Extractive Industries
Transparency Initiative

Mission critical

Strengthening governance of mineral value chains for the energy transition

REPORT

Sustainable Minerals Institute

This study, commissioned by the Extractive Industries Transparency Initiative (EITI) and funded by the USAID programme, was undertaken by The University of Queensland.

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Abbreviations

3Ts – Tantalum, tin and tungsten associated with conflict-affected and high-risk areas

AMD – Acid mine drainage

ASEAN – Association of Southeast Asian Nations

ASI – Aluminium Stewardship Initiative

ASM – Artisanal and small-scale mining

BEPS – Base erosion and profit shifting

CSO – Civil society organisation

CRIRSCO – Committee for Mineral Reserves International Reporting Standards

DRC – Democratic Republic of the Congo

EITI – Extractive Industries Transparency Initiative

ESG – Environmental, social and governance

ETM – Energy transition mineral

EU – European Union

EV – Electric vehicle

E-waste – Electronic waste

FPIC – Free, prior and informed consent

GRI – Global Reporting Initiative

IA – Impact assessment

ICP – Informed consultation and participation

IDB – Inter-American Development Bank

IEA – International Energy Agency

IPAF – Indigenous Peoples Advisory Forum

IRMA – Initiative for Responsible Mining Assurance

LME – London Metal Exchange

MNE – Multinational enterprise

MSG – Multi-stakeholder group

OECD – Organisation for Economic Co-operation and Development

PEP – Politically exposed person

PNG – Papua New Guinea

RMI – Responsible Minerals Initiative

SOE – State-owned enterprise

Solar PV – Solar photovoltaics

UK – United Kingdom

UN – United Nations

US – United States

USGS – United States Geological Survey

Foreword

RECENT GEOPOLITICAL EVENTS have had profound implications for energy markets, highlighting the urgent need to find new pathways to improve energy security, broaden energy access and accelerate the transition to renewable energy sources.

Mineral resources are essential components of the energy transition, and demand for transition minerals such as lithium, graphite, cobalt and nickel is already increasing. Commodity markets, however, are rarely predictable, and producers and consumers of transition minerals alike will be faced with uncertain and volatile market conditions as renewable energy technologies evolve. The boom-and-bust nature of demand creates an imperative for strengthening governance of mineral value chains, to ensure that the means of production are consistent with the ends to which minerals are used for the benefit of people and the planet.

The research in this report has identified governance risks at a subnational, national, transnational and global level which are exacerbated by current trends in the demand for critical minerals. Many of these risks, such as potential shortcuts in consultation processes, encroachment into conservation areas and the depletion of water resources, will be hardest felt by the most vulnerable communities in regions rich in these minerals. At a national level, price volatility may lead to unpredictable revenue flows, posing challenges to sound economic planning. Strong export demand may reduce incentives for value addition and beneficiation. In transnational supply chains, there are risks of increased smuggling or illicit mineral flows and corruption, where governance risks ultimately disrupt supply of the minerals needed for low-carbon energy technologies. Yet, balancing these risks are opportunities – to attract investment, increase local procurement, improve employment and livelihoods, and address the needs of local communities.

Many of the largest producers and potential producers of critical minerals already implement the EITI Standard and are taking measures to strengthen governance and improve transparency, accountability and multi-stakeholder dialogue. This report presents recommendations to strengthen these approaches, and to move beyond them by deepening international and regional cooperation to ensure that transition minerals contribute to a just energy transition.

Such actions would be timely. They are particularly necessary given the fragmented and geographically dispersed nature of critical mineral value chains, with multiple countries and companies specialising in different steps in the global supply process. Without greater awareness, collaboration and action, the outlook for global energy markets may remain volatile and uncertain, and our ability to reach global sustainable development goals will be impeded. The EITI looks forward to contributing to this growing debate, and to strengthening multi-stakeholder collaboration to secure a more certain energy future.

Rt Hon. Helen Clark
EITI Board Chair

Executive summary

DECARBONISATION of the energy sector in a bid to limit climate change is driving demand for a range of minerals, including cobalt, graphite, lithium, nickel and rare earth elements. Demand is escalating because the technologies underpinning the energy transition, such as wind turbines, solar panels and electric vehicles, are dependent on reliable and sustainable supplies of these minerals.

The energy transition offers sustainable development opportunities for resource-rich countries through mining investment, mineral production and value addition. The rush to supply minerals deemed essential to energy access and transition, however, increases tension between the rights of stakeholders in minerals-producing countries and the needs of global society. Governance and corruption risks in transition mineral value chains could negatively impact mining host communities, host governments and mining companies, as well as midstream and downstream businesses, consumers and governments sourcing minerals. Ultimately, the success of the energy transition is threatened by a lack of transparency and accountability around transition minerals production, commodity trades and financial flows.

Global standards like the EITI endorse the principle that the means of minerals production should be consistent with the ends to which minerals are used to benefit people and the planet. The EITI has set the global standard for resource governance for 20 years, bringing together governments, industry and civil society to promote greater transparency, accountability and public participation in the mining, oil and gas sectors. It now has an important role to play in supporting a just energy transition.

This study, commissioned by the EITI, provides an overview of global value chains of selected transition minerals and highlights the relationship between global energy transition objectives and the need for stronger minerals sector governance. It demonstrates that EITI implementing countries account for a substantial share of transition minerals mining. Meanwhile China and several other non-EITI implementing countries dominate processing and final product manufacturing. The fragmented and geographically dispersed nature of transition mineral value chains, with multiple countries and companies specialising in different steps, creates challenges for effective resource governance. The report identifies four risk areas in the value chains of transition minerals and provides recommendations on how to mitigate risks through policy actions, advocacy, analysis and partnerships.

Governance opportunities and risks

Increased demand for transition minerals is bringing about risks for diverse stakeholders which, if not addressed, could hinder the sector's contribution to sustainable development and inhibit the fight against climate change. Spanning across global, transnational, national and subnational levels of mineral governance, these risks are manifold, ranging from environmental impacts and corrupt deals to price shocks and disruptions in global supply chains (see Figure 1).

Yet there are numerous opportunities to address these risks. In resource-rich countries, there is an opportunity to improve governance frameworks and transparency to attract investment in the extraction and beneficiation of transition minerals. This can in turn promote local procurement, employment and livelihoods linked to mining, social investment and community-led development. There is also an opportunity for industry to collaborate in the development of value chains from mining to the manufacturing and deployment of energy transition technologies.

For governments and consumers in countries importing transition minerals, there is an opportunity for more responsible and reliable sourcing through regulation and open data initiatives. There is also an opportunity for companies in transition mineral value chains to use voluntary standards to certify their environmental, social and governance (ESG) performance and meet their supplier due diligence requirements. At the global level, there is an opportunity for greater international and regional cooperation to ensure that transition minerals contribute to a just energy transition.

The rush to supply minerals for the energy transition increases tension between the rights of stakeholders in minerals-producing countries and the needs of global society

FIGURE 1

Governance risks across subnational, national, transnational and global levels

SUBNATIONAL

Governance risks for local stakeholders

- More exploration and mining for transition minerals may encroach on conservation areas and Indigenous and land-connected peoples' territories.
- Pressure to approve mining projects may limit time for community consultations and impact assessments.
- Water-intensive mining methods may contribute to water scarcity and could have adverse impacts on communities, especially on women and girls.
- Rising commodity prices may trigger more unregulated or illegal artisanal and small-scale mining (ASM).
- Local government capacity constraints in remote regions may hinder effective planning for sustainable development outcomes.

NATIONAL

Governance risks for mineral-rich countries

- Lack of robust, public geological data may hinder competition in the development of transition minerals.
- Regulation may lag behind developments in the market for transition minerals, causing governance gaps.
- Fast-tracking contracts and licenses may increase corruption risks.
- Local content policies and state participation may enable favouritism and corruption.
- Opaque tax structuring across transition mineral value chains may result in lost revenue for governments.
- Price volatility may lead to unpredictable revenue flows and macroeconomic planning challenges.
- Export-oriented mining policies may fail to realise potential for mineral beneficiation and value addition.
- Rushed public procurement for low carbon energy and transport infrastructure may open new channels for corruption.

TRANSNATIONAL

Governance risks across transition mineral value chains

- Rising mineral prices may drive smuggling and other illegal activities.
- Smelters and refineries may be unable to meet ESG standards due to production pressure and soaring energy costs.
- Commodity trading deals increasingly involving state-owned enterprises (SOEs) may be at heightened risk of corruption.
- Tightened due diligence regulations may disadvantage “high-risk” producer countries.

GLOBAL

Governance risks to the energy transition

- Governance weaknesses may disrupt the supply of transition minerals needed for low-carbon energy technologies.
- Transition mineral strategies may lead to a “decarbonisation divide” between mineral producer and consumer countries.
- Geopolitical rivalries may weaken cooperation on the energy transition.

Overview of recommendations

With the stakes high in the rapidly changing market for transition minerals, governments, companies and civil society must act now to strengthen mineral sector governance. Transparency, accountability and multi-stakeholder dialogue are needed across the value chains of transition minerals to maximise opportunities and mitigate risks. For more detailed recommendations, see Section 4.

RECOMMENDATIONS TO GOVERNMENTS

Countries producing transition minerals

- Explicitly address governance and corruption risks in transition mineral strategies.
- Require more detailed public reporting of transition mineral reserves.
- Provide clear justifications for the use of "fast-tracked" license awards processes.
- Ensure sufficient time and resources are allocated to conducting due diligence checks in awards processes.
- Build up an understanding of the revenue potential of the transition minerals sector and adopt policies to support effective long-term economic planning. For example, consider using a sliding royalty, for which the rate changes with respect to a change in commodity price.

Countries importing transition minerals

- Ensure trade agreements on transition minerals balance the interests of producers and importers.
- Build strategic partnerships with producing countries that promote transparency and governance reforms in the mining sector.
- Ensure that responsible sourcing laws and regulations include strong governance safeguards.

RECOMMENDATIONS TO COMPANIES

All companies in transition mineral value chains

- Integrate governance risk assessment and business integrity principles across all business units.
- Commit to transparency on revenue flows and financial relationships between upstream and downstream companies along the value chain.

Mining companies

- Engage early and often in community consultations to build trust in transition minerals projects, including before entering offtake agreements with downstream companies.

- Partner with civil society organisations (CSOs) to support capacity building and financial management training for local government and communities to self-govern mining revenues and corporate social investment effectively.

Downstream companies

- Ensure corruption and governance safeguards are properly considered in supply chain due diligence processes.

RECOMMENDATIONS TO CIVIL SOCIETY

- Disseminate EITI disclosures to local communities to inform them of governance risks and opportunities in the transition minerals sector.

- Analyse mining contracts to check whether any deals deviate from industry norms, give unduly favourable treatment to companies or have insufficient ESG safeguards.

- Analyse production and revenue disclosures to identify corruption risks and potential revenue losses.

RECOMMENDATIONS TO EITI MULTI-STAKEHOLDER GROUPS

- Review awards processes to check for corruption risks, especially when “fast-tracked” procedures are used.

- Require more in-depth reporting on state participation.

- Support more timely data disclosures to ensure reporting remains relevant in the rapidly evolving transition minerals sector.

- Include midstream and downstream companies in multi-stakeholder groups (MSGs).

RECOMMENDATIONS TO THE EITI INTERNATIONAL SECRETARIAT AND THE EITI BOARD

- Engage with other sustainability standards and supply chain due diligence initiatives to strengthen alignment in approaches and to ensure governance challenges are given due consideration.

- Engage with key stakeholders working on climate policy to ensure the importance of mineral governance to the success of the energy transition is better understood.

1. Introduction

1.1 Global context

The urgent climate agenda to shift energy consumption and transportation away from fossil fuels is escalating demand for transition minerals.[1] The technologies underpinning the energy transition, such as wind turbines, solar panels and electric vehicles, rely heavily on minerals such as cobalt, graphite, lithium, nickel and rare earth elements. Reliable and sustainable supplies of these minerals for the energy transition could be enhanced by more effective governance at every stage of the value chain.

The success of the energy transition is threatened by a lack of transparency and accountability around transition minerals production, commodity trades and financial flows

Weak governance and corruption present major challenges for resource-rich countries and increase tension between the rights of local communities and the needs of global society. Ultimately, the success of the energy transition itself is threatened by a lack of transparency and accountability around transition minerals production, commodity trades and financial flows.

The EITI has set the global standard for resource governance for 20 years, bringing together governments, industry and civil society to promote greater transparency, accountability and public participation in the minerals and energy sectors. There is a clear message that global standards like the EITI bring to the climate agenda: that the means of minerals production should be consistent with the ends to which they are used to benefit people and the planet. The EITI Principles place citizens at the heart of resource governance, sharing a belief that "the prudent use of natural resource wealth… contributes to sustainable development and poverty reduction" and upholding "the principle and practice of accountability by government to all citizens for the stewardship of revenues and expenditure".[2] The EITI has an urgent role to play in supporting efforts to ensure a just energy transition.

If growing mining investment, mineral production and supply is well governed, it offers new opportunities for sustainable development of resource-rich regions, as well as for midstream and downstream industrial hubs. Getting this right is important, as it can significantly increase the prospects of successfully fighting climate change. EITI implementing countries have an opportunity to do better for their citizens – and for global society – by strengthening their governance of the production, transformation and sourcing of transition minerals. Managing risks across every stage in the life of mining and across mineral value chains requires robust regulation, strong institutions and multi-stakeholder collaboration.

1.2 Research aims and methods

The aims of this study are to:

1. Provide an overview of global value chains for transition minerals from production to end use, and build an understanding of the relationship between global energy transition objectives and growing minerals demand.

2. Identify key governance risks and opportunities in mineral value chains, and explain how demand related to the energy transition could reshape these dynamics.

1 Most of the minerals required for the energy transition are metals, with exceptions such as graphite. The term "minerals" is used throughout this report to refer to both metallic and non-metallic minerals.

2 EITI (2003), The EITI Principles. Retrieved from www.eiti.org/documents/eiti-principles.

3. Develop recommendations for how stakeholders in government, business and civil society could strengthen governance of transition mineral value chains and contribute towards a just energy transition.

The study draws on four sources of information and diverse perspectives on resource governance and the energy transition. First, a review of literature, including academic writing and specialist mining industry news sources, informed all sections of the report. Second, the mapping of global trends in relation to transition mineral value chains (Section 1 and Appendix 3) and governance risks (Section 2) draws on data extracted from publicly available databases of mineral reserves, production, trade statistics and governance indices.

Third, governance risks and opportunities (Section 2) were identified through qualitative interviews with a range of experts working in government, the private sector, CSOs and academia. A total of 32 key informants – 17 women and 15 men – participated in interviews conducted in English, French, Russian and Spanish. The semi-structured interviews were conducted from June to July 2022 in accordance with the University of Queensland's human ethics research protocol (Approval no. 2020/HE002457). The interviews ranged from 40-90 minutes in duration. A list of interviewees' organisations is provided in Appendix 1.

Finally, Section 3 draws on the primary documents of relevant minerals standards and initiatives, including the EITI Standard, for a comparative analysis of governance reporting requirements and alignment.

1.3 Definition of transition minerals

This study uses the term "transition minerals" to refer to minerals that serve an essential function in the transition from fossil fuels to low-carbon energy sources and transportation. These are sometimes also called "green minerals", "energy transition minerals" (ETMs), "strategic minerals" or "critical minerals".

The commonly used term "critical minerals" emphasises the essential and irreplaceable role that these minerals play in national security, economic efficiency and energy security. Criticality of minerals is also defined by supply chain vulnerabilities when there is a concentration of mineral production or processing in a limited number of countries.

In the current geopolitical context, national security concerns and economic interests are conveyed in the lists of critical minerals (or materials) recently issued by the **United States (US)**[3] and the **European Union**[4], as well as **Australia**[5] and **Japan**.[6]

3 U.S. Geological Survey (2022), 2022 Final List of Critical Minerals. Retrieved from https://www.federalregister.gov/documents/2022/02/24/2022-04027/2022-final-list-of-critical-minerals.

4 European Commission (2020), Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0474.

5 Australian Government, Department for Industry, Science and Resources (2022), Critical Minerals Strategy. Retrieved from https://www.industry.gov.au/sites/default/files/March%202022/document/2022-critical-minerals-strategy.pdf.

6 Agency for Natural Resources and Energy (2020), Japan's new international resource strategy to secure rare metals. Retrieved from https://www.enecho.meti.go.jp/en/category/special/article/detail_158.html; Nakano, J. (2021), *The Geopolitics of Critical Minerals Supply Chains,* report prepared for the Center for Strategic and International Studies, report prepared for Center for Strategic & International Studies. Retrieved from https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/210311_Nakano_Critical_Minerals.pdf?DR03x5jlrwLnNjmPDD3SZjEkGEZFEcgt.

These lists[7] include many minerals needed for the energy transition (such as cobalt and lithium); however, they usually exclude ETMs with lower levels of supply chain risks (such as copper and aluminium).

For the purposes of this report, the term “transition minerals” is therefore more precise than “critical minerals”, and avoids contention over why certain minerals are deemed “critical” (see further discussion in the national governance risks presented in Section 2).[8]

A range of transition minerals is essential for low-carbon energy generation, transport and storage. They are used in the manufacturing and operation of solar panels, wind turbines, electric vehicles (EVs), batteries, electricity transmission networks, hydrogen electrolysers and fuel cells, nuclear energy and hydro-electric power infrastructure. Each mineral has specific characteristics that define its role in these technologies and infrastructure. Figure 2 provides a summary of the use of a selection of minerals in energy transition technologies, with further detail on each provided in Appendix 3.

1.4 Key trends in demand for transition minerals

Low-carbon power generation and electrification are having a profound impact on the demand for transition minerals. As the global energy transition accelerates, low-carbon energy technologies will experience rapidly growing markets, driving growth in the demand for a range of minerals.

Several assessments exist regarding the future mineral demand from low-carbon energy technologies. Regardless of the methodology underlying these assessments, there is an expectation that the rapid and large-scale deployment of low-carbon energy technologies will result in significant increases in mineral demand. However, there is little agreement on what the exact demand trajectories for specific minerals will be. This is largely due to uncertainties around the energy technologies deployed in the future, the life span of these technologies, and future trends of substitutions, recycling and reuse.

