 2022-to-2030 period to reach projected demand under the NZE Scenario. With proper tax regulatory frameworks, robust natural resource revenue sharing and benefits-sharing agreements, these investments into projects can lead to an increase in revenue flows from royalties, tax contributions and other fees that can be used for government spending in areas that improve socio-economic well-being. A focus on investment in mid- and upstream can also ensure that communities retain the largest value-added segment of the supply chain for critical minerals.

The shift to a minerals-based energy economy also has the potential to boost employment in the mining sector. In 2022, 800 000 people worked in the mining of copper, cobalt, nickel and lithium, up 25% year-over-year due to a record jump in demand from battery manufacturers. In the NZE Scenario, the global critical minerals extraction workforce nearly doubles between 2022 and 2030. The mining industry can also provide indirect employment opportunities with service providers and other types of businesses necessary to run a mine site. Mining can also increase skills and educational attainment for local workers, particularly where there is preferential hiring and companies directly provide training, educational and skill development opportunities. An extensive literature has shown the link between increased skills and an improvement of the socio-economic well-being of workers, their families and future generations, including Mitra 2022, Zabel 2018, and Kaushal 2014.

Mining projects often require large amounts of capital to flow into a community as mines often require new infrastructure, especially when located in remote areas. This may include power supply for operational needs; transportation networks such as roads, trains, or ports for construction and to access markets; and housing, businesses and services for workers. Infrastructure development not only creates jobs but also has the potential to independently benefit communities beyond the direct value to a mine and beyond its lifetime. Mining companies often also spend money on community investments such as renewable electricity, internet connectivity, education and training, healthcare, sports and recreation – all of which can benefit communities.

Ensuring that supply chains are sustainable and responsible is essential to realise the socio-economic opportunities of mining so that clean energy transitions can be truly people-centred. For example, mitigating corruption ensures that the full inflow

of capital into communities and countries is realised; strong human rights protections can ensure decent jobs that keep workers safe; and consultation with communities can build trust and allow companies to equitably share socio-economic benefits, which can reduce the risk of ensuing conflicts and ensure that infrastructure investments are directed towards the greatest needs. Enabling the fair and even distribution of economic benefits will in itself also be vital to avoid supply disruptions. Without any realised benefit to local communities, mining projects may face backlash and delays from local opposition, which can potentially hinder energy transitions.

## This guidance explores how policy can encourage a sustainable and responsible mineral value chain while ensuring supplies are secure and resilient

A growing number of jurisdictions have announced national or regional strategies to ensure a stable, secure and resilient supply of critical minerals. Through these strategies, governments have announced policy actions at the national level to diversify minerals supplies, attract new investment, and expand research, development and demonstration. At the international level, the IEA's member countries have announced the launch of a voluntary critical minerals security programme.

In announcing measures to ensure security of mineral supplies, many countries have simultaneously committed to ensuring that these policies encourage sustainable and responsible practices such as through the Mineral Securities Partnership and the Sustainable Critical Mineral Alliance. Some strategies, such as the Australian Critical Minerals Strategy, 2023-2030, the Canadian Critical Minerals Strategy and the European Union's Critical Raw Materials Act, identify improving performance on environmental, social and governance issues as an explicit goal. In line with these commitments and building on the experience thus far, this guidance explores how policy makers can incorporate sustainable and responsible supply considerations into policies aimed at addressing security of supply.

Taking account of the available policy levers, we have identified **five key recommendations** for policy makers.

- Ensure **legal and regulatory protections** for the environment, workers, Indigenous Peoples and communities, supported by sufficient means of implementation and enforcement regimes.
- Channel **public spending** to encourage the development of better practices and to incentivise good performance.
- Strengthen the **collection and reporting of granular and standardised data** to enable benchmarking and progress tracking across the industry and throughout the supply chain.

- Ensure that companies **improve transparency throughout the supply chain**, including by enhancing traceability, undertaking due diligence and reporting publicly on risks and mitigation actions.
- Support the development of **initiatives that help companies demonstrate that their operations are sustainable and responsible** while ensuring cross-compatibility and interoperability.

While each recommendation has implications for all countries, the implementation may differ between countries depending on their relative position within the supply chain. For example, producing countries may focus more heavily on improving legal and regulatory regimes that govern mining. Consuming countries, on the other hand, may direct their attention towards strategic investment conditions, procurement sourcing criteria or supply chain due diligence. Some countries serve as both consumers and producers, necessitating a review of regulations to align with current and future needs for appropriate action.

## Some risks are more likely to hinder supply than others

While it is important to address all the potential negative impacts of mineral production, certain risks are especially likely to create issues for security of supply by disrupting short-term supply or acting as a barrier to new developments. In this report, we have identified six focus areas that have important implications for supply security:

- **Water scarcity** can lead to disputes with local communities or shortages of water, which is needed in large quantities for mining activities.
- **Greenhouse gas emissions** from mining and processing can undermine the case for new developments and contribute to regulatory and financial risks.
- Impacts on **biodiversity** may pose growing regulatory and financial risk as criteria concerning biodiversity impacts are introduced.
- **Human rights** violations can pose major reputational and legal risks for companies that do not do enough to ensure their supply chains do not contribute or are linked to abuses.
- Failure to meaningfully engage with **communities** – including respect for the rights of **Indigenous Peoples** – can engender local opposition and lead to protests or blockades that stop production or make it difficult to obtain permits or begin operations even with the required permits.
- Instances of **corruption** can lead to protracted delays in new projects, and perceived risks may deter new investment in certain regions.

To be sure, there are other risks associated with minerals production that can pose issues for security of supply, including tailings disposal, contribution to armed conflict, air and water pollution, unequal treatment of women and injuries to workers.

In order to maximise the resilience of supply chains, governments will need to adopt a holistic approach that addresses all of these risks.

## In parallel with effort to improve mining practices, greater investment in alternatives is needed

While new mines, processing facilities and refineries are needed in the near to medium term, over time recycling and other secondary supplies may play a larger role. In the long term, the critical minerals industry can be truly "sustainable" only if the supply chain is fully circular, with all or close to all material re-entering the supply chain at its end of life. While this report focuses on ways to mitigate the negative consequences of existing and new sources of primary supply for the clean energy transition, there is a parallel need for policy makers and industry to focus on reducing the demand for primary supplies as well. This can come through demand-side reductions such as efficiency improvements and behavioural changes, or through a focus on circularity and recycling. These efforts can also work to reduce the negative impacts of mining, create benefits through job creation and infrastructure investments, and foster sustainable and responsible supply chains and practices.

## About this guidance

This guidance has been prepared under the guidance of a dedicated Task Force of the IEA Working Party on Critical Minerals (CMWP). This guidance has also benefited from consultations and input from other delegates to the CMWP, as well as conversations with civil society, including organisations representing Indigenous Peoples, industry associations and industry representatives. While directed primarily at governments, the guidance is intended to benefit other stakeholders that are curious to understand how the different risks are defined by current standards and regulatory landscape.

The guidance is structured as follows. Part I addresses the **key levers for policy action** and is organised around the five key recommendations outlined above. Part II consists of an analysis of **six focus areas** that have particular implications for security of supply.

# Part I: Levers for policy action

There are many potential actions available that can drive improvements in sustainable and responsible practices across the critical minerals industry. In practice, effectively mitigating environmental, social and governance risks will require action from many different actors, including governments, regulators, industry and other stakeholders. This part focuses on what governments can do to set expectations, enact requirements and create incentives to ensure that industry effectively mitigates, minimises or prevents the environmental, social and governance impacts of minerals production. To this end, it identifies five key recommendations for policy makers that can help to bring positive changes across the industry.

## 1. Ensuring robust regulatory regimes

Most countries have existing regulatory frameworks that target mining and processing activities. These include fiscal regimes that establish royalties and other charges for concessions, social regimes requiring engagement with affected communities and infrastructure development, occupational safety and health requirements to protect workers, and environmental measures requiring impact assessments and placing limits on air pollution, water pollution and other impacts. **The first lever for action should be to ensure that existing legal regimes are fit for purpose, incorporating robust and effective protections for the environment, workers, Indigenous Peoples and communities, coupled with stringent enforcement; these regimes must be evaluated for their effectiveness and regularly revised where necessary.**

### Regulatory frameworks may need to be revisited to ensure they incorporate robust protections

The growing demand for critical minerals is likely to bring a change in the landscape of producers, with some countries developing mining and processing operations that previously had none. Countries with existing mining sectors may also see a shift of production into new geographical areas and into minerals that were previously produced only in low volumes. Those with mature regulatory systems may need to revisit existing frameworks and tools at all levels to ensure that environmental, social and governance issues associated with critical minerals are well covered.

Regulatory regimes can include performance- or outcome-based requirements for water use efficiency, water pollution, greenhouse gas emissions and other air

pollution. In many cases, these regulations are based on "best available technologies", and may need to be revised depending on the mineral to take account of technological developments that can enable better performance. Many countries also have requirements for community consultation and consent from Indigenous Peoples. It is necessary to ensure that companies undertake meaningful and continuous consultation and respect Indigenous Peoples' rights to facilitate obtaining and maintaining a social licence to operate. Regulatory regimes can also require or set transparency expectations for both industry and government activities. Mandated disclosures by mineral rights holders – including companies, governments and state-owned enterprises – regarding contracts and licences, beneficial ownership, and payments to governments, alongside transparency measures aimed at how governments manage and allocate revenue associated with minerals production, can help reduce incidents of corruption and build mutual trust among stakeholders.

Given the amount of time needed to revise legislative and regulatory frameworks, countries should consider undertaking a full review of environmental, social and governance protections to identify gaps and ensure that existing frameworks are fit for purpose. Where gaps are identified, countries can explore revisions to laws and regulations as appropriate.

## Legal protections cannot be effective without sufficient enforcement and accountability

While there may be a need to revise and update the written laws, there is a parallel need to prioritise effective implementation and enforcement of existing protections. As changing laws can be a lengthy process, it is essential to explore enforcement needs before considering revision, which can help identify whether a gap needs to be filled in the laws in the first place. Some producers have high standards but low capacity and resources to enforce the standards, posing a risk to the supply chain. Consequently, the revision process can include an assessment of resource needs to ensure that enforcement authorities have the necessary staff and other resources.

Policy makers should also explore whether the legal regime provides sufficient accountability for private actors. Insufficient accountability or grievance mechanisms can lead to low compliance and also limit access to justice and compensation of affected stakeholders. Adopting corporate accountability rules can address these issues, guaranteeing that energy transitions are people-centred while mitigating supply risks. Grievance mechanisms, whether judicial or non-judicial, are also important to ensure that stakeholders have an accessible way to express concerns and seek redress for rights violations or other issues occurring at mine sites.

## Policy makers should ensure that expediting permit lead times does not compromise regulatory protections

Considering the amount of time needed to move mining from exploration to production – an average of 16 years when analysing mines that came online between 2010 and 2019 – governments are facing significant pressure to expedite permitting processes. The length of time to obtain a permit depends on the jurisdiction and mine; for example, it takes an average of seven to ten years in the United States and around two years in Australia and Canada. With the pace of development required to meet global climate goals, there is no question that the time to obtain a permit needs to come down. However, if reduced processing time is caused by lax regulatory protections, this may jeopardise long-term supply security and put any socio-economic benefits of the project at risk.

As past delays have often been associated with compliance with regulatory requirements, there may be a temptation to reduce processing times by relaxing environmental, social and governance protections. However, weaker protections increase the likelihood of supply disruptions from water disputes, community protests, tailings disasters, incidents of bribery and other adverse impacts. And in fact, in some cases, strengthening aspects of these protections may bolster project timelines, such as in the case of governance, where stronger governance has been found to decrease lead times.

Some strategies have been proposed to reduce permitting times. The United States Inflation Reduction Act provides funding to various government agencies to hire new personnel and develop tools and guidance to strengthen and accelerate environmental reviews. Separately, the United States released a Permitting Action Plan outlining key actions, including better internal co-ordination, tracking of review progress, enhancing outreach and providing technical assistance to affected stakeholders. The European Union's proposed Critical Raw Materials Act would allow certain projects to be designated as "strategic" that would have a streamlined permitting process.

## Advanced economies can help developing economies improve regulatory protection through targeted technical assistance and capacity building

Developing economies may be less likely to have effective legal regimes, due to capacity constraints and rule-of-law challenges. Advanced economies can assist in revising and updating the legal regimes of these countries and strengthening enforcement. This can take the form of bilateral assistance programmes, such as the United States' Commercial Law Development Program or assistance provided by the German development agency, GIZ, or through multilateral initiatives such as the Intergovernmental Forum on Mining, Minerals, Metals and Sustainable

Development (IGF), the Extractive Industries Transparency Initiative (EITI), the Energy Resource Governance Initiative (ERGI) and the World Bank's Extractives Global Programmatic Support (EGPS). However, there remains significant need for support among emerging and developing economies to further develop regulatory protections and enforcement capacity across a number of environmental, social and governance issues.

**Recommendations**

- Producer countries can **undertake a multi-stakeholder review of existing regulatory frameworks and their implementation** to identify gaps and determine whether they take account of the latest practices and technologies to reduce consequences of mining and processing.
- Where gaps are identified, producer countries can **explore updates to laws and regulations** to ensure adequate protections, implementation and enforcement regimes, including corporate accountability mechanisms.
- Producer countries can **maintain commitments to environmental, social and governance protections** in any efforts to speed up permitting of new mines and processing facilities.
- Advanced economies, particularly those with well-established mining industries, **should consider offering technical assistance, technology transfer and capacity building** to help improve mining codes and regulatory frameworks, including enforcement support, and update them where necessary.
- All countries can **support international co-operation on legal and regulatory protections** through initiatives such as IGF, EITI, ERGI and EGPS.

# 2. Directed public spending

Governments are already spending money on energy development, with an increasing proportion of this being directed at critical minerals. Meanwhile, countries are developing new security of supply programmes aimed at diversifying supplies, supporting strategic projects and reducing the risks of supply disruption. **This creates an opportunity for producer and consumer governments alike to use public spending to encourage the development and deployment of better environmental, social and governance practices and incentivise good performance.**

## Public financing can help companies improve practices even if they do not receive a premium in the market

While companies are increasingly facing reputational risks related to environmental, social and governance performance, many companies report that they still would not expect to receive a premium for adopting good environmental, social and governance practices. As these practices can be costly, this means there are limited immediate price incentives for companies to invest in actions designed to reduce the negative consequences of their activities beyond what is required by law. However, as investors, companies and governments increasingly focus on environmental, social and governance issues, companies stand to financially benefit from strong performance by attracting a wider pool of investment and buyers and creating a larger pool of accessible markets. However, studies have also indicated that high performance can positively impact share prices and returns while low performance can negatively impact share prices, meaning a broader financial incentive can exist.

Public financing or financial levers can play a role by directly supporting efforts to reduce consequences for the environment, workers, communities and society. As investor and consumer scrutiny on these projects increases, these efforts can help companies ensure that they remain competitive against projects that cannot demonstrate good environmental, social and governance performance. Further, reducing these harms can deliver supply security benefits as individual projects will be less likely to face supply disruptions.

## There are opportunities to tailor security of supply policies to reinforce responsible supply objectives

Countries are already using public finance in support of security of supply programmes. Some advanced producer economies have announced financial support in the form of grants, loans or loan guarantees for strategic projects domestically, such as the Australian Critical Minerals Development Program, the United States Infrastructure and Jobs Act and Inflation Reduction Act, and the Canadian Strategic Innovation Fund, and multilateral support under the umbrella of the Minerals Security Partnership. There are also export finance mechanisms such as the Australian Critical Minerals Facility and similar funding opportunities available from the United Kingdom. Some countries without domestic production also make financing support available for overseas projects, for example Japan, or through direct equity investments through sovereign wealth funds or state-owned enterprises, as in Saudi Arabia and the People's Republic of China (hereafter, "China").

Some governments, including Japan, Korea and the United States, hold stockpiles of certain minerals to guard against supply disruptions of materials needed for

clean energy technologies or other purposes. To build and maintain these stockpiles, it is necessary to periodically purchase materials for the stockpile.

These financing and stockpiling programmes are generally designed to support one or more security of supply objectives, such as preparing for acute disruptions, developing domestic capabilities, or de-risking investments in new technologies or higher-risk jurisdictions. However, producer and consumer governments alike can encourage responsible mining practices through these arrangements by incorporating sustainable and responsible sourcing conditions. For example, procurement contracts to support national stockpiles can include reporting requirements on a broad range of performance metrics covering environmental, social and governance impacts, such as greenhouse gas and water use intensity. Similarly, financing arrangements for investments in projects to bolster security of supply could include conditions on supply chain transparency and set expectations on sustainable and responsible sourcing practices. Other conditions could require companies to perform supply chain due diligence or require that they demonstrate performance through a credible industry standard.

On the financing side, support for projects can include favourable terms for governments loans or financial benefits such as tax incentives or subsidies linked to meeting specified environmental, social and governance targets. Governments could also provide specific guidelines for what practices or performance is expected of grant, loan or tax incentive recipients along the lines of the International Finance Corporation's (IFC's) Performance Standards on Environmental and Social Sustainability. These could also be extended to incentivising co-production of critical minerals, investment into recycling, and remediation of and production from waste, all of which could help to reduce primary demand extraction and improve sustainability performance. Tying financing instruments to performance standards or targets can provide a strong incentive for companies to not only improve their practices, but also to demonstrate their performance publicly.

## Investing in innovation and new infrastructure can create a supportive environment

There remains significant scope for innovation in mining and processing technologies that could reduce the negative impacts of minerals production. For example, more energy-efficient techniques could reduce the energy intensity, and in turn the greenhouse gas intensity, of mining and processing activities. Similarly, newer technologies for water management can reduce the amount needed for processing and maximise waste water reuse. Traceability technologies, such as blockchain-based chain of custody systems and geo-based fingerprinting methods, could facilitate transparency and co-ordination across supply chains by following the flow of materials from upstream to downstream. These innovations

may also provide additional benefits through cost savings or operational efficiencies along the supply chain, further reinforcing responsible and sustainable practices.

Governments, particularly in advanced economies, have long played an important role in financing and supporting research and development for clean energy technologies, particularly where there exists a public benefit to innovation. New programmes aimed directly at supporting technologies that can reduce the impacts of mining could improve the state of the art and ensure these technologies reach market. In parallel, existing funding programmes could incorporate criteria indicating that projects designed to improve environmental, social and governance outcomes are eligible and encouraged. Governments can also support commercialisation of technologies that can reduce impacts by working with international partners to identify potential business partners and to facilitate development of new markets abroad.

Targeted infrastructure investments can also facilitate environmental, social and governance performance. Many mining projects require new infrastructure development, such as roads, rail lines, and community services like schools and medical facilities to support workers. Innovative technologies may require further digitalisation, necessitating information and communication technologies infrastructure. Regardless of whether governments undertake these investments or rely on industry to finance this, concentrating on ensuring that investments improve conditions for workers and surrounding and affected communities, and supporting projects that utilise technologies that reduce negative impacts, can alleviate environmental and social pressures.

Investment in a cleaner electric grid in regions with mining, refining or smelting facilities can help to bring down greenhouse gas emissions and facilitate local economic development. Australia is funding efforts at certain mines to boost renewable electricity generation to support the critical minerals sector through the Powering Australia Plan and the Powering the Regions Fund. Bringing down emissions at mines can help those mines become more competitive, particularly as countries increasingly apply carbon pricing to supply chain emissions, consider carbon border adjustment mechanisms for traded commodities and introduce traceability policies, such as battery passport requirements. Moreover, power can be shared from such grids to local mining communities at low cost, allowing household access to clean energy.

**Recommendations**

- Producing countries can **offer targeted financial support for measures designed to prevent, minimise or mitigate negative impacts** at existing or proposed critical minerals projects on the environment, workers, communities and society.
- Countries with national stockpiles can **incorporate environmental, social and governance performance requirements** into public procurement contracts that support stockpiles.
- Countries that offer public financial support for critical mineral mining and processing projects can **include incentives or favourable terms linked to meeting specified environmental, social and governance criteria** in relevant agreements.
- Advanced economies **can support research, development, commercialisation and adoption on improved environmental practices, resource efficiency, traceability technologies** and other enabling technologies with public innovation funding.
- All countries can **invest in infrastructure or develop strategic financing mechanisms** that can facilitate improvements in environmental, social and governance practices.

# 3. Tracking and monitoring performance

Thorough, accurate and transparent data on environmental, social and governance metrics are needed to track industry progress towards sustainable and responsible mineral supply. Information allows companies, policy makers and other stakeholders to identify trends and tailor policies and priorities for the industry. **Governments can strengthen the collection and reporting of granular and standardised data to enable benchmarking and progress tracking.**

## Current mining company reporting does not allow for an industry-wide assessment of progress towards sustainable and responsible supply chains

The IEA conducted an initial assessment of company progress across various environmental, social and governance dimensions based on the public sustainability reports published by 20 major mining companies that have a strong

presence in energy transition minerals.[1] The analysis reveals that reporting on these metrics varies substantially in both consistency and breadth. Some companies provide very granular reporting, across several years, with data for hundreds of categories and detailed regional information. Others provide only highlights on an aggregate level, covering only a handful of areas.

Altogether, over all dimensions reviewed during this assessment, less than half were disclosed by more than 15 companies (see table below). Total energy consumption, scope 1 and 2 greenhouse gas (GHG) emissions, injuries, female share of the total workforce, and community investment were the most-reported categories. In other areas, such as due diligence checks, recycled waste, gender diversity in management and environmental protection investment, only a small percentage of the 20 major companies disclosed information.

Even where data are available, it is difficult to compare performance of companies producing the same minerals or within the same region. Most companies aggregate their reported data in some form or another, often at the company level. This means it is often not possible to differentiate performance for specific minerals or groups of minerals, particularly for companies whose production is dominated by high-volume commodities such as iron ore and coal. It is also not often possible to access site-level information, making it challenging to assess performance of assets in distinct regions or countries. The challenge of understanding and comparing industry-wide performance is further complicated by the limited public reporting obligations of state-owned enterprises and unlisted companies.

[1] The 20 companies considered are Albemarle, Anglo American, BHP, CMOC, Codelco, First Quantum Minerals, Freeport-McMoRan, Ganfeng Lithium, Glencore, KGHM, Mineral Resources, Norilisk Nickel, Pilbara Minerals, Rio Tinto, Southern Copper, SQM, Teck Resources, Tianqui Lithium, Vale and Zhejiang Huayou.

### Reporting on selected environmental, social and governance metrics by 20 major mining companies

| | | | |
|---|---|---|---|
| **Environmental** | Emissions and energy consumption | Total energy consumption | 19 |
| | | Total scope 1+2 GHG emissions | 19 |
| | | $SO_x$ emissions | 16 |
| | | PM emissions | 13 |
| | | $NO_x$ emissions | 12 |
| | | Renewable energy consumption | 12 |
| | | Scope 3 emissions | 10 |
| | | GHG intensity | 6 |
| | Water | Water consumption | 13 |
| | | Water withdrawal | 13 |
| | | Water reuse and recycling | 11 |
| | Land | Land area rehabilitated | 10 |
| | | Land area disturbed | 9 |
| | Waste | Hazardous waste | 17 |
| | | Waste generation | 16 |
| | | Recycled waste | 2 |
| **Social** | Health and safety | Injuries | 19 |
| | | Occupational diseases | 11 |
| | | Fatalities | 5 |
| | Gender | Female share of total workforce | 18 |
| | | Female management | 3 |
| | Community | Community investment | 18 |
| | | Environmental protection investment | 2 |
| **Governance** | | Payables to governments | 10 |
| | | Due diligence | 5 |



Notes: $SO_x$ = sulphur oxides; PM = particulate matter; $NO_x$ = nitrogen oxides. Metrics were selected based on an IEA assessment of relevant metrics and what was available across company sustainability reports. A broader analysis would be required to comment on indicators not covered in reports. The 20 major mining companies included are: Albemarle, Anglo American, BHP, CMOC, Codelco, First Quantum Minerals, Freeport-McMoRan, Ganfeng Lithium, Glencore, KGHM, Mineral Resources, Norilsk Nickel, Pilbara Minerals, Rio Tinto, Southern Copper, SQM, Teck Resources, Tianqi Lithium, Vale and Zhejiang Huayou. Reported data are for all operations and are not limited to critical minerals.

Source: IEA analysis based on publicly available company sustainability reports.

While there is growing recognition that reporting on environmental, social and governance metrics is important not only for investors but for market access and social acceptability, some companies do not report on sustainability at all. For example, six of the top ten cobalt companies, together accounting for almost 40% of global cobalt production, did not publish a sustainability report or data for 2022. Additionally, the practice of voluntary and selective reporting with inconsistent metrics can skew industry performance assessments, as companies may be likely to report on areas where they excel.

## Guidelines for a more cohesive and credible approach to tracking and measuring progress

While voluntary reporting provides information about how certain elements of the industry are doing, overall, improvements are needed to enable accurate gauging or tracking of industry-wide progress on environmental, social and governance

issues. Policy makers can play an influential role in setting norms and expectations on common indicators for measurement and reporting. Government can also provide support for companies to deliver.

Policy makers can collaborate to provide guidelines and recommendations for performance indicators, ideally in a co-ordinated manner that ensures international acceptance and compatibility with data reporting requirements in existing standards and regulatory requirements. By announcing expectations regarding the necessary sustainability and social responsibility metrics, governments can encourage industry to make additional data available.

Specific recommendations on how to include indicators that utilise multiple data points to provide information above simple measures of performance can encourage more informative and consistent reported data. For example, water use per mined output can give a deeper understanding of relative water use, allowing for better comparability across companies, and percentage of women in leadership roles gives better understanding of diversity and inclusivity in operations.

These indicators can be made mineral-, project- or segment-specific to account for the fact that some metrics are more relevant in certain contexts. For example, it may be more important to focus on biodiversity metrics for open-cast nickel mining in forested areas, whereas performance on water use could be more relevant for brine-based lithium production in water-stressed regions. Methodological guidelines for data collection and reporting also help to improve comparability across companies. These can be particularly relevant for harder-to-quantify metrics. Inclusion of benchmarking best practices and an emphasis on reporting across multiple years can enable progress tracking overtime.

Not all companies have the capacity to implement data collection and reporting structures, particularly smaller companies. Sometimes, a company's lack of relevant data can even be a barrier to seeking approvals during the permitting process. Technical assistance can help companies set up such structures and build capacity to meet reporting standards. Public reporting platforms may also facilitate collection of data and dissemination to the public, rather than relying solely on industry to make information public. Making pertinent information available publicly can also support efforts to streamline permitting processes.

In some cases, governments already require environmental, social and governance reporting. For example, many countries require companies to report GHG emissions, including Canada, France, South Africa and the United States, while others encourage disclosure under a voluntary scheme, including India and Brazil. There are also examples of regional and global co-operation for GHG tracking and assessment, including the European Union's battery regulations and incoming mandate for a battery passport and the Global Battery Alliance, which

has released a Greenhouse Gas Rulebook for the battery passport. For disclosure requirements on social and governance performance, some countries have these for covered companies alongside other disclosure requirements, such as in Australia, Germany, Norway and the United Kingdom.

General disclosure requirements for companies also exist, both mandatory and voluntary. The European Union's Corporate Sustainability Reporting Directive (CSRD) will make it mandatory for all large European companies and companies listed on EU-regulated markets to report on selected environmental, social and governance metrics. The CSRD is working to release sector-specific requirements, including for the mining sector. The Global Reporting Initiative (GRI), one of the most widely used voluntary reporting standards, includes direction on how environmental, social and governance metrics are reported. The GRI is working to develop a sector-specific standard for mining that will have a broader range of measures. Notably, for both the CSRD and the GRI, the refining section of the value chain is not covered.

Countries without disclosure requirements for companies could implement similar requirements and consider expanding to cover additional elements of sustainable and responsible critical mineral supply chains. Accessible and comparable site-level environmental, social and governance performance indicators would assist policy makers and purchasers in evaluating their exposure to environmental, social and governance risks. An improved reporting framework could also support differentiated prices based on environmental, social and governance performance.

**Recommendations**

- Both producing and consuming countries can **provide guidelines to companies throughout the supply chain** on which environmental, social and governance metrics that both unlisted and listed companies within their jurisdiction should report. These could include mineral- and segment-specific recommendations to address relevant risks.
- Countries can **work together to issue methodological guidelines for detailed data collection and reporting based on international best practice**, with a focus on benchmarking and reporting over multiple years to track progress over time, as well as best practices on verification and disaggregation.
- All countries, but particularly advanced economies, **can provide or facilitate technical assistance to companies** that do not have the resources for implementation of performance monitoring and collection.

- All countries can **explore introducing additional reporting requirements and public reporting platforms that aggregate and disseminate sustainability and social responsibility metrics** across the value chain and across different metals and locations.
- Countries with existing data collection efforts can **explore whether existing standards and reporting initiatives can make data publicly available** in a user-friendly format.

# 4. Making supply chains more transparent

Improving transparency throughout the supply chain has important benefits both in terms of mitigating negative impacts and for security of supply. Greater transparency ensures that efforts to understand supply chains and mitigate risks can be demonstrated and verified, which enables purchasers and customers to undertake due diligence, allows governments to verify compliance with regulatory requirements, and facilitates performance and progress tracking. It can also allow for product and brand differentiation, potentially creating a competitive advantage for companies with responsible sourcing. At the same time, traceable supplies supported by transparent reporting on risks and mitigation actions can aid industry players and governments in gauging supply chain risk. Supply chain transparency can also improve security of supply as it enables industry players and governments to track risks that may cause supply disruptions. **To facilitate greater transparency and more responsible critical minerals supply chains, governments can encourage or require companies to improve chain of custody and traceability information, undertake due diligence, and report transparently on risks and mitigation actions.**

## Companies are exploring different approaches to enhancing transparency

A critical step in bringing greater transparency throughout the supply chain is for companies to build a better understanding of where the materials they source genuinely come from. A lack of awareness of the links in the supply chain could hinder regulatory compliance and access to capital and market incentives. For instance, to receive tax credits under Section 45X of the Inflation Reduction Act (which limits tax credits to vehicle batteries using critical minerals sourced, processed or recycled from specific regions) would require a company to be able to demonstrate the origin of its minerals. This can be achieved through different means, including through traceability, chain of custody systems or identification of upstream actors.

In many cases, companies that manufacture clean energy technologies purchase the materials they need through an intermediary – in supply chain parlance, a “tier 1” supplier. That intermediary may source its materials from a different company who may also source from yet another company – “tier 2” and “tier 3” suppliers. These sources may come from multiple feed sources, leading to "blended supply". For example, electric vehicle manufacturers may purchase battery cells that already incorporate lithium, cobalt, nickel and other materials. Even those that manufacture battery cells themselves may purchase those materials from a commodities trader or other materials supplier. An illustration of this is the platform built by Resource Matters, which maps out the cobalt supply chain of some large companies from extraction to production.

However, supply chains are dynamic and change regularly. If the tier 1 supplier is regularly purchasing the lowest-cost available materials, then the source of the materials it delivers may change many times per year. Because of these changes, a snapshot of a moment in time may not present an accurate picture of the potential risks. One way to address this problem is for intermediaries to provide an up-to-date, verified list of possible suppliers over a given time frame. Even if this does not show the source of a specific individual shipment, this can enable companies to assess the risks across all potential suppliers. Alternative approaches include active, continuous tracing, which can allow purchasers to know where the materials are coming from for particular shipments.

Companies are increasingly recognising the need to develop an accurate picture of their supply chains. Some companies, including particularly large auto manufacturers, have taken a more active approach to managing their supply chains for some critical minerals rather than relying solely on commodities brokers or other intermediaries. These companies have entered into long-term offtake agreements directly with mining companies, which can provide greater assurance about the upstream source of materials. Some companies have also begun making direct investments in mining activities for relevant minerals to ensure they have full control over their supplies. This can allow those companies with sufficient market size and leverage to engage more directly with environmental, social and governance issues at a local level.

**Involvement of top-seven electric vehicle and batter makers in the critical minerals supply chain**

| EV makers | Long-term offtake | Mining | Refining | Battery makers | Long-term offtake | Mining | Refining |
|---|---|---|---|---|---|---|---|
| BYD | | ○ ● | ○ ● | CATL | | ○ ● | ○ ● |
| Tesla | ○ ● | ● | ● | LG Energy Solution | ○ ● | ● | ○ ● |
| Volkswagen | ○ ● | ● | ● | BYD | | ○ ● | ○ ● |
| General Motors | ● | ● | ● | Panasonic | ○ ● | | |
| Stellantis | ● | ● | | SK On | ○ ● | ● | ● |
| Hyundai | ● | | | Samsung SDI | ○ ● | | |
| BMW | ○ ● | | ● | CALB | | | |

○ Before 2021 ● Since 2021



Note: EV = electric vehicle; CATL = Contemporary Amperex Technology Company Limited.
Source: IEA (2023), World Energy Outlook 2023.

**Technological developments in traceability tools**

A growing number of companies now offer material traceability services, which essentially involves working with tier 1, 2, 3 suppliers (and beyond) to not only identify the participants in their supply chains, but also digitally track those sources up to the point of incorporation into an end product. This type of continuous tracing of information can allow an assessment of risks and of environmental, social and governance performance as it attaches information on country of origin and data on performance to the material along the supply chain.

The most common current application of tracing data on environmental, social and governance performance is on greenhouse gas emissions, which enables companies to track scope 1, 2 and 3 emissions along the value chain. In theory, this could be expanded to other elements of sustainable supply chains as well, such as water intensity, enabling a full life-cycle assessment.

Policy makers and companies, however, should be aware of the limitations of end-to-end product traceability. Sophisticated technological solutions, while appropriate in some contexts, may not be fit for purpose in small-scale, high-risk or informal segments of the supply chain – all significant sources of supply for critical minerals – and making them a baseline expectation may therefore limit supply chain diversification and undercut responsible sourcing strategies

beneficial to the workers and affected communities. Cost implications of continuous traceability must be fully considered, and, where appropriate, a risk mitigation approach may be more beneficial. In addition, due to the nature of both aggregation and blending in mineral supply chains, particularly at the smelting and refinery stage of the supply chain, traceability is not always possible or practical.

In order for traceability technology tools such as decentralised databases, blockchains and smart contracts to be useful tools to support sustainable and responsible supply chains, clear definitions and defined objectives are necessary. This includes specifying recipients of any aggregated data, establishing accountability for data producers and traceability technology companies, and assessing whether regulatory requirements and enforcement need to be adjusted for these purposes.

## Existing frameworks can provide guidance for companies to undertake supply chain due diligence

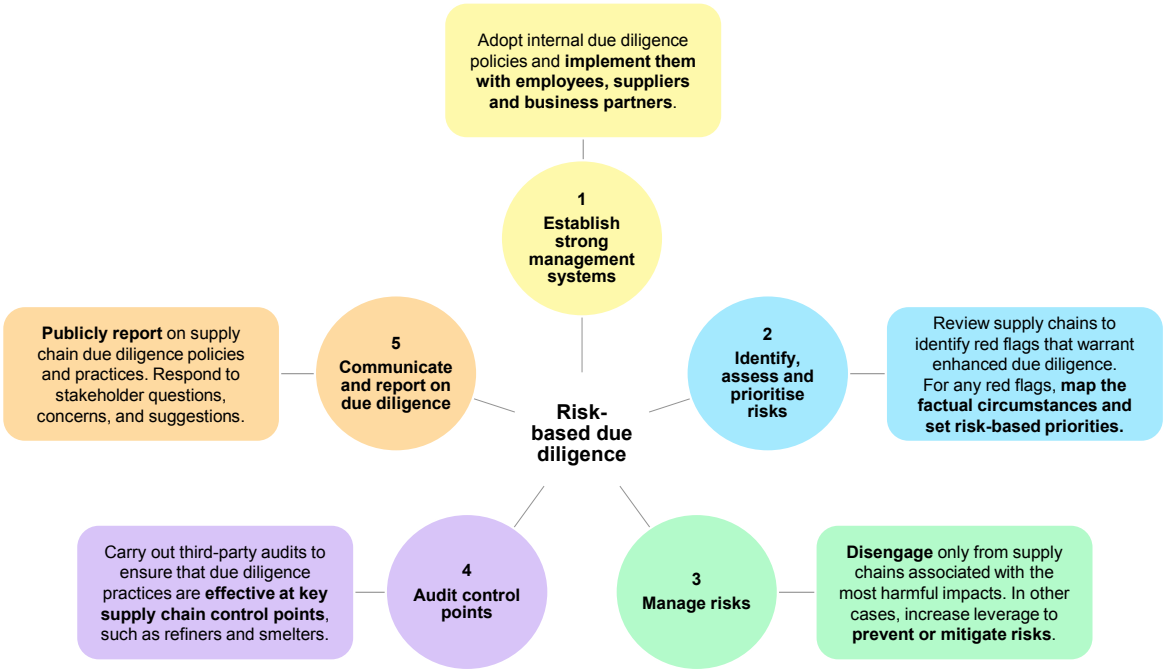
The most widely recognised international standards that can support companies in looking more closely at environmental, social and governance issues in their operations and supply chains are the OECD Guidelines for Multinational Enterprises on Responsible Business Conduct (hereafter "OECD MNE Guidelines"), the UN Guiding Principles on Business and Human Rights, the OECD Due Diligence Guidance for Responsible Business Conduct (hereafter "OECD RBC Guidance"), and the OECD Due Diligence Guidance for Responsible Supply Chains of Minerals (hereafter "OECD Minerals Guidance"). These instruments were developed through a multi-stakeholder process with in-depth engagement from governments, including non-OECD Member countries, industry and civil society, and they have been adopted and approved by OECD member countries along with several other countries.

While the OECD MNE Guidelines and the OECD RBC Guidance are the most comprehensive standards for minimising adverse impacts that may be associated with enterprises' operations, products or services across all sectors of the economy, the Minerals Guidance provides recommendations on supply chain due diligence on specific risks, including some of the most severe. In 2023, the OECD published a Handbook on Environmental Due Diligence in Mineral Supply Chains (hereafter "OECD Environmental Handbook") in order to provide practical recommendations to companies on using these instruments to address related risks in the minerals sector.

The OECD Minerals Guidance is designed specifically for companies involved in sourcing minerals in conflicted-affected and high-risk contexts. It is global in scope

and applies to all mineral supply chains. It provides detailed recommendations to help companies respect human rights and avoid contributing to conflict and serious economic crimes through their mineral purchasing decisions and practices. The guidance lays out a five-step framework for risk-based diligence.[2]

### Five-step framework for companies to undertake risk-based due diligence






Source: Based on OECD (2016), OECD Due Diligence Guidance for Responsible Supply Chains of Minerals.

It is designed to enable investment to flow in fragile contexts, providing the needed flexibility for companies to implement tailored risk mitigation strategies and ensure production and trade of mineral resources is carried out sustainably and responsibly. It does not prescribe that businesses should disengage from all conflict-affected and high-risk areas. On the contrary, the guidance assists businesses in recognising and addressing these risks following a risk-based approach.

It is also broad in scope and applies equally to all stages in the chain — from extraction to smelting to manufacturing. Considering the role that smelters and refiners play as choke points in mineral supply chains, the OECD Minerals

[2] Other OECD instruments and handbooks on responsible business conduct that were developed after adoption of the OECD Minerals Guidance have included an additional step: step 6, provide for or co-operate in remediation when appropriate. The OECD Environmental Handbook likewise includes this step. Within the current five-step framework of the Minerals Guidance, and based on evolving interpretation, remedy should be implemented as part of step 3 regarding how companies in the minerals supply chain manage and respond to risks.

Guidance also sets out a division of responsibility between upstream and downstream companies in this regard, with the measures taken being commensurate to the severity and likelihood potential adverse impacts. While implementation of due diligence can and should be tailored to particular company activities and relationships (such as their positions in the supply chain), the guidance provides a framework for all companies to ensure that they do not contribute to human rights abuses, serious economic crimes or conflict.

Further, the due diligence approach is not limited to risks associated with conflict and warfare. Although it was initially developed with a focus on conflict-affected areas, the same approach can be applied to a wide variety of risks and potential impacts, including human rights abuses, corruption and governance risks, environmental damage and pollution, labour risks and security management risks. It can also be a useful compliance tool, helping companies ensure that they observe international law and comply with domestic legal and regulatory requirements.

## In many cases, market rules and legal requirements mean that due diligence is no longer optional

OECD RBC instruments are being increasingly referenced and adopted in legislation. For example, the OECD Minerals Guidance has now been widely, and to varying extents, integrated into regulatory frameworks, notably in the United States and the European Union, as well as in producing and trading countries such as the Democratic Republic of Congo, Rwanda and the United Arab Emirates. Incorporation into legislation has driven a significant increase in uptake and disclosure across the industry.

In the United States, the Dodd-Frank Act has required supply chain due diligence in relation to tin, tantalum, tungsten and gold (3TG) originating in the Democratic Republic of the Congo or an adjoining country since 2011. In 2021, the European Union also introduced supply chain due diligence requirements through its Conflict Minerals Regulation. This regulation applies to tin, tantalum, tungsten and gold sourced from any country or area that is conflict-affected or high-risk. These requirements have been further complemented by the EU 2023 Batteries Regulation, which includes supply chain due diligence requirements for critical raw materials used in batteries (i.e. cobalt, natural graphite, lithium, nickel and their chemical compounds). The European Commission proposal for a new EU Critical Raw Materials Act, likewise, would require alignment with OECD Responsible Business Conduct instruments for meeting the sustainability criteria for EU recognition and support to "strategic projects" in third countries aiming to diversify and secure critical raw material supply chains.

In parallel with these policy developments, supply chain due diligence principles are increasingly being integrated into industry guidelines and market requirements around the world. For example, the China Chamber of Commerce of Metals, Minerals and Chemicals Importers and Exporters, which counts over 6 000 members, has developed a due diligence standard aimed at Chinese companies that is based on OECD standards. Further, the London Metal Exchange has also started enforcing mandatory requirements on supply chain due diligence for all metals traded on the exchange since 2022 based on the Minerals Guidance. Additional due diligence standards have been developed in line with OECD standards for specific supply chains such as cobalt and graphite. The London Platinum and Palladium Market has similar requirements.

Over time, expectations for environmental and human rights due diligence are likely to continue to grow due to pressure from governments, investors, purchasers of commodities, and consumers of the final product. Mandatory due diligence legislation is already in place in France, Germany, Norway and Switzerland and is being discussed in other countries. In the European Union, the European Commission's Proposal for a Directive on Corporate Sustainability Due Diligence would require EU-based companies to carry out due diligence in order to identify and manage adverse impacts on human rights and the environment in their operations and value chains, referencing OECD RBC standards as the international benchmark. New European corporate sustainability reporting requirements and disclosure legislation for the financial sector also reference OECD RBC due diligence standards.

As new legislation emerges, often with broad horizontal scope, companies can already get "ahead of the curve" by putting in place robust due diligence processes consistent with international standards that can help them to better manage and respond to risks and impacts along their supply chains. They will then be well placed to build on and tailor existing systems and processes to the specificities of new regulatory requirements.

## Some industry segments pose special challenges

Artisanal and small-scale mining (ASM) poses particular challenges in terms of transparency. From a mapping perspective, it can be difficult to properly track the origin of materials from ASM because it is often informal or outside of the regulatory framework. While sophisticated companies may be able to participate in due diligence and supply chain tracing programmes, this can be challenging for individual ASM actors. Further, the reputational risks may encourage companies to seek to remove ASM from their supplies, when a more effective approach may be to engage more actively to mitigate risks. Although ASM has been most prominent in tungsten, tantalum and cobalt, other critical minerals such as copper and lithium are seeing growing amounts of materials coming from ASM.

The midstream sector has been particularly difficult to gather complete information about in recent years. Audits of smelters and refiners may be difficult to verify, with downstream consumers often not having access to detailed audit reports or having few avenues for confirmation. Given the importance of these facilities in the supply chain, a lack of transparency at smelters and refiners can introduce risks even where consumers have good information about other links in the chain.

**Recommendations**

- **Encourage or require all companies to adopt transparent responsible business conduct practices in sourcing decisions**, including undertaking risk-based due diligence consistent with international standards, instituting systems of controls and transparency to obtain information on the sources of their supplies, and reporting transparently on processes, activities and outcomes.
- **Ensure that company approaches to due diligence place first emphasis on mitigation and prevention** when risks or impacts are identified and with disengagement as measure of last resort, consistent with OECD Responsible Business Conduct instruments.
- For public procurement or investment decisions, including purchases for potential public stockpiling programmes, **require due diligence for all types of environmental, social and governance risks**.
- **Ensure appropriate funding, resourcing and capacity building** of national authorities mandated with the enforcement of due diligence requirements.

# 5. Support for voluntary sustainability standards

Well-designed and credible voluntary sustainability standards can, depending on their scope and activities, support companies in achieving specific environmental, social and governance criteria and in carrying out due diligence that can provide sourcing companies valuable information on whether an individual supplier or project meets these criteria. Broader sustainability initiatives can support companies in other ways, for example through enabling due diligence, providing best practice tools and guidance, collaborative approaches, traceability or chain of custody systems, site-level risk information, or stakeholder engagement activities. **Governments can support the development of credible voluntary sustainability standards and encourage harmonised approaches consistent with international standards, provided that these do not result in over-reliance by companies or governments on initiatives as indicators of compliance or responsible conduct.**

## Companies can use voluntary standards systems to support their own environmental, social and governance objectives

The current landscape of sustainability initiatives is complex and fragmented as they vary significantly in scope, ambition and activities, as well as in the quality of their audit and assurance methodologies, governance and oversight systems, levels of transparency, stakeholder engagement, and overall credibility. As a result, companies lack clarity about what particular schemes do and do not do and the role that an individual scheme can play in making their operations or supply chain sustainable and responsible. Some initiatives primarily exist to support company due diligence, whereas others exist to set requirements for performance. An introduction to the range of categorisations of initiatives and standards can be found in the box below. This report focuses primarily on voluntary sustainability standards.

Industry and multi-stakeholder voluntary sustainability standards that set requirements for companies and assess performance or products against them for mineral projects have proliferated in recent years, mirroring the growing attention paid to the need for sustainable and responsible mineral extraction and refining. There are many types of these standards, including disclosure standards, lender-driven standards and issue-specific standards, each with different purposes and with varying degrees of uptake among the industry. Notably, voluntary sustainability standards that focus on the midstream or whole of the supply chain are nowhere near as prolific.

In all cases, companies retain ultimate responsibility for their own performance and for how they utilise voluntary sustainability standards. They should make good-faith efforts to understand the precise scope and activities that the initiatives cover, and are responsible for building on, tailoring and acting on the information they receive from or collect for the purposes of the standard. Companies should also have systems in place to check the quality of the information and the overall credibility of the third-party initiative.

Governments can support companies by encouraging transparency on what individual standards do and do not cover, their degree of regulatory alignment, and overall credibility. For example, they can provide companies with centralised, public information on the scope and credibility of individual voluntary sustainability standards, which some governments have already done, including Germany's Institute for Geosciences and Natural Resources (BGR)'s Sustainability Standard Systems for Minerals Resources. Governments could also utilise available alignment assessments by organisations such as the OECD, ISEAL or other third-party assessors to help provide clarity.