As the global energy transition accelerates, low-carbon energy technologies will experience rapidly growing markets, driving growth in the demand for a range of minerals

7 The latest lists of critical minerals and materials are provided in Appendix 2.

8 Research participant, interviewed 7 July 2022.

FIGURE 2

Transition minerals in energy transition technologies[9]

Relative importance of mineral for specific energy technologies

● Higher ● Lower

Minerals used in one or two technologies

Mineral	Use	EVs and battery storage	Solar	Wind	Nuclear	Hydro	Geothermal	Hydrogen	Electricity networks
Cobalt	Cathodes, battery cells and battery packs	Higher							
Graphite	Anodes in lithium-ion batteries	Higher							
Lithium	Battery cathodes and consumer electronics	Higher							
Rare earth elements	Permanent magnets used in EV motors and wind turbines	Higher		Higher					

Minerals used across a wide range of technologies

Mineral	Use	EVs and battery storage	Solar	Wind	Nuclear	Hydro	Geothermal	Hydrogen	Electricity networks
Bauxite	Aluminium production	Higher	Higher	Lower	Lower				Higher
Copper	Electrical power wiring and transmission, electronics, batteries	Higher	Higher	Higher	Lower	Lower	Lower	Lower	Higher
Chromium	Production of stainless and specialised steel	Lower		Lower	Lower	Lower	Higher		
Manganese	Production of steel and battery-grade compounds	Lower		Higher		Lower	Lower		
Molybdenum	Production of highly specialised corrosion-resistant steel		Lower	Lower	Lower	Lower	Lower		
Nickel	Production of stainless steel and battery cathodes	Higher	Lower	Lower	Lower	Lower	Higher	Higher	
Tantalum	Electronics, superalloys, nuclear reactors, batteries	Lower			Lower				
Tin	Electrical connections and corrosion-resistant iron and steel		Lower		Lower				
Titanium	Corrosion-resistant alloys				Lower	Lower	Lower		
Zinc	Corrosion-resistant steel, batteries	Lower	Lower	Higher	Lower	Lower			

It is important to emphasise that many of these minerals are also used in a variety of other applications. For example, copper is a major base metal used in construction, infrastructure, electronics and transportation. Stainless steel – produced using chromium, manganese, molybdenum, nickel, tantalum, tin, titanium or zinc – is used in many other applications.

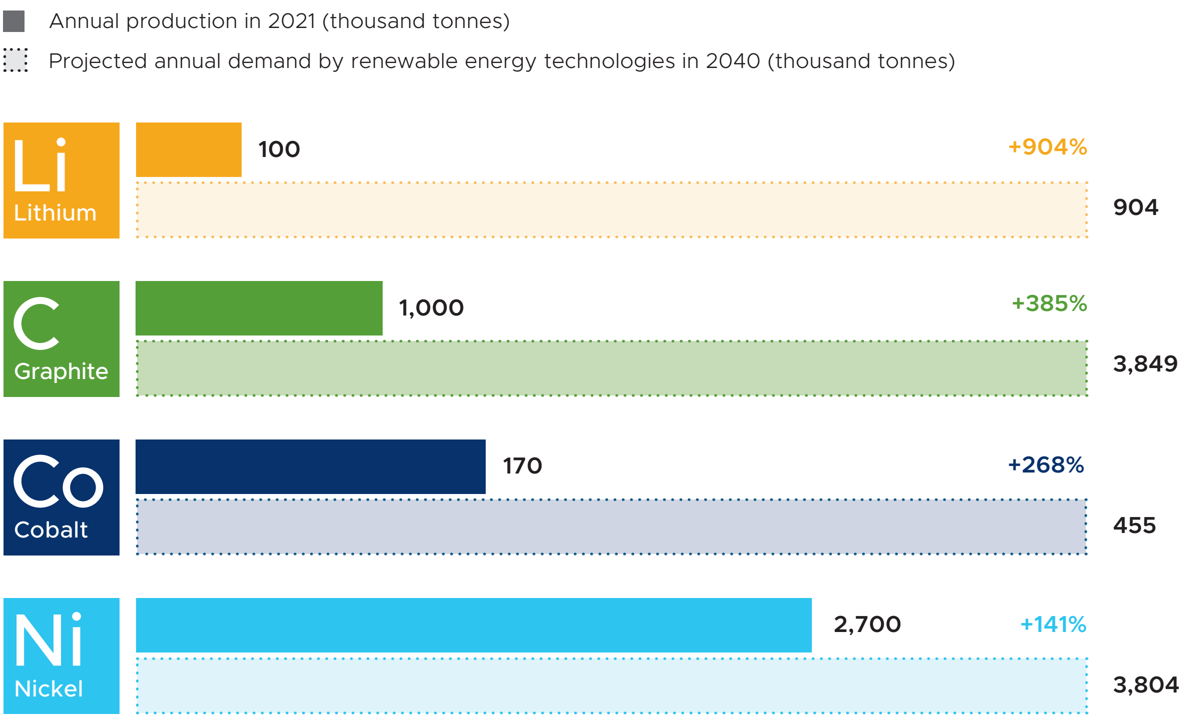
9 Hund, K., La Porta, D., P. Fabregas, T., Laing, T. and Drexhage, J. (2021), *Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition*. World Bank Group. Retrieved from https://pubdocs.worldbank.org/en/961711588875536384/Minerals-for-Climate-Action-The-Mineral-Intensity-of-the-Clean-Energy-Transition.pdf; International Energy Agency (IEA) (2021), *The Role of Critical Minerals in Clean Energy Transitions*. Retrieved from https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions; Gielen, D. (2021), *Critical Materials for the Energy Transition*. International Renewable Energy Agency. Retrieved from https://www.irena.org/Technical-Papers/Critical-Materials-For-The-Energy-Transition.

For minerals that are used across a broad range of technologies – including aluminium, copper, chromium and molybdenum – demand is likely to increase steadily. For minerals that are used in a small range of technologies, such as cobalt, lithium and graphite, future demand is estimated to increase at a particularly fast pace, potentially requiring an increase in current production levels by at least 500% by 2040. The demand for minerals in this latter group is likely to be volatile and unpredictable as technological innovations could change requirements. For example, efforts to replace cobalt with nickel as a cathode in lithium-ion batteries may cause a shortage of battery-grade nickel supplies and an oversupply of cobalt. If such a switch is delayed, demand for cobalt could continue to increase.

There are high uncertainties related to the requirements of future technologies and the pace of decarbonisation.[10] For this and other reasons,[11] producers of these minerals risk overinvesting in their extraction. Companies might be reluctant to invest given these uncertainties. Therefore, any forecasts must be treated with caution.

FIGURE 3

Projected growth in demand from energy technologies by 2040 for major transition minerals



10 Gielen, D., *Critical Materials for the Energy Transition*.

11 Toledano, P., Brauch, M., Kennedy, S. and Mann, H. (2020), *Don't Throw Caution to the Wind: In the Green Energy Transition, Not All Critical Minerals Will Be Goldmines*. Columbia Center on Sustainable Investment. Retrieved from https://scholarship.law.columbia.edu/sustainable_investment_staffpubs/7.

TABLE 1

Demand estimates for selected transition minerals[12]

MINERAL	Annual production in 2021 (thousand tonnes)	Projected annual demand by renewable energy technologies in 2040 (thousand tonnes)	Projected annual demand by renewable energy technologies in relation to current annual production (%)
Lithium (Li)	100	904	904%
Graphite (C)	1,000	3,849	385%
Cobalt (Co)	170	455	268%
Nickel (Ni)	2,700	3,804	141%
Copper (Cu)	21,000	15,147	72%
Molybdenum (Mo)	300	51	17%
Rare earth elements	280	47	17%
Tantalum (Ta)	2	0	13%
Zinc (Zn)	13,000	876	7%
Manganese (Mn)	20,000	664	3%
Chromium (Cr)	41,000	459	1%
Tin (Sn)	300	2	1%
Titanium (Ti)	8,200	14	0%

12 IEA, *The Role of Critical Minerals in Clean Energy Transitions*. Retrieved from https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions; USGS (2022), Mineral Commodity Summaries 2022. Retrieved from https://www.usgs.gov/centers/national-minerals-information-center/commodity-statistics-and-information.

1.5 EITI implementing countries and transition mineral value chains

Global mineral value chains are geographically dispersed and fragmented, with multiple countries and companies specialising in different steps. Mining of transition minerals takes place across many EITI implementing countries; however, **China** and several other non-EITI implementing countries control most of the processing of many transition minerals.

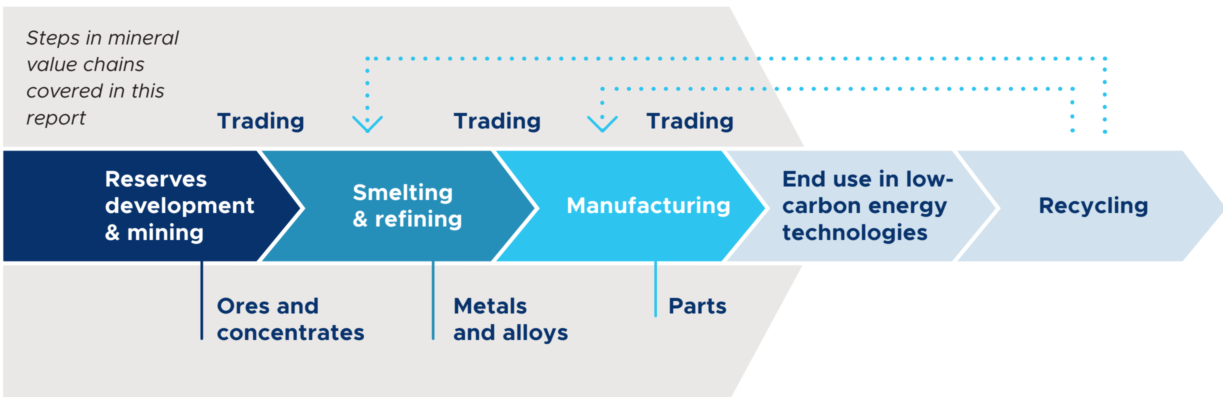
A substantial part of the growing demand for transition minerals will likely be satisfied by EITI implementing countries. There are currently over 50 countries that implement the EITI Standard. An EITI policy brief from May 2022 provides an overview of major transition minerals production (lithium, cobalt, nickel, copper and rare earth elements) in EITI implementing countries.[13] This report focuses on value chains of a broader range of minerals critical to the energy transition: aluminium, chromium, cobalt, copper, graphite, lithium, manganese, molybdenum, nickel, rare earth elements, tantalum, tin, titanium and zinc.

The global value chain represents the different stages and processes a mineral will go through to produce a product. Each transition mineral's value chain has specific characteristics which are detailed in Appendix 3.

Three broad steps are covered in this report (see Figure 4). At the first step, exploration and reserve development takes place through the mining of ores and the concentration of minerals. At the second step, minerals are further processed (smelted or refined) to produce the metals or alloys, which are then, in the third step, used in manufacturing parts needed in end-use, low-carbon energy applications. Other major steps are end-use in low-carbon energy technologies and recycling, which could not be mapped systematically within the scope of this report due to limited time and lack of data.

FIGURE 4

Steps in mineral value chains



13 EITI (2022), *Making the grade: Strengthening the governance of critical minerals*. Retrieved from https://eiti.org/documents/strengthening-governance-critical-minerals.

TERMINOLOGY

MINERAL RESOURCES refer to naturally occurring material that exists in both discovered and undiscovered deposits, the economic extraction of which is currently or potentially feasible.

MINERAL RESERVES are parts of mineral resources that can be economically mined at present.

Reserves and mining

EITI implementing countries hold large shares of identified mineral reserves and resources. Figure 5 provides an overview of the role of EITI implementing countries in global reserves of selected transition minerals. EITI countries account for a relatively high concentration (more than 20%) of bauxite, cobalt, chromium, tin and nickel reserves. The highest concentrations are in the **Democratic Republic of the Congo (DRC)** (cobalt), **Guinea** (bauxite), **Indonesia** (nickel, cobalt, tin) and **Kazakhstan** (chromium). Resources are, in general, less well known for most of the minerals, as they also include undiscovered deposits (see Terminology).

EITI implementing countries also account for significant shares of current mining of selected transition minerals. Figure 6 demonstrates the role of EITI countries in global mine production as of 2021. There is a high concentration of production (more than 20%) in several EITI countries. Countries that stand out are the **DRC** for cobalt and tantalum, **Indonesia** for nickel and tin, and **Kazakhstan** for chromium. ASM makes a significant contribution to the production of some transition minerals. According to existing estimates, almost 40% of the world's refined tin has its origins in ASM,[14] with some of the largest ASM for tin located in the DRC and Indonesia. Between 20% and 40% of cobalt mined in the copper-cobalt belt of the province of Katanga in southern DRC is mined artisanally and on a small scale.[15]

More details on reserves and mining of specific transition minerals in EITI implementing countries are presented in Appendix 3.

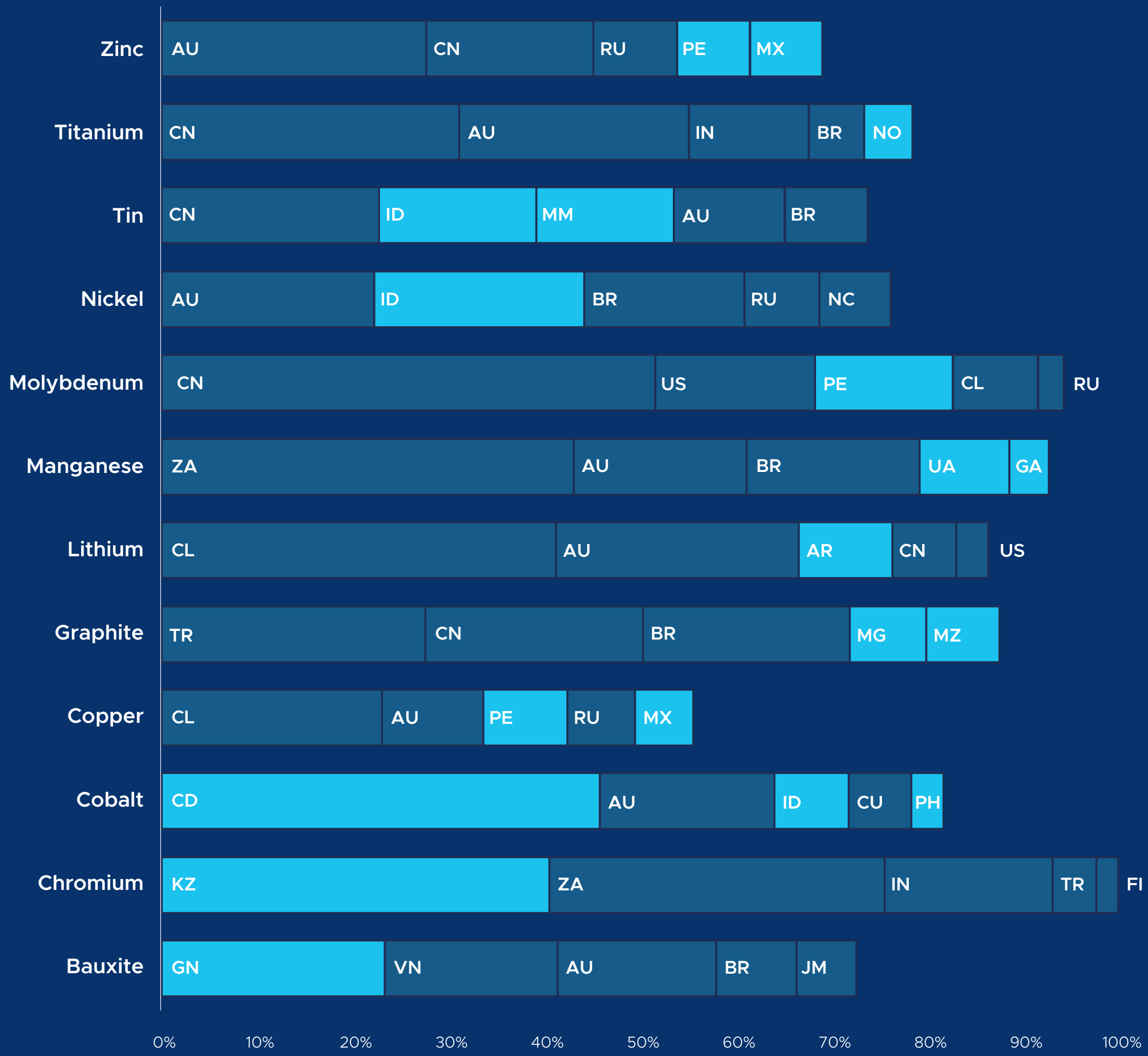
14 International Tin Association (2022), *Artisanal and Small Scale Mining Policy*. Retrieved from https://www.internationaltin.org/wp-content/uploads/2020/02/ITA-ASM-policy-doc-v2_FINAL_EN.pdf.

15 Trafigura (2020), *Report on State of the Artisanal and Small-Scale Mining Sector*. Retrieved from https://www.trafigura.com/brochure/2020-state-of-the-artisanal-and-small-scale-mining-sector/.