**Types of sustainability initiatives**

There are multiple categorisations of the broad spectrum of standards, initiatives and schemes that exist to support sustainable and responsible supply chains:

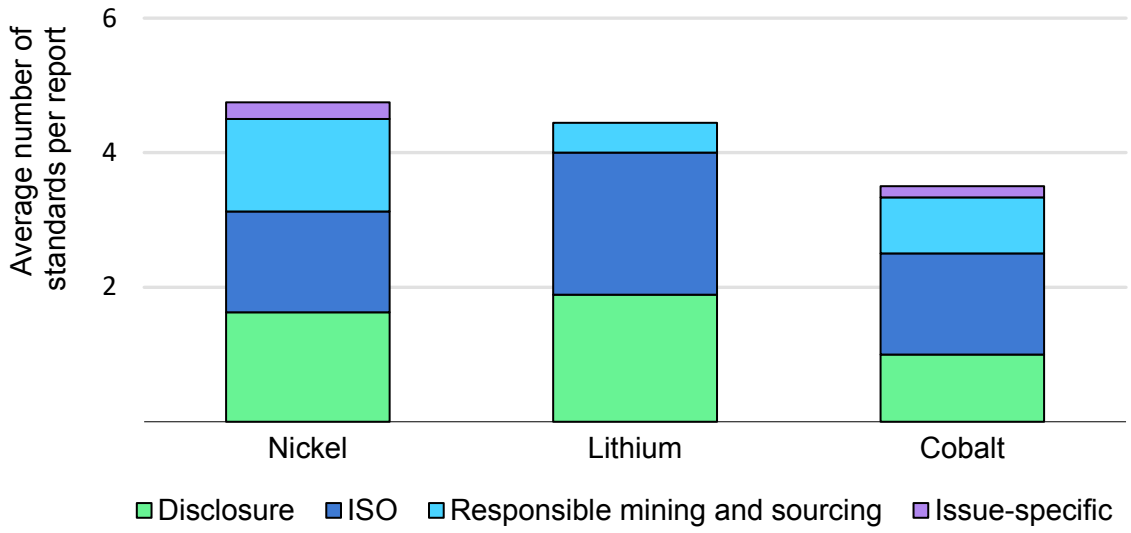
**Sustainability initiatives** cover a broad category of initiatives and, as defined by the OECD, can be multi-stakeholder-, government- or industry-led. They can provide various resources such as tools, information and capacity building. Their functions can include setting requirements, monitoring, auditing, verifying, assuring, certifying, benchmarking or assessing business practices or products based on sustainability goals. Examples include government-supported sector dialogues, global framework agreements, due diligence and responsible sourcing initiatives, reporting frameworks, and certifications. They can be broadly categorised into subsets:

- **Verification initiatives:** schemes to certify, assure, benchmark or assess business practices or products against specific requirements, allowing for measurement of a company's policies and practices against the adopted standard.
- **Facilitation initiatives:** schemes that play a more collaborative or facilitative role in supporting companies' due diligence, but do not actively monitor, assess, assure, verify or certify a company's performance. They may establish environmental or social targets or metrics for companies to follow and provide participating companies or their business partners with traceability or chain of custody systems, country-level risk mapping, site-level monitoring, risk assessment and prevention tools, reporting frameworks, or complaints-handling mechanisms.

**Sustainability systems** refer to a range of organisations that define sustainability performance levels or improvement pathways, including measuring, monitoring or verifying performance or progress, as defined by ISEAL.

**Voluntary sustainability standards** are private standards that set and assess performance for products or operations to meet specific economic, social and environmental sustainability metrics, as defined by the UN Forum on Sustainability Standards.

**Site-level standards used by the top 10 companies with a 2022 sustainability report by type**






Note: Types of standards are grouped based on a selection of standards analysed by SRK Consulting: issue-specific include standards focused on issues such as the Voluntary Principles on Security and Human Rights (VPSHR); responsible mining and sourcing includes the International Council on Mining & Metals (ICMM), Mining Association of Canada's Towards Sustainable Mining (TSM) initiative, and Initiative for Responsible Mining Assurance (IRMA), among others; ISO refers to the International Organization for Standardization's standards on environment, health and safety, risk, and social responsibility; and disclosure includes non-financial/sustainability reporting initiatives, climate-specific disclosures and other disclosure initiatives.

Source: IEA analysis using company sustainability reports.

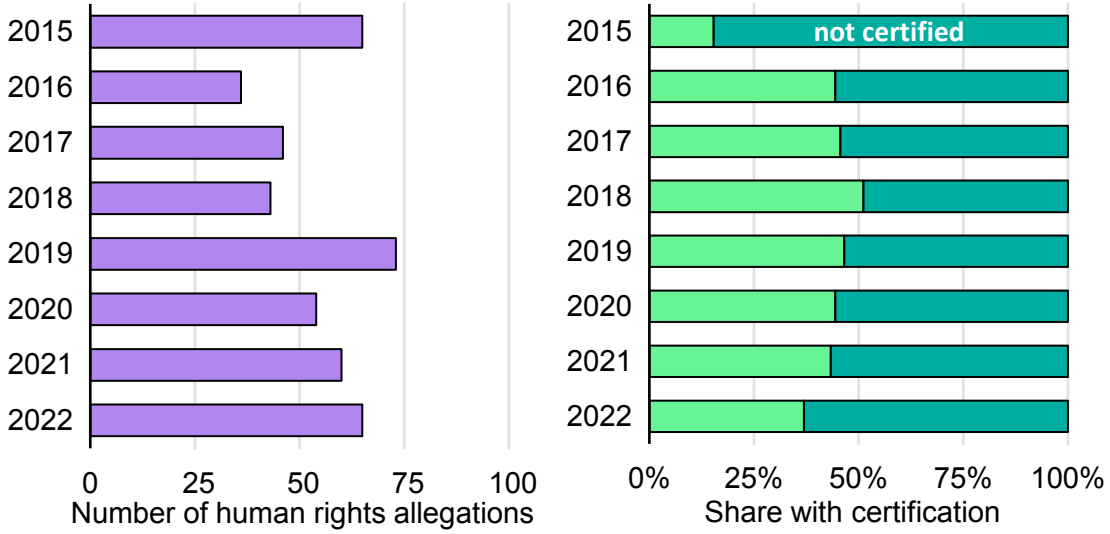
This analysis focuses primarily on voluntary sustainability standards that cover the most relevant environmental, social and governance risks and that are implemented with a system requiring independent third-party verification or certification. These include the ICMM's Mining Principles and related performance expectations, IRMA's Standard for Responsible Mining, the TSM initiative, the Responsible Minerals Initiative and the Copper Mark's Risk Readiness Assessment Criteria Guide (the Copper Mark). However, the intention is not to promote comprehensive approaches over standards with narrow focus in all circumstances; standards can be effective precisely because they specialise and focus their resources and expertise, for example on specific risk issues, segments of the supply chain or geographies.

While in general these standards can all lead to increased transparency regarding sustainability performance, as noted, there are major differences between standard systems in the overall stringency of requirements, the scope of their application, the specific approach to compliance and reporting, uptake and in oversight and assurance systems. The most comprehensive review of these standards is from BGR, which aims to provide a comparative overview of sustainability standard systems as well as their uptake and implementation, and which was last updated in 2022.

# Standards should be assessed based on a range of credibility criteria

Voluntary sustainability standards can be a useful source of information for companies, but participation or membership in a standard cannot guarantee responsible or sustainable conduct, nor should it be considered a replacement for proper due diligence aligned with international due diligence standards.

**Number of human rights allegations and share of companies with a human rights allegation that meet at least one standard**






Note: Includes companies that have met one of the following standards for at least one site: IRMA, ICMM, TSM and Copper Mark.

Sources: IEA analysis based on data collected by the IEA and Business & Human Rights Resource Centre (2023), Transition Minerals Tracker.

As voluntary sustainability standards are primarily designed to enable companies to demonstrate how they are performing against specific criteria or requirements, the specific relevance and value of a given standard is a function of, among other things, its scope and how credible it is to its intended audience – whether investors, purchasers, governments, civil society or the public. There is growing demand from governments and other stakeholders for harmonised approaches to credibility criteria or principles for the broader range of initiatives as the landscape grows in complexity. ISEAL has developed Credibility Principles that define the core values of credible and effective sustainability systems. Meanwhile OECD adherent governments and the European Union

recently called on the OECD to develop harmonised credibility criteria for sustainability initiatives (currently under development).[3]

Noting the work of the OECD and ISEAL on this topic, as well as ongoing debates about what credibility criteria are appropriate for all initiatives, factors that may affect credibility include:

- **Degree of alignment with relevant international frameworks.** Relevant requirements and/or activities and management systems of the standard are consistent with international standards on due diligence, including core risk-based principles of progressive improvement and proportionality, contain adequate detail and are contextually appropriate.
- **Clarity on scope.** The initiative communicates its scope publicly and clearly, including in terms of subject areas, geographies, activities and entities covered.
- **Transparency.** Level of transparency of the initiative, including whether the reports and outcomes of activities, audits or other assessments and information on the initiative's governance and oversight systems, assurance mechanisms (where relevant) and stakeholder engagement are publicly available.
- **Multi-stakeholder engagement.** The initiative includes approaches to meaningful consultation, participation and engagement with relevant stakeholders, such as workers, communities and unions, including in relation to the design and revision of the initiative's standards and policies, monitoring and evaluation systems, and impact assessments.
- **Quality of assurance mechanism, where included.** Where an assurance mechanism exists to assess and assure or certify the quality of company performance, it should be robust with appropriate safeguards to ensure the independence of audits or other assessments and meaningful participation in the audit or assessment from relevant communities and workers. See for example ISEAL's Assurance Code of Good Practice.

While these factors, among others, can help stakeholders to make determinations about an initiative's credibility, there is still no common approach to credibility and limited publicly available information about the extent to which individual initiatives would meet credibility criteria. Existing benchmarks and databases, such as the International Trade Centre's Standards Map, as well as ISEAL's own assessments, tend to rely on self-reporting or desktop review of documents rather than evaluations of how initiatives, including assurance systems, operate in practice. The OECD Alignment Assessments of sustainability initiatives do provide a unique implementation component, including through stakeholder interviews and site-level shadow assessments.

[3] The OECD is in the process of developing credibility criteria for sustainability standards and other types of multi-stakeholder and industry schemes, following a recent mandate set out in the Ministerial Declaration on Promoting and Enabling Responsible Business Conduct in the Global Economy, adopted by the European Union and 51 adherent governments on 15 February 2023. The OECD is consulting ISEAL on the content of the criteria.

## Voluntary sustainability standards can support sustainable and responsible supply chain practices, but greater transparency, harmonised approaches to credibility and appropriate incentives are needed

While there can be significant reputational and commercial benefits for companies to voluntarily join and participate in standards, the specific incentives depend on a range of factors – including the legislative landscape, demands set by buyers, the specific geography, the commodity and the supply chain segment. Policy makers can play a role in supporting and promoting the development, coherence, transparency and, in some cases, adoption of credible standards and approaches.

Some industry associations or bodies have adopted standards as a mandatory requirement for their members. For example, a requirement for membership with the Mining Association of Canada (MAC) is the adoption of TSM. This has been adopted by 14 other mining associations worldwide, where a key requirement for affiliation with TSM is mandating adoption by all members of the associating organisation. A key factor of TSM is that each association can adapt the system to their own local needs outside of the seven core requirements. The Canadian government has played an active role in supporting TSM, particularly in adoption by organisations overseas. Canada also has lent its support to the TSM standard, with a programme that provides matching funds for companies pursuing the highest levels of performance under the TSM Climate Change Protocol.

A primary driver for standards uptake is market pressure. Standards were originally devised as investment tools to assess risk based on corporate sustainability at the operational level, given the negative reputation of mining among investors. Selective pressure on the market can encourage or discourage uptake of standards based on consumer and investor preferences. Standards such as the OECD's Due Diligence Guidance are good examples of those that are adopted (at least initially) because of market pressures and investment considerations. Investors, stakeholders and consumers have increasingly been putting pressure on companies to conform to these standards in their critical mineral supply chains. Incorporating standards requirements into spending decisions, including for public procurement, could help ensure there are market incentives for good performers.

Legislation has also been a key driver for companies to implement and report on good-practice standards.[4] Some national and regional governments have institutionalised standards, effectively giving them the force of law. For example,

[4] The European Union's adoption of the OECD's Due Diligence Guidance and recent battery regulation decisions are examples of formerly independent standards being adopted into governance frameworks, where introduction of an enforcement mechanism caused industry-wide adoption of the standard.

the US Securities and Exchange Commission's proposed Climate Disclosure rule would require companies to quantify greenhouse gas emissions and builds on other voluntary climate-related frameworks, such as those by the Task Force on Climate-Related Financial Disclosures and the Greenhouse Gas Protocol. Governmental oversight in standard setting is still necessary, however, to ensure public interest representation, accountability, and long-term viability in the standard-setting process.

Some standard-setting bodies and commentators have pushed back against this approach, claiming that standards are not designed for regulatory purposes. Rather, the purpose of standards is to improve the practices of companies beyond (and not within) government regulation. Nonetheless, standards systems can play a role in establishing industry expectations and demonstrating what is possible, which can pave the way for more robust regulatory action.

**Recommendations**

- **Promote collaborative approaches to align voluntary sustainability standards with international frameworks** and credibility criteria, while supporting transparency on the scope and credibility of individual initiatives.
- Actively **encourage the adoption and improvement of credible voluntary sustainability standards** and other types of sustainability initiatives that complement legal frameworks and align with relevant international standards, agreements and legislation.
- **Set expectations for companies to review and evaluate sustainability initiatives they participate in** for credibility, alignment with international standards, agreements and legislation, and to take responsibility to ensure participation in standards is meaningful.
- **Encourage standards systems to clearly communicate their scope and improve alignment and compatibility** among credible standards to clarify the landscape and simplify implementation by companies.
- Where possible, **develop centralised public digital platforms** to provide companies and other stakeholders with information on the scope, degree of alignment and credibility of sustainability systems.
- **Consider providing access to financial support to reduce barriers for companies participating in credible voluntary sustainability standards**, particularly for small enterprises that may find them cost-prohibitive or not have the systems in place to implement them, subject to evaluation of credibility and taking into account market implications.

# Part II: Focus areas

It is important to minimise harm from all types of environmental, social and governance risks to ensure that critical mineral supplies are sustainable and responsible. Mitigating these risks can help protect people, communities and the environment. In addition, comprehensively addressing these risks can bolster security of supply. Environmental, social and governance impacts can disrupt current and future supply in different ways:

- **physically** preventing a mining or refining operation through material constraints to operation
- **regulatory and legal** requirements preventing permits from being issued, leading to shutdowns, blocking access to markets, etc.
- **reputational** impacts leading to divestment or being a barrier for new investment
- **social** pressure leading to protests, litigation and blockage of supply if there is a lack of acceptance or consent.

While these impacts are possible for all types of risk, some risks raise more security of supply concerns than others, with implications for the viability of realising clean energy transitions. This section explores **six focus areas** that can impact supply security through one or more of these disruption pathways: **water**, **greenhouse gas emissions**, **biodiversity**, **human rights**, **communities** and **corruption**.

For each risk, this section characterises the potential impacts associated with the risk and the implications for supply security, supported by illustrative examples of disruptive events. We offer a snapshot of how the industry is performing right now based on available data, followed by a review of coverage and gaps in existing standards, including ICMM, IRMA, TSM and Copper Mark. Each section also showcases examples of existing policies and regulations that align with the IGF's Mining Policy Framework (IGF Framework), which was updated in November 2023. The IGF Framework outlines essential recommendations for mining sector regulations based on six pillars: laws, policies and institutions; financial benefits; socio-economic benefits; environmental management; post-mining transition; and ASM. Finally, we present key recommendations for policy makers designed to implement the overarching policy levers for proactive and effective risk management identified in Part I.

# 1. Water

## Nature of risk

### Water is vital to critical mineral development

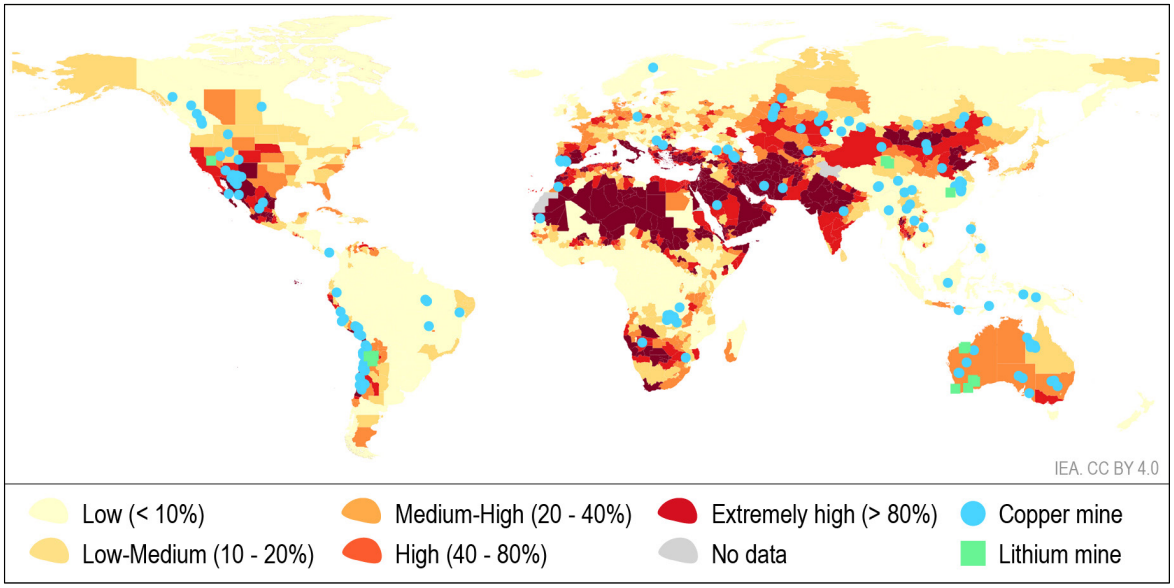
Water is used all along the mineral production value chain, from exploration to processing (e.g. flotation uses water to concentrate mineral ores) and transport. It is a major input of many standard operations, such as cleaning, cooling, dust control and pumping. Some mineral supply chains are more susceptible to water-related risks. For example, lithium brine extraction and copper processing are particularly vulnerable given the location of many mines in arid regions, whereas nickel processing is vulnerable due to its high water requirements. Nonetheless, water remains a crucial element in the production of all critical mineral supply chains and will be increasingly important as the world transitions to a minerals-based energy economy and climate change makes water flows more variable.

## Supply security

### Water stewardship is a key element of supply security, especially in water-scarce regions

One of the biggest material risks to supply is **water scarcity, which can lead to a slowdown or complete halt of production**, with 40% of major mining companies reporting that water risk could close operations, disrupt production capacity and constrain growth. This a problem exacerbated by the geographical location of mines and deposits in arid regions. Over 50% of today's lithium and copper production is concentrated in areas with high water stress levels, such as northern Chile and Australia, and this proportion is set to increase as more mines are developed for the clean energy transition leading to increased risk of supply disruptions from water scarcity issues.

**Location of copper and lithium mines and water stress levels, 2020**




Notes: The exact water stress levels vary by location. The assessment of the share of mines located in water-stressed areas was made based on granular regional representations; these are aggregated at the subnational level on the map for the sake of simplification. Water stress levels are as defined in the Aqueduct 3.0 dataset according to the ratio of total water withdrawals over the total available surface and groundwater supplies.
Source: IEA (2022), Reducing the impact of extractive industries on groundwater resources.

Failure to meet regulatory or legal requirements for water stewardship can halt supply due to **delayed or denied permits**, **government-ordered shutdowns and limited market access**. This will vary based on the jurisdiction of operation, but could result from excessive withdrawals, mining effluents and other environmental impacts of mining, including acid mine drainage and poor tailings management that could contaminate downstream water bodies. Water pollution is particularly worrisome in the processing stage, where grinding, milling and concentration methods often generate polluting effluents loaded with heavy metals and chemicals. Difficulties in addressing water pollution or scarcity issues may also cause permitting delays or may prevent projects from moving forward.

A lack of proper water stewardship that causes damage to water resources for other uses, either real or perceived, can lead to a lack of community acceptance or reputational damages. Ineffectual water stewardship can halt or disrupt supply through community responses such as **protests** and **litigation**. This is particularly relevant for minerals that require significant water withdrawals for mining and processing or are located in geographical areas at risk of water scarcity.

Sustainable Development Goal 6 calls for access to and sustainable management of water and sanitation for all. Clean energy transitions should aim to support this goal. Water constraints already impact supplies of some critical minerals, and implementing proper water stewardship practices will become

increasingly important in this context, especially as the demand for critical minerals grows to support clean energy transitions.

**Water use at Los Bronces copper mine: Charting a path from troublemaker to solution provider**

Water stewardship is particularly important in water-scarce regions, such as at the Antofagasta mine in the arid, mountainous desert region of northern Chile. Many of the mines in the region have suffered partial shutdowns and reduced production. Excessive water extraction, attributed in part to mining activities, has depleted groundwater reserves in the region, leading Chile to restrict access to some of its aquifers. Many mines in the region are developing measures to reduce their impacts on fresh water use, such as investing in desalinisation plants or water recycling.

To implement its goal of eliminating fresh water consumption by 2030 and to get approval from local government and stakeholders for the extension of its mining permit, Anglo American initiated a water supply project in the Los Bronces copper mine through an agreement with a Chilean water desalination provider. The project involves sourcing desalinated water from a newly established plant in the Valparaiso region, which will be conveyed via a pipeline and pass through Anglo American's Las Tortolas plant before reaching the Los Bronces mine. This project would serve the dual purpose of meeting the mine's water requirements and benefiting nearby communities such as Colina and Til Til, supporting water provision for approximately 20 000 individuals.

Beyond this phase, Anglo American is devising a scheme to introduce a water exchange programme, directing desalinated water toward human consumption. This mechanism involves exchanging treated waste water to sustain the mine's operations. In a broader context, this project signifies the company's response to the ongoing drought crisis in central Chile, which has already led to diminished mining output at the Los Bronces mine. Yet this project's value as a solution remains unproven, owing to regional co-ordination shortfalls and potential adverse impacts of the infrastructure.

# Industry performance

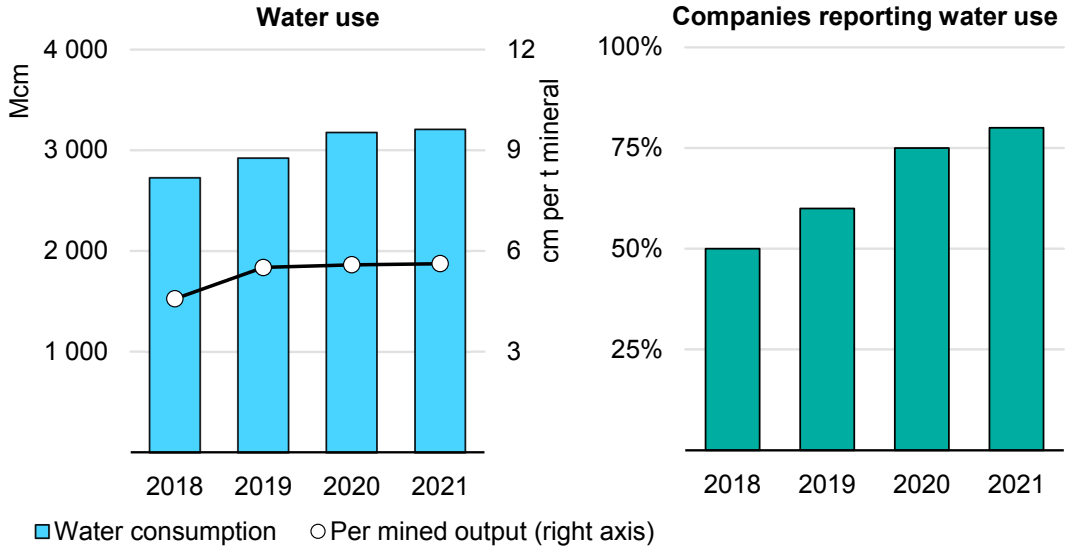
## Many companies still report high levels of water usage, although there are signs of progress

There are a variety of ways that companies have started to address water management at their operations. **Water stewardship** is the use and management

of water in a socially equitable and sustainable manner, which, in the context of mining operations, is more than looking at water as an "operational fence line" issue, which views water management only through improved efficiency, water reuse and control over effluent discharges. Instead, it aims to support the sustainable management of the local water catchment or watershed. Implementing water stewardship along the mining supply chain is crucial for the sustainable and responsible supply of critical minerals.