FIGURE 5

Percentage of global transition minerals reserves located in EITI implementing countries[16]

EITI implementing country

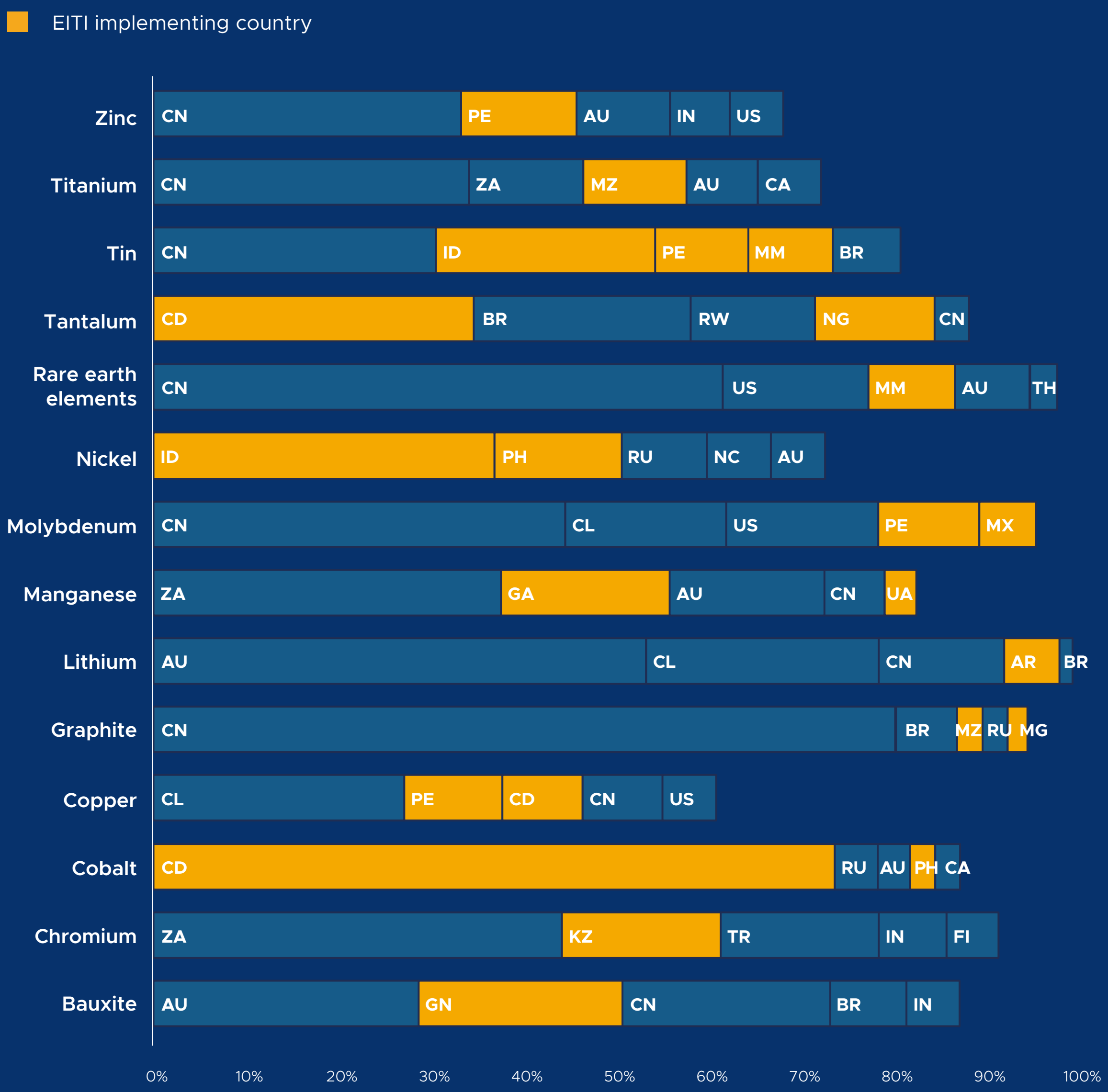


AR ARGENTINA
AU AUSTRALIA
BR BRAZIL
CD DRC
CL CHILE
CN CHINA
CU CUBA
FI FINLAND
GA GABON
GN GUINEA
ID INDONESIA
IN INDIA
JM JAMAICA
KZ KAZAKHSTAN
MG MADAGASCAR
MM MYANMAR
MX MEXICO
MZ MOZAMBIQUE
NC NEW CALEDONIA
NO NORWAY
PE PERU
PH PHILIPPINES
RU RUSSIA
TR TURKEY
UA UKRAINE
US UNITED STATES
VN VIETNAM
ZA SOUTH AFRICA

16 USGS, Mineral Commodity Summaries 2022.

FIGURE 6

Percentage of global transition minerals production originating from EITI implementing countries[17]



AR ARGENTINA
AU AUSTRALIA
BR BRAZIL
CA CANADA
CD DRC
CL CHILE
CN CHINA
FI FINLAND
GA GABON
GN GUINEA
ID INDONESIA
IN INDIA
KZ KAZAKHSTAN
MG MADAGASCAR
MM MYANMAR
MX MEXICO
MZ MOZAMBIQUE
NI NIGERIA
NC NEW CALEDONIA
NO NORWAY
PE PERU
PH PHILIPPINES
RU RUSSIA
RW RWANDA
TH THAILAND
TR TURKEY
UA UKRAINE
US UNITED STATES
ZA SOUTH AFRICA

17 USGS, Mineral Commodity Summaries 2022.

Smelting and refining

Processing of transition minerals can be characterised by high geographic concentration in a small number of countries, mainly dominated by **China**. In 2019, China accounted for 50% to 70% of global refined cobalt and lithium production, 50% of copper smelter production and 90% of global production of rare earths.[18]

For other transition minerals, processing is more geographically varied, with some processing taking place in EITI implementing countries. While China accounts for 35% of refined nickel production, over the last five years **Indonesia** has rapidly increased its nickel refining activities to become the second largest nickel refiner. Some mineral processing takes place in other EITI countries, examples being cobalt smelting in **DRC**, copper smelting in **Zambia**, chromium processing in **Albania** and nickel refining in the **Philippines**.

Appendix 3 provides details on the processing of specific transition minerals. High concentration of processing in a few countries raises geopolitical concerns and risks that could arise from physical disruption or trade restrictions. For more details, see Section 2.4 on global governance risks to the energy transition.

Processing of transition minerals is concentrated in a small number of countries and mainly dominated by China

Manufacturing

Key actors involved in manufacturing low-carbon energy technologies are concentrated in **China**, **Europe** and **North America**. However, industries critical for the energy transition are rapidly evolving, with many countries and companies setting up new facilities to manufacture components for low-carbon energy generation, transmission and storage.

To reduce supply risks, manufacturers see an opportunity to vertically integrate or engage directly with suppliers, thereby bypassing traders. Two major trends can be identified. First, battery or EV manufacturers are seeking equities in mining projects to secure raw materials. Second, battery and EV manufacturers are closing deals with suppliers, directly bypassing traders. See National governance risk 5 in Section 2 for the implications of this trend.

18 IEA, *The Role of Critical Minerals in Clean Energy Transitions*; USGS, Mineral Commodity Summaries 2022.

FIGURE 7

Top countries manufacturing energy transition technologies

SOLAR PANELS manufacturing is concentrated in China (about 70%), followed by Vietnam (8%), South Korea (5%), Malaysia (4%) and the US (3%). Among the 10 largest solar panel manufacturers, eight are based in China, one in the US and one in South Korea.

WIND TURBINE manufacturing is characterised by a high complexity of its major segments, including production of blades, bearings, gearboxes, generators, castings and towers with different levels of concentration, fragmentation and outsourcing. The 10 largest manufacturers of wind turbines are based in China, Denmark, Germany, Spain, and the US, with key manufacturing sites in Brazil, China, India and the US.

EV BATTERY (lithium-ion) manufacturing is dominated by China (about 80%), followed by the US (6%), Hungary (4%), Poland (3%), South Korea (2.5%) and Japan (2.4%). The top 10 manufacturers are based in China, Japan and South Korea.

PRODUCTION OF ELECTRIC CARS is concentrated in China (44%), followed by Europe (25%) and the US (18%). The top 10 manufacturers are located in China, France, Germany, Japan and the US.

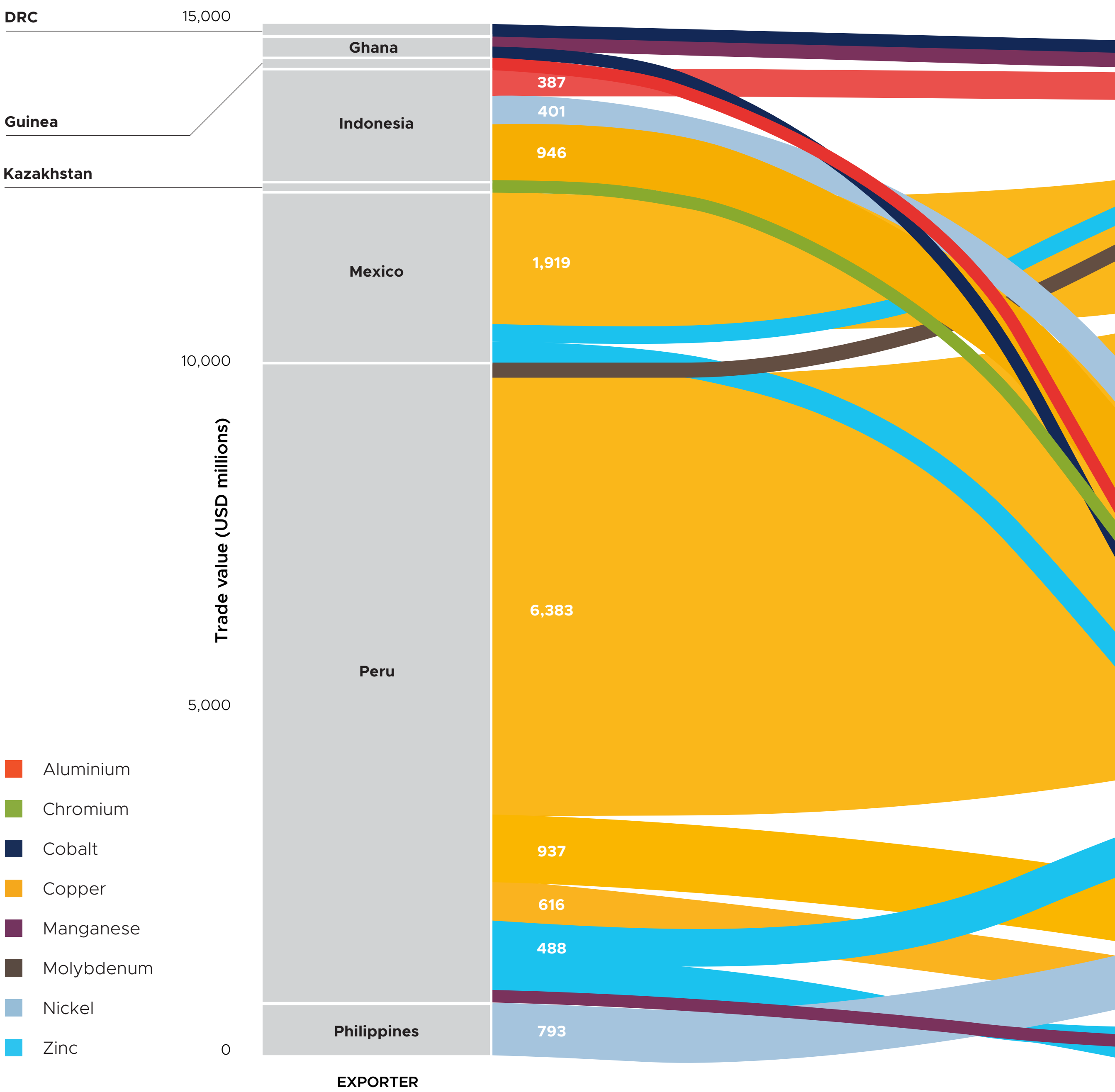
Trade

Exports of transition minerals from EITI implementing countries are mainly in the form of unprocessed ore and concentrates. Figure 8 shows the value of trade flows as reported by EITI implementing countries for selected minerals. In monetary terms, mineral exports from EITI countries are dominated by copper ores and concentrates from **Indonesia**, **Mexico** and **Peru**, followed by ores and concentrates of nickel and aluminium from the **Philippines** and **Indonesia**. The largest importer of mineral ores and concentrates from EITI implementing countries is **China**, followed by **Japan**, **South Korea** and **Spain**.

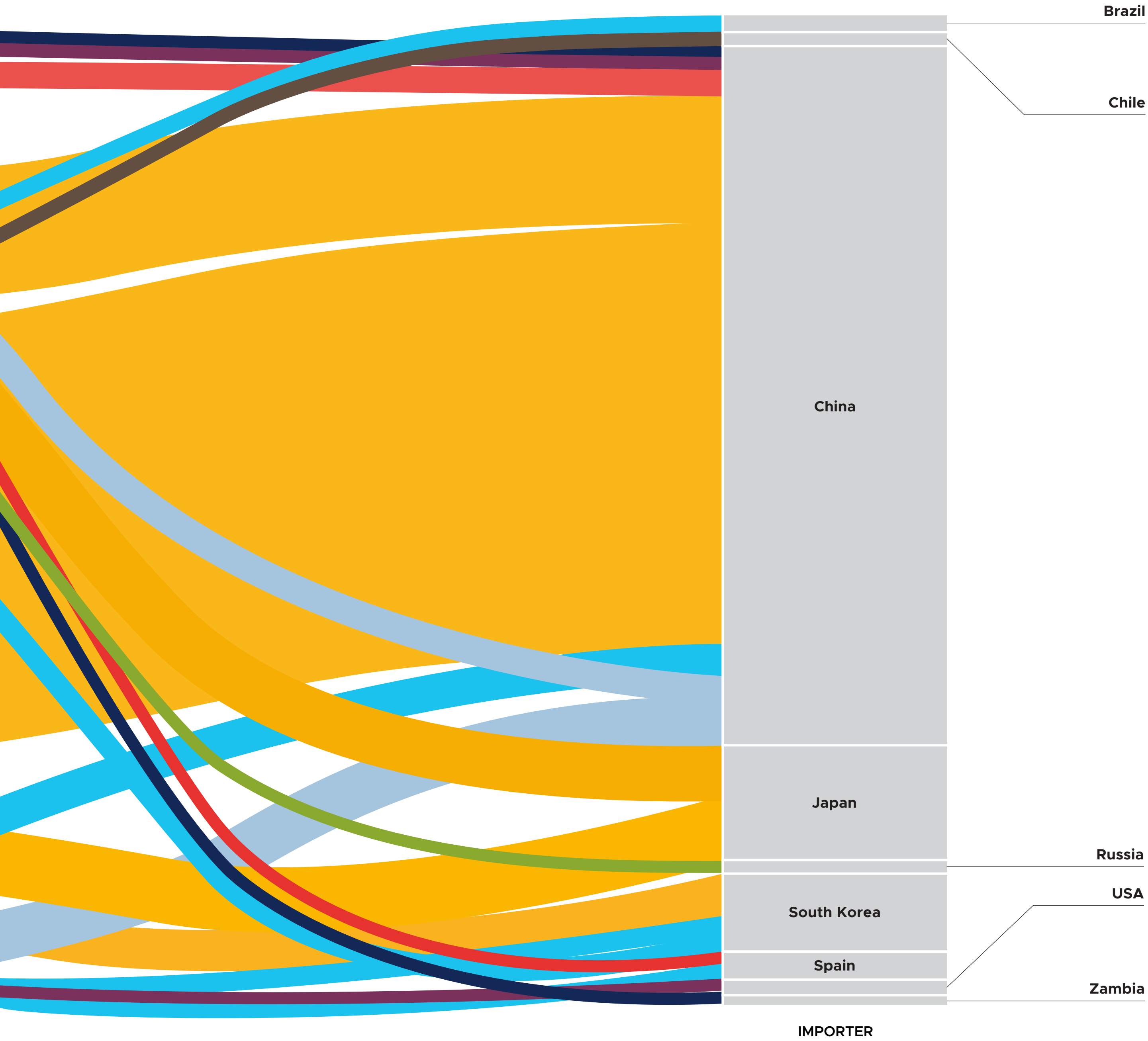
FIGURE 8

Transition mineral trade flows of exports from EITI implementing countries to importing countries[19]

Average trade value between 2015 and 2021 for top 20 trade flows from EITI implementing countries (USD millions)



19 UN Comtrade (2022), International Trade Statistics Database. Retrieved from https://comtrade.un.org/.


Brazil
Chile
China
Japan
Russia
USA
South Korea
Spain
Zambia
IMPORTER

Trade in transition minerals is subject to export restrictions and bottlenecks. In recent years, export restrictions have been introduced by governments seeking to encourage the creation of higher-value downstream processing (for example, Indonesian government export restrictions on unprocessed nickel, tin, bauxite and copper). Moreover, COVID-19 has exposed numerous supply bottlenecks and risks as mines, refineries and ports put on hold and delayed their operations.

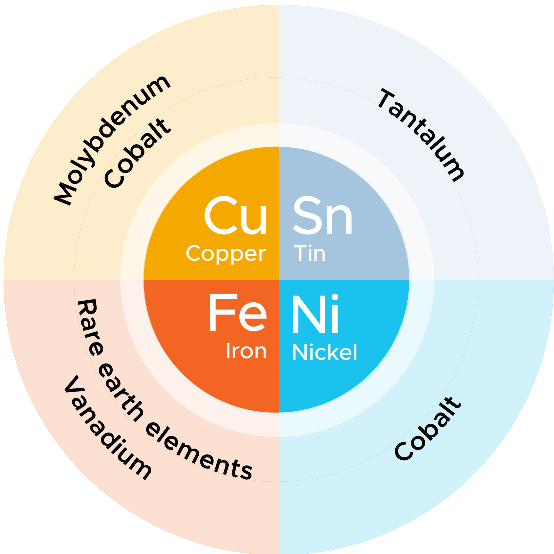
1.6 Limitations: Uncertainties and data gaps

EITI implementing countries report extensive information about mining activity in their jurisdictions. When understanding and quantifying transition mineral supply, it is important to recognise inherent uncertainties and data gaps in reported resources, reserves, production and trade volumes.[20]

One major source of uncertainty is that many transition minerals are by-products of main economic minerals (see Figure 9).[21] Cobalt is primarily a by-product of copper and nickel mining, but it is not recovered by all mines. Under favourable economic conditions, by-products such as cobalt can be extracted at refineries. However, by-products are often not accounted for in resource and reserve estimates nor recorded in mine production volumes, and they can have smelter or refinery production that is unquantified. Therefore, there are significant data gaps for these metals.

FIGURE 9

Major industrial metals and their by-product metals[22]



20 Northey, S., Mudd, G. and Werner T. (2018), Unresolved complexity in assessments of mineral resource depletion and availability. *Natural Resources Research*, 27(2), 241-255. https://doi.org/10.1007/s11053-017-9352-5.

21 McNulty, B.A. and Jowitt, S.M. (2021), Barriers to and uncertainties in understanding and quantifying global critical mineral and element supply. *iScience*, 24(7), 102809. https://doi.org/10.1016/j.isci.2021.102809.

22 Ibid.

TERMINOLOGY

MAIN PRODUCTS form the primary source of revenue of a given mining operation.

CO-PRODUCTS are minerals that are only feasible to be mined collectively.

BY-PRODUCTS are incidental products recovered during smelting, refining and other processes to extract main- or co-products.

Uncertainties exist in available geological information. Some countries have substantial geological information repositories that may be restricted or difficult to access. Other countries lack basic geological information, or they are poorly mapped. Moreover, the estimation of reserves and resources is dynamic and can change significantly as geological knowledge grows from successive exploration programmes and as commodity prices fluctuate.

Another data gap exists in the production and trade associated with ASM. Reporting generally does not include information on unreported, unregistered and illegal mineral production, despite the large role they play in some global value chains. For example, production and trade of cobalt and tin contain large proportions of unaccounted mineral supply.[23] The EITI Standard requires countries to estimate ASM production figures, which helps to shed light on its scale in national contexts. However, most of this reporting focuses on ASM for gold and gemstones, rather than transition minerals.

Finally, there is a significant gap in knowledge relating to the levels of recovery of minerals from waste streams and abandoned mines. As new technologies emerge and are being adopted at mine sites and refineries, enhanced recovery of minerals could help to reduce some uncertainty around production and supply volumes.

23 Global Witness (2022), *The ITSCI laundromat*. Retrieved from https://www.globalwitness.org/en/campaigns/natural-resource-governance/itsci-laundromat/.

2. Governance risks and opportunities in transition mineral value chains

INCREASED DEMAND FOR MINERALS needed in the energy transition is creating governance risks and opportunities for diverse stakeholders. This section identifies governance risks and opportunities across subnational, national, transnational and global levels of analysis.

SUBNATIONAL: Governance risks at the subnational level affect Indigenous peoples, mining communities, artisanal and small-scale miners, mining companies, local businesses, farmers, community-based organisations and local government. If mining is well governed and integrated into the local and regional economy, there are opportunities for local procurement, employment and livelihoods linked to mining, social investment and community-led development. Poor governance exacerbates risks of adverse impacts, including loss of natural habitat, contamination and loss of land and water access, as well as negative impacts to the livelihoods, health and wellbeing of local people.

NATIONAL: At the national level, the production, processing, export and use of transition minerals can be a driver of economic growth, energy access and sustainable development.[24] There is also an opportunity for industry to support the development of value chains from mining to manufacturing and renewable energy infrastructure. Without effective governance, however, countries face the risk of revenue losses, investment impediments and corruption.

TRANSNATIONAL: Impacted stakeholders at the transnational level include upstream, midstream and downstream companies; governments sourcing transition minerals; and consumers. There is an opportunity for companies to use sustainability standards to certify their ESG performance and meet their supplier due diligence requirements. Overlooking these measures can result in legal, commercial and reputational risks. For governments and consumers in countries importing transition minerals for their own energy access, better governance of mineral value chains is critical for more responsible and reliable sourcing.

GLOBAL: Governance risks at the global level affect all stakeholders in the energy transition. These include disruption to the supply of transition minerals, geopolitical conflict and unequal burden of transition mineral development placed on producer countries (the "decarbonisation divide"). There is an opportunity for greater international and regional cooperation to ensure that transition minerals contribute to a just energy transition.

24 Mineral beneficiation is the process of separating valuable minerals from the waste material in mined ores.

TERMINOLOGY

RESOURCE GOVERNANCE refers to the norms, institutions and processes for decision-making about extractive industries in the public and private sector.

PUBLIC SECTOR RESOURCE GOVERNANCE involves government agencies, laws and regulations for protecting the environment and human rights and channelling mineral resources toward sustainable development.

CORPORATE GOVERNANCE in the extractive industries refers to business integrity and the corporate structures, policies and systems of responsible business conduct and shared value creation.

CIVIL SOCIETY PARTICIPATION is a principle of transparent, accountable governance; it refers to the process of enabling citizens and CSOs to engage freely in policy dialogue and to hold authorities and other stakeholders to account.

MULTI-STAKEHOLDER GOVERNANCE includes representation of government, industry and CSOs.

FIGURE 10

Subnational governance risks and opportunities for local stakeholders

Exploration & licensing

- More exploration and mining for transition minerals may encroach on conservation areas and land-connected peoples' territories.
- Pressure to approve mining projects may limit time for community consultations and impact assessments.

Extraction

- Water-intensive mining methods may contribute to water scarcity and could have adverse impacts on communities, especially on women and girls.
- Rising commodity prices may trigger more unregulated or illegal ASM.

Revenue management

- Local government capacity constraints in remote regions may hinder effective planning for sustainable development outcomes.

2.1 Subnational governance risks and opportunities for local stakeholders

This subsection identifies five key governance risks for Indigenous and land-connected peoples, mining communities, ASM and other local stakeholders within regions undergoing exploration and mining for transition minerals. There is an opportunity for local stakeholders to share in the benefits of mining, provided there is transparency, participation and multi-stakeholder governance at the subnational level. If not governed well, the exploration and extraction of transition minerals may harm local communities and the land, water and biodiversity of the region.

SUBNATIONAL GOVERNANCE RISK 1

More exploration and mining for transition minerals may encroach on conservation areas and Indigenous and land-connected peoples' territories

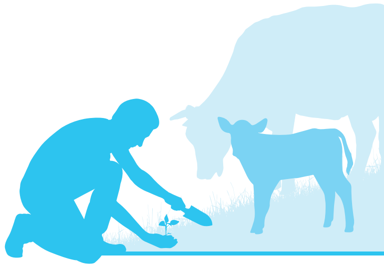
With the expected increase in global mining of transition minerals during the next few decades, mining could intensify pressure on natural habitats and land-connected peoples. Mining of transition minerals is associated with extensive and destructive environmental impacts raising concerns for biological conservation. The impacts can occur both within and outside leased areas through transport and infrastructure corridors (e.g. rail networks and access roads), resulting in the fragmentation of habitats and ecosystems. If not managed well, acid mine drainage (AMD) and tailings disposal could lead to disastrous impacts on ecosystems over considerable distances from the mines themselves.

Figure 11 shows transition mineral projects (mines and known mineral deposits) in EITI implementing countries located in proximity to nature conservation areas, including key biodiversity areas, biodiversity hotspots and land and marine protected areas. Among 700 transition minerals projects currently active in EITI countries, 50% overlap with conservation areas. Mining may exert or intensify existing pressures on biodiversity in EITI countries through habitat loss, degradation, pollution, alien species and overexploitation.

In many EITI implementing countries, transition mineral projects are located on or near the lands traditionally owned or under customary use of Indigenous and other land-connected peoples. For land-connected peoples, land holds much more than economic value; it is strongly associated with their culture, language, spirituality, identity and traditional law. When mining disrupts land use, it also displaces established social, environmental, economic and cultural systems, posing existential threats to Indigenous and other land-connected peoples. Historically, Indigenous and rural peoples have also experienced higher levels of marginalisation, discrimination and poverty.

Figure 12 shows transition mineral projects located on Indigenous and peasant peoples' lands in EITI implementing countries. Among nearly 700 active mineral projects (existing mines and known reserves), about 80% of these projects are located on territories of land-connected peoples. Many of the companies operating transition mineral projects in EITI countries face allegations of human rights abuse, impacting Indigenous and local communities.[25]

Under existing United Nations (UN) declarations, Indigenous and land-connected peoples have consultation and consent rights. In many EITI jurisdictions, projects on or near Indigenous peoples' land require complex negotiation to ensure free, prior and informed consent (FPIC) is obtained before any activities are undertaken. The following subsection elaborates on risks to consultation and consent processes.



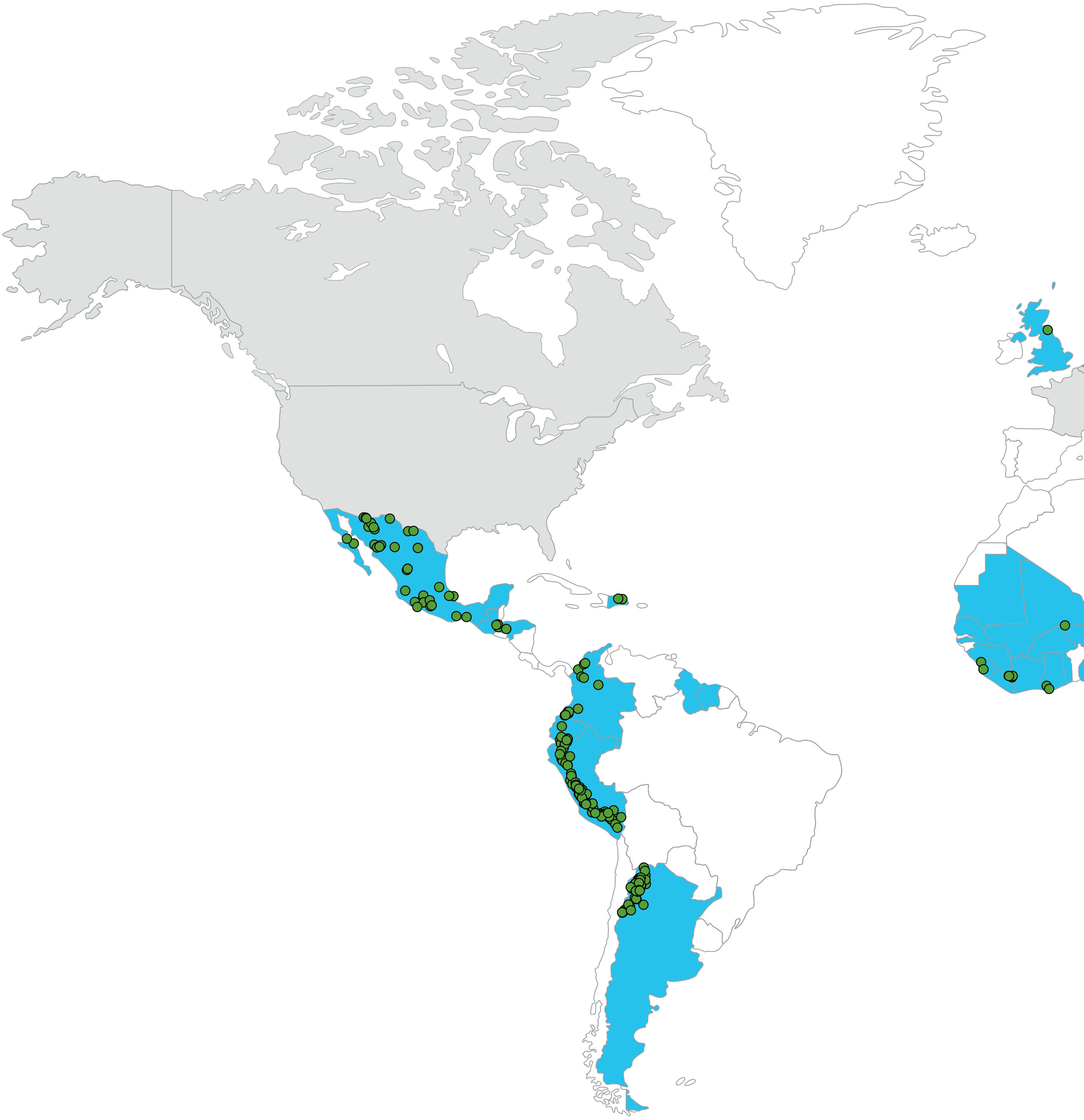
When mining disrupts land use, it also displaces established social, environmental, economic and cultural systems, posing threats to land-connected peoples

25 The Business & Human Rights Resource Centre's Transition Minerals Tracker provides records of over 100 allegations in the copper, cobalt, lithium, nickel and manganese extraction projects in Argentina, the DRC, Guatemala, Madagascar, Mexico, Papua New Guinea (PNG), Peru and the Philippines. See: Business & Human Rights Resource Centre (2022), Transition Minerals Tracker: Global analysis of human rights in the energy transition. Retrieved from https://www.business-humanrights.org/en/from-us/briefings/tmt-2021/.

FIGURE 11

Transition mineral projects near nature conservation areas[26]

- Mineral projects on or in proximity to nature conservation areas
- EITI implementing country



26 Adapted from Lèbre, E., Stringer, M., Svobodova, K., Owen, J.R., Kemp, D., Côte, C., Arratia-Solar, A. and Valenta, R.K. (2020), The social and environmental complexities of extracting energy transition metals. *Nature Communications*, 11(1), 1-8. Retrieved from https://doi.org/10.1038/s41467-020-18661-9.

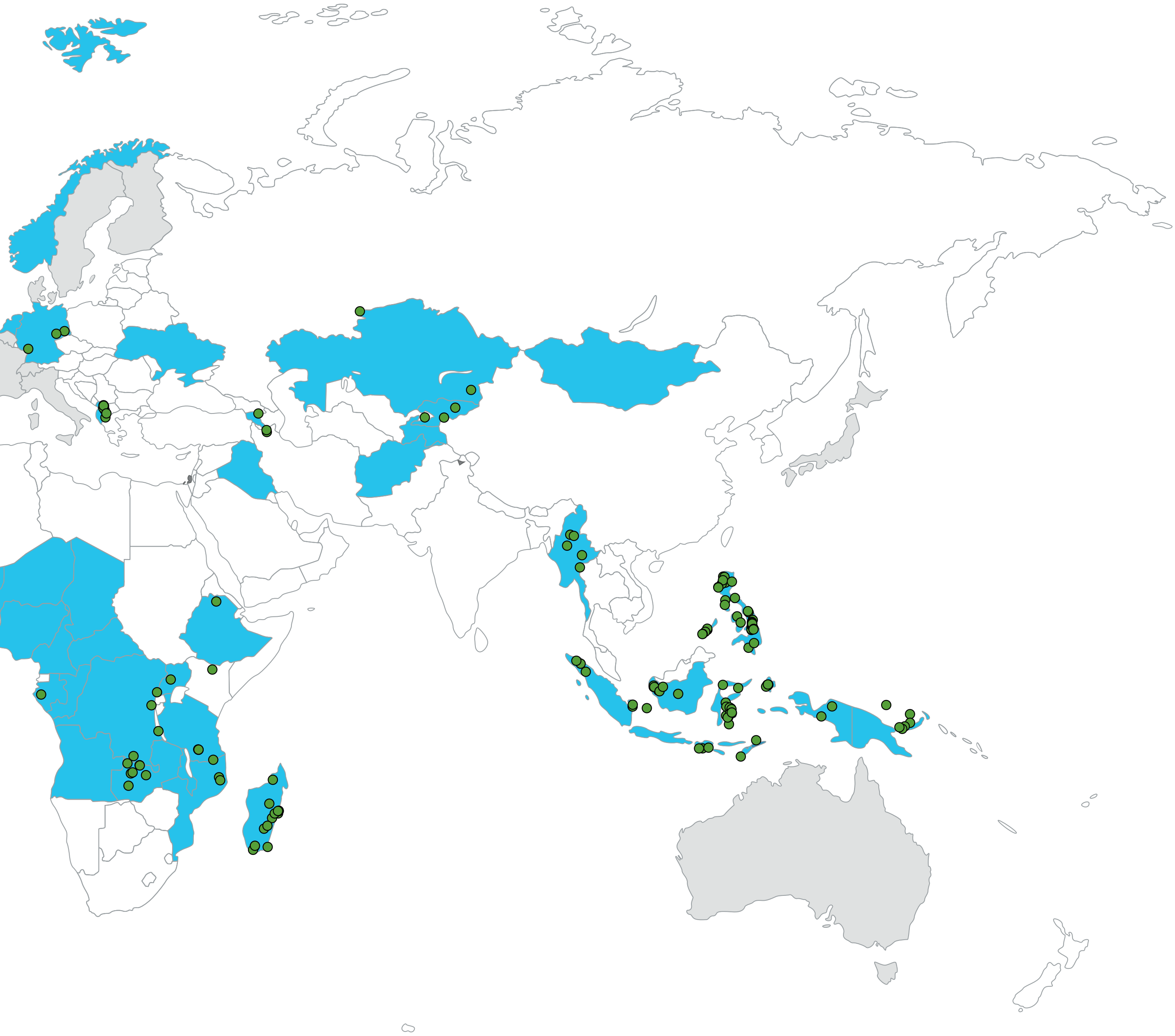
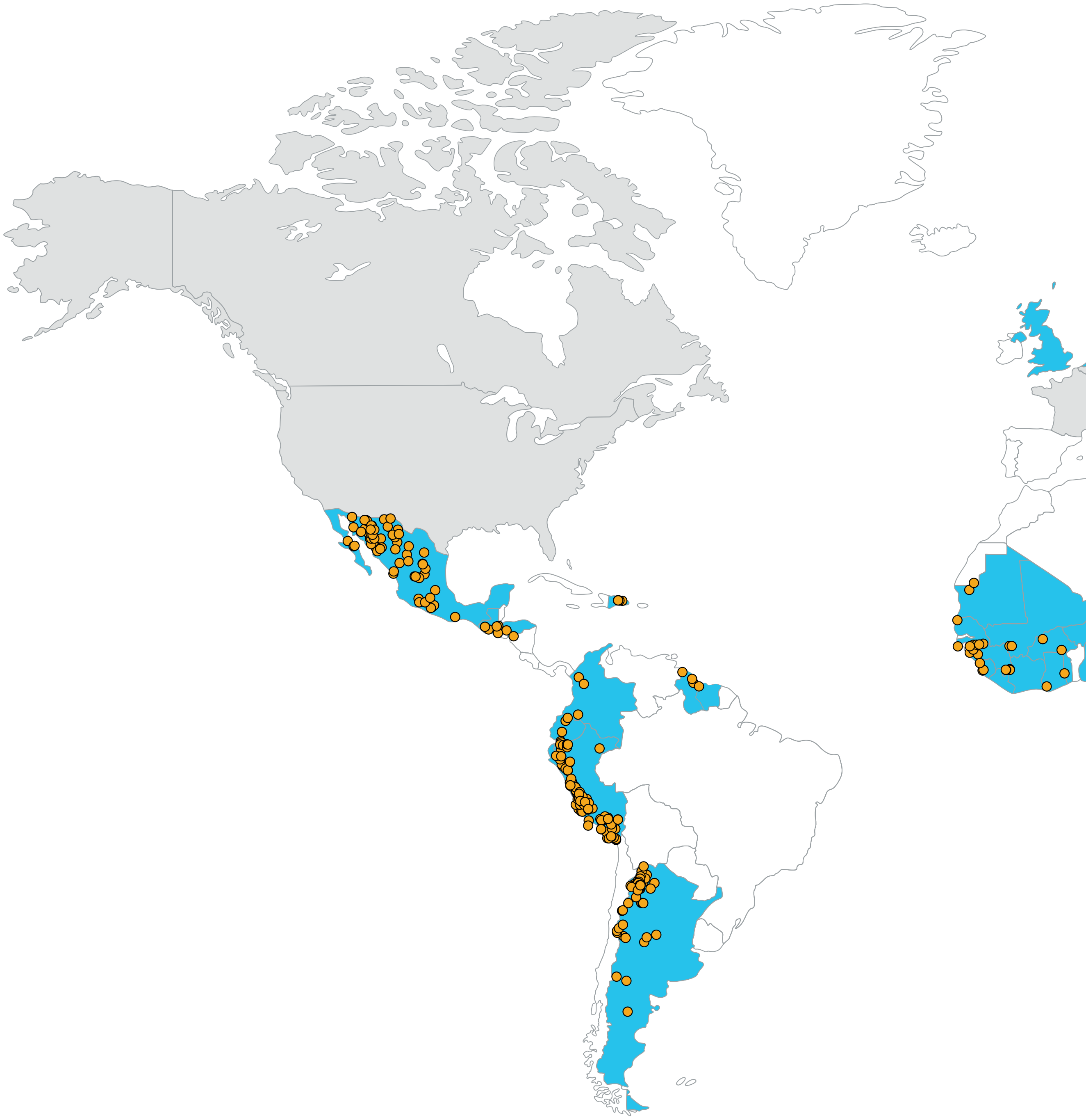