Based on IEA analysis of 20 major mining companies that have a strong presence in energy transition minerals, many companies still have high levels of water use, with consumption increasing by nearly 20% since 2018. Positively, sustainability reports showed an increase in the availability of data for the latest years, indicating the industry is putting more effort into tracking its performance. Companies could report more metrics on water usage that demonstrate good water stewardship practices, such as water efficiency and intensity and investment into research and development for the purposes of reducing water usage, among others.

**Water consumption and reporting on water use by 20 major mining companies**



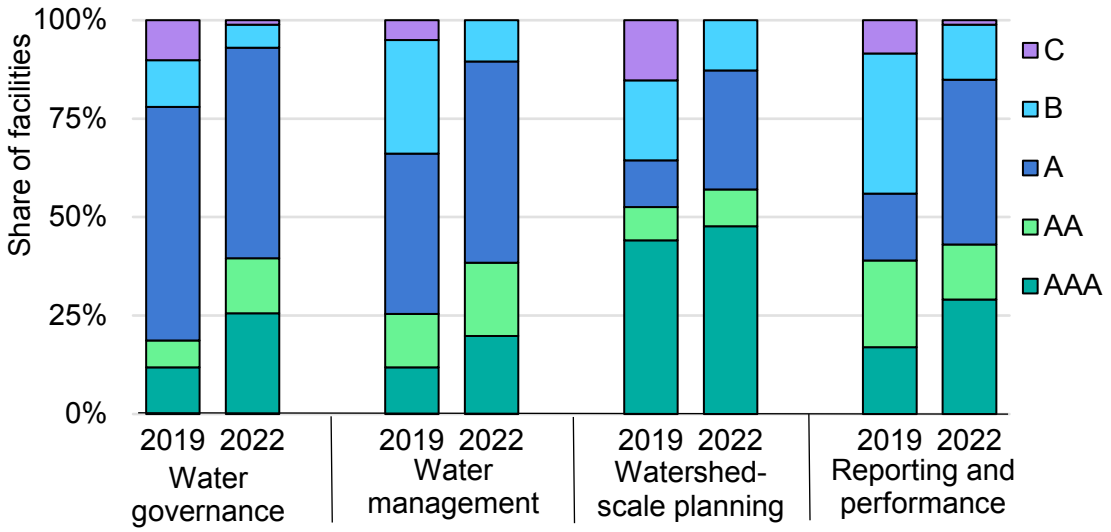



Notes: Mcm = million cubic metres; cm per t mineral = cubic metres of water used per tonne of mineral extracted. Shows aggregated data for those companies among the 20 major companies IEA assessed that reported water use (Albemarle, Anglo American, BHP, Codelco, First Quantum Minerals, Freeport-McMoRan, Glencore, Mineral Resources, Norilsk Nickel, Rio Tinto, Teck Resources and Tianqi Lithium). Considers reported data for all operations and is not limited to critical minerals.
Source: IEA (2023), Critical Minerals Market Review 2023.

Some standards require that companies report on water stewardship, such as the MAC's TSM. Self-reported data from members of MAC give an example of what can be reported on and give an indication that positive progress is being made towards sustainable water stewardship, at least among MAC companies. The bulk of data reported indicates increasing compliance in every category, with an

exceptionally large number of companies excelling in the planning segment and fewer than five firms having low grades in any criteria. Notably, many companies excel at watershed-scale planning and water reporting and performance, while fewer companies excel at water governance and operational water management. More generally, relatively few countries provide detailed information on how their mining industry addresses water issues.

**Self-assessed performance on water stewardship by Mining Association of Canada companies by Towards Sustainable Mining grade**






Notes: The above chart is an excerpt of TSM data, covering the self-reported water stewardship reporting from 2019 to 2022. Members of MAC must apply and report on TSM at their Canadian operations; therefore most data are from Canada-based mines. Each company is given a rating from C to AAA by criteria, ranging from not compliant to excelling against the TSM standard.

Source: IEA analysis based on Mining Association of Canada data.

# Standards

## Many standards systems include measures to improve water quality and minimise groundwater drawdown, although in different ways

The surveyed standards cover critical areas of water stewardship, especially in terms of assessment and due diligence processes. However, not all standards are equally stringent or comprehensive. As an example, most standards have built-in requirements for consultation with stakeholders regarding water use in the planning phase of the operation, but few require continuing consultation. Additionally, while some standards require that mines assess impacts of water use and set general performance targets, these do not always include specific

commitments for the watershed such as maintaining baseline-level water quality, maintaining adequate water quantity and minimising groundwater drawdown.

In all standards, water assessments and due diligence reporting are typically mandatory – all necessitate evaluating impacts, future uses and public disclosure of water performance. However, the rigour of the standards vary. Both TSM (level A) and IRMA enforce stringent requirements for the establishment and continuous monitoring of site-specific and catchment-level water balances, in addition to the implementation of environmental protection and mitigation strategies. On the other hand, the Copper Mark primarily targets mitigation measures, whereas the ICMM encourages their adoption but stops short of making them compulsory.

Coverage is also mixed in terms of planning for extreme natural events. Although some standards have not specifically included emergency measures for droughts, floods and similar events, TSM requires an emergency plan to address natural environmental water crises at level B. IRMA requires emergency planning in general, while ICMM and the Copper Mark do not require it at all.

# Existing policies

## Most countries already have legal structures to address water quality, although fewer specifically address water scarcity

The IGF Framework recommends that governments adopt water management standards, including watershed-level planning and environmental management programmes, to protect water sources and mitigate climate change risks. It advises requiring mining entities to manage surface and groundwater impact, treat mine effluent streams, protect groundwater from waste, and establish mechanisms for monitoring and enforcing water quality and quantity standards. As a means to avoid adverse impacts to water quality and quantity, the IGF Framework emphasises the need for participation by mining communities in monitoring committees, with reference to guidelines by the World Health Organization and the IFC.

Most jurisdictions already require mine operators to monitor water quality and treatment effluents. In Canada, for example, the regulatory framework consists of a patchwork of laws and regulations at the federal, provincial and territorial levels that collectively ensure that companies manage water resources and mitigate the consequences of mining activities. The Federal Environmental Effects Monitoring programme establishes water quality standards and monitoring requirement for all sectors, with specific requirements applicable to mining. These are embodied in the Metal and Diamond Mining Effluent Regulations that sets water quality targets and establishes provisions for monitoring of environmental impacts.

Environmental impact assessments are a feature of many jurisdictions' mining laws, and often include specific requirements on water. British Columbia's Environmental Assessment Act Reviewable Projects Regulation, for example, limits the total waste discharge for permitted project. Mining codes also often include water-related safeguards. The British Columbia Mines Act includes environmental protection provisions for major mines, expansions and expansive exploration undertakings. Mining entities must secure pertinent environmental permits, which often encompass areas such as waste discharge and water utilisation.

Groundwater drawdown, however, is an area that is less commonly covered in mining laws. California's Sustainable Groundwater Management Act (SGMA) regulates groundwater, which is seen as a shared asset of the locality. SGMA uses the term "sustainable yield", defined as the maximum amount of water that can be withdrawn annually from a groundwater supply without causing an undesirable result. It also requires Groundwater Sustainability Plans that involve different stakeholders such as mining operators and local communities and must contain certain elements, including monitoring protocols and mitigation of overdraft.

South Africa's National Water Act is another example of an integrated approach to water management. In conjunction with the Policy and Strategy for Groundwater Quality Management, the act recognises the need for integrated management of water and participation on the catchment level. The government is also required to assess and approve mining activities considering the impact on groundwater. Companies are then required to monitor groundwater at facility level if they pose a potential threat to groundwater quality, depending on specified trigger levels for which are defined based on site-specific investigations. As in other countries, enforcement has faced challenges in South Africa, underscoring the need for both well-designed legal frameworks and effective implementation.

**Recommendations**

- **Ensuring robust regulatory regimes**. Consider if existing staff and resources are adequate to monitor compliance and enforce regulations. Review whether existing regulations adequately protect water resources, including by establishing targets for water quality, water use and effluents that improve over time. These could include requirements on monitoring and reporting as well as participating in local governance for continuous consultation in water use decisions. Current mining codes and permitting regulations can also be updated to include such regulations.

- **Directed public spending**. Incentivise good water stewardship practices by making strategic public funding or procurement decisions conditional on adopting water stewardship practices and achieving water performance metrics. This could include targets to reduce the impact of mining activities on water resources, reduced water use and improved water quality metrics, among others. In parallel, governments can invest in research and development for technologies that reduce water use or support companies driving innovation in this field.
- **Tracking and monitoring performance**. Support the monitoring and collection and reporting of data from mine sites with thorough methodological guidelines on how to measure water performance, including recommendations for data collection and monitoring of groundwater resources, water use and intensity, and water stewardship practices. Technical assistance could be provided for relevant companies.
- **Making supply chains more transparent**. Improve transparency across the supply chain through regulations or guidance that encourage or require companies to embed environmental risks, including water use and water depletion, into due diligence systems. Additional attention should be paid to those minerals and processes that are particularly water-intensive, in line with a risk-based approach.
- **Support for voluntary sustainability standards**. Encourage the use of credible voluntary sustainability standards that incorporate clear performance metrics on water use and water stewardship. Companies should also be incentivised to improve the coverage of water issues in existing standards.

# 2. Greenhouse gas emissions

## Nature of risk

### There is a growing imperative to tackle emissions from energy transitions minerals

GHG emissions from critical mineral production can occur at multiple places along the supply chain. The industry relies on heavy equipment and industrial processes that can be relatively energy-intensive and have historically been powered by fossil fuels. In 2021, the average GHG emissions for the production of critical minerals produced ranges from 4.6 t of carbon dioxide equivalent ($CO_2$-eq) per tonne of refined copper to 75.8 t $CO_2$-eq per tonne of neodymium oxide. These emissions will vary greatly depending on the type of processes, the energy efficiency and whether the power is sourced renewably. As of today, emissions

from the critical minerals industry are relatively small compared with other sectors, largely due to low production volumes. However, these emissions could grow alongside projected growth in demand, including indirect emissions from purchased energy.

Clean energy technologies have lower levels of GHG emissions compared with other technologies even when considering the full life-cycle emissions. Total life-cycle greenhouse gas emissions of electric vehicles are around half those of internal combustion engine cars on average, with the potential for a further 25% reduction with low-carbon electricity. However, lowering mining's GHG emissions will be crucial in the production of critical minerals to ensure there is a sustainable, responsible and reliable supply.

# Supply security

## High GHG emissions from critical minerals activities may create barriers to expanding supply

With the expected proliferation of domestic, regional and international GHG emissions regulatory requirements, it will be increasingly important for mining companies to find ways to reduce emissions. Failure to do so may make it **difficult to obtain permits and licences** if operations don't meet increasingly stringent national GHG emissions requirements. In the context of regional and international requirements, failure to mitigate GHG emissions may also **limit market access** for high-GHG-emitting operations.

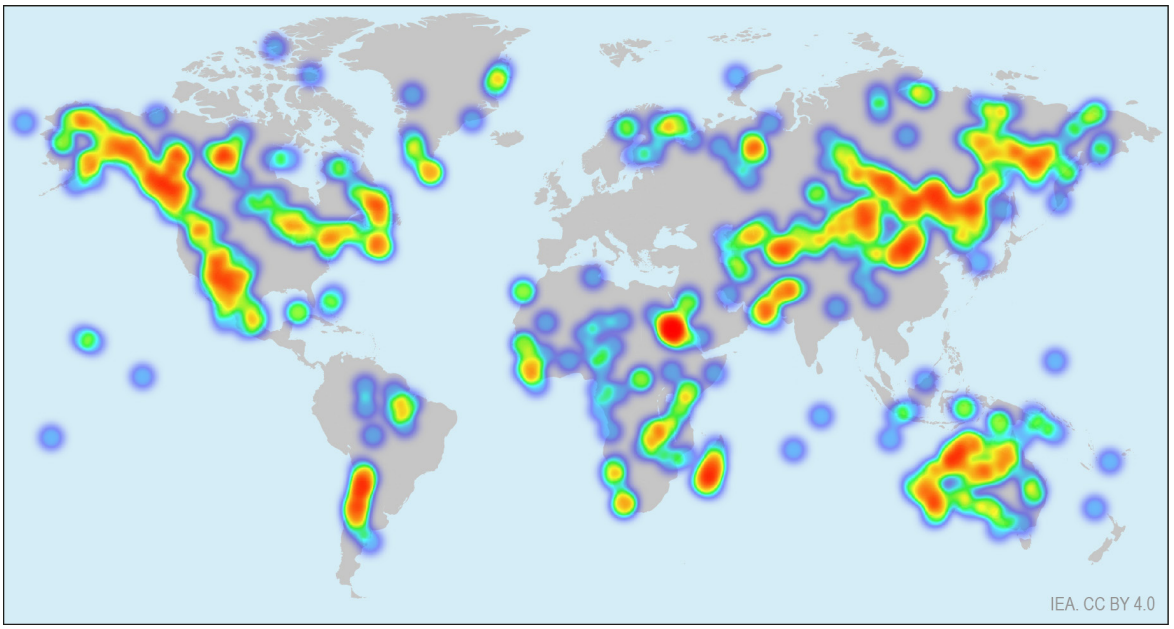
Increasing regulatory pressure can lead to **increased costs** for mines as carbon taxes raise the cost of mining, especially for high-emitting mining sites such as those that rely on fossil fuels for power. These increased costs could limit supply if it means some operations are not economical given the carbon price or the cost of mitigation actions. Although a carbon tax could be beneficial to the mining industry in the long-term as it will shift demand to renewable energies, there would likely be near-term consequences for supply, particularly at those mines with high GHG intensities, including those in remote areas far from clean energy infrastructure.

Given that the development of new critical minerals deposits and increased demand primarily arises from their essential role in clean energy technologies necessary for combating climate change, the **social acceptability of mining** may decrease if critical mineral mining does not reduce its GHG emissions, which may make it harder to obtain a social licence to operate. This could arise from **lowered demand** from companies aiming to produce net zero or low-emissions end-use technologies if suppliers are unable to meet emissions targets. Due to impending regulations, **downstream and end-use companies** are already increasingly

looking to buy low-carbon minerals to reduce their life-cycle emissions, and production with higher emissions may find fewer and fewer customers over time. Looking ahead, **consumers' purchasing decisions** may increasingly take emissions into account with improved access to information about emissions through tools such as the battery passport.

High GHG emissions along the critical mineral supply chain may eventually serve as a **prohibitive barrier in developing new operations** in areas where cost-efficient renewable sources of energy or GHG abatement technologies and methods are unavailable. This is particularly relevant for minerals that require energy-intensive processes and for developing resources in regions that are not grid-connected or grid-powered by sufficient levels of renewables. According to analysis for a forthcoming Nuclear Energy Agency report, 15.8% of critical mineral deposits are remote. As new reserves and resources of critical minerals are developed to meet demand from the clean energy transition, mining supply chains will need to invest in technological improvements to bring down emissions.

### Heat map of remoteness of critical mineral deposits




Note: Location of remote mines is approximate. Remoteness is defined as a distance of more than 20 km from an electricity distribution network.

Sources: Chart and analysis from forthcoming Nuclear Energy Agency analysis. Data on deposits are from two US Geological Survey datasets and data for electricity grids are from Arderne, C. et al. (2019), Predictive mapping of the global power system using open data.

By contributing to GHG emissions, mining could also be **reinforcing supply risks** in other areas and increasing its own risk of being exposed to the impacts of climate change, which can stop production or create delays. Climate change is known to exacerbate extreme weather conditions and fundamentally alter global precipitation, temperature and hydrological conditions, all of which could

potentially severely disrupt the entire length of mineral supply chains, both upstream and downstream. Changing weather patterns, especially altered flood levels and increased water stress, could disturb individual mine sites' infrastructure and operations.

**Industry is co-ordinating amongst themselves to tackle GHG emissions across mineral supply chains**

Some industry groups and initiatives are coming together to combat GHG emissions in the sector. For example, ICMM has collaborated with manufacturers to commit to introducing emission-free surface mining vehicles by 2040. Other coalitions of companies, such as the First Movers Coalition, which is made up of companies that use large quantities of aluminium, have committed that at least 10% of their primary aluminium procurement volume will be low-emissions by 2030. Another example is the Global Mining Guidelines Group, which has an Electric Mine Working Group that aims to accelerate the adoption of all-electric technologies mining. These initiatives and targets showcase that companies are coming together and expressing their desire to work with low-carbon minerals.

Individual companies are also making strides to tackle GHG emissions in their supply chains through full electrification or through implementing electric equipment.

# Industry performance

## Many companies have made commitments to reduce GHG emissions, but concrete progress is still lacking

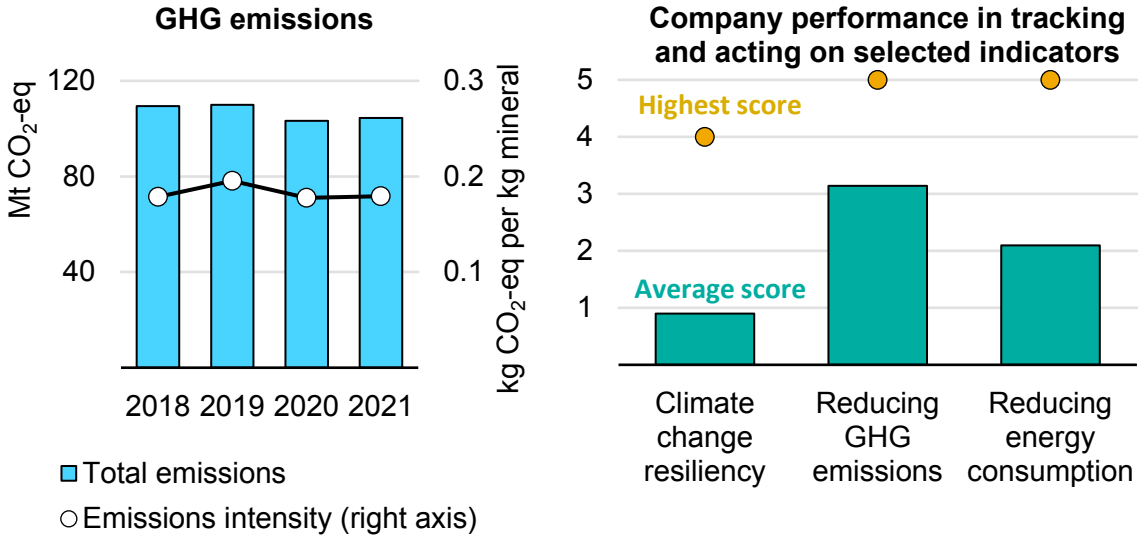
There are various ways that companies have started to address GHG emissions in their operations and along their supply chain. These include using less energy-intensive processes, decarbonising their sources of power and electrifying operations, and sourcing from operations with lower GHG emissions, among others. Companies have also started increasingly recognising the importance of reducing GHG emissions in the mining sector, as shown by the number of large mining sector companies making scope 1 and 2 net zero commitments and short-term reduction targets,[5] although few have made any scope 3 emissions reductions targets.

[5] Scope 1 emissions come directly from sources owned or controlled by the company; in the context of mining, one example could be emissions released by diesel-run mining vehicles. Scope 2 emissions come from the off-site production of energy that is used by the company; in the context of mining, one example could be emissions created from generating electricity used to smelt minerals.

Despite this progress in commitments, emissions reductions have been slow – most of the 20 major mining companies prominent in energy transition minerals have not made substantial reductions in their GHG emissions in recent years, as seen by company reports in recent IEA analysis. Although GHG emissions are one of the most widely reported on environmental, social and governance metrics – almost 100% of companies analysed reported scope 1 and 2 emissions – progress needs to be made on reduction implementing reductions.

Based on data from the Responsible Mining Index 2022, which scores companies across a set of indicators based on company-published data, many of the world's top cobalt, copper and nickel companies are showing limited progress on tracking, reviewing and acting to improve their performance on reducing scope 1, 2 and 3 emissions. Similarly, assessed companies are not acting rapidly enough to reduce energy consumption or to assess and address how climate change can exacerbate the impacts of current and future operations on the environment.

**GHG emissions by 20 major mining companies and indicators of company performance for selected top cobalt, copper and nickel companies**





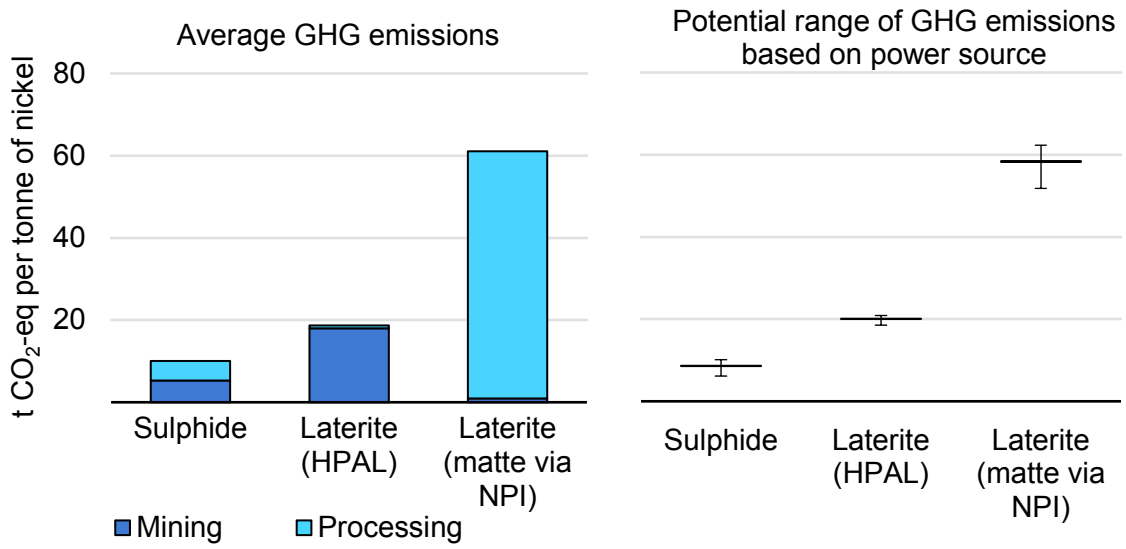

Notes: Mt = million tonnes; kg = kilogramme. Left chart shows aggregated data for those companies among the 20 major companies IEA assessed that reported greenhouse gas emissions (Albemarle, Anglo American, BHP, CMOC, Codelco, First Quantum Minerals, Freeport-McMoRan, Ganfeng Lithium, Glencore, Mineral Resources, Norilsk Nickel, Rio Tinto, SQM, Teck Resources and Tianqi Lithium). Considers reported data for all operations and is not limited to critical minerals. Right chart shows aggregated scores based on Responsible Mining Index 2022 for critical mineral producing companies. More information on the scoring framework can be found here. Scores are standardised for a maximum possible score of 5 across all categories.

Sources: Left chart: IEA (2023), Critical Minerals Market Review 2023. Right chart: IEA analysis based on Responsible Mining Index 2022 and S&P Global Market Intelligence data.

Many of the critical minerals required for clean energy technologies have high GHG emissions intensity, especially during the processing stage of the supply chain. For each mineral, potential GHG emissions intensities vary depending on the stage of supply chain, with the methods of extraction and processing, and with

the electricity source of the operation. For instance, if the most energy-intensive processing route for nickel production – extracting and processing laterite ore to matte via nickel pig iron – relies on a high-carbon electricity source, it emits ten times more GHG emissions than the least energy-intensive route for sulphide.

**Current average GHG emissions intensities of nickel production processes**






Notes: HPAL = high-pressure acid leaching; NPI = nickel pig iron. The ranges of GHG emissions intensities correspond to a range of assumptions for the emissions intensity of electricity (between 240 grammes [g] of $CO_2$ per kilowatt-hour [kWh] and 600 g $CO_2$/kWh). For reference, the global average emissions intensity for electricity is around 464 g $CO_2$/kWh. Includes scope 1 and 2 emissions from mining and processing.

Source: IEA analysis based on Trytten Consulting Services and Skarn data.

# Standards

## Most existing standards require target-setting, quantification and public reporting, but specific approaches vary considerably

All the prevalent standards require companies to disclose corporate-level climate change policies and facility-level performance targets, and to report on scope 1 and 2 emissions. They also generally require a GHG emissions management system with data collection and monitoring. However, the specific approach among standards varies considerably.

In terms of emission targets, ICMM members have committed to achieving net zero scope 1 and 2 emissions by 2050 or sooner. All ICMM members have also committed to report their emissions annually and to obtain external verification. Other standards require companies to establish GHG reduction targets, but they do not specifically require a target of net zero by 2050. Regular reporting of emissions according to an internationally recognised protocol is required by all standards, although external validation is not uniformly required.

Standards vary in their treatment of scope 3 emissions, in contrast to the more consistent approach for scope 1 and 2 emissions. For instance, TSM (at Level AAA) encourages site-level emissions reduction commitments, reporting and independent assurance of material scope 3 emissions. In contrast, the Copper Mark and ICMM require these measures. Generally, these standards do not presently compel companies to synchronise their emissions reduction strategies with upstream or downstream partners, which could improve consistency in scope 3 reporting.

Notably, not all standards offer precise guidance on emissions measurement or reporting procedures. For example, only the Copper Mark requires site-level baseline and reporting, whereas IRMA allows either site-level or corporate-level. The standards also generally allow companies to choose what reporting standard or methodology they use, provided that it is internationally recognised. Consequently, companies adhering to the same standard might adopt different approaches when measuring and reporting their emissions, setting targets, and outlining mitigation plans, which poses a challenge in terms of assessing performance across companies. That said, there are some initiatives to facilitate comparability. For example, the Global Battery Alliance established a battery passport and Greenhouse Gas Rulebook to set globally harmonised rules that make battery carbon footprints transparent and accessible.

In general, all standards provide limited guidance as to how companies may achieve and make progress against their targets. For example, the Copper Mark encourages offsets only after companies have made efforts to reduce emissions, while TSM requires that use of offsets be documented. IRMA, on the other hand, does not provide guidance on this point in its 2018 standard, but the draft IRMA 2.0 specifies that offsets may be used if the site can demonstrate a carbon mitigation hierarchy is followed, minimising the need for offsets.

# Existing policies

## There is a growing trend of regulations that mandate GHG reporting and mitigation targets

The IGF Framework advises governments to implement several key measures on GHG emissions. These include adopting standards to control and reduce GHG emissions in line with national and international climate change commitments including the Paris Agreement. It also recommends that governments require mining entities to improve energy efficiency, reduce and report emissions, establish robust mechanisms for monitoring emissions, regularly inspect and analyse emissions reports, and enforce regulations with appropriate sanctions to ensure legal and regulatory compliance. It also recommends that targets and emissions calculations be in line with international guidance such as the Guidance by the Task

Force on Climate-Related Financial Disclosures and the Intergovernmental Panel on Climate Change (IPCC).

While many countries have set national net zero targets, there are few instances where companies are legally required to adopt their own targets. That said, where net zero targets are incorporated into legally binding regulation, this sends a strong signal that companies should be prepared to adopt similar targets to ensure they are prepared for future policy developments.

Some governments have begun exploring how to use their purchasing power to encourage companies to set GHG targets and demonstrate progress. Canada's recently introduced Standard on the Disclosure of GHG Emissions and the Setting of Reduction Targets and the United States' proposed Federal Acquisition Regulation require suppliers for large public procurements to measure and disclose GHG emissions while adopting reduction targets aligned with the Paris Agreement. When applied to mining directly, such as in the case of procurements for public stockpiles, these can create direct incentives for minerals companies. For other products, these rules can indirectly encourage mining companies to align their emissions targets with those of the country's direct suppliers.

Some regulations already address GHG monitoring and reporting in the metal mining sector, and these types of policies are rapidly expanding in scope and purpose. For example, the US Environmental Protection Agency's (EPA's) Greenhouse Gas Reporting Program (GHGRP) has been requiring large metal manufacturing facilities to report their emissions annually under specific methodologies that incorporate those of the IPCC. A facility's emissions report undergoes a thorough verification process, with resulting data made publicly accessible. Because it is aimed at informing the EPA on compliance with the Clean Air Act, only scope 1 and 3 emissions must be reported under the GHGRP, and scope 2 emissions are excluded.

Corporate accountability laws also sometimes include reporting on GHG emissions, with a particular focus in recent years on scope 3 emissions. For example, the European Commission's Corporate Sustainability Reporting Directive (CSRD) requires both large EU companies and foreign companies with EU subsidiaries to disclose their emissions beginning in 2024, with the potential to expand disclosure along the whole value chain, including scope 3 emissions. By 2027, the EU Battery Regulation will mandate battery producers to disclose the complete carbon footprint of electric vehicle batteries over their life cycle. Using the Product Environmental Footprint methodology, end users must account for the full cycle, from raw material extraction to waste management. Moreover, the proposed corporate accountability acts in California and New York require scope 1, 2 and 3 reporting.

Mechanisms such as carbon pricing and emissions trading schemes also contribute to emissions mitigation in the mining sector. For instance, Canada recently

expanded its clean fuel standard to cover mining activities. Additionally, efforts have been made to facilitate the operation of carbon taxes across national borders. One notable example is the European Union's Carbon Border Adjustment Mechanism (CBAM), which imposes a carbon tax on imported energy-intensive goods, such as aluminium. The aim of the mechanism is to prevent EU producers from simply relocating their operations to regions with less stringent GHG emissions regulations, thereby maintaining environmental standards. Mechanisms such as these have the potential to expand to other emissions-intensive and trade-exposed critical minerals in the future.

**Recommendations**

- **Ensuring that regulatory regimes are robust**. Review GHG emissions reporting regimes to ensure they are fit for purpose and consider incorporating emissions reduction into regulatory regimes consistent with its international commitments, potentially through GHG mineral intensity targets that decrease over time. Reduction targets could consider emissions from mine- or processing-site power sources. Site-level monitoring and reporting requirements can complement these targets to track performance.
- **Directed public spending**. Support research and development for technologies that reduce emissions from mining and processing. Tie strategic investment decisions to reducing emissions or energy use intensity at mining and processing sites. Public procurement of minerals or technologies intensive on minerals could include requirements around emissions. Offer financing for projects that reduce greenhouse gas emissions at mining and processing projects, such as renewable electricity deployment in mining regions.
- **Tracking and monitoring performance**. Support harmonised methodology and public reporting so customers and other stakeholders can easily compare emissions, plans and targets. Small companies might need technical support to monitor emissions accurately and representatively. Reporting should aim to cover all relevant areas, including small and medium mines and scope 3 emissions.
- **Making supply chains more transparent**. Improve transparency across the supply chain through regulations or guidance that encourage or require companies to embed greenhouse gas emissions in due diligence systems.
- **Support for voluntary sustainability standards**. Support credible voluntary sustainability standards that contribute to meaningful emissions reductions through clear targets and robust monitoring, bolster the traceability of GHG emissions along the supply chain, support market mechanisms, and provide guidance on emissions accounting methodologies. Support consistent measurement and reporting procedures across standards to establish a cohesive framework for evaluating GHG emissions performance in the mining industry.

# 3. Biodiversity

## Nature of risk

### Mining and processing activities can damage habitats and reduce biodiversity

Mining activity is often destructive to the surrounding ecosystem and requires land-use changes, although the impact of a particular mine depends on the type of mine (e.g. open-pit versus underground), geological mineral source (e.g. lithium hard rock versus brine deposits) and geographical context (e.g. mines located in tropical rainforests will have higher biodiversity impacts than mines on degraded land). Geographical or locational context is the key risk factor for adverse biodiversity impacts, especially when mining enters relatively remote and undisturbed areas. This can have large implications for biodiversity, particularly as mining activities may be located in Key Biodiversity Areas (KBAs).[6]

These impacts can be direct, indirect and cumulative, ranging from the site level, such as habitat loss and fragmentation, to local or regional level, such as water contamination or particulate matter emissions, to global level, such as climate change. Biodiversity risks are not limited to activities taking place within mine sites, as mines often require local or regional infrastructure, including roads and rail lines, that can also disrupt natural habitats and ecosystems, including migration routes. Mineral transport and processing are also significant users of land and drivers of changes in land use. Declining ore grades and increasing mineral demand could lead to mounting impacts from critical mineral supply on land use and biodiversity.

## Supply security

### Biodiversity loss is emerging as an important contributor to supply risk

The importance of biodiversity as a supply risk is growing as countries and regions are expected to implement more stringent requirements following the signing of the Kunming-Montreal Global Biodiversity Framework at the United Nations' 15th Conference of the Parties (COP15) on biodiversity held in early 2023. Failure to take effective steps to mitigate impacts on biodiversity can **complicate regulatory**

[6] According to the International Union for Conservation of Nature's (IUCN's) Global Standard for the Identification of Key Biodiversity Areas, KBAs are defined as "sites contributing significantly to the global persistence of biodiversity." They are identified by applying the criteria and thresholds included in the IUCN Global Standard, which take into consideration all taxa and levels of biodiversity, including genetic, species and ecosystems.

**processes, including by** making it **difficult to obtain permits and licences** or leading to a **rejection of environmental assessments** or **revocation of licences**.

The loss of biodiversity is also closely linked to risks that involve local communities, Indigenous Peoples and water stewardship. Improper mitigation of biodiversity risks can lead to a project not obtaining or losing its **social licence to operate,** which can lead to **protests**, **blockades**, **strikes** and **litigation**.

Biodiversity impacts can also lead to **reputational** and **investment risks** for companies. This will be increasingly true as investors look to include more environmental, social and governance criteria in their investment decisions. For example, the recently released recommendations from the Taskforce on Nature-Related Financial Disclosures aim to be aligned with the goals in the Kunming-Montreal Global Biodiversity Framework. Another example is Nature Action 100, an initiative looking to mobilise institutional investors to establish a common agenda around nature and biodiversity and drive corporate engagement on biodiversity by targeting 100 prominent companies, 13 of which are mining companies. Recent corporate announcements related to deep-sea mining also illustrate the importance that investors and buyers place on this topic, as biodiversity impacts are a key concern among opponents.

Globally, nearly a third of the mines and exploration sites located in KBAs are critical minerals projects, and a large portion of these sites are exploration projects. Failure of down-, mid- or upstream segments of the supply chain to properly implement mitigation strategies could mean that any of the above risks may hinder the development of the needed supply at the scale and pace required.

# Industry performance

## Progress has been slow on biodiversity impacts, but companies are increasingly committing to address them

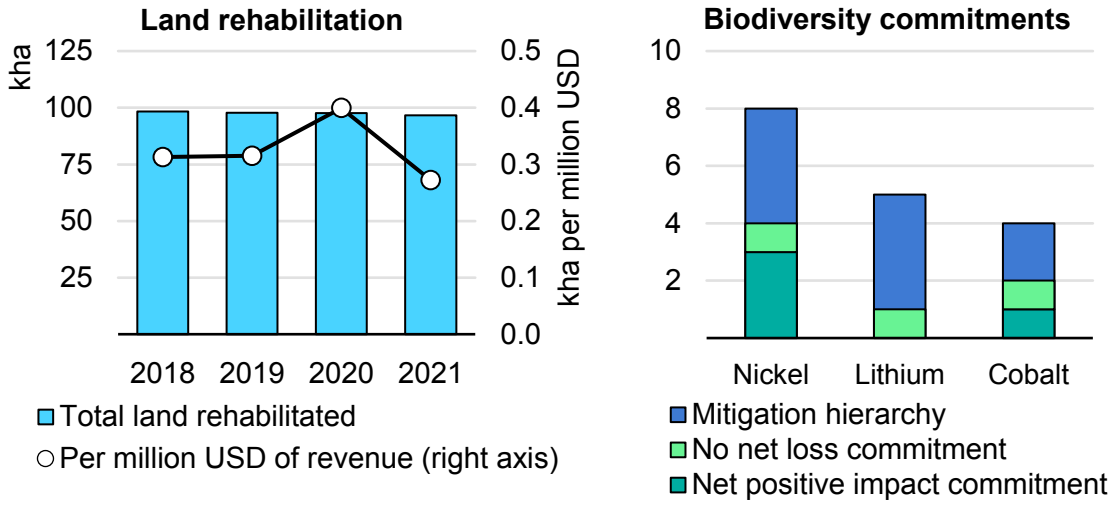
When sourcing or developing supply in or from countries, areas or projects that are located in areas with high levels of biodiversity risk, a common approach is to follow the mitigation hierarchy of avoid, minimise, rehabilitate or restore, or offset as a last resort. In addition, some companies have made either a “no net loss” or “net positive impact” commitment regarding biodiversity:

- **“No net loss”**: any loss of biodiversity must be offset with an equivalent gain which does not necessarily have to occur in the same geographic area as the impacted site. However, alternative sites should ideally support the same or similar types of habitats or species to ensure that ecological balance is maintained.

- **"Net positive impact"**: any activity leads to an improvement in the quality and quantity of the environment compared with its baseline state. A company might not only restore habitats it has damaged but also create new habitats, thus increasing biodiversity beyond baseline levels.

Among the top 10 critical mineral companies, most nickel producers have announced a public commitment to follow the mitigation hierarchy approach, compared with about half of the top 10 lithium and cobalt companies – possibly because more nickel operations are located in areas of high biodiversity where mitigation hierarchy implementation is more crucial. Overall, only a quarter of these companies have a no net loss or net positive impact commitment.

**Land rehabilitation by 20 major critical mineral companies and number of companies with biodiversity commitments**






Notes: kha = thousand hectares. Left chart shows aggregated data for those companies among the 20 major companies IEA assessed that reported on land rehabilitation (Albemarle, Anglo American, BHP, CMOC, Codelco, First Quantum Minerals, Freeport-McMoRan, Ganfeng Lithium, Glencore, Mineral Resources, Norilsk Nickel, Rio Tinto, SQM, Teck Resources and Tianqi Lithium). Considers reported data for all operations and is not limited to critical minerals. Right chart shows data for the top ten producers of nickel, lithium and cobalt. All companies with a "net positive impact" or "no net loss" commitment have also committed to follow the mitigation hierarchy.

Source: IEA analysis based on company sustainability reports and S&P Global.

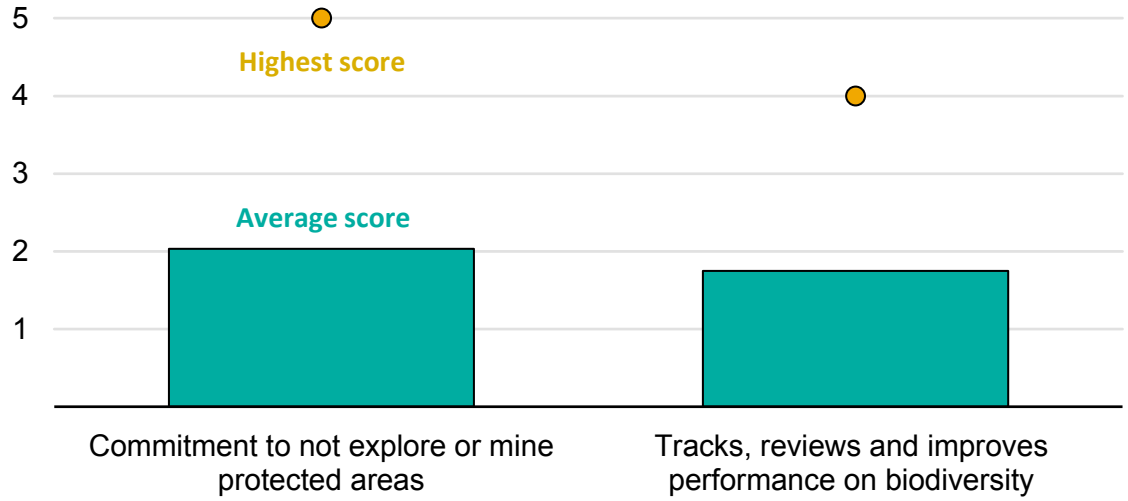
Assessing and measuring biodiversity are vital to implement this mitigation hierarchy. Biodiversity must be assessed across a wide range of measures that cover not only impacts on an adequate spatial level, but also the different characteristics of species and habitats, including species richness and abundance, and ecosystem sustainability and resiliency, as well as the key role of biodiversity hotspots and endemic species. Baseline and asset-level biodiversity data are crucial to manage this risk as biodiversity impacts should consider habitat conditions before operations and are particular to specific locations. Although the importance of protecting biodiversity and deploying mitigation hierarchies is becoming more prominent, companies are still lagging in their monitoring and

reporting of biodiversity impacts, and external evaluations of tangible impacts are hard to find, making it difficult to assess the industry's performance.

Based on IEA analysis of 20 major mining companies that have a strong presence in energy transition minerals, many companies report on only a select few biodiversity metrics. Consistent with the Global Reporting Initiative's (GRI's) current reporting standard on biodiversity, these often cover only land rehabilitation or land disturbed. GRI is currently updating its biodiversity standard to include additional metrics, but in the meantime, the currently reported metrics, while useful, do not allow a robust assessment of biodiversity impacts. And even within these metrics, there is a lack of demonstrable progress. For example, the amount of land rehabilitated by these companies has remained flat since 2018. When measured in relative terms, the amount of land rehabilitated over this period per USD of revenue has actually decreased by almost 15%. Notably, many companies assessed did not report on any biodiversity metric at all and less than half of the companies assessed reported on land impacts. Further, although most companies report across multiple years, baseline data are generally not available, making it difficult to assess the overall impacts of operations.

The Responsible Mining Index 2022 provides insight into wider company performance on biodiversity by scoring companies based on whether they meet certain criteria across two indicators. Specifically, whether they commit to not explore or mine World Heritage Sites, respect protected areas, and not use practices that threaten habitats and whether they track, review and act to improve performance with respect to biodiversity. The average score for companies on both indicators is less than half the maximum attainable score.

**Indicators of company performance for selected top cobalt, copper and nickel companies**






Notes: Aggregated scores based on Responsible Mining Index 2022 for critical mineral producing companies. More information on scoring framework can be found here. Scores are standardised for a maximum possible score of 5.
Source: IEA analysis based on Responsible Mining Index 2022.

**Alcoa's jarrah forest initiative in Western Australia: Biodiversity in mine rehabilitation**

Australia is one of the world's top bauxite producers, the key source of aluminium, which is increasingly being used in power grids. Alcoa has been mining bauxite in the "jarrah forest" since the 1960s, a forest that is renowned for its diverse flora and is one of the most plant-species-rich forests in the world outside of tropical rainforests.

The rehabilitation requirements set by the Australia Environmental Protection Authority have evolved to take account of the new scientific advances over the years. The company also works with the Department of Biodiversity, Conservation and Attractions as it progresses forest management and plans to hand back rehabilitated areas. Monitoring is undertaken every year, with a clear objective: to restore a functional jarrah forest ecosystem that matches the pre-mining land uses.

To meet this objective, the company does not engage in mining activities in old-growth forests or national parks and mines only areas that have been previously logged at least once. It has also invested in research and development since the 1970s towards this goal. The company transitioned to using entirely native species in rehabilitation in 1988, aiming to return the same number of plant species as in the surrounding reference forest. Rehabilitation strategies include salvaging and reusing fresh topsoil, shaping areas to fit within the surrounding topography of the forest and treating the seeds before use to simulate the processes they experience in the natural environment.

The company first achieved 100% species richness return in 2001, and has reported that more than 75% of the areas cleared for bauxite mining have been rehabilitated. Published peer-review research estimates that the company has had a success rate of approximately 90%. Ongoing research focuses on improving habitat recovery for all species.

Despite this, the company has faced pushback that is threatening its social licence to operate as stakeholders have felt their expectations around the company's environmental obligations were not met. This highlights the tension often present between "completion criteria", which often include site productivity, return of biodiversity, and long-term ecosystem trajectories and other ecosystems, and ways of measuring and reporting, which can greatly impact the assessment of completion.

# Standards

## Standards play a role in driving regulatory goals and enforcement towards improved biodiversity protection

Until recently, the focus on biodiversity in standards systems was relatively limited, meaning that protections for biodiversity stemmed primarily from national laws. However, while laws to protect biodiversity exist in many countries, they are not uniformly incorporated into mining requirements. Thus, voluntary standards can play a role in directing attention towards biodiversity protection in resource extraction, particularly in countries without effective regulatory protections.

The IFC Performance Standard 6 (IFC PS6), widely used in project financing, is based on the no net loss principle and the mitigation hierarchy to avoid, minimise, rehabilitate, restore and offset as a last resort. The IFC Performance Standards are adopted by 140 financial institutions in 39 countries through the Equator Principles, and many mining standards are patterned after them. The IFC PS6 requires borrowers to consider direct, indirect and residual impacts on biodiversity. The IFC PS6 also requires borrowers to adopt systems and verification practices if they purchase commodities produced in regions with risk of significant impacts on natural or critical habitats, as defined in the standard. While initially designed for the agricultural sector, it is an example of how supply chain mapping and impact mitigation can be encouraged by a standard.

While all standards prevent their members from operating in legally protected areas, the IRMA and Copper Mark standards include particularly detailed commitments, citing the UN Convention on Biological Diversity (UNCBD), the World Heritage Convention and the Ramsar Convention on Wetlands. IRMA and the Copper Mark also provide protections for some areas that are not necessarily legally designated protected areas. For example, the Copper Mark provides that KBAs, High Conservation Value Areas and critical habitats could fall under a site's management responsibility and must be incorporated into the site's biodiversity assessment. Thus, even if domestic law would theoretically permit a development, voluntary standards might impose additional limits.

A commitment to no net loss is required by the Copper Mark, IRMA and TSM (for level AAA rating), while ICMM treats it as an ambition. The provision on net positive impact or net gain is seen as a step above and beyond "no net loss" and is explicitly mentioned as an ambition under the Copper Mark.

As with other focus areas, biodiversity commitments should be measurable and verifiable, preconditioned by a baseline study to identify biodiversity values. This can then be coupled with a defined biodiversity scope, impact scope, measurable goal, upper limits to impacts, appropriate time frame and transparency

commitments. An example of this is IRMA's requirement to specify objectives with measurable outcomes, indicators and timelines, as well as to frequently monitor these indicators in detail.

Existing standards do not specify the methodology that companies must use, making it difficult to compare results across standards. Some issue-specific standards are aiming to support common definitions, such as the Business and Biodiversity Offsets Programme's Standard on Biodiversity Offsets, the Taskforce on Nature-related Financial Disclosures recommendations for financial disclosures of mining and metals companies, and guidance on measuring business nature dependencies issued by the UN Environment Programme Conservation Monitoring Centre.

# Existing policies

## Mining codes, policies and financial regulations are aiming to address biodiversity risks

The IGF Framework recommends that government adopt policies and build capacity to manage biodiversity and ecosystem services and require mining entities to identify and manage related risks and impacts, aiming for no net loss across the mine life cycle through the mitigation hierarchy. It also recommends that governments require mining operations to avoid legally protected areas, with reference to the UNCBD, the World Heritage Convention and the Ramsar Convention on Wetlands. Robust biodiversity management systems are needed, including regular inspections by government-assigned independent reviewers and report analyses, with enforcement of standards and appropriate sanctions and accountability mechanisms to ensure compliance. The IGF provides a case study of Senegal and Türkiye to illustrate these principles.

Along with prohibiting large-scale development in protected areas, many jurisdictions require biodiversity to be considered in major projects or set limits to natural resource use and pollution discharge. Some jurisdictions have progressed by covering biodiversity safeguards by an agency-level regulation that details targets and methodologies to prevent and mitigate adverse impacts. Policy makers have also turned to zoning mechanisms, permitting, emissions standards, and disclosures on corporate financing and due diligence.