FIGURE 12

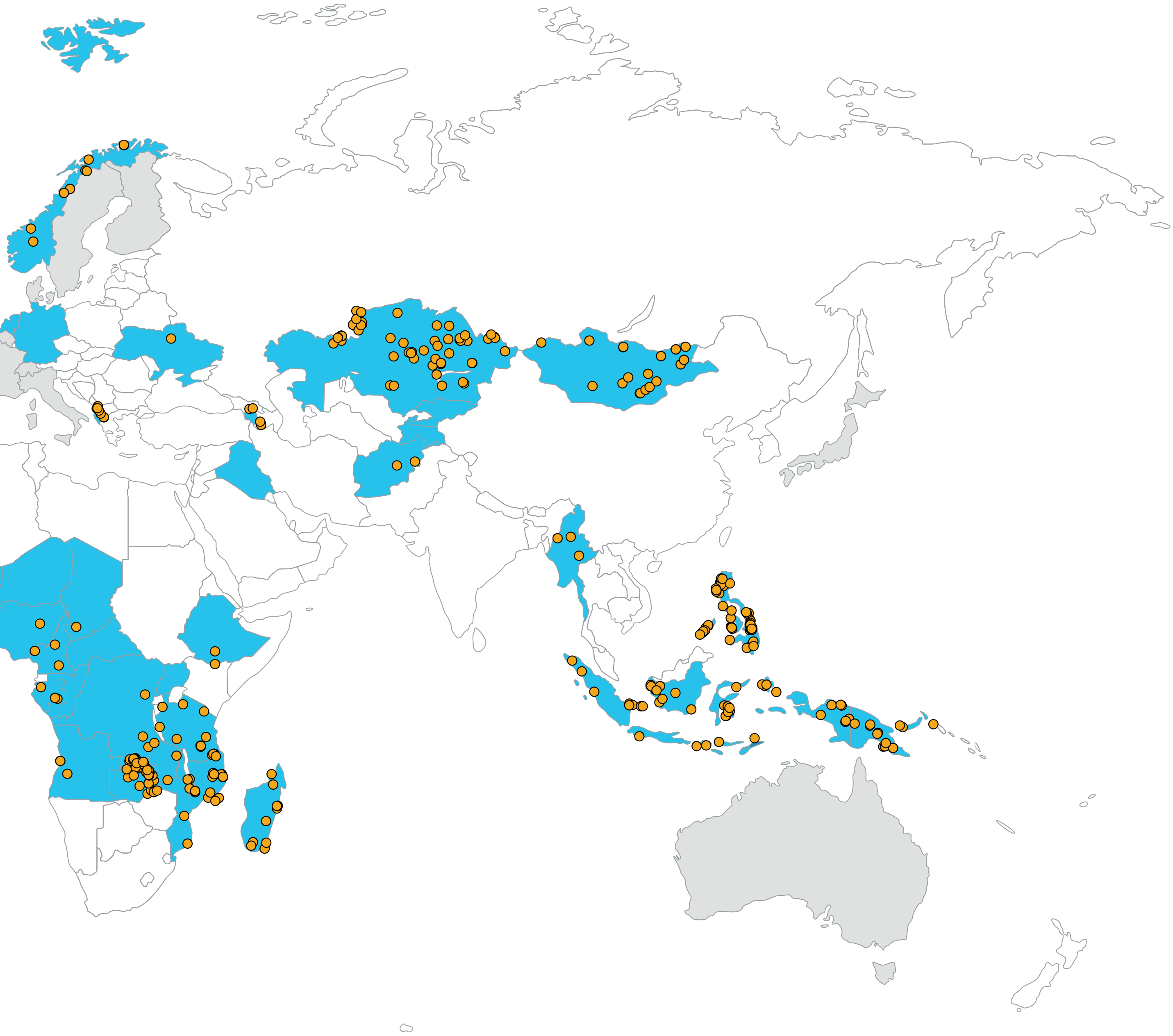
Indigenous and peasant peoples' lands close to transition mineral projects[27]

Mineral projects on or in proximity to lands of land-connected peoples

EITI implementing country



27 Adapted from Owen, J.R., Kemp, D., Harris, J., Lechner, A.M. and Lèbre, E. (2022), Fast track to failure? Energy transition minerals and the future of consultation and consent. *Energy Research & Social Science*, 89, 102665. Retrieved from https://doi.org/10.1016/j.erss.2022.102665.



SUBNATIONAL GOVERNANCE RISK 2

Pressure to approve transition minerals projects may limit time for community consultations and impact assessments

The race to secure market share and reap the benefits from transition minerals may increase governance risks related to the social and environmental impacts of mining. In their haste to obtain approval for mineral exploration and production, companies and governments may try to rush consultation processes and impact assessment. The consequences of these risks will be felt most strongly at the subnational level with the risk of approvals being granted without giving due consideration to the needs and priorities of communities and the environment.

Genuine and meaningful community consultation is critical for ensuring that impacted people are fully informed about a proposed mining project; have the opportunity to form and share their views; and have their concerns addressed. The International Finance Corporation calls this process informed consultation and participation (ICP),[28] and the OECD provides guidance on meaningful stakeholder engagement for the extractive sector.[29] If the project is located on Indigenous peoples' land, proponents must obtain FPIC before any decisions are made or any activities are undertaken. Both ICP and FPIC can be used as local level governance instruments. Indigenous peoples, for example, are increasingly using the concept of FPIC to exert jurisdictional authority over their traditional territories.

Meaningful consultation and the attainment of FPIC (where applicable) take time. All rights holders and other impacted peoples need to be identified, and care should be taken to include women, young people and disadvantaged groups.

Sufficient time needs to be allocated for discussion, review of the proposed mine plan, clarification of details, articulation of potential impacts, co-design of mitigation strategies and negotiation of the community benefits to be derived from the project. In addition, project information needs to be communicated in a format and in language that is accessible to community members.

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28 International Finance Corporation (2012), IFC Performance Standards on Environmental and Social Sustainability – Effective January 1, 2012. Retrieved from https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_handbook_pps.

29 OECD (2017), *Due Diligence Guidance for Meaningful Stakeholder Engagement in the Extractive Sector*, OECD Publishing, Paris. Retrieved from https://www.oecd.org/publications/oecd-due-diligence-guidance-for-meaningful-stakeholder-engagement-in-the-extractive-sector-9789264252462-en.htm. Forty-five countries have adhered to recommendation to adopt this guidance. An assessment framework is provided for industry to evaluate its stakeholder engagement performance and targeted guidance for specific stakeholder groups such as Indigenous peoples, women, workers and artisanal and small-scale miners.

CASE STUDY

Argentina

Governance risks are evident in Argentina which, along with Chile and Bolivia, forms part of the "Lithium Triangle". This is a remote, sparsely populated region at altitude that has rich lithium reserves which are concentrated in salt pans. On the Argentinian side of the triangle, there are only two mines in operation, but more than 60 proposed projects are in various stages of development.[30] Many of the project proponents are "junior miners" that have low market capitalisation and may have limited capacity to meet their consultation obligations.

A new regulatory framework for mining is being established, with significant pressure on the existing administrative mechanisms to cope with the surge in demand for project assessments. At the same time, Indigenous peoples are asserting their land rights. Because land tenure is often unclear, it is challenging to identify rights holders and other landowners and, therefore, to undertake inclusive consultation and consent processes. In addition, the small under-resourced communities are at risk of being overwhelmed by consultation demands from multiple proponents.[31]

Mining proponents can undermine community consultation when they:

- Take advantage of weak laws and enforcement by ignoring their consultation obligations.
- Deliberately provide information in a way that community members cannot understand (too much information, widespread use of technical terms, not using local language).
- Promise or give payments, gifts, food support or other advantages to community leaders to obtain approval for a project.
- Do not consult in good faith (tokenistic consultation, late notification about meetings, holding meetings in places that are difficult for community members to access).[32]

30 Research participant, interviewed 4 July 2022; Geist, A. (2021, September 14), In Argentina's north, a "white gold" rush for EV lithium gathers pace. Reuters. Retrieved from https://www.reuters.com/world/americas/argentinas-north-white-gold-rush-ev-metal-lithium-gathers-pace-2021-09-14/.

31 Research participant, interviewed 4 July 2022.

32 Transparency International Australia (2021), *Stronger community voices: Addressing corruption risks in community consultation in mining*. Retrieved from https://transparency.org.au/publications/stronger-community-voices/.

Tension between the pace required to attract mine investment on the one hand and the substantial timeframes needed for meaningful consultation and consent processes on the other is exacerbating risk across multiple governance dimensions.

Heightened demand for transition minerals may also create governance risks for the assessment of mining impacts. Many new mines will have larger, deeper footprints, have lower grade ore, consume more energy and water, generate more waste and produce harmful elements.[33] Copper, cobalt and nickel mining operations, for example, are renowned for generating AMD, because these metals are often associated with sulphides. This is a risk for mineral extraction and reprocessing activities. According to an environmental scientist of mine tailings and mined land rehabilitation:

> *"There is currently a tailings reprocessing frenzy, without understanding the geochemical processes that may lead to dispersion of AMD and contaminants if we disturb old tailings storage facilities. The reality is that we know little about the mobility and toxicity of some of [the] critical elements."*[34]

Most jurisdictions require proponents to undertake formal IAs in order to analyse the biophysical, social, economic and institutional consequences of mining projects; foster public participation in decision-making; and identify processes for monitoring and mitigating harmful impacts.[35] Data generated from the IA process is used by regulators to inform their project decision-making. IAs are also required to secure finance for mining projects under international banking standards, such as the Equator Principles.[36]

The EITI's Requirement 6.4 encourages implementing countries to disclose information on the management and monitoring of the environmental impact of the extractive industries. This could include information on environmental impact assessments.

There are significant resourcing and temporal costs in undertaking IAs and delivering the multi-volume environmental impact statement. Technical specialists are required to manage and complete a host of major studies. The time taken to complete an IA varies depending on the complexity of the project and its context, and can typically take more than three and a half years.[37] The EIS for Newcrest and Harmony Gold Mining's Wafi Golpu copper-gold project in **Papua New Guinea** (**PNG**), for example, was submitted in June 2018, but some components of the socio-economic studies were undertaken up to five years earlier (including a human health baseline survey in 2013 and community consultations in 2014 and 2015).

Tension between the pace required to attract investment and the timeframes needed for meaningful consultation is exacerbating governance risks

33 Bainton, N., Burton, J. and Owen, J.R. (2021), Land relations, resource extraction and displacement effects in island Papua New Guinea. *The Journal of Peasant Studies*, 1-21. Retrieved from https://doi.org/10.1080/03066150.2021.1928086; Valenta, R.K., Kemp, D., Owen, J.R., Corder G.D. and Lèbre, E. (2019), Re-thinking complex orebodies: Consequences for the future world supply of copper. *Journal of Cleaner Production*, 220, pp. 816-826. Retrieved from https://doi.org/10.1016/j.jclepro.2019.02.146.

34 Research participant, interviewed 7 July 2022.

35 International Association for Impact Assessment (2009), *What is Impact Assessment?* Retrieved from https://www.iaia.org/uploads/pdf/What_is_IA_web.pdf.

36 Heffron, R.J. (2020), The role of justice in developing critical minerals. *The Extractive Industries and Society*, 7. Retrieved from https://doi.org/10.1016/j.exis.2020.06.018.

37 See this US study undertaken over 30 years: deWitt, P. and deWitt, C.A. (2008), How Long Does it Take to Prepare an Environmental Impact Statement? *Environmental Practice 10(4)*. Retrieved from https://doi.org/10.1017/S146604660808037X.

In the bid to get transition mineral projects approved and operational, regulators across jurisdictions have signalled a willingness to fast-track mining projects. **Peru**, for example, has streamlined community consultation processes for its mining projects.[38] **Brazil** has introduced a new policy to expedite the approvals process for mining projects of strategic importance,[39] and **Australia** has implemented incentives for mining investment and eased regulations.[40] These initiatives raise questions about the quality of IAs that can be delivered under fast-tracked arrangements (for more on this, see National governance risk 3 below). A further risk emerging in some producer countries is a scarcity of qualified impact assessors.[41] Without the capacity to establish accurate environmental and socio-economic baselines, it will be impossible to monitor and effectively mitigate the impacts of mining projects.

SUBNATIONAL GOVERNANCE RISK 3

Water-intensive mining methods may contribute to water scarcity and have adverse impacts on communities, especially on women and girls

Mining is a water-intensive activity. Large quantities of water are required throughout the mining lifecycle of most transition minerals, from exploration drilling through to extraction, processing, dust control and the rehabilitation of mined land in preparation for closure and relinquishment. Lithium bromide evaporation methods used on the salt flats of **Argentina**, for example, are particularly water intensive.[42] Many transition minerals are in arid regions with high levels of water stress. Escalating demand for these minerals could drive up production and place increasing pressure on scarce water resources.

In these environments, mining-impacted people may struggle to access water for their health and wellbeing. There are gender impacts too. In their study on gender and water governance, researchers found that in developing economies, being "a good mother" includes accessing safe water for the family.[43] In arid parts of Sub-Saharan Africa, it is the responsibility of girls to fetch water, often over long distances.[44] Not being able to meet their family obligations can exacerbate risks to these women and girls.

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38 Owen, W. (2021), Peruvian mining poised for fast post-pandemic economic recovery. *Global Mining Review*. Retrieved from https://www.globalminingreview.com/mining/05032021/peruvian-mining-poised-for-fast-post-pandemic-economic-recovery/.

39 Ministry of Mines and Energy (2020), *Mining and development program Brazil: A mine of opportunities, goals and action plan 2020/2023*. Retrieved from https://www.gov.br/mme/pt-br/assuntos/secretarias/geologia-mineracao-e-transformacao-mineral/publicacoes-1/programa-mineracao-e-desenvolvimento/programa-mineracao-e-desenvolvimento-2020-2023-english-version.pdf/.

40 Australian Government (2020), Congestion busting assessments protecting our environment and our economy. Retrieved from https://minister.awe.gov.au/ley/media-releases/congestion-busting-assessments-protecting-our-environment-and-our-economy.

41 Research participant, interviewed 4 July 2022.

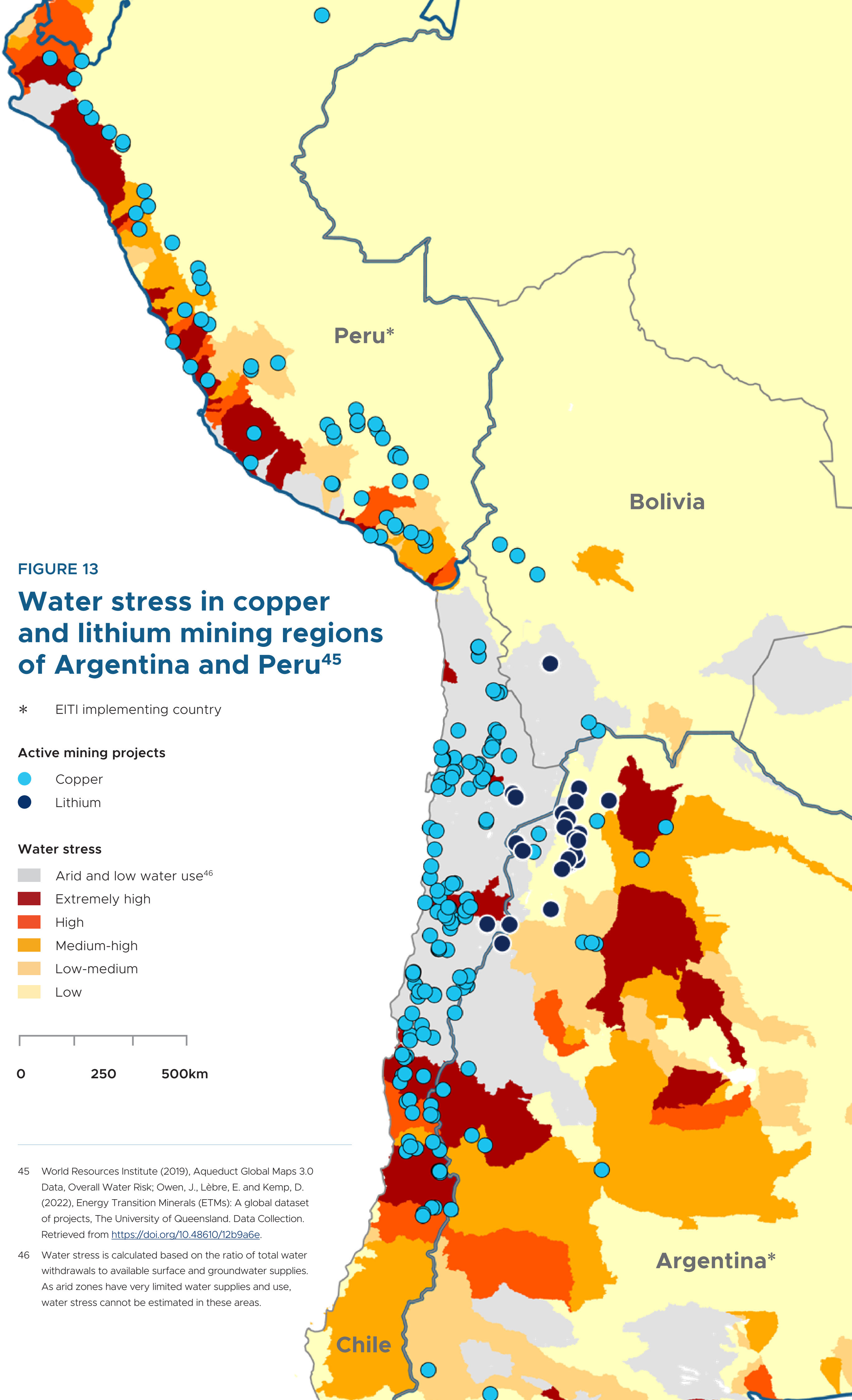
42 Ibid.

43 Özerol, G. and Harris, L.M. (2020), Gender-sensitive analysis of water governance: Insights for engendering energy transitions. In Clancy, J., Özerol, G., Mohlakoana, N., Feenstra, M., Sol Cueva, L. (Eds.), *Engendering the Energy Transition,* 59–82. Palgrave Macmillan, Cham. Retrieved from https://doi.org/10.1007/978-3-030-43513-4_4.

44 Eaton, J., Krishna, A., Sudi, C., George, J., Magomba, C., Eckman, A., Houck F., and Taukobong, H. (2021), Gendered social norms change in water governance structures through community facilitation: Evaluation of the UPWARD intervention in Tanzania. *Frontiers in Sociology, 6*. Retrieved from https://doi.org/10.3389/fsoc.2021.672989; USAID (2019, April 10), Water management: Helping women in rural Tanzania find their voice. Retrieved from https://www.usaid.gov/tanzania/news/apr-10-2019-water-management-helping-women-rural-tanzania-find-their-voice.

FIGURE 13

Water stress in copper and lithium mining regions of Argentina and Peru[45]



* EITI implementing country

Active mining projects

- Copper
- Lithium

Water stress

- Arid and low water use[46]
- Extremely high
- High
- Medium-high
- Low-medium
- Low

0 250 500km

45 World Resources Institute (2019), Aqueduct Global Maps 3.0 Data, Overall Water Risk; Owen, J., Lèbre, E. and Kemp, D. (2022), Energy Transition Minerals (ETMs): A global dataset of projects, The University of Queensland. Data Collection. Retrieved from https://doi.org/10.48610/12b9a6e.

46 Water stress is calculated based on the ratio of total water withdrawals to available surface and groundwater supplies. As arid zones have very limited water supplies and use, water stress cannot be estimated in these areas.

The extraction of some transition minerals, such as copper, nickel and bauxite, produces extensive mining footprints. Large, open-cut mines significantly modify the natural landscape and produce water risks, such as pollution from wastewater and AMD as well as the potential for catastrophic failure of infrastructure, such as dams and tailings storage facilities (e.g. the 2019 Brumadinho dam disaster in **Brazil**).

Strong governance is required to prevent serious harm to the people who live in these fragile environments and to limit the biophysical impacts from mining transition minerals.