In China, the National Biodiversity Strategy and Action Plan has led to several policies protecting biodiversity, including the National Plan for Major Function Zones, which designates zones where mining and other industrial activities are either prohibited or allowed only with certain conservation restrictions, and a fund to improve restoration and environmental protection in mining operations. More recently, China enacted a law to protect the Qinghai-Tibet Plateau's environment,

which focuses on climate and biodiversity preservation, including measures like geographical surveys, risk assessments, and the creation of a biodiversity monitoring network. The law restricts, but does not completely ban, mineral extraction, especially in river source nature reserves.

Impact assessments are a common tool that often include biodiversity provisions. Under the EU Environmental Impact Assessment (EIA) Directive, for example, mining companies need to conduct a biodiversity assessment when their projects fall under certain conditions. The EIA must identify, describe and assess the direct and indirect effects of the mining project on human beings, fauna, flora, soil, water, air, climate, landscape, material assets and cultural heritage. EIAs must include measures to prevent or mitigate adverse effects and allow public involvement in consultation processes. The EU Directive on public access to environmental information, in accordance with the Aarhus convention, guarantees public access to such information, including project-specific biodiversity studies, thereby making EIA analysis on biodiversity impacts and discussion of reduction, mitigation and compensation measures available to the public.

Australia's Environment Protection and Biodiversity Conservation Act provides guidance for activities that may adversely affect biodiversity. Any activity that may significantly affect protected areas should be avoided unless there is approval from the minister after a special assessment process is taken deeming the project necessary. Each state oversees its own impact assessment processes. South Africa also has its own Biodiversity Act, which is further implemented through other laws and regulations. The 2013 Mining and Biodiversity Guidelines outline how the mining sector should address biodiversity issues in the country.

Measures for biodiversity conservation and protection can be applied as conditions to a mine's permit at all stages, but baselines should be established prior to any activity. This can happen during impact assessments. In 2022, the Ministry of Environment in the Philippines published an administrative order to provide measures on biodiversity conservation in mining operations, mainstreaming all applicable laws into mining projects. It requires, among other things: data gathering on critical ecosystems and species to establish baselines, progressive rehabilitation at every stage of mining operation, full-time personnel with biodiversity expertise, 5% of the total area set aside as reference ecosystem, and participatory governance from local stakeholders.

Often, the approach to project risk mitigation is to focus on direct impacts and site-level activities, but indirect impacts also need to be considered. This necessitates a dual approach that involves both companies and state authorities. Companies are responsible for actions regarding site-level activities and listed in impact assessments, which includes addressing risks at the project or operation level and implementing measures to manage these direct impacts. On the other hand,

addressing biodiversity risks, which are typically large-scale and require large-scale solutions, is the responsibility of state authorities. States need to implement regional measures, such as avoiding road expansion and habitat fragmentation, promoting sustainable resource use, limiting extensive forestry, and dealing with cumulative impacts from multiple coinciding developments in areas affected by mining.

Financial due diligence and disclosure regulations are also developing as a trend to support common definitions for measurement, reporting and verification of company data. In Europe, the 2019 Sustainable Finance Disclosure Regulation (SFDR) harmonised transparency rules for financial market participants. This includes impact disclosures based on standardised indicators, including biodiversity indicators, such as the share of investments in companies with operations located in or near biodiversity-sensitive areas where their activities negatively affect those areas. In this context, France amended its pioneering 2015 finance industry environmental, social and governance transparency legislation with Article 29 of the Energy and Climate Law, which mandates all financial entities, including banks and insurers, to report not only climate but also biodiversity-related risks. Disclosures require a "double materiality" approach, necessitating disclosures on how financial activities affect and are affected by these risks. Additionally, they must outline their strategies for reducing biodiversity impacts, setting specific targets in line with international biodiversity goals.

To compensate for inevitable biodiversity loss, offsets are available in some jurisdictions (Australian state-level governments such as New South Wales have offset schemes based on the federal Biodiversity Conservation Act). However, critics have raised concerns that in general, biodiversity offsets imply that biodiversity is interchangeable and substitutable. On a practical level, offsets often encounter logistical and contractual challenges in implementation, such as difficulties in acquiring land for habitat-based offsets and offset permanence. These issues, compounded in some jurisdictions by weak compliance, regulatory enforcement, governance inconsistencies and lack of local community input have resulted in implementation failures, such as in Madagascar and internationally.

International co-operation in this area has ramped up over the last few years, which explains the amount of focus on it today. This includes the Finance for Biodiversity Pledge launched in the run-up to COP15 of the UNCBD in 2021, which calls for the protection and restoration of biodiversity through finance activities and investments. Also, Target 15 of the Kunming-Montreal Global Biodiversity Framework provides that parties of the Convention on Biological Diversity are to take legal measures to encourage large companies to progressively reduce negative impacts on biodiversity by monitoring, assessing and disclosing risks and impacts.

**Recommendations**

- **Ensuring robust regulatory regimes**. Assess and review the adequacy of existing regulations related to biodiversity protection and whether these have effective safeguards and targets for conservation, preservation and reduction of impacts on ecosystems. Update mining codes, permitting requirements and due diligence regulations to integrate elements of biodiversity protection. These regulations may encompass monitoring, reporting and verification requirements as well as active participation of local communities and Indigenous Peoples. Adequate resources should be directed at enforcement and compliance.
- **Directed public spending**. Embed robust and validated assessments of biodiversity and risk-based mitigation hierarchy as conditions to public procurement contracts or investment arrangements, ensuring that these include clear targets for biodiversity at all stages of mining operations. Invest in research and development focused on reducing the ecological footprint from mining.
- **Tracking and monitoring performance**. Integrate and support common definitions and methodologies for measuring and monitoring site-level data of biodiversity performance. Technical assistance may be provided to relevant stakeholders, including local communities that participate in data collection and monitoring.
- **Making supply chains more transparent**. Introduce regulations or guidelines that encourage or mandate companies to incorporate biodiversity risks into due diligence systems as well as require public disclosure of biodiversity data related to their mining activities. Particular emphasis should be placed on minerals and processes that have a significant impact on biodiversity.
- **Support for voluntary sustainability standards**. Promote adoption of credible voluntary sustainability standards that incorporate clear performance metrics for biodiversity conservation and responsible ecosystem management. Companies should also be incentivised to go above and beyond minimum requirements instituted by law and existing standards.

# 4. Human rights

## Nature of risk

### Critical minerals extraction and processing pose serious risks to human rights

The mining industry has historically been associated with adverse human rights impacts at many stages along the mineral value chain. Human rights violations that are commonly associated with the mining industry include labour violations, such as child labour or forced and compulsory labour, which are notably prevalent in artisanal and small-scale mining; failure to respect land rights and Indigenous Peoples' rights to land, use of natural resources and self-determination; violations of the right to health, with some cases of torture, or cruel, inhuman and degrading treatment or sexual violence perpetrated by security forces of the state or private companies; and threats or attacks against human rights defenders. The right to a clean, healthy and sustainable environment is also an emerging trend in mining industry litigation. The mining industry is particularly at risk for human rights violations as often operations are located in regions marked by political instability, economic disparities, conflict and weak governance. Since the OECD Guidelines for Multinational Enterprises were released, more human rights complaints have been filed against companies in the mining and manufacturing sectors than any other sectors.

The urgency of the energy transition may lead to pressure to circumvent human rights standards for critical minerals projects, which may weaken protections that prevent human rights violations. Although the mining industry gives rise to risks of violations of many different human rights, this section focuses specifically on forced labour and child labour rights as others that are most prominent given documented cases and regulatory requirements are covered in other sections.

## Supply security

### Human rights violations can disrupt operations and prevent new projects from coming online

Mining companies are bound by domestic laws and policies that can help define what human rights are. In the case of multinational mining companies, they can also be bound by laws in their countries of registration, which may differ in either complexity or stringency. Not respecting the rule of law in relevant jurisdictions can lead to **shutdowns**, **the denial of permits or licences,** or **litigation**, all of which can be costly and reputationally damaging. Companies are also increasingly facing supply chain due diligence requirements from downstream suppliers, which may limit **market access** if the company is unable to demonstrate that they follow human rights norms.

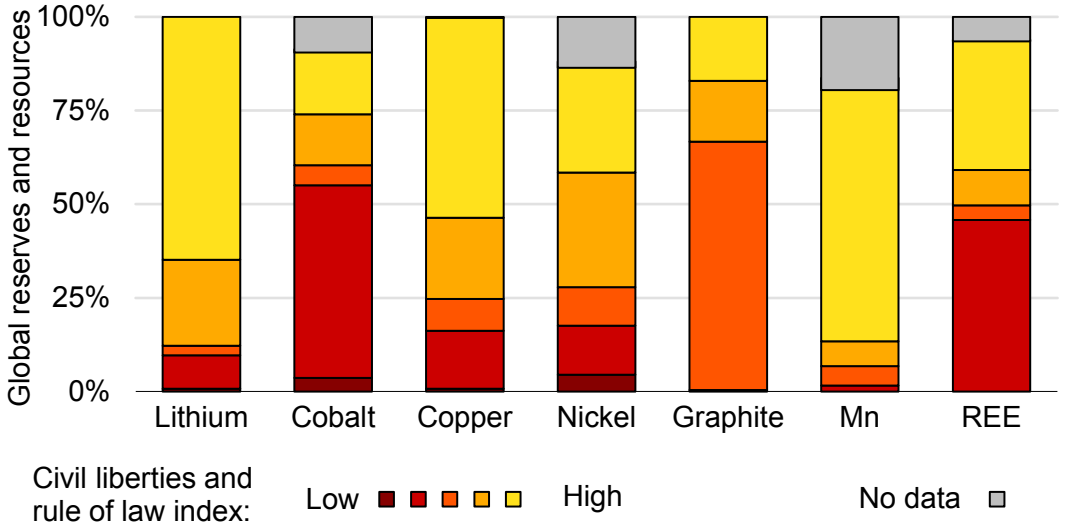
There is also a material risk to supply if a lack of respect for human rights leads to **harm to workers, accidents** or **mine failures**, which can interrupt supply of minerals. Failing to provide proper equipment, training on safe procedures, or adequate working conditions can also lead to stop-work orders or mine closures.

Minerals projects can also **risk losing the social licence to operate** over human rights allegations or violations. Strikes, protests, demonstrations and blockades can result in shutdowns and reputational costs that may impact ability to obtain a permit. Litigation processes or protests against allegations or violations could lead to forced closures of mines. Further downstream, consumers **may not buy the end-use products** if there are human rights allegations in the supply chain, putting clean energy transitions at risk.

Human rights allegations or violations can also lead to **reputational damage that can impact investment decisions**, resulting in exclusion from investment funds and investor deterrence and withdrawal from projects. The risk is present not only in upstream mining operations, but also for midstream processes.

As the world increasingly develops critical minerals reserves and resources needed for the clean energy transition, these ways that human rights risks can disrupt critical minerals supplies will be particularly relevant as much of the world's reserves and resources of critical minerals are in countries that lack robust protections for human rights, or the means to enforce them.

**Civil liberties and rule of law index for global critical mineral reserves and resources**






Notes: Mn = manganese; REE = rare earth elements. Data are from the V-Dem Dataset, and averages their civil liberties index, physical violence index, political civil liberties index, private civil liberties index, rule of law index, and access to justice index.

Sources: IEA analysis based on V-Dem data and Owen, Lebre & Kemp (2022), Energy Transition Minerals (ETMs): A Global Dataset of Projects.

**Child labour in the Democratic Republic of Congo's informal mining sector**

Human rights abuses may be present in both artisanal and small-scale mining (ASM) and large-scale mining. Cobalt is currently primarily supplied by the Democratic Republic of Congo (DRC), with the ASM sector making up a significant share of supply. While ASM production and its share of supply varies, it fulfils an important role in promoting smooth market functioning: ASM sites take much less time to begin production compared with their industrial counterparts, they help traders and producers top up during a shortage or sell off when their other sources of supply are in overcapacity, and they help balance supply and demand between cobalt and copper as swing producers, with artisanal miners switching between the two co-located commodities based on international prices.

However, while the Democratic Republic of Congo has made strides in integrating due diligence into its legal framework, gaps and ambiguities in the Mining Code regarding co-operation between ASM and industrial producers have left the sector largely informal, allowing the use of child labour, hazardous and abusive working conditions, and forced labour to persist at many sites. In particular, those working in ASM are highly susceptible to hazardous working conditions due to weak or unenforced regulatory protections. Workers in underground shafts haul heavy loads and handle toxic chemicals, but protective equipment is not usually available at mine sites. Although there is no reliable data on the prevalence of child labour, surveys have found children present at 30% of visited ASM sites in the Democratic Republic of Congo. While this does not necessarily indicate a human rights violation, it may signify a cause for concern. The worst forms of child labour generally persist in ASM activities that occur outside the legal structure and are linked to poverty as a primary driver.

After one instance of children employed at a mine dying due to a tunnel or wall collapse in 2019, an international human rights group filed a lawsuit against technology companies for sourcing cobalt from the mine.* While the court dismissed the case, the defendants and associated companies incurred reputational damage from publications that made allegations regarding sourcing cobalt from child labour. The companies issued public statements to defend themselves after several news articles reported the suit. While not defendants, other mining companies mentioned in the complaint also responded to preserve their reputation, either by issuing public statements describing measures they are taking to address child labour concerns or suspending the purchase of artisanal cobalt from DRC mines until industry standards are met.

However, disengaging entirely from ASM as a strategy does not constitute responsible sourcing and may exacerbate the causes of child labour. To varying extents, ASM offers socio-economic advantages; losing these may heighten the local community's vulnerability to other forms of exploitation. Formalisation of the sector could mitigate the worst forms of child labour, but this has its own

unintended consequences as well. Addressing poverty at its core is essential for a lasting solution. This requires ongoing collaboration across actors and sustained community engagement.

*Under the US Trafficking Victims Protection Reauthorization Act, plaintiffs claimed that technology companies knowingly benefited from and participated in the trafficking and dangerous working conditions at the mines, which led to the children's deaths or injuries.

# Industry performance

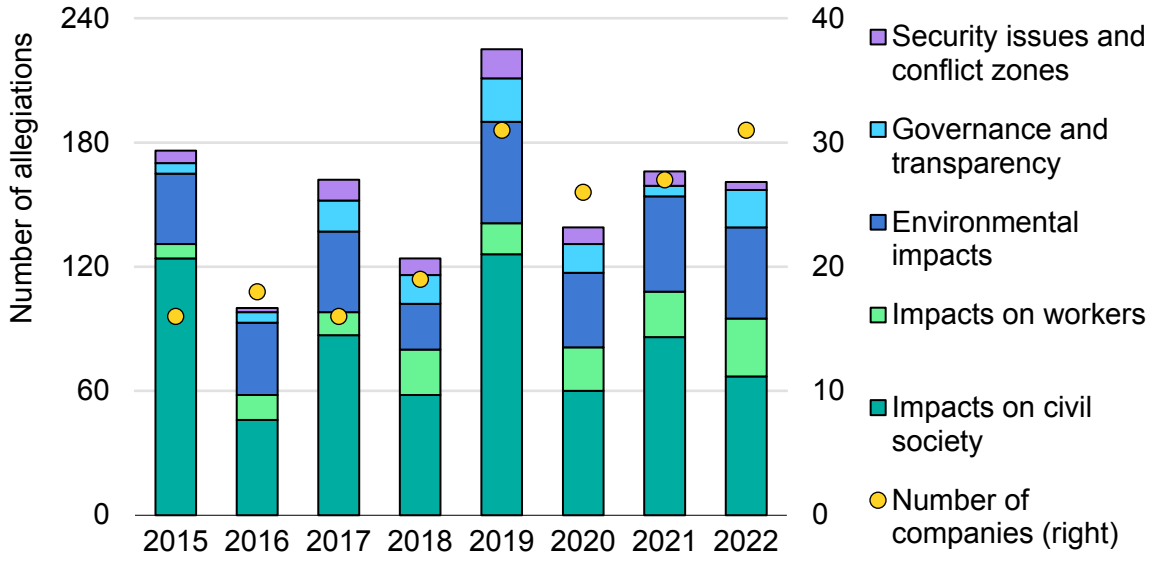
## There is an increasing number of human rights allegations in the mining industry

The mining industry can adopt various practices to mitigate human rights risks. These include implementing internal human rights policies that follow the United Nations Guiding Principles on Business and Human Rights and creating internal processes that enable the implementation of these policies, implementing due diligence processes, and having robust internal grievance mechanisms.

Although many companies implement these practices, there remain individual examples of substantiated human rights violations by the mining industry. Even so, an overall picture of the prevalence of human rights violations is difficult to ascertain. This can be exacerbated by the lack of access to full and fair justice by those groups who are facing the human rights violations and by threats and attacks directed at human rights defenders seeking to draw public attention to the issue.

Data on human rights allegations in mining operations collected by the Business & Human Rights Resource Centre provides some external information on trends, although it has some limitations – reports are not independently verified, and the status of claims following the initial public report is not tracked. Overall, tracked companies have seen a steady number of allegations in recent years, mainly for alleged violations of local communities' rights, attacks on civil society organisations and environmental impacts. There are also an increasing number of companies that are facing allegations, with many companies having more than one project with an allegation and facing allegations that fall under multiple categories.

**Number and type of human rights allegations against mining companies, 2015-2022**






Notes: The data cover only reported allegations against companies operating globally significant producing mines of cobalt, copper, lithium, manganese, nickel and zinc. All allegations are publicly reported, specific incidents including attacks against human rights defenders or legal/regulatory action against companies. Allegations are not independently verified. Each allegation can be related to multiple categories.
Sources: IEA analysis using data from Business & Human Rights Resource Centre (2023), Transition Minerals Tracker.

Looking at critical minerals supply chains specifically, approximately 40% of current global production of cobalt, lithium and copper comes from a mining project with at least one human rights allegation in 2022. Many of these are in the top 20 producing projects worldwide. This is partly due to the concentration of production among a few projects and companies and in a few countries and regions – particularly for cobalt and lithium – but indicates that the world's most dominant sources of production are implicated in this risk.

Assessing company performance from self-reporting is also difficult, as many companies report very little information on human rights or none at all. Of the 20 major mining companies prominent in critical mineral production that the IEA assessed,[7] ten mention specific strategies for integrating human rights due diligence practices into their business practices and operations, which vary from utilising internationally agreed upon frameworks such as OECD Guidance to an internal human rights strategy. Of those that mention due diligence practices, only five report on specific quantifiable metrics to assess due diligence practices, such as number of due diligence checks or screening by third parties. This is despite 17 out of the 20 companies having a human rights policy for their business.

[7] The initial assessment was carried out for the Critical Minerals Market Review 2023.

# Standards

## Standards offer a practical approach to addressing human rights risks, complementing more robust legal rights frameworks

The standards assessed universally incorporate human rights provisions, drawing from established normative frameworks such as the UN Guiding Principles on Business and Human Rights (UNGPs) and the OECD Minerals Guidance. However, these provisions vary greatly in specificity and stringency, underscoring the unequal emphasis placed on different aspects of human rights within these standards. For example, the Copper Mark requires that the company have policies, procedures and practices in place in compliance with the UNGP, while IRMA provides specific details on how policy should be formulated and issued (e.g. approved by senior management and informed by relevant expertise).

Some initiatives have developed guidance notes to encourage more stringent policies, although these are not always binding. ICMM's Human Rights Due Diligence Guidance, for example, describes different levels of maturity for human rights due diligence programmes and details best practices for companies. The Copper Mark's Policy on Human Rights and the Environment, revised in April 2023, outlines a procedure for instances where a company is suspected of being linked to adverse human rights impacts. Upon receiving relevant information, the Copper Mark conducts a fact-finding process through external sources or third-party assessments and will work with the company to respond to the situation. Failure of the company to meet the criteria can lead to the suspension or removal of the Copper Mark.

The prevailing standards also have different approaches to substantive prohibitions on specific human rights abuses. IRMA and the Copper Mark include more comprehensive provisions that prohibit exploitative working conditions and workplace discrimination, while respecting freedom of association among its members. For example, the Copper Mark details commitments in separate criteria on prohibiting child labour and forced labour. It includes a specific section on ASM, as well as references to relevant International Labour Organization Conventions and the UNGPs. Other standards rely on high-level principles such as the UNGPs and otherwise focus primarily on procedural elements such as due diligence practices or implementation of management systems. Given the unequal depth of human rights provisions across standards systems, policy makers should carefully assess whether a given standard aligns with domestic policies when considering how compliance with the standard implicates supply risk.

Finally, all standards oblige companies to create site-level grievance mechanisms in line with UNGPs, which call for operational-level grievance mechanisms that

can identify human rights impacts and provide solutions to remediate those impacted. Besides being legitimate, accessible, predictable, equitable, transparent, rights-compatible and a source of continuous learning, these should also be based on engagement and dialogue. The IFC provides guidelines for establishing site-level grievance mechanisms, which form the foundation for the guidelines of TSM, ICMM and IRMA. These also include provisions on ensuring that the mechanism is designed through engagement with stakeholders. In addition to requirements to establish operational-level grievance mechanisms, the Copper Mark and IRMA have both established mechanisms to hear complaints at the corporate level as well.

# Existing policies

## The increasing prevalence of due diligence regulations will put additional pressure on companies

The IGF Framework addresses human rights in several ways. It recommends that mining policies, codes, agreements and standards respect international human rights agreements and normative language on human rights. It advises that legislation ensure that mining entities respect workers' rights, prohibit forced and child labour, and ensure the rights, health and safety of miners and the community. On ASM, the framework emphasises improving health and safety standards, providing education, and enforcing laws prohibiting forced and child labour. To concretise these rights, the framework advises governments to require mining entities to set up a free and retribution-free grievance mechanism that offers prompt and effective resolution, is culturally sensitive, and supports confidential and protected complaints, including those related to gender-based violence.

A number of countries have adopted legislation in recent years targeting human rights in supply chains that apply to the minerals sector along with other sectors. For example, the European Union's recently enacted Corporate Sustainability Reporting Directive includes human rights impacts reporting measures, while the Generalised Scheme of Preferences framework provides for preferential trade treatment to be withdrawn in instances of serious or systematic violations of human rights. Germany's Supply Chain Due Diligence Act of 2021 and France's Law No. 2017-399 on the duty of care of parent companies and ordering companies and Canada's Fighting Against Forced Labour and Child Labour in Supply Chains Act are other examples of due diligence reporting that require companies to identify risks of human rights violations and implement preventive measures. These laws apply to various products and are likely to pressure mining companies, as end-use companies are increasingly scrutinising their mineral supply chains in response.

Other laws have more specific implications for critical mineral companies. Specific to batteries, human rights due diligence requirements in the EU Batteries Regulation require operators to establish and publish due diligence policies for cobalt, graphite, lithium, nickel and related compounds that must align with OECD Due Diligence Guidelines and the UNGPs. The United States Uyghur Forced Labor Prevention Act establishes a rebuttable presumption that goods partially or wholly produced in the Xinjiang Uyghur Autonomous Region of China are produced with forced labour and therefore banned for importation. Recognising that forced labour is prevalent in this specific area, companies must undertake measures to trace the origin of goods that may originate in Xinjiang in order to demonstrate compliance, which may have particular relevance for lithium producers.

The National Action Plans (NAPs) under the UNGPs provide guidance on what countries are doing to streamline human rights in business regulations. For example, the Viet Nam NAP published in July 2023 includes specific timelines for integrating business and human rights principles into its laws. The government aims to incorporate responsible bidding requirements into its Law on Procurement by 2024. The government also aims to review and propose amendments to promote and protect labour rights and the rights of vulnerable groups compatible with international legal standards by 2025. Regarding grievance mechanisms under the UNGP, Chile's NAP makes the Ministry of Energy responsible for promoting the development of mechanisms to resolve disputes between companies and communities for energy-related projects.

Furthermore, countries have created specialised rules for ASM to formalise and oversee these operations and have introduced supply chain diligence to enhance miners' livelihoods and foster ethical mining supply chains. Peru has made significant strides in implementing due diligence standards, aligning with OECD recommendations. In the context of formal mining, positive advancements from due diligence mechanisms have been observed in land transaction negotiations and environmental impact management and social conflict prevention. Also, Colombia's proposal for a new National Mining Policy released in June 2023 introduces six guiding approaches to reorientate the mining industry. On human rights, the proposal aims to introduce due diligence instruments.

**Recommendations**

- **Ensuring robust regulatory regimes**. Review and update regulatory frameworks to ensure human rights protections in the mining sector are adequately robust, particularly aligning with the UNGPs and OECD Guidelines. For example, legal provisions can ensure that child labour and forced labour are prohibited at the mine site and ensure that human rights defenders are adequately protected. Sufficient resources should also be directed at enforcement and compliance.
- **Directed public spending**. Include elements of human rights-related conditions in public procurement contracts, such as a prohibition on the employment of child labour, forced labour and modern slavery, exploitative working conditions, discrimination in the workplace and respecting labour rights (e.g. freedom of association). Provide targeted support for technical assistance and capacity building to developing and emerging economies.
- **Tracking and monitoring performance**. Support the monitoring and collection of aggregated data from mine sites with thorough methodological guidelines on measurement of relevant human rights performance data and indicators.
- **Making supply chains more transparent**. Improve transparency across the supply chain through regulations or guidance that encourage or require companies to embed human rights risks in due diligence systems for all minerals supply chains.
- **Support for voluntary sustainability standards**. Support credible voluntary sustainability standards that incorporate best practices human rights protection and monitoring along the supply chain based on robust due diligence and establishing of site-level grievance mechanisms for reporting violations.

# 5. Communities

## Nature of risk

### Local communities and Indigenous Peoples are directly impacted by mining projects

Mining projects often bring a host of changes to local land use, the local environment and the local economy, which can cause both negative and positive impacts to communities. These impacts affect nearby towns, villages, communities and Indigenous Peoples, as well as workers. They can include changes and impacts on the local environment through land changes, displacement, lack of respect for consent rights, water resource use, water and air pollution, and deforestation, which can cause adverse health effects. Mining can also bring with it changes in the population and economic structure of areas.

Critical mineral resources are highly correlated with being on or near Indigenous land. Although some of the same impacts may affect both Indigenous and non-Indigenous Peoples, the latter have a particular relationship with the land and its resources and they can hold different rights than other types of community; they should be treated as distinct groups when companies or governments are creating engagement plans. The free, prior and informed consent (FPIC) process as defined under the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) is legally required in some contexts, and even where it is not, it should be used as best practice for engagement with Indigenous Peoples.

As demand for critical minerals continues to grow, active and meaningful engagement with groups who have traditionally used the land where these minerals lie will be crucial to ensure they are able to raise their concerns and have their voice be taken into account in the decision-making process.

## Supply security

### Failing to obtain and maintain a social licence to operate can prevent projects from coming online and lead to shutdowns and disruptions

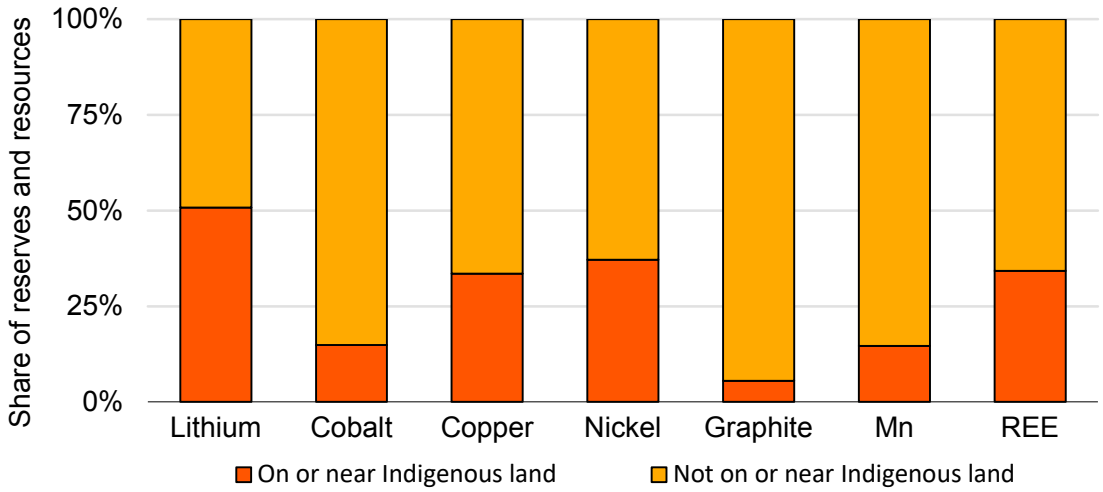
Indigenous Peoples and local communities have legitimate concerns over the potential impacts of a facility. If their concerns are not properly addressed and if the benefits of the project are not distributed equitably and fairly, these groups may oppose operating mines or the development of new mines. The lack of a **social licence to operate** can disrupt supply or block the development of new

supply if local opposition evolves into **blocking** or **revocation of licences**, **referendums**, **litigation**, **protests**, or **blockades** **from local communities**.

A lack of buy-in from local communities or Indigenous Peoples or unclear regulatory and legal obligations around consultations can also cause **reputational damage that impacts investment decisions** for companies and regions. This can adversely impact further investments in the region or lead to withdrawal of exploration requests over concerns about the risk.

Governments have an important role to play in ensuring communities are respected and that mining companies follow international standards. In many jurisdictions, local communities have a right to be consulted on individual projects, while others have incorporated the FPIC process into domestic legislation for Indigenous Peoples impacted by development projects. Supply disruptions can arise if companies do not follow the legal requirements to properly consult with communities, such as through the **cancelling of mining licences**. Failure to obtain FPIC from Indigenous Peoples where legitimately expected can also lead to **denied licences**, **the revocation of permits** or **government-ordered shutdowns**. Furthermore, following FPIC principles as best practice for engagement is an emerging industry expectation, even in the absence of domestic legal requirements. Disruptions can happen when companies fail to understand and address the needs of affected groups, both in mitigating the negative impacts of mining and in providing secondary benefits for local communities and Indigenous Peoples. This will be particularly significant as the world develops future supply, as the minerals critical for the clean energy transition are often located on or near Indigenous land.

**Share of global reserves and resources of selected critical minerals that are on or near Indigenous land**






Notes: "On or near" is defined as within 10 km of geographical areas where Indigenous, tribal groupings or strong claims to customary tenure have been recognised as supported by state instruments using the definition in Garnett et al. (2018), A spatial overview of the global importance of Indigenous lands for conservation.

Sources: IEA analysis based on public data compiled by Owen, Lebre and Kemp (2022), Energy Transition Minerals (ETMs): A Global Dataset of Projects.

**Local opposition to rare earths mine in Greenland**

One of the world's largest known deposits of rare earth elements is located on the southern tip of Greenland at Kvanefjeld (or Kuannersuit). The Kvanefjeld deposit is located 7 km from the nearest town, Narsaq, which is home to just above 1 300 inhabitants. Exploitation at the site has been controversial for years, partly due to the presence of uranium. In 2013, the civil organisation Urani Naamik was born out of residents' concerns about the health and environmental consequences that the operation could cause to their community. Risks include the spread of radioactive dust through wind erosion and leakages of potentially radioactive tailings into water sources as a result of mining. Concerns were heightened by fears that developing the mine would threaten the traditional Indigenous Inuit lifestyle that dominates the town, and the precedent it might set for other areas, given that 89% of the Greenlandic population are recognised as Indigenous Inuits.

As the project sponsors initiated procedures to pursue exploitation, local opponents expressed that the consultations did not provide adequate time for meaningful consultation, while environmental organisations criticised the project's environmental impact assessment as insufficient and inaccurate. The Office of the United Nations High Commissioner for Human Rights requested that the sponsor explain what steps it had taken to seek free, prior and informed consent from the Indigenous Inuit Peoples.

The controversy over the mine contributed to the collapse of the sitting Greenlandic government in 2021, which was followed by snap elections where the Kvanefjeld mine dominated the discussion. The party opposed to the mine won a majority in the election and the new government passed a law effectively stopping the project from moving forward.

# Industry performance

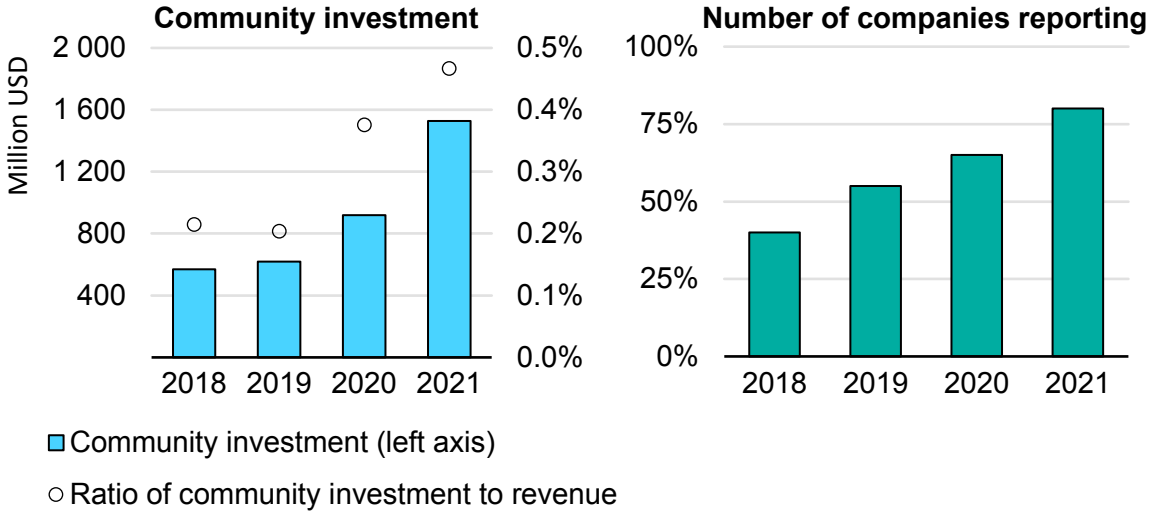
## The mining industry is increasingly recognising the importance of effective engagement with communities and Indigenous Peoples in order to operate

There are different ways that companies along the critical minerals value chain can mitigate the impacts of mining on communities and Indigenous Peoples, while providing for potential local value-addition as well. These include meaningfully engaging with communities from the inception of a project, supporting local job creation with respect to developing and operating the project, investing in the community in whatever capacity is most beneficial to them, providing support for local development and opportunities, and setting up co-equity ownership, co-management of operations, and benefit-sharing agreements, among others.

By assessing whether and how companies are performing these actions, it is possible to evaluate how the mining industry is performing with respect to communities and Indigenous Peoples. International references such as those the in the United Nations Declaration on the Rights of Indigenous Peoples and the International Labour Organization Indigenous and Tribal Peoples Convention, 1989 (ILO 169) provide guidance for practices in this area.

According to IEA analysis of 20 major mining companies prominent in energy transition minerals, companies have been increasing the monetary benefits provided to communities. From 2018 to 2021, there was a 62% increase in dollars invested in communities, and companies invested almost four times more per million USD in revenue. Few companies report data for many consequent years, meaning that tracking progress over a longer period of time is more difficult.

**Community investment reported by 20 major mining companies**





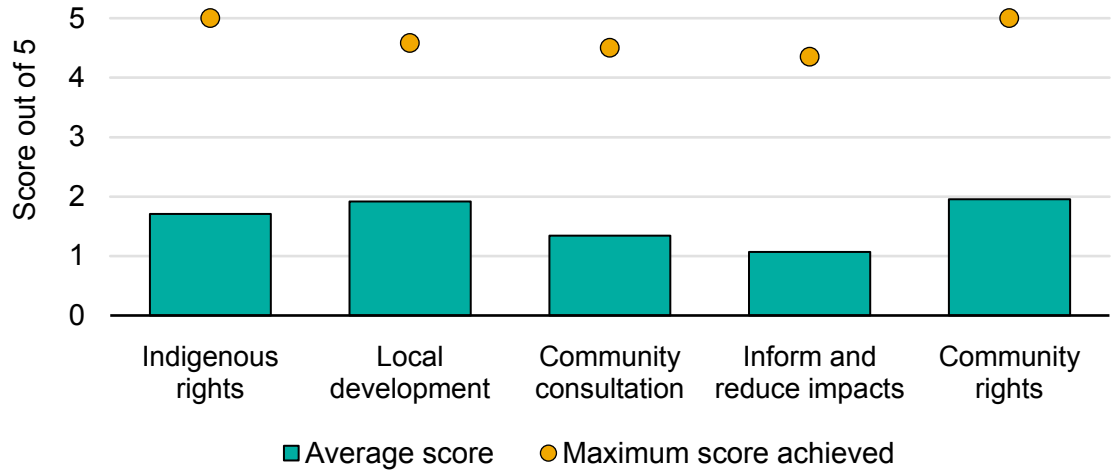

Notes: Left chart shows aggregated data for those companies among the 20 major companies IEA assessed that reported on community investment (Albemarle, Anglo American, BHP, First Quantum Minerals, Freeport-McMoRan, Glencore, Mineral Resources, Norilsk Nickel, Rio Tinto, Teck Resources and Tianqi Lithium). Right chart also considers CMOC, Ganfeng Lithium and SQM. Considers reported data for all operations and is not limited to critical minerals.

Sources: IEA (2023) Critical Minerals Market Review 2023 based on company annual reports and S&P Global.

The Responsible Mining Index 2022 provides some insight into how the critical mineral mining industry is performing across a wider set of measures. Taking as an example the world's top cobalt, copper and nickel companies, few perform well on indicators covering Indigenous Peoples' rights, economic community development, consultation with communities, evaluation and mitigation of impacts, and community rights. The average score for assessed companies is less than half of the maximum possible score across all relevant measures.

Within these aggregated categories, companies are performing particularly poorly on disclosing the impacts of operations on women, youth and children, at implementing systems for examining and addressing how climate change can exacerbate the impact of operations on communities and workers, and working to ensure livelihoods are improved or restored following any involuntary resettlement. However, the best-performing companies have achieved a score near or at the maximum, indicating that better performance is possible.

**Average and maximum score achieved on community and Indigenous Peoples performance indicators for selected copper, cobalt and nickel companies**



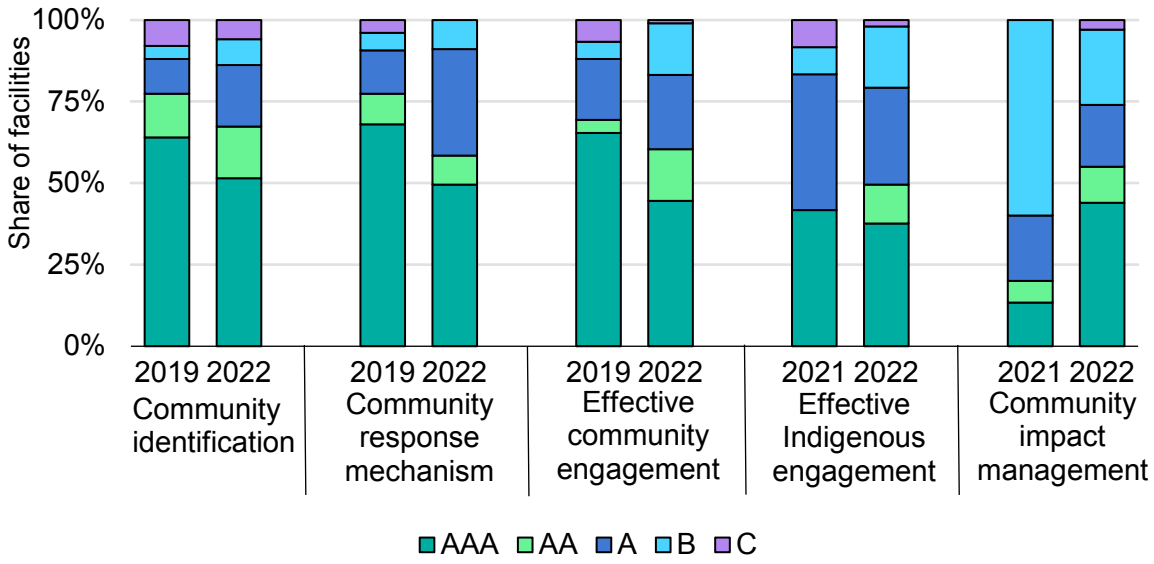



Notes: Aggregated categories and scores based on Responsible Mining Index 2022 for critical mineral producing companies. More information on scoring framework can be found here. Scores are standardised for a maximum possible score of 5 across all categories.

Source: IEA analysis based on Responsible Mining Index 2022.

There has also been a shifting recognition of the separate and important distinction between community and Indigenous Peoples engagement and consultation. Using MAC's data on member companies' adherence to TSM as a snapshot of progress, Indigenous Peoples engagement was added as a separate category in 2021. As a sample of industry performance, it seems that industry is making strides towards recognising these issues and that some companies are making positive progress towards community and Indigenous Peoples engagement, though it is important to note that this covers only the Canadian context. A recent report from Oxfam that looked at battery minerals also concluded that improvements are needed, indicating that few companies adopt strong free, prior and informed consent policies that unequivocally prevent them from proceeding with a project if Indigenous Peoples withhold consent.

**Self-assessed performance in engagement with communities and Indigenous Peoples by Mining Association of Canada companies by Towards Sustainable Mining grade**






Notes: The above chart is an excerpt of TSM data, covering the Indigenous Peoples and community self-reporting from 2019 to 2022. The last two indicators were added after 2021, therefore there are no data for 2019. Each company is given a rating from C to AAA by criteria, ranging from not compliant to excelling against the TSM standard.
Source: IEA analysis based on Mining Association of Canada data.

# Standards

## Standards requiring ongoing community engagement foster local ownership and contribute to the legitimacy of a mining project

Community engagement provisions in standards systems are somewhat mixed in terms of comprehensiveness and stringency. Most standard requirements focus primarily on process and planning. For example, the TSM protocol expects companies to identify communities of interest, develop engagement processes with input from these communities and periodically review those processes. Essentially all standards require companies to develop engagement plans in one form or another and to establish grievance mechanisms, albeit with differing levels of detail.

Several substantive commitments are unique to certain standards. IRMA's level of detail regarding community engagement is notable. In addition to requiring that engagement processes be accessible, IRMA requires companies to demonstrate efforts to ensure inclusivity for women and vulnerable groups. IRMA also requires companies to assist communities in assessing their capacity to engage in consultations and to offer assistance where appropriate. The Copper Mark uniquely includes public disclosure of risks, planned actions, progress and results

related to affected stakeholders and Indigenous Peoples' rights as core requirements. TSM requires that communications to the public be published in the local language if requested and that materials be clear, understandable and accessible.

For Indigenous Peoples, many standards set FPIC as an aspiration or an aim. As the most stringent, IRMA requires obtaining unequivocal consent from Indigenous Peoples, including both for new mines and for changes at existing mines that may result in new or increased impacts. The Copper Mark requires its members to respect Indigenous Peoples' rights including FPIC and hold a separate engagement process where relevant. The ICMM and TSM include commitments on FPIC, stopping short of an express requirement, but set expectations for what companies should do to ensure meaningful ongoing engagement. Particular to TSM, it requires members to establish a collaborative decision-making process to acknowledge Indigenous Peoples' right to define their own FPIC process.

# Existing policies

## Countries are increasingly requiring companies to consult with communities and seek consent from Indigenous Peoples

The IGF Framework recognises the need for consultation and engagement in both the permitting and licensing process and in designing socio-economic benefits, with special attention to Indigenous Peoples. It advises governments to require mining entities to consult with affected communities in preparing the permit application and in each stage of the mining cycle, providing an opportunity for them to express concerns about project risks, impacts and mitigation measures as well as on the socio-economic implications of the project. It also advises mining entities to establish grievance mechanisms and provide fair compensation for those displaced by mining. Results of the consultation process should be accessible to communities. To respect Indigenous Peoples' rights and perspectives, their free, prior and informed consent should be obtained when applicable and outcomes of the FPIC process should be captured in community agreements.

International law as embodied in the UNDRIP and ILO 169 recognises that Indigenous Peoples have the right to give or withhold FPIC concerning decisions that may affect them such as resource extraction. Consequently, many countries have incorporated FPIC into their national legislation, with some enacting laws specifically empowering Indigenous Peoples to stop or suspend projects. For example, the Philippine Mining Act includes the right to stop or suspend a project because of Indigenous Peoples' opposition. Similarly, Sierra Leone has recently integrated FPIC in its national mining legislation, allowing local communities to veto any project affecting them. Canada's Critical Minerals Strategy lays out the government's strategy for supporting Indigenous Peoples' engagement, which

includes a commitment to uphold the duty to consult, with the aim of securing FPIC from Indigenous Peoples. The country is also developing a National Benefits Sharing Framework to help ensure Indigenous Peoples directly benefit from major resource projects in their territories. Several countries in Latin America and southern Africa also have policies in place to safeguard community consent.

Proposed updates to Finland's mining code include a greater focus on the rights of the Sámi people. The amendments would require that protection and respect for the Sámi people and culture are taken into consideration more effectively during permit examination. For example, the mining authority would be obligated to investigate the consequences of mining activities to the rights of the Sámi as indigenous people if they have considerable significance on their rights – even when activities are outside the Sámi's home area. The mining authority would then be required to consider measures needed to reduce and prevent adverse impacts.

Moreover, community development is required by mining laws of several countries. The Philippine Mining Act is one of the more specific laws and requires that where an agreement is entered into with a community or with artisanal miners, royalties must be paid into a trust fund for their socio-economic well-being. The implementing rules require the creation of a five-year social development and management programme in consultation with the local communities. In Mongolia, the Mineral Law requires licence holders to establish Local Co-operation Agreements (LCAs) with heads of local administrative units. The purpose of LCAs is to outline the contributions made by companies to the well-being of residents in specific regions, focusing on aspects such as environmental protection, local content, infrastructure investments and job creation. Similar provisions are found in Sierra Leone and Peru.

**Recommendations**

- **Ensuring robust regulatory regimes**. Implement regulatory regimes that require identifying, engaging with and including local communities and Indigenous Peoples in land-use planning and the development of minerals activities based on FPIC principles as applicable. Regulations should also include best practice engagement and consultation provisions for changes to existing operations that may lead to new or increased impacts.
- **Directed public spending**. Tie public funding or procurement policy to community engagement and consultation, impact mitigation, benefits sharing, investments in mining communities, and targeted strategies that address community concerns. Benefits sharing could be either directly from the company, e.g. royalty-sharing schemes, through indirect means such as local sourcing, skills development and training, mine closure plans, or community

infrastructure improvement or through the allocation of centrally collected taxes or royalties to social and economic infrastructure in producing areas.

- **Tracking and monitoring performance**. Support the monitoring and reporting of site-level data on relevant indicators of company performance regarding community engagement and, working with Indigenous Peoples, whether and how FPIC is obtained.
- **Making supply chains more transparent**. Improve transparency across the supply chain through regulations or guidance that encourage or require companies to embed community engagement and Indigenous Peoples' rights in due diligence systems, in line with relevant OECD guidance. Encourage or require publication of community benefits sharing agreements and consultation or FPIC processes.
- **Support for voluntary sustainability standards**. In reviewing voluntary sustainability standards, ensure compliance with national and local requirements on local community consultation and consent from Indigenous Peoples. Support credible local community and Indigenous Peoples-led consultation schemes, taking account of special rights and status, and those that use FPIC as best practice for engagement.

# 6. Corruption

## Nature of risk

### The critical minerals industry is vulnerable to corruption risks at every stage of the supply chain

Corruption is often defined as the abuse of entrusted power for private gain. Corruption in the mineral supply chain can come in many forms, including bribery, misappropriation of funds, embezzlement and fraud. It can also come at many stages, such as selecting and awarding contacts or extraction licences, when negotiating contracts (whether between companies and the state or between companies and suppliers), when obtaining consent or compensation for affected communities, in the negotiation of commodity trading deals, during the course of operations, and paying taxes and fees. Corruption risks are also present for refining, processing and recycling.