CASE STUDY

Peru

A lack of financial acumen is hampering local governments in Peru from optimising substantial royalty payments received from the mining sector. According to an expert observer, "hundreds of millions of dollars a year are given to a municipality that has received no training on how to budget, and doesn't know how to access national government initiatives".[47] Government initiatives are set annually, and local governments are under pressure to spend funds before the end of each year. As a result, funding may be misappropriated or wasted. Despite significant royalties reaching local governments, some mining-affected communities do not have access to basic amenities, such as sewage, water treatment or paved roads.[48] The EITI's Requirement 4.6 on subnational payments, Requirement 4.7 on disaggregation of data and Requirement 5.2 on subnational transfers help to track these revenue flows.

47 Research participant, interviewed 28 June 2022.

48 Ibid.

SUBNATIONAL GOVERNANCE RISK 4

Rising commodity prices may trigger more unregulated or illegal ASM

At least nine of the selected minerals identified as critical to the energy transition are known to be mined by ASM. These are bauxite, chromium, cobalt, copper, manganese, nickel, tantalum, tin and zinc.[49] Where deposits of these minerals are located in areas of weak governance and conditions of poverty, rising commodity prices may set off a rush in ASM. For example, ASM of copper in **Peru** occurs only when prices are high.[50] A rapid increase in ASM activity can quickly pollute and cause damage to the environment; threaten the health and safety of the people involved – including women and children; and drive conflict.

In the **DRC**, transition minerals mined by ASM include tin, tantalum, copper and cobalt. ASM for copper and cobalt has been through boom-and-bust cycles since the early 2000s. It takes place on and near large-scale mining concessions from tailings and dangerous underground mine shafts.[51] In December 2019, the DRC government issued a decree that all ASM cobalt production would be purchased and marketed by a subsidiary of the state-owned company Gécamines.[52] While state control of ASM cobalt could be an opportunity to improve traceability in the cobalt value chain from the DRC, it needs greater transparency to avoid corruption. Smuggling and illegal taxation are also key governance risks for tin and tantalum.[53]

Manganese mining in **Zambia**'s province of Luapula is mainly driven by ASM, which is sold to small, **Chinese**-owned smelting plants. While export figures are tracked, the Zambian government does not have accurate production figures.[54] In **Afghanistan**, there is ASM for chromium and other minerals; however, their quantities are unknown in the current governance context.[55]

Less is known about governance risks of ASM for other minerals critical to the energy transition, although recent investigations by civil society groups are providing some insights. For example, Global Witness has reported that toxic in-situ methods are being used for ASM extraction of rare earth elements in **Myanmar**, and that contaminated sites are being abandoned once the minerals have been extracted.[56]

Rising commodity prices may set off a rush in artisanal and small-scale mining

49 World Bank (2020), *Democratic Republic of Congo: Artisanal and small-scale mining sector (Delve Country Profile)*. Retrieved from https://delvedatabase.org/uploads/resources/Delve-Country-Profile-DRC.pdf.

50 Research participant, interviewed 7 July 2022.

51 World Bank (2020), *Democratic Republic of Congo: Artisanal and small-scale mining sector (Delve Country Profile)*.

52 Le Bec, C. (2021, April 18). DRC: Gécamines takes over the artisanal cobalt mining sector. *The Africa Report*. Retrieved from https://www.theafricareport.com/78130/drc-gecamines-takes-over-the-artisanal-cobalt-mining-sector/.

53 World Bank (2020), *Democratic Republic of Congo: Artisanal and small-scale mining sector (Delve Country Profile)*.

54 Research participant, interviewed 20 June 2022.

55 Research participant, interviewed 7 July 2022.

56 Global Witness (2022), *Myanmar's poisoned mountains: The toxic rare earth mining industry at the heart of the global green energy transition*. Retrieved from https://www.globalwitness.org/en/campaigns/natural-resource-governance/myanmars-poisoned-mountains/.

CASE STUDY

Indonesia

In West Timor, Indonesia, an estimated 325,000 farmers were mining manganese for additional income from 2009 to 2012. A 2015 study notes that Indonesian regulations pertaining to ASM gold mining were ill-suited to these lesser-known activities producing manganese. The study noted that the differences between ASM gold and manganese mining in Indonesia pointed to "…a need to view the challenges and opportunities provided by different forms of ASM very differently, depending on the context and characteristics of the activity".[57] Greater understanding of ASM for manganese by Indonesian stakeholders and a more formalised approach to governance of the sector could reduce harmful environmental and social impacts while enhancing livelihood benefits in West Timor.

It is difficult to predict where ASM is likely to occur in the future because "the idea of an economic deposit in geology is determined by whether it is economic to mine on a large scale".[58] It is possible that political elites are investing in ASM for transition minerals as they do in ASM gold, and have a vested interest in keeping the value chains under the radar of regulation. There may also be money laundering and risks of illicit financial flows from ASM for transition minerals, but existing evidence of links between ASM and transnational organised crime focuses on gold and gemstones.[59]

The lack of data about ASM for transition minerals is evident in the literature on environmental health risks, where little is known beyond the dangers of mercury use in gold processing. A systematic literature review of 176 studies of ASM health risks across 38 African, American and Asian countries found that only 21 articles were not about gold mining. These articles covered tantalum, tin, zinc, bauxite, cobalt, copper, chromium and manganese. The authors conclude that, "research into the 'global health data gap' on ASM should diversify in terms of commodities".[60] Health risks of ASM for transition minerals are likely to occur in EITI implementing countries. Nickel deposits in **Nigeria**, for example, co-occur with lead, which is reported to have health impacts for ASM miners and their communities.[61]

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57 Fisher, R., Ling, H., Natonis, R., Hobge, S., Kaho, N., Mudita, W., Markus, J., Bunga, W. and Nampa, W. (2019), Artisanal and small-scale mining and rural livelihood diversification: The case of manganese extraction in West Timor, Indonesia. *Extractive Industries and Society, 6(1)*. Retrieved from https://doi.org/10.1016/j.exis.2018.08.004.

58 Research participant, interviewed 7 July 2022.

59 Hunter, M. (2020), Illicit financial flows: Artisanal and small-scale gold mining in Ghana and Liberia. OECD Development Co-operation Working Papers, No. 72, OECD Publishing, Paris. Retrieved from https://doi.org/10.1787/5f2e9dd9-en; OECD (2019), *Interconnected supply chains: a comprehensive look at due diligence challenges and opportunities sourcing cobalt and copper from the Democratic Republic of the Congo*. Retrieved from https://mneguidelines.oecd.org/Interconnected-supply-chains-a-comprehensive-look-at-due-diligence-challenges-and-opportunities-sourcing-cobalt-and-copper-from-the-DRC.pdf.

60 Cossa, H., Scheidegger, R., Leuenberger, A., Ammann, P., Munguambe, K., Utzinger, J., Macete, E. and Winkler, M.S. (2021), Health Studies in the Context of Artisanal and Small-Scale Mining: A Scoping Review. *International Journal of Environmental Research and Public Health*, 18(4):1555. Retrieved from https://doi.org/10.3390/ijerph18041555.

61 Research participant, interviewed 7 July 2022.

Poor governance of environmental and social impacts of ASM is inevitable if the health and environmental risks are not known before the rush for transition minerals. The EITI's Requirement 6.3a to estimate ASM activity could be used to better understand and govern ASM for transition minerals.

When collected efficiently and spent wisely, revenues from transition minerals can contribute to achieving the sustainable development goals

SUBNATIONAL GOVERNANCE RISK 5

Local government capacity constraints in remote regions may hinder effective planning for sustainable development outcomes

For many local governments, the development of transition minerals within their jurisdictional boundaries offers the prospect of economic advancement through a share of mining royalties and other revenue streams, infrastructure development, job creation and procurement of local goods and services. The challenge of realising this economic potential from mining is well documented, and likely to be intensified in the context of a boom in a new mining region.[62]

The challenge is intensified further when transition minerals are located in remote, sparsely populated regions administered by under-capacitated local governments. In this context, wages are low, municipal staff numbers are limited and there may be competency constraints, such as low levels of literacy and numeracy, lack of public administration skills and poor understanding of regulatory requirements.[63] Many local governments are inexperienced at dealing with powerful, well-funded international mining companies. The consequences for local governments facing these challenges include loss of potential revenue and economic opportunities; fewer local jobs and access to training; weak negotiation outcomes; and greater chance of adverse environmental impacts.

2.2 National governance risks and opportunities for mineral-rich countries

This subsection identifies eight governance risks at the national level, which affect the governments and citizens of countries with significant reserves of transition minerals. There is an opportunity for resource-rich countries to attract investment in transition minerals extraction and beneficiation, and for industry to collaborate in strategic business development of value chains from mining to manufacturing and renewable energy infrastructure. When collected efficiently and spent wisely, revenues from transition minerals can contribute to the sustainable development goals.[64] If not planned effectively, mineral-rich countries could lose potential revenues, deter investment, miss the opportunity to diversify their economies and fail to address corruption and other governance risks.

62 See, for example: Argent, N., Markey, S., Halseth, G., Ryser, L. and Haslam-McKenzie, F. (2021), The socio-spatial politics of royalties and their distribution: A case study of the Surat Basin, Queensland. *Environment and Planning A: Economy and Space*. Retrieved from https://doi.org/10.1177/0308518X211026656; Skrzypek, E., Bainton, N., Burton, J. and Lèbre, E. (2022), The Justice Dimensions of Extracting Energy Transition Metals from the Pacific. *The British Academy.* Retrieved from https://doi.org/10.5871/just-transitions-s-i/e-s.

63 King, R.S., Owusu, A. and Braimah, I. (2013), Social Accountability for Local Government in Ghana. *Commonwealth Journal of Local Governance (13-14)*. Retrieved from https://doi.org/10.5130/cjlg.v0i13/14.3724; Zorrilla, C. (2005), Local Governments and Mining. *Mines and Communities (MAC)*. Retrieved from http://www.minesandcommunities.org/article.php?a=7987.

64 Sturman, K., Toledano, P., Akayuli, C. F. A. and Mzamose, G. (2020), African Mining and the SDGs: From vision to reality. In Ramutsindela M. and Mickler, D. (Eds.), Africa and the sustainable development goals. *Sustainable Development Goals Series*. Springer, Cham. Retrieved from https://doi.org/10.1007/978-3-030-14857-7_6.

The eight risks facing public policymakers when making national resource governance decisions are shown in Figure 14. The risks are categorised according to four broad decisions found in the Natural Resource Governance Institute resource governance decision chain: deciding to extract; getting a good deal; managing revenues; and investing for sustainable development. Section 2.2 is structured according to this framework.

FIGURE 14

Governance risks in the national decision chain to extract transition minerals[65]

Decision	Risks
Deciding to extract	• Lack of robust, public geological data may hinder competition in the development of natural resources. • Regulation may lag behind developments in the market for transition minerals, causing governance gaps.
Getting a good deal	• Fast-tracking of contracts and licenses may increase corruption risks. • Abuse of local content policies may lead to favouritism and corruption. • Opaque tax structuring across mineral value chains may result in lost revenue for governments.
Managing revenues	• Price volatility may lead to unpredictable revenue flows and macroeconomic planning challenges.
Investing for sustainable development	• Export-oriented mining policies may fail to realise potential for mineral beneficiation and value addition. • Rushed public procurement for low carbon energy and transport infrastructure may open new channels for corruption.

NATIONAL GOVERNANCE RISK 1

Lack of robust, public geological data may hinder competition in the development of transition minerals

Comprehensive, publicly available geological data determines the ability of countries to attract responsible investors and negotiate favourable terms for the country and its people. Exploration and mapping of mineral deposits is limited in many EITI implementing countries, especially in Africa, but also

65 Adapted from NRGI (2018), "The Natural Resource Charter Decision Chain". Retrieved from https://resourcegovernance.org/sites/default/files/documents/nrgi_primer_nrc-decision-chain.pdf.

in Central Asia, Latin America and Southeast Asia.[66] Transition minerals that have only recently been used in new technologies, such as lithium, graphite and rare earth elements, have not been explored extensively anywhere in the world.[67] These data gaps limit the opportunities of these countries to develop their mineral resources and contribute to the energy transition.

Where discoveries have been made, access to open geological data is important to support a transition mineral development strategy and to level the playing field in negotiations between governments, companies and communities. Transparent information can improve terms of contracts; facilitate mine planning; and ensure that all stakeholders are well informed.

Governance risks arise from speculation and competition to control geoscience data. Companies may exaggerate mineral discoveries to attract investors, or "flip" assets, while keeping the location, ore grade and other details secret from their competitors. Corrupt mining officials and politically exposed persons (PEPs) may seek to take advantage of privileged access to geological data to receive kickbacks and beneficial ownership in mining deals.[68]

Several mining jurisdictions around the world have aligned regulations with the Committee for Mineral Reserves International Reporting Standards (CRIRSCO). These include standards for metals and non-metallic industrial minerals (such as graphite), and draw from the Best Practice Guidelines for Reporting of Lithium Brine Resources and Reserves.[69] Only four EITI implementing countries – **Colombia**, **Indonesia**, **Kazakhstan** and **Mongolia** – have adopted the CRIRSCO good practice guidance for public reporting of exploration results, mineral resources and mineral reserves. However, many of the exploration and mining companies in EITI country jurisdictions are required to report this data publicly, for example, listed companies in **Australia** and **Canada**. Host governments usually receive this data in large PDF files, from which it may be difficult to extract useful information for public disclosure.[70]

Transition minerals such as cobalt, gallium, molybdenum and germanium are produced as by-products of major commodities such as bauxite, zinc, copper and iron ore. Many mines have these minerals discarded in tailings dams. The minerals can still be recovered, but only if the value exceeds the costs of extracting and processing them.[71] In most jurisdictions, mining companies are only required to report on economic reserves, meaning that governments have little data on the potential to produce these minerals.[72] For example, **Zambia**'s EITI MSG identified a lack of accurate data for cobalt reserves and production figures.[73]

Transparent geological data can improve contract terms, facilitate mine planning and ensure that all stakeholders are well informed

66 UN Economic Commission for Africa (2018), *Desktop Review of African Geological Survey Organisation Capacities and Gaps*. Retrieved from https://repository.uneca.org/handle/10855/24429; Research participant, interviewed 7 July 2022.

67 Research participant, interviewed 26 July 2022.

68 Research participant, interviewed 7 July 2022.

69 CRIRSCO, Home page. Retrieved from https://www.crirsco.com.

70 Research participant, interviewed 7 July 2022.

71 Yellishetty, M. (2022, May 11). Australia has rich deposits of critical minerals for green technology, but we are not making the most of them… yet. *The Conversation*. Retrieved from https://theconversation.com/australia-has-rich-deposits-of-critical-minerals-for-green-technology-but-we-are-not-making-the-most-of-them-yet-182331.

72 Research participant, interviewed 7 July 2022.

73 Research participant, interviewed June 2022.

In the past, this lack of information has allowed ASM-mined cobalt from the **DRC** to cross the border and be refined and exported from Zambia, evading the DRC's regulations.[74] See Transnational governance risk 1 for more on this issue.

NATIONAL GOVERNANCE RISK 2

Regulation may lag behind developments in the market for transition minerals, causing governance gaps

Strong global demand for transition minerals is fostering a desire among governments in producer countries to develop their resources. This response has been called "rushing after the market" by one governance commentator.[75] The speed at which mineral exploration and investment for the energy transition are taking place can compromise the quality of the design and implementation of the regulatory framework. Issues as fundamental as mineral and land tenure rights can take years, if not decades, to settle or revise. Even minor tax amendments and institutional reforms may take several months. Consequently, governments may not be ready to properly regulate the sector if there is an increase in demand for transition minerals.

The challenge of regulatory inertia is most acute in jurisdictions where there has been little mining in the past, or where mining regulation overlaps between various levels of government. There is a risk that "when regulatory frameworks are not clear, corruption risks are higher".[76] For example, in **Argentina**'s federal system, lithium projects have multiplied from just two operations in 2008 to more than 50 projects, in various stages of approval, by 2020. The legal recognition of land rights over the vast salt flats where lithium is found is unresolved and varies across three provinces. This illustrates the governance challenges and uncertainty that can arise when investment picks up in contexts where policies and regulations are in flux.

NATIONAL GOVERNANCE RISK 3

Fast-tracking of contracts and licenses may increase corruption risks

As highlighted in Section 2.1, there are many challenges that can arise in the awards processes for minerals licenses and contracts when there is a rush to extract transition minerals. Aside from potential shortcomings in community consultations and impact assessments, efforts to fast-track approvals can lead to heightened corruption risks.

As the capacity of government departments is stretched by a flurry of exploration and mining applications, the temptation to offer bribes to speed up or influence approvals is likely to increase.[77] There is also a risk of increased inducements being offered to approve projects that do not have rights holder or landowner consent and to permit projects that pose considerable risks to people and the environment. As one governance specialist said: "I think there's a significant risk, with this rapidly exploding and growing demand [for] permitting shortcuts, that licenses are given that don't have consent and don't have the social license to operate".[78]

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74 Research participant, interviewed 7 July 2022.

75 Research participant, interviewed 1 July 2022.

76 Research participant, interviewed 4 July 2022.

77 Caripis, L. (2022, February 15), Corruption in critical minerals puts the energy transition at risk. Retrieved from https://transparency.org.au/corruption-minerals-energy-transition-risk.

78 Research Participant, interviewed 23 June 2022

There are serious implications for the national economy and prospects for sustainable development if corruption takes hold during licensing and contracting. The EITI's Requirement 2.2 on contracts and license allocations may be used to monitor any "fast-track" approvals for transition minerals exploration or production licenses, while Requirement 2.5 on beneficial ownership disclosure may be used to prevent conflicts of interest. For example, the EITI MSG in the **Philippines** has used EITI Requirement 2.5 to identify PEPs involved in nickel mining contracts.[79] Global Witness has also considered the EITI Requirements in its assessment of the costs of the **DRC**'s nascent lithium industry.[80]

There are serious implications for the national economy and prospects for sustainable development if corruption takes hold during licensing and contracting

NATIONAL GOVERNANCE RISK 4

Local content policies and state participation may enable favouritism and corruption

The transition mineral strategies of several EITI implementing countries emphasise the importance of local employment and procurement as an engine of socio-economic development. However, the introduction of local content laws has been known in the past to encourage nepotism and revolving doors for politically well-connected elites to move between government and the private sector.[81]

In jurisdictions where governance is weak and demand for transition minerals is strong, there is a risk that local content policies may fail to realise the potential value of the sector. This is particularly the case in contexts where there is only a limited pool of qualified local workers or companies, making it easier for political and business elites to capture these opportunities. Business integrity standards for local procurement and hiring by mining companies are critical to avoiding corruption risks.[82]

Similarly, policies that seek to ensure transition minerals contribute towards national economic development may see preferential treatment given to state-owned enterprises (SOEs) over potentially more competent mining companies and management. Refer to Transnational risk 3 for examples of SOEs producing and trading in transition minerals and the associated governance risks.

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79 EITI (2022), *Making the grade: Strengthening governance of critical minerals*.

80 Global Witness (2021), *Renewable energy at what cost? A closer look at the DRC's nascent lithium sector*. Retrieved from https://www.globalwitness.org/en/campaigns/natural-resource-governance/renewable-energy-at-what-cost-a-closer-look-at-drcs-nascent-lithium-sector/.

81 Research participant, interviewed 5 July 2022.

82 Transparency International (2021), *Five lessons for building business integrity in the mining sector: Lessons from Transparency International's Accountable Mining Programme*. Retrieved from https://transparency.org.au/publications/five-lessons-for-building-business-integrity-in-the-mining-sector/.

CASE STUDY

Senegal

EITI Requirement 6 on reporting social and economic spending could be used to encourage company reporting on local employment and local procurement. The EITI MSG in Senegal requires reporting by mining companies to break down procurement spending between national and international suppliers, reflecting local procurement. This data has been provided in reconciliation reports for three consecutive years and can provide a model for other EITI implementing countries to follow.[83]

NATIONAL GOVERNANCE RISK 5

Opaque tax structuring across transition mineral value chains may result in lost revenues for governments

Tax base erosion and profit shifting (BEPS) is a serious governance challenge for countries pursuing resource revenues from taxation of multinational enterprises (MNEs). BEPS occurs when companies shift reporting of profits generated in higher tax jurisdictions to other parts of their business in lower tax or no-tax jurisdictions. This challenge could become more pronounced in the transition minerals sector given the integrated business structures of many of the MNEs involved in mining, processing, refining, marketing and trading in transition minerals across multiple jurisdictions. There are also increasingly powerful global partnerships controlling transition mineral value chains, for example, through the consolidation of mine-to-car business deals by upstream and downstream MNEs. The negotiation of large offtake agreements, for example by EV companies like Tesla, is part of this trend.[84] Opaque and fixed pricing arrangements that are agreed between MNEs before mineral production begins may lead to revenue losses for host governments.

The economic costs of base erosion and profit shifting to producing countries can be considerable. For example, research on profit shifting in mining across Sub-Saharan Africa indicates that African countries are losing, on average, between USD 470 million and USD 730 million per year in corporate income tax from MNE tax avoidance. The baseline estimate – which also includes Sub-Saharan African economies with small mining sectors – suggests a revenue loss of about USD 600 million, based on tax rate differentials between African countries and offshore affiliates in the same MNE group.[85]

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83 Research participant, interviewed 5 July 2022.

84 Tesla partners with nickel mine amid shortage fears (2021, March 5). *BBC*. Retrieved from https://www.bbc.com/news/business-56288781.

85 Albertin, G., Yontcheva, B., Devlin, D., Devine, H., Gerard, M., Beer, S., Suljagic, I. J. and Thakoor, V. V. (2021), Tax avoidance in Sub-Saharan Africa's mining sector. International Monetary Fund. Retrieved from https://www.imf.org/en/Publications/Departmental-Papers-Policy-Papers/Issues/2021/09/27/Tax-Avoidance-in-Sub-Saharan-Africas-Mining-Sector-464850.

It is not easy for tax administrations of mineral exporting countries to stand up to aggressive tax minimisation by these global business arrangements. For example, the integration of transition mineral value chains, combined with the price volatility of these commodities, makes it easy for business entities to over- or under-estimate transfer prices to minimise tax on these transactions.

The OECD's Transfer Pricing Guidelines for MNEs and Tax Administration 2022 upholds the "arm's length principle". This principle means that the transfer price for the transfer of commodities between associated enterprises should be the same as it would be in an open market. Prices should be matched with a "recognised and transparent" international commodity exchange market or be set by governmental price-setting agencies.[86]

The high degree of uncertainty of demand and supply drives commodity price volatility for transition minerals

In **Argentina**, the General Directorate of Customs established a reference price of lithium carbonate at USD 53 per kilogram for exports to a number of countries in May 2022. This step was taken in response to "irregularities detected and investigated over the last two years in lithium carbonate exports". The aim of the reference price is to prevent sellers from avoiding tax by declaring low prices with customs.[87] So far, only a third of EITI implementing countries have adopted the OECD's Transfer Pricing Guidelines.[88] Of these countries, only Argentina, **Indonesia**, **Mexico**, **Nigeria** and **Peru** are using the OECD guidance or domestic law to regulate mineral commodity transactions.[89]

NATIONAL GOVERNANCE RISK 6

Price volatility may lead to unpredictable revenue flows and macroeconomic planning challenges

The high degree of uncertainty of demand and supply drives commodity price volatility for transition minerals. The price of certain transition mineral commodities can fluctuate wildly, especially in the current geopolitical context, as seen when the London Metal Exchange (LME) suspended trade of nickel in March 2022 in response to extreme price volatility.[90] These dynamics can make it difficult for governments to maximise revenues without deterring investment; deliver on public spending commitments; and optimise opportunities for economic diversification.

Countries that only produce one or two commodities, such as copper or nickel, are particularly vulnerable to fluctuations in commodity prices. The risks of political instability associated with mining boom-and-bust cycles are well documented in the "resource curse" literature. This is firstly because mining investment becomes uncertain when demand for specific minerals fluctuates rapidly.

86 OECD (2020), Transfer Pricing Guidelines 2.18. Retrieved from https://tpguidelines.com/category/transfer-pricing-guidelines/oecd-transfer-pricing-guidelines-2017/.

87 Tang, J. (2022, June 6), Argentina's lithium carbonate reference value to have limited impact on Chinese imports. S&P Global. Retrieved from https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/metals/060622-argentinas-lithium-carbonate-reference-value-to-have-limited-impact-on-chinese-imports-sources.

88 Others include Angola, Colombia, Germany, Indonesia, Liberia, Mexico, Nigeria, Norway, Peru, PNG, Senegal and the UK.

89 OECD, *Transfer Pricing Guidelines 2.18-2.22*. Retrieved from https://tpguidelines.com/category/transfer-pricing-guidelines/oecd-transfer-pricing-guidelines-2017/.

90 Onstad, E. (2022, March 8). LME forced to halt nickel trading, cancel deals, after prices top $100,000. *Reuters*. Retrieved from https://www.reuters.com/business/lme-suspends-nickel-trading-day-after-prices-see-record-run-2022-03-08/.

Governments struggle to set fiscal frameworks at the right point to maximise revenues without deterring investment. Secondly, governments are unable to estimate revenue projections and may not deliver on public spending commitments. As a result, political instability and social conflict can ensue. In countries rich in transition minerals, these risks can even arise before resource extraction commences. This phenomenon has been called the "presource curse".[91]

During mineral commodity price booms, host governments are often tempted to increase taxation, which may bring in windfall revenues in the short term while deterring investment in the long term. Established mines on existing concessions are captive to tax increases as demand escalates. For example, the **DRC** government raised taxation on transition minerals from 2% to 10% in 2022.[92] Between 2021 and 2022, **Armenia**'s government made a number of changes to taxation, royalties and export licensing for its copper and molybdenum industry to capture higher revenues and redirect profits into mineral beneficiation and value addition.[93]

As previously undeveloped minerals become economically feasible to produce, some countries may have an opportunity to diversify away from single commodity dependence. This would help to reduce economic and political vulnerability to mineral commodity price volatility. For example, the boom-and-bust cycle for copper in single commodity dependent countries like **Zambia** has been ongoing for decades. In recent years, increased demand for nickel prompted the Munali Nickel Mine in Zambia to restart production in 2019 after being in care and maintenance for eight years.[94] Cobalt production is increasing after 10 years of low prices, and lead, zinc and vanadium production is planned for the Kabwe mine.

NATIONAL GOVERNANCE RISK 7

Export-oriented mining policies may fail to realise potential for mineral beneficiation and value addition

Sustainable development opportunities for countries producing transition minerals rest not only on mineral prospectivity, but also on capacity for value addition, local employment and local procurement. The rush to secure transition minerals for the industrial hubs of Asia, Europe and North America puts pressure on resource-rich countries to pursue export-oriented policies.[95] This may be at the expense of domestic use of these minerals; value addition in mineral processing and midstream transformation; or even downstream manufacturing of EV batteries and other clean energy technologies.

Several EITI implementing countries recognise this resource governance risk and have industrial policies in place to ensure future economic linkages from their extractive industries.

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91 Milhalyi, D. and Cust, J. (2017), What is the Presource Curse? NRGI. Retrieved from https://resourcegovernance.org/blog/what-presource-curse.

92 Research participant, interviewed 29 June 2022.

93 Armenian government introduces new royalty system replacing state duty for copper, molybdenum concentrate exports (2022, May 5). *Armenpress*. Retrieved from https://www.armenpress.am/eng/news/1082457.html.

94 Research participant, interviewed 20 June 2022.

95 Research participant, interviewed 7 July 2022.

For example, **Indonesia's** Battery Industrial Strategy aims for the country to develop an integrated EV supply chain and become an EV battery producer and exporter.[96] In the **DRC**, a recent study commissioned by the UN Economic Commission for Africa demonstrates the potential for producing battery precursors in the country, harnessing its ample cobalt and other battery minerals from the region.[97] Other initiatives are being undertaken at a regional scale. The DRC and **Zambia** have signed a cooperation agreement to facilitate the development of a value chain for the production of electric batteries. The agreement establishes a common governance framework called the DRC-Zambia Battery Council.[98]

In the absence of a long-term, holistic industrial strategy, a hastily constructed refinery or power plant risks becoming a white elephant project, whereby its cost outweighs its usefulness or value. In **Guinea**, the military junta installed in October 2021 has issued an ultimatum to bauxite mining companies to establish local alumina refineries.[99] There is, however, little capacity in the country to supply the amount of electricity required to refine alumina.[100]

NATIONAL GOVERNANCE RISK 8

Rushed public procurement for low-carbon energy and transport infrastructure may open new potential channels for corruption

On the public expenditure side of national budgets, large-scale procurement of low-carbon energy and transport infrastructure will need to be implemented quickly in order to meet energy transition targets. In 2021, for example, many countries prioritised expenditure on clean energy infrastructure as part of their economic recovery plans.[101] Such large-scale public procurement, however, comes with governance risks of bribery, corruption and state capture. The Open Contracting for Infrastructure Data Standard is a global initiative to provide information on the full procurement process for infrastructure projects, including the planning, tender, award, contract and implementation phases.[102] Open data and contracting of clean energy infrastructure presents an opportunity for EITI implementing countries to benefit from the energy transition beyond supplying transition minerals to the global market.

96 Research participant, interviewed 28 June 2022.

97 United Nations Economic Commission for Africa (2021), *The Cost of producing battery precursors in the DRC*. Retrieved from https://repository.uneca.org/handle/10855/48054.

98 Malasi, D.M., Vutsoro, R. and Lado, H. (2022), La RDC et les batteries électriques : ouvrir le débat à l'ensemble des parties prenantes. NRGI. Retrieved from https://resourcegovernance.org/blog/la-rdc-et-les-batteries-electriques-ouvrir-le-debat-a-l-ensemble-des-parties-prenantes.

99 Samb, S. (2022). Guinea extends deadline for bauxite miners to present refinery plans. *Reuters*. Retrieved from https://www.reuters.com/world/africa/guinea-extends-deadline-bauxite-miners-present-refinery-plans-2022-06-10/.

100 Research participant, interviewed 6 July 2022.

101 San Martin, M. (2021), Open contracting for infrastructure: An OGP commitment to support the recovery. Open Governance Partnership. Retrieved from https://www.opengovpartnership.org/stories/open-contracting-for-infrastructure-an-ogp-commitment-to-support-the-recovery/.

102 Ibid.

2.3 Transnational governance risks and opportunities across transition mineral value chains

This subsection identifies four transnational governance risks across transition mineral value chains, as shown in Figure 15. There is an opportunity for companies in transition mineral value chains to ensure access to the minerals they need to do business, while complying with voluntary and regulatory requirements. These companies face commercial, legal and reputational risks if they fail to exercise due diligence of their suppliers. For governments and consumers in countries importing transition minerals, there is an opportunity to access low-carbon energy and transportation. They face risks to their energy security and from increasing climate change if transition minerals are not supplied responsibly and reliably into their energy and EV markets.

FIGURE 15

Transnational governance risks across transition mineral value chains

TRANSNATIONAL GOVERNANCE RISK 1

Rising mineral commodity prices may drive smuggling and other illegal activities

Soaring prices for transition minerals could result in more smuggling and fake certification of ASM minerals entering the mineral value chain. For example, in June 2022, the Final Report of the Group of Experts on the **DRC** to the UN Security Council reported that illicit cross-border smuggling of coltan increased from 2021 to 2022.[103]

103 UN Security Council (2022), Letter dated 10 June 2022 from the Group of Experts extended pursuant to Security Council resolution 2582 (2021) addressed to the President of the Security Council. S/2022/479. Retrieved from https://digitallibrary.un.org/record/3977153?ln=en.

Higher rates of smuggling may also increase the risk of fake certification of ASM minerals entering the mineral value chain.[104]

The implications are that downstream companies will not be able to meet their responsible sourcing due diligence commitments. Countries and companies seeking to secure a supply of transition minerals for the energy transition could lose trust in mineral certification schemes and hence stop using them.

TRANSNATIONAL GOVERNANCE RISK 2

Smelters and refineries may be unable to meet ESG standards due to production pressure and soaring energy costs

The escalating demand for transition minerals will likely cause more pressure on existing refineries to increase production, as well as new investments in refineries capable of producing transition minerals. New refineries may lack the experience and management systems needed to exercise due diligence over their suppliers, while existing refineries' capacity will be stretched by this demand. According to one of the global standards for transition mineral value chains, the initiative has "struggled to engage with smelters and refineries on governance issues".[105]

The energy intensity of smelting and refining minerals risks undermining the contribution of some transition minerals to the energy transition altogether. For example, alumina refineries have been forced to close in Europe and North America due to soaring electricity costs in 2022.[106] In **Indonesia**, the use of coal-fired electricity to power nickel refineries weakens the country's ambitions of becoming a green energy hub.[107] Some smelters and refineries are producing transition minerals as co-products of their primary product stream, requiring investment in additional infrastructure. The significant cost and time required to build new facilities or refit existing ones may stall adequate supply of transition minerals and delay further action to address climate change.[108]

As resource-rich countries develop strategies to take advantage of the global competition for transition minerals, some are increasingly involving state-owned enterprises in the sector

TRANSNATIONAL GOVERNANCE RISK 3

Commodity trading deals increasingly involving SOEs may be at heightened risk of corruption

As resource-rich countries develop strategies to take advantage of the global competition for transition minerals, some are likely to increasingly involve SOEs in these growing industries. For example, the **DRC** established a subsidiary of the SOE Gécamines to manage all artisanally-mined cobalt.[109] In **Indonesia**, SOEs manage trade of tin, nickel, bauxite and other mineral commodities.

104 For example, see Global Witness (2022), *The ITSCI Laundromat: How a due diligence scheme appears to launder conflict minerals*. Retrieved from https://www.globalwitness.org/documents/20347/The_ITSCI_Laundromat_-_April_2022.pdf.

105 Research participant, interviewed 23 June 2022.

106 Research participant, interviewed June 2022.

107 Research participant, interviewed 28 June 2022.

108 How Australia can refine its critical minerals approach (2022, July 7). *Australia Resources & Investment*. Retrieved from https://www.australianresourcesandinvestment.com.au/2022/07/07/how-australia-can-refine-its-critical-minerals-approach/.

109 Le Bec, C., DRC: Gécamines takes over the artisanal cobalt mining sector.

Lack of transparency of revenue flows between governments and SOEs is a well-known risk in EITI implementing countries,[110] and it will require additional attention in the governance of transition mineral value chains, as mentioned in National governance risk 4.

Studies of corruption risks in commodity trading tend to focus on the oil sector, with very little information or analysis about corruption in the commodity trading of transition minerals. However, corruption between commodity traders and SOEs is certainly a risk in trade of metals such alumina, copper, nickel and zinc. For example, in 2014, the US company Alcoa paid USD 384 million in penalties for bribery of foreign officials under the US Foreign Corrupt Practices Act of 1977. The conduct at issue in Alcoa's case did not involve extraction operations; rather, authorities alleged that Alcoa was involved in a scheme involving the payment of more than USD 100 million to officials in **Bahrain** with influence over contract negotiations relating to Alcoa's supply of alumina (refined from bauxite extracted in the company's global mining operations) to Aluminium Bahrain, a state-owned aluminium producer.[111]

There is little reporting about transition minerals commodities trading with SOEs, as most commodity trading is with SOEs in the petroleum sector. For example, Glencore's *Payments to Governments Report 2021* lists many "first payments" to petroleum SOEs, but only a few for transition minerals, such as for nickel trade with **Indonesia**'s PT ANTAM, copper and molybdenum in **Peru**, and aluminium in **Cameroon**.[112]

TRANSNATIONAL GOVERNANCE RISK 4

Tightened due diligence regulations may disadvantage "high-risk" producer countries

As voluntary standards for the due diligence of mineral value chains are increasingly adopted into law in **Europe**, **North America** and other jurisdictions, downstream companies face higher compliance costs and risks to doing business. An unintended consequence of mandatory due diligence standards is the tendency of manufacturers to try to de-risk their supply chains by avoiding certain producer countries or regions altogether. For example, EV manufacturers, such as Tesla, have rushed to invest in nickel mining in **New Caledonia** and cobalt mining in Western **Australia**. While BMW Group supports ASM formalisation of cobalt projects in the **DRC**, the company sources 80% of its cobalt from Australia and 20% from a mine in **Morocco**.[113]

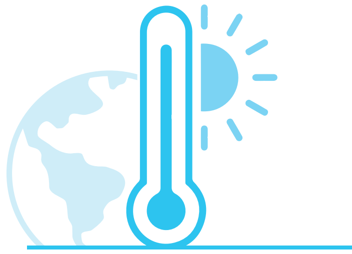
110 Gillies, A. and Shipley, T. (2022), *Anticorruption Guidance for Partners of State-Owned Enterprises*. NRGI. Retrieved from https://resourcegovernance.org/analysis-tools/publications/anticorruption-guidance-partners-state-owned-enterprises.

111 O'Donnell, J. and Head, E. (2015), Recent developments illustrating corruption risks in the mining industry. Herbert Smith Freehills. Retrieved from https://www.herbertsmithfreehills.com/latest-thinking/recent-developments-illustrating-corruption-risks-in-the-mining-industry.

112 Glencore (2021), *Payments to Governments Report 2021*. Retrieved from https://www.glencore.com/media-and-insights/insights/2022-06-payments-to-governments-report-2021.

113 BMW to buy cobalt direct from Australia, Morocco for EV batteries (2019, April 24). *Reuters*. Retrieved from https://www.reuters.com/article/us-bmw-electric-cobalt-idUSKCN1RZ1RK.

Global competition to explore, produce and source transition minerals is increasingly fierce, with high-income and middle-income producer countries like **Australia**, **Canada**, **Chile** and **Norway** marketing their minerals strategically as "responsibly mined" or "conflict free". Strengthening governance of transition mineral value chains, particularly those originating from low- and middle-income countries of **Africa**, **Asia Pacific**, **Central Asia** and **Latin America**, will be pivotal to an inclusive, equitable energy transition. Mining performance standards and commodity-specific value chain certification schemes have an important role to play in supporting meaningful change.