The mining stage of the supply chain is particularly at risk for corruption as it is a state-involved industry with high levels of investment, wealth generation and economic rents. Corruption can occur across multiple pressure points, including government, firms and in global transactions. The government often owns either the land from which minerals are extracted or the mineral resources themselves

and can be heavily involved in regulating and overseeing the mining sector through the granting of licences and approvals for exploration, development, construction and operation, and collection of royalties. Firms and traders can use corruption to get access to resources and maximise their profit.

The rapid development of critical minerals required for the clean energy transition and the potentially large economic gains to be realised in this push makes the sector especially liable for corruption risk. This is especially true given that large amounts of these minerals are in countries with high levels of corruption, but even advanced economies are not immune to corruption allegations. An extensive literature has found strong links between natural resource wealth and corruption, including Lashitew and Werker 2020, Ross 2015, Bhattacharyya and Hodler 2010, and Sachs and Warner 2001, suggesting that as demand for critical minerals grows in the coming years, the incentives for corruption will increase accordingly.

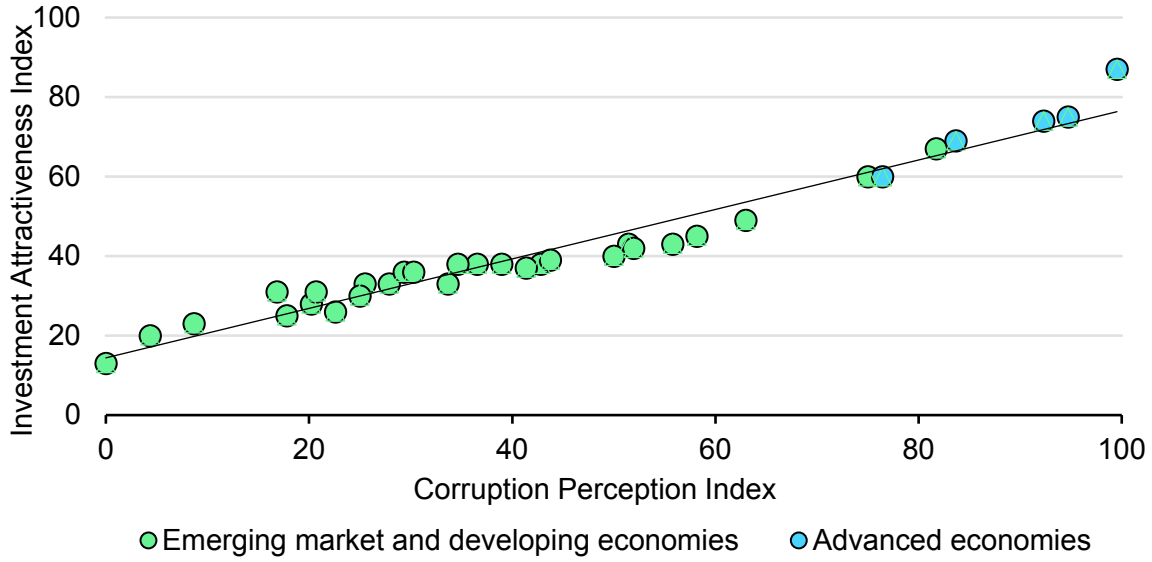
# Supply security

## Instances of corruption may cause delays, discourage investment and erode public support for mining projects

In addition to diverting resources from investments in infrastructure, health, education and other public needs, corruption can have major impacts on supply availability. High-level allegations of corruption can lead to **protracted delays** in developing new mine projects. National officials may place a hold on existing licences to investigate allegations, or otherwise seek to revise or revisit licence terms. Smaller incidents may lead to more time-limited **shutdowns or delays** in operations, such as when officials demand “grease payments” to obtain necessary approvals or permits.

Perceptions of corruption risk may make certain locations **less attractive for investment**, which can limit opportunities for diversification. If investors decide to exit high-risk jurisdictions altogether, this can reinforce market concentration.

**Attractiveness for mining investment compared with perceptions of corruption by country**



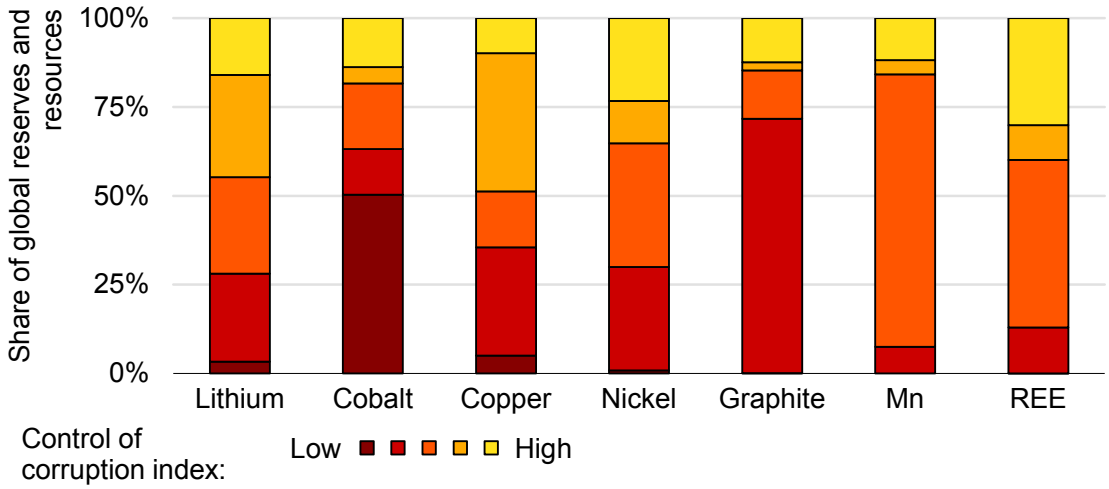



Note: The Corruption Perceptions Index ranks countries around the world based on how corrupt their public sectors are perceived to be. The results are given on a scale of 0 to 100, where 0 is highly corrupt and 100 is highly clean.

Sources: IEA analysis based on Fraser Institute's Annual Survey of Mining Companies 2022 and the Corruption Perceptions Index.

As the reserves and resources of critical minerals needed for the clean energy transition are developed, this risk will be particularly relevant for minerals that are primarily located in areas with high perceptions of corruption. Minerals such as cobalt, nickel, graphite, manganese and rare earth elements are highly concentrated in these areas; however, the location of reserves and resources of lithium and copper still present corruption risks as well.

**Control of corruption index for global critical minerals reserves and resources**






Note: Mn = manganese; REE = rare earth elements.

Sources: IEA analysis based on the World Bank Worldwide Governance Indicators and Owen, Lebre and Kemp (2022), Energy Transition Minerals (ETMs): A Global Dataset of Projects.

Allegations of corruption may also **erode public support** for individual projects, which can affect a project's ability to maintain a social licence to operate. This is a particular problem where public funds designated to support affected communities are diverted for other purposes – public or private – as well as when economic opportunities are captured by corrupt actors instead of local communities. This diverts benefits away from those who are affected by mining and can lead to an erosion of public support. This can lead to higher likelihoods of supply disrupting events, such as protests, strikes, blockades and litigation, and can also make it more likely that communities will oppose development of new supply.

Corruption may also **exacerbate other supply chain risks** if it hinders compliance or enforcement of environmental and social requirements, making it less likely that poor practices in other areas are brought to light. This can undermine environmental and social requirements and aggregate negative impacts, making good governance an essential backbone for sustainable and responsible supply chains.

**A decade of delays due to corruption: Simandou**

Exploration licences for the Simandou project in Guinea, which centres on one of the richest greenfield deposits of iron ore in the world, were first granted to Rio Tinto in 1997. The project has since been mired in corruption-related delays for the past decade.

In 2008, the Guinean government stripped Rio Tinto of half the Simandou concession and reissued it to BSG Resources (BSGR), citing lack of development. Six years later, the government revoked BSGR's mining rights and launched an investigation into the licence's legality. The revocation began a five-year work stoppage at the site while the company was still building infrastructure to support eventual exploitation.

In 2014, a series of corruption allegations and lawsuits began between the government and the two companies. BSGR filed an arbitration case against Guinea accusing the government of expropriation, followed by a lawsuit by Rio Tinto against BSGR in a US court. In 2016, the Guinean Mining Minister accused Rio Tinto of having offered a bribe to obtain exploitation rights in 2010, and Rio Tinto admitted to paying USD 10.5 million to a Guinean official in 2011. A 2022 award in the arbitration proceeding between BSGR and Guinea found "overwhelming evidence" of corrupt practices by BSGR.

A final stop-work order was lifted in March of 2023 after eight months of disputes among current partners and the government about ore and control of the rail line. As of the time of writing, the Simandou project has not yet yielded any ore – or the promised revenue and resources for affected communities – despite the initial hopes that it would be online in 2015.

# Industry performance

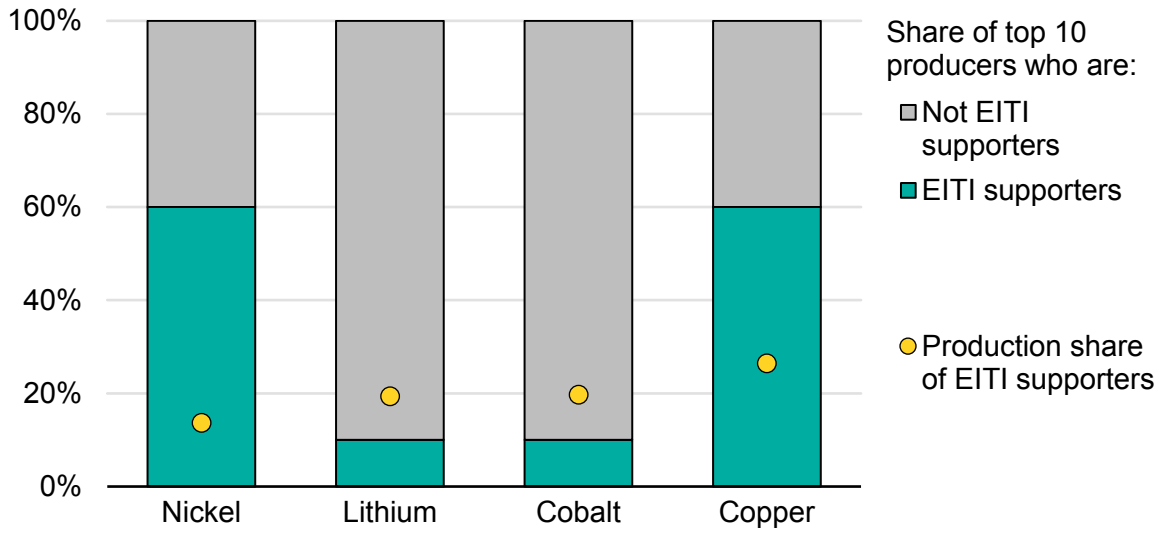
## Progress has been limited on addressing corruption risks and there remain significant data challenges

Companies along the critical minerals supply chain can adopt and implement policies that provide safeguards against corruption. The EITI Standard, which was updated in 2023 to include corruption as a core objective and validation process, provides a set of objective measures of resource governance policy for the EITI implementing countries. These include requirements to publish contracts and licences, to report beneficial ownership, and to disclose payments to governments. Companies can also follow voluntary disclosure requirements so that their performance in preventing and mitigating corruption risk can be assessed, such as the Global Reporting Initiative's anti-corruption standard. Organisations such as the Natural Resources Governance Institute (NRGI) also provide recommendations and guidance.

While adopting these policies does not guarantee that corruption will not take place, measures of transparency should make it less likely. It is equally key to ensure that such policies are effectively enforced, as currently many contracts in EITI implementing countries are still unpublished even where policies exist to require disclosure, as shown in the recent EITI country validations.

Under EITI's governance structure, companies may join as "supporting companies", which means they're expected to uphold the EITI Standard through reporting in EITI implementing countries where they operate and are encouraged to participate in multi-stakeholder groups. A handful of the largest critical mineral companies are officially supporters of EITI, which together cover a relatively small proportion of global production. Copper has the most coverage, with 6 of the top 10 companies – covering 26% of global production of copper – supporting EITI. Notably, very few top lithium and cobalt companies are EITI supporters. Corruption mitigation could be improved if more critical mineral companies commit to – and implement – EITI principles.

**Production share and number of top 10 critical mineral companies that are Extractive Industries Transparency Initiative supporters**



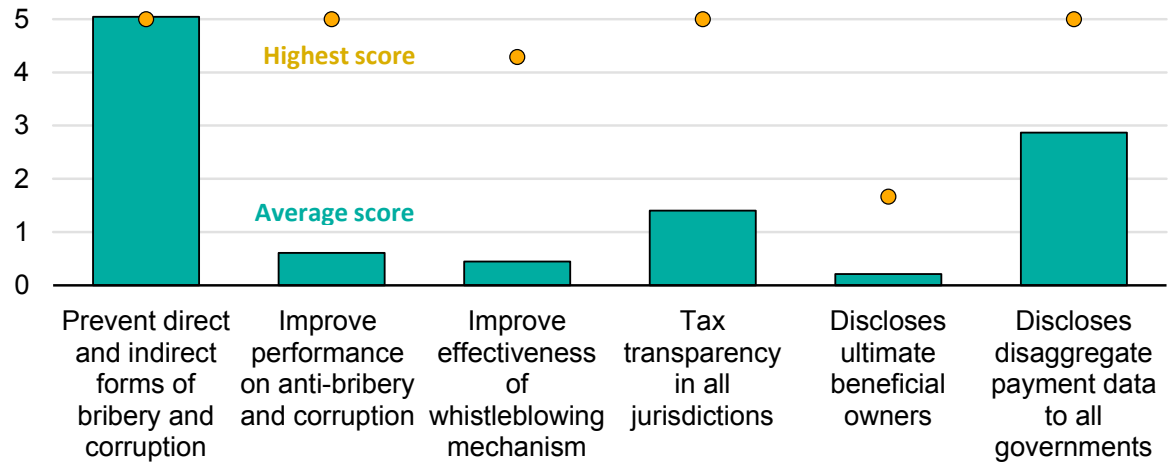



Note: Critical mineral companies are the top producing companies in lithium, nickel, cobalt and copper according to S&P Global Market Intelligence data.
Source: IEA analysis based on EITI and S&P Global Market Intelligence data.

Measuring on-the-ground levels of corruption is notoriously difficult because corrupt actors have a strong incentive to avoid detection. Nevertheless, some measures do exist based either on direct evidence such as public allegations, investigations or lawsuits, or on indirect evidence from perceptions of experts or market actors. Most existing external measurements of corruption show significant corruption risks associated with mining, particularly in emerging markets and developing economies. The Business & Human Rights Resource Centre's Transition Minerals Tracker includes 37 allegations of corruption since 2010, with nearly a fifth coming from 2022 alone. An OECD study of all foreign bribery cases found that around one-fifth of the cases investigated came from the extractive sector.

Publicly reported company data can also give some indication on the corruption performance in the sector. The Responsible Mining Index 2022, which scores companies across a set of indicators that assess company-published data, reveals that assessed companies are on average performing well in preventing direct and indirect forms of bribery and disclosing data such as payments to governments and lobbying practices. For other measures, especially holding leadership accountable for responsible business conduct, company disclosures on ultimate beneficial owners, and improving practices, the average score is much lower. At the same time, it is notable that a small minority of companies have achieved the maximum possible score for many metrics, showing that it is possible to do better.

**Average and maximum score achieved on corruption performance indicators for selected copper, cobalt and nickel companies**






Notes: Aggregated categories and scores based on Responsible Mining Index 2022 for critical mineral producing companies. More information on scoring framework can be found here. Scores are standardised for a maximum possible score of 5 across all categories.

Source: IEA analysis based on Responsible Mining Index 2022.

# Standards

## The approach to addressing corruption is mixed across standards systems, with few providing in-depth coverage

The surveyed standards systems typically mandate that their members establish anti-bribery and anti-corruption procedures, although IRMA provides the most specific requirements. Most standards typically do not delve into corruption issues in detail, but this approach perhaps reflects the idea that corruption is often seen as primarily within the purview of governments for regulation and enforcement. Nevertheless, there are areas where companies can reduce their exposure to corruption risks and contribute to a transparent environment that disincentivises corruption. In fact, there is a trend for requirements to be increasingly detailed among standards. For example, ICMM announced in December 2021 that its members would be required to disclose all contracts entered into after 1 January 2021 where not prohibited by law. Separately, IRMA's draft Standard 2.0 expanded the anti-corruption corporate policy requirement and include new reporting requirements.

Employee training requirements and public disclosures including material payments to governments, beneficial ownership, mineral development contracts and political contributions are areas where industry can support government efforts to reduce corruption in alignment with the EITI Standard. Disclosure requirements are uneven across the standards. For instance, the requirement to

disclose political contributions is required by IRMA and ICMM, the Copper Mark requires a company to establish procedures for approval of such payments, and TSM does not require commitments on disclosures. Nonetheless, TSM's Responsible Sourcing Alignment Supplement covers some measures designed to reduce corruption risks for companies that are implementing TSM alongside other international standards. In contrast, IRMA devotes a chapter to financial transparency and anti-corruption, and the Copper Mark revised its standard to effect a zero-tolerance stance on facilitation payments and other corrupt practices.

Although not an industry certification scheme, the EITI Standard is a global benchmark aimed to foster transparency and accountability in extractive industries. For example, in collaboration with Open Ownership, the EITI is actively working to deepen beneficial ownership transparency through an initiative called Opening Extractives. Furthermore, all EITI implementing countries are required to publish details of new contracts with private companies, providing an additional tool to fight corruption in the extractive sector.

# Existing policies

## Financial transparency regulations can enhance accountability in extractive industry supply chains

The IGF Framework and the EITI Standard recommend that governments adopt financial transparency principles that can help to reduce corruption risks. Both advise governments to manage and distribute financial benefits transparently and to comprehensively disclose fiscal charges paid by mining entities, distribution of revenues and subnational transfers, and rules and processes governing the financial relationship with state-owned enterprises. Both the IGF Framework and the EITI Standard call for transparent and consistently applied mining policies and permitting processes, specifically promoting disclosure and public access to mineral agreements.

As laid out in the IGF Framework and the EITI Standard, financial transparency policies covering beneficial ownership transparency, contract publication and government payments disclosure can play a crucial role in curbing corruption risks across critical mineral supply chains. For example, the United Kingdom's Companies Act requires companies to maintain a register of People with Significant Control. Established in 2016 and continuously refined, the register has effectively disrupted and deterred criminal and corrupt practices through its beneficial ownership transparency rules. In October 2023, the United Kingdom enacted the Economic Crime and Corporate Transparency Act, which is a significant development aligning the country's legislative framework with international standards in financial regulation and anti-money laundering.

In order to be effective, these transparency regulations must be broadly applied and enforced. Indonesia, for example, has established a similar beneficial ownership information register that at least theoretically could provide a similar level of transparency to what is seen in the United Kingdom and Europe. However, in practice, relatively few companies appear to be complying, underscoring the need for robust enforcement.

The EITI has been a key driver in assisting emerging and developing economies in increasing transparency. Malawi, which is an EITI implementing country, will soon introduce a regulatory framework for the extractive sector to ensure disclosure of natural resource contracts and beneficial owners. It aims to support meaningful public oversight and identify loose ends and loopholes that can be tightened to ensure responsible natural resource governance, expenditure, and social and environmental governance. Moreover, Malawi aims to create a sovereign fund with clear and transparent rules of deposits and withdrawals to ensure that proceeds from mineral wealth are invested in public goods.

The Extractive Sector Transparency Measures Act (ESTMA) in Canada and the Dodd-Frank Act's Section 1504 in the United States exemplify regulations for public disclosure of payments to governments by extractive companies. ESTMA requires businesses involved in the commercial development of oil, gas and minerals to publicly report certain types of payments annually. This includes social payments made in exchange for no opposition to a project as well as non-cash contributions to domestic and foreign governments. The total payment value of reported projects on ESTMA as of publication is over CAD 700 billion (Canadian dollars) (around USD 520 billion). The Dodd-Frank Act similarly obliges resource extraction companies to disclose payments to governments, including those made by their subsidiaries or controlled entities. Data and reporting for both laws are published online – the ESTMA Data Portal is published by the government, while the Dodd-Frank Act requires the reporting company to publish the information online in an interactive data format and with detailed category tags.

Another important element in preventing corruption is ensuring adequate protections for the victims of corruption while bolstering the rights and activities of civil society, journalists, whistleblowers, and other anti-corruption actors, who are pivotal in investigating wrongdoing, holding entities accountable and advocating for reform, yet often face resource constraints and threats. The US Presidential Initiative for Democratic Renewal commits funding to reinforce democracy and human rights on an international scale. It supports global independent media through a fund and accelerator, and establishes protective measures for journalists. Concurrently, the initiative targets international corruption through the Empowering Anti-Corruption Change Agents Program.

**Recommendations**

- **Ensuring robust regulatory regimes**. Incorporate transparency principles based on the EITI Standard within regulatory frameworks and ensure that they are effectively enforced, including provisions requiring companies to disclose beneficial ownership, publish contracts and licences, and disclose payments to governments. Consumer countries can also ensure that anti-corruption and anti-bribery laws are strictly enforced.
- **Directed public spending**. Encourage companies to identify and address corruption risks by tying public funding or procurement decisions to data reporting on corruption metrics and public disclosure requirements. Provide technical assistance and capacity building to emerging and developing economies to improve transparency requirements and enforcement.
- **Tracking and monitoring performance**. Support the alignment of data collected and reported on, including by developing recommendations for measures to assess corruption risks.
- **Making supply chains more transparent**. Improve transparency across the supply chain through regulations or guidance that encourage or require companies to embed corruption in due diligence systems for all minerals supply chains, in line with relevant OECD guidance.
- **Support for voluntary sustainability standards**. Encourage credible voluntary sustainability standards to incorporate anti-corruption measures and improvements in governance practices and data reporting, in line with a risk-based approach.

# Annex

## Abbreviations and acronyms

| | |
|---|---|
| ASM | artisanal and small-scale mining |
| BGR | Institute for Geosciences and Natural Resources |
| BSGR | BSG Resources |
| CAD | Canadian dollars |
| CBAM | Carbon Border Adjustment Mechanism |
| CMWP | Working Party on Critical Minerals |
| $CO_2$-eq | carbon dioxide equivalent |
| COP | Conference of the Parties |
| CSRD | Corporate Sustainability Reporting Directive |
| DRC | Democratic Republic of Congo |
| EGPS | Extractives Global Programmatic Support |
| EIA | environmental impact assessment |
| EITI | Extractive Industries Transparency Initiative |
| EPA | Environmental Protection Agency |
| ERGI | Energy Resource Governance Initiative |
| ESTMA | Extractive Sector Transparency Measures Act |
| FPIC | free, prior and informed consent |
| GHG | greenhouse gas |
| GHGRP | Greenhouse Gas Reporting Program |
| GRI | Global Reporting Initiative |
| ICMM | International Council on Mining & Metals |
| IEA | International Energy Agency |
| IFC | International Finance Corporation |
| IGF | Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development |
| IPCC | Intergovernmental Panel on Climate Change |
| IRMA | Initiative for Responsible Mining Assurance |
| IUCN | International Union for Conservation of Nature |
| KBA | Key Biodiversity Area |
| LCA | Local Co-operation Agreement |
| MAC | Mining Association of Canada |
| NAP | National Action Plan |
| NRGI | Natural Resources Governance Institute |
| NZE Scenario | Net Zero Emissions by 2050 Scenario |
| SDFR | Sustainable Finance Disclosure Regulation |
| SGMA | Sustainable Groundwater Management Act |
| TSM | Mining Association of Canada's Towards Sustainable Mining |
| UNCBD | United Nations Convention on Biological Diversity |
| UNDRIP | United Nations Declaration on the Rights of Indigenous Peoples |
| UNGPs | United Nations Guiding Principles on Business and Human Rights |
| USD | United States dollar |

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Typeset in France by IEA - December 2023
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