If mineral supplies are disrupted, this could mean that low-carbon technologies may not be deployed at the scale and speed needed to tackle climate change

2.4 Global governance risks to the energy transition

This subsection concludes that there are three broad governance risks at the global level, which threaten the energy transition in distinct ways, by: disrupting supply of transition minerals; deepening inequality between citizens of high-income and low-income countries; and weakening international cooperation needed to tackle climate change.

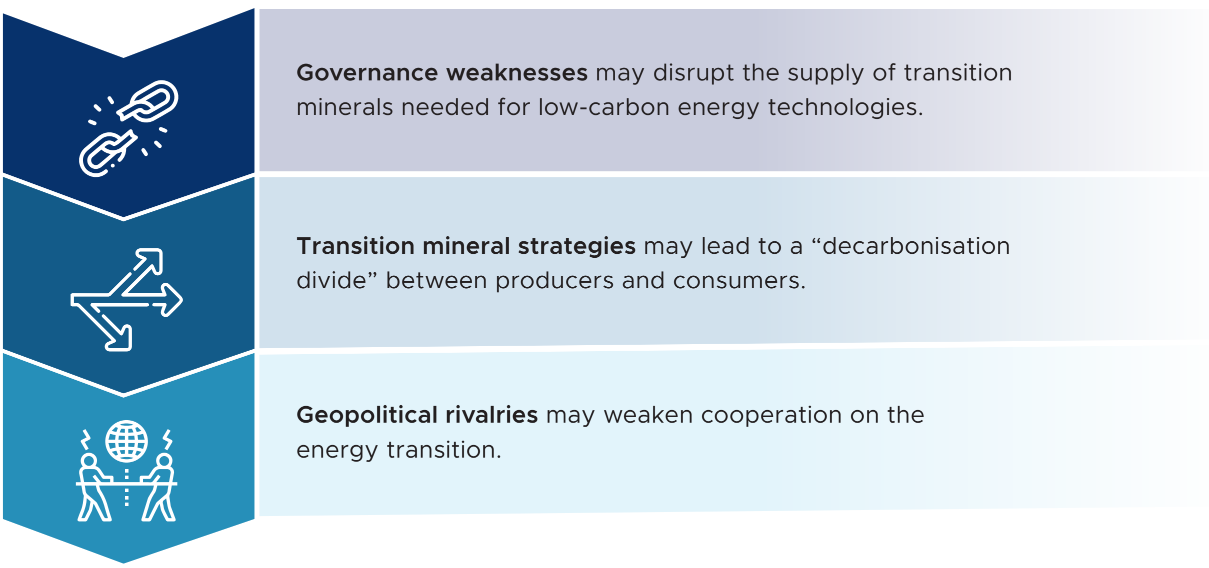
GLOBAL GOVERNANCE RISK 1

Governance weaknesses may disrupt the supply of transition minerals needed for low-carbon energy technologies

If governance risks are overlooked or misunderstood by the public and private sectors, then environmental destruction, social conflict, corruption scandals and other harmful consequences of poorly regulated resource extraction are likely to disrupt the supply of transition minerals needed for the energy transition. If mineral supplies are disrupted, this could mean that low-carbon technologies may not be deployed at the scale and speed needed to tackle climate change.

FIGURE 16

Global governance risks to the energy transition



For all the attention focused on ESG risks in minerals to energy transition value chains, the "G" in ESG – governance – is not well understood by all stakeholders and is sometimes overlooked altogether. For example, EY's report, *Top 10 Business Risks and Opportunities for Mining and Metals in 2022*, lists "environment and social issues" as the number one risk for the sector.[114] The report goes on to explain that "ESG factors [have] become a bigger priority for investors, shareholders and a broader group of stakeholders", but the survey results make no mention of governance in general or corruption in particular. Rather, respondents list local community impact, water management, green production, diversity and biodiversity as the issues where the mining and metals sector will face the most scrutiny.

A representative of one of the transition minerals due diligence standards observed that buyers of transition minerals for clean energy technologies tended to have "tunnel vision" towards the environmental requirements of the standard in particular, while neglecting to pay attention to the governance requirements.[115]

Yet, the governance requirements of global standards for mining and transition mineral value chains are fundamental to ensuring that environmental and social safeguards are in place for responsible mining and sourcing of minerals for the energy transition.

The energy transition raises the question of who bears the burden of transition mineral extraction

GLOBAL GOVERNANCE RISK 2

Transition minerals strategies may lead to a "decarbonisation divide" between mineral producer and consumer countries

The global energy transition raises questions of distributive justice: who benefits from the deployment of low-carbon energy infrastructure, and who bears the burden of rapid development of transition minerals extraction? There is a risk that historical patterns of injustice and domination in international relations lead to "cleaner air and cleaner production in the Global North, [while] much of the environmental and social harm is simply made invisible and displaced, or spatially externalised, to the Global South".[116] The term "decarbonisation divide" is used to describe this phenomenon.

An example of displaced harm is evident in downstream impacts of decarbonisation. Enormous quantities of electronic waste (e-waste) are accumulating in low-income countries where informal sector "waste pickers" make small amounts of money from recycling copper, aluminium and other metals.[117] Electronic waste can contain mercury, lead, cadmium, flame retardants, asbestos, refractory ceramic fibres and radioactive substances.

114 Mitchell, P. (2021, October 7). Top 10 business risks and opportunities for mining and metals in 2022. *EY*. Retrieved from https://www.ey.com/en_gl/mining-metals/top-10-business-risks-and-opportunities-for-mining-and-metals-in-2022.

115 Research participant, interviewed 23 June 2022.

116 Sovacool, B.K., Hook, A., Martiskainen, M., Brock A. and Turnheim, B. (2020), The decarbonisation divide: Contextualising landscapes of low-carbon exploitation and toxicity in Africa. *Global Environmental Change, 60*. Retrieved from https://doi.org/10.1016/j.gloenvcha.2019.102028.

117 See, for example, Akormedi, M., Asampong E. and Fobil, J.N. (2013), Working conditions and environmental exposures among electronic waste workers in Ghana. *International Journal of Occupational and Environmental Health, 19*(4), 278-286. https://doi.org/10.1179/2049396713Y.0000000034.

In **Ghana**, where highly toxic e-waste is processed and recycled, hazardous processes such as breaking electric vehicle batteries with machetes are common and workers often do not wear personal protective equipment. In these areas of Ghana, toxic e-waste is one of the most potent sources of morbidity.[118]

The distributive injustice associated with energy production is not a new phenomenon. For example, uranium extraction in **Niger** has fuelled French power stations for decades, while local communities have lived without electricity. As a West African civil society representative asked: "The energy transition may create inequalities when industrialised countries decide to go green – at the expense of whom?"[119]

Stronger regional and global governance of the energy transition is needed to manage the risk of powerful states advancing their national interests above international cooperation. For example, the EU's Green Deal policy aims to minimise a decarbonisation divide by ensuring that countries producing transition minerals are regarded as partners, rather than simply suppliers, in the energy transition. The OECD's draft *Equitable Framework and Finance for Extractive-based Countries in Transition* proposes that partner countries first meet their own renewable energy needs (i.e. decarbonise their extractive sectors, implement just transition plans, diversify their economies and develop low-carbon value chains), before exporting surplus minerals to the EU. [120]

There are several important inter-governmental initiatives that can help to avoid a "race to the bottom" between countries competing for investment in their mining sectors. The African Minerals Development Centre of the African Union is working to harmonise the transition minerals strategies of member states in line with the 2009 African Mining Vision.[121] The Association of Southeast Asian Nations (ASEAN) Minerals Cooperation Action Plan 2016-2025 commits to "adopt sustainable minerals development principles and implement leading practices to progressively improve governance and economic, social and environmental outcomes through the collective engagement of Member States… investors in minerals, and relevant non-government actors," while seeking to harness the opportunities for "green growth" and the energy transition.[122] The Inter-American Development Bank (IDB) identified the need for Latin American countries to take advantage of the energy transition momentum, acknowledging the role of the IDB in leveraging the mining sector for sustainable development.[123]

118 Sovacool, B.K., Hook, A., Martiskainen, M., Brock A. and Turnheim, B. (2020), The decarbonisation divide: Contextualising landscapes of low-carbon exploitation and toxicity in Africa.

119 Research participant, interviewed 2 July 2022.

120 Research participant, interviewed 29 June 2022; OECD (2022), Draft Equitable framework and finance for extractive-based countries in transition (EFFECT). Retrieved from https://www.oecd.org/dev/equitable-framework-Finance-EFFECT.htm.

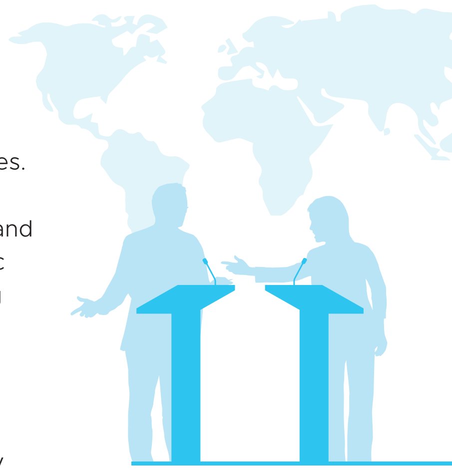
121 Kitaw, M. (2022, June 9). Green Minerals: Opportunities for Africa [Webinar]. *South African Institute of International Affairs*. Retrieved from https://saiia.org.za/event/green-minerals-opportunities-for-africa/.

122 ASEAN Secretariat (2021), *ASEAN Minerals Cooperation Action Plan 2016-2025 (AMCAP-III) Phase 2: 2021-2025*. Retrieved from https://asean.org/book/asean-minerals-cooperation-action-plan-2016-2025-amcap-iii-phase-2-2021-2025/.

123 IDB (2022), *Apalancando el Crecimiento de la Demanda en Minerales y Metales por la Transición a una Economía Baja en Carbono*. Retrieved from https://publications.iadb.org/es/apalancando-el-crecimiento-de-la-demanda-en-minerales-y-metales-por-la-transicion-una-economia-baja.

GLOBAL GOVERNANCE RISK 3

Geopolitical rivalries may weaken cooperation on the energy transition



Russia's invasion of Ukraine in February 2022 has revealed the fragility of an international security system based on veto rights for historically powerful states. Rising geopolitical tensions in Asia Pacific and Europe (between **China** and **Australia**, **India**, **Indonesia**, **Japan**, **South Korea** and other Asian and Pacific Island nations as well as the **US** and European countries), have seen growing strategic importance placed on control of transition minerals supply chains. The resulting uncertainty is affecting global markets at precisely the time when international cooperation and free, fair trade in mineral commodities is most needed to address the climate crisis.

The price volatility of transition minerals, including those needed for the energy transition, proved highly susceptible to geopolitical disruptions in the first half of 2022. This has heightened the sense of urgency to secure transition mineral supply chains, for example, in statements from the US Presidency.[124]

Transition minerals are highly susceptible to geopolitical disruptions

The escalating energy crisis in **Europe** has seen the incoming EU Presidency in July 2022 announce that "the Czech Presidency will put emphasis on the EU's energy security issues, which are currently more pressing than the energy transition".[125] While this may signal only a temporary shift in priorities for the EU, it demonstrates how easily political consensus on the energy transition may be undermined by economic and security threats.

The role of global governance initiatives, such as the EITI, is more relevant than ever in this polarised and uncertain international context. In the next section of the report, global standards and initiatives for responsible mining and due diligence of mineral value chains are reviewed to assess whether they adequately address the governance risks identified in this chapter.

124 The White House (2022, February 22), Securing a Made in America supply chain for critical minerals. Retrieved from https://www.whitehouse.gov/briefing-room/statements-releases/2021/02/24/fact-sheet-securing-americas-critical-supply-chains/.

125 Czech Presidency of the Council of the European Union (2022), Priorities of the Czech Presidency of the Council of the European Union in 2022. Retrieved from https://czech-presidency.consilium.europa.eu/en/programme/priorities/.

3. Aligning the EITI Standard with mining and minerals standards to strengthen governance of transition mineral value chains

THIS SECTION IDENTIFIES VOLUNTARY SUSTAINABILITY STANDARDS and initiatives relevant to the governance of minerals needed for the energy transition. This high-level overview provides a starting point for further engagement between the stakeholders of these various initiatives on how to address the issues of resource governance more effectively in transition mineral value chains.

While there has been a proliferation of responsible mining principles, standards and certification schemes in recent years, a few stand out as defining best practices for responsible business conduct in mining and mineral value chains. Some are applicable to all types of mining, while others pertain to specific commodities. Performance standards generally apply to upstream mining and mineral processing, while chain of custody and due diligence standards apply across the value chain.

The table below outlines the governance requirements of 14 standards and initiatives, and whether and how they refer to the EITI. This comparison informs the recommendations to policymakers in the conclusion (see Recommendations 4.5) on how to further align and emphasise governance requirements in responsible mining and mineral value chain initiatives. Alignment between the EITI and these standards should not be considered in technical terms only, as a way of harmonising requirements or aligning the validation processes and mechanisms. It will be important to identify common interests of the stakeholders of the different initiatives and seek opportunities for collaboration at the global and national levels.[126]

126 OECD (2020), *Promoting coherence between standards on responsible mineral supply chains*. Retrieved from https://mneguidelines.oecd.org/promoting-policy-coherence-between-the-oecd-and-eiti.pdf.

TABLE 2

Governance requirements of standards and initiatives relevant for transition minerals

Standard or initiative	Relevant requirements	EITI mentioned	Uptake in EITI countries
Aluminium Stewardship Initiative (ASI) Performance Standard and Chain of Custody Standard[127]	Performance Standard Section A: Governance, includes principles of business integrity and transparency. Contains guidance to support disclosure in accordance with the EITI Principles.[128] Multi-stakeholder governance, such as ASI's Indigenous Peoples Advisory Forum (IPAF), gives a platform to Indigenous community groups affected by bauxite mining.	Yes	Bauxite mine in Guinea preparing for certification; certified aluminium refinery in Argentina; indigenous members of IPAF in Ghana and Guinea.
Cobalt Industry Responsible Assessment Framework (CIRAF)[129]	Provides a management framework to participants on how to respond to and manage four risk categories and nine risk areas relating to responsible production and sourcing. "Conflict and financial crime" is one of the nine risk areas.	No	Mining company members operating in EITI countries include Ambatovy, Anglo American, Glencore and Vale.
Code of Risk-mitigation for ASM engaging in Formal Trade (CRAFT)[130]	Requirement 2.2.1: Payment of Taxes and EITI advises ASM mineral producers to disclose – if requested – payments of taxes, fees and royalties in accordance with the EITI Principles. Requirement 5: Company Governance prohibits bribery and facilitation payments, and urges ASM mineral producers to resist bribery to conceal or disguise the origin of minerals, and to eliminate money-laundering and disclose ultimate ownership.	No	Version 2 of the Code applies to tin, tantalum and tungsten (3Ts) as well as gold, cobalt and coloured gemstones. It is relevant to ASM of 3Ts and cobalt in the DRC, cobalt in Zambia and tin in Indonesia, among other EITI countries.

127 ASI (2022), *ASI Performance Standard V3*. Retrieved from https://aluminium-stewardship.org/asi-standards/asi-performance-standard. This initiative is involved in an OECD alignment assessment process. For more information, see OECD (2018), Alignment assessment of industry programmes with the OECD minerals guidance. Retrieved from http://mneguidelines.oecd.org/industry-initiatives-alignment-assessment-minerals.htm.

128 ASI (2022), *ASI Performance Standard V3*.

129 Cobalt Institute (2021), *Introducing the Cobalt Industry Responsible Assessment Framework (CIRAF)*. Retrieved from https://www.cobaltinstitute.org/wp-content/uploads/2021/05/introducing-the-cobalt-industry-risk-assessment-framework__20-Nov.pdf.

130 CRAFT (2022), *Requirements for ASM mineral producers commodity-independent requirements*. Retrieved from https://www.craftmines.org/wp-content/uploads/2020/10/CRAFT-2.0-Vol-2A-ENG.pdf.

Standard or initiative	Relevant requirements	EITI mentioned	Uptake in EITI countries
Global Battery Alliance Principles for a Sustainable Battery Value Chain[131]	Principle 10: Supporting responsible trade and anti-corruption practices, local value creation and economic diversification	No	Key stakeholders in the EV industry are located in EITI implementing countries (e.g. Germany).
Global Reporting Initiative (GRI)[132]	The GRI G4 Mining and Metals Sector Disclosures is currently under revision by the GRI Sector Standards Project for Mining. The GRI 11 Oil and Gas Sector and GRI 12 Coal Sector Standards make extensive references to the EITI. The GRI 205: Anti-corruption 2016 makes references to the EITI.	Yes	Most publicly listed mining companies operating in EITI implementing countries use the GRI standards for sustainability reporting.
ICMM Performance Expectations[133] Position Statement: Transparency of Mineral Revenues, 2021	Principle 1: Ethical Business advises implementing policies and practices to prevent bribery and corruption and publicly disclosing facilitation payments. Principle 10: Stakeholder Engagement advises publicly supporting the implementation of the EITI and compiling information on all material payments at the appropriate levels of government, by country and by project. The Position Statement was updated in 2021 with enhanced member commitments around contract disclosure.	Yes	ICMM members are MNEs op-erating in most, if not all, EITI implementing countries. Many are MSG members in these countries, and through their ICMM membership, they are also EITI supporting compa-nies at the global level.

131 Global Battery Alliance, Establishing a sustainable and responsible battery value chain. Retrieved from https://www.globalbattery.org/.

132 GRI (2021), GRI Standards. Retrieved from https://www.globalreporting.org/how-to-use-the-gri-standards/gri-standards-english-language/.

133 ICMM (2022), *Mining principles, performance expectations*. Retrieved from https://www.icmm.com/en-gb/our-principles/mining-principles/mining-principles.

Standard or initiative	Relevant requirements	EITI mentioned	Uptake in EITI countries
Initiative for Responsible Mining Assurance (IRMA)[134]	Requirements for business integrity include transparency in revenue payments for companies to governments. Chapter 1.5 profiles the EITI and states, "the IRMA Standard is intended to support, without duplicating, the work of the EITI". Further transparency requirements state: • 1.5.1 disclosure of country-level payments, including SOE production entitlement. • 1.5.2 disclosure of project-level payments includes data on mine production, disaggregated by product type and volume. • 1.5.3 support for the EITI. • 1.5.4 advises for beneficial ownership data to be publicly accessible.	Yes	The lithium mining company Fenix, operating in Argentina, certified against IRMA in February 2022. Carrizal's Zimapan mine in Mexico – which produces lead, zinc, copper and silver – is currently under assessment. Broad multi-stakeholder membership includes Anglo American, BMW, Ford, Human Rights Watch, IndustriALL, the International Union for Conservation of Nature, Mercedes-Benz, Tesla and Volkswagen.
International Tin Supply Chain Initiative (ITSCI)[135, 136]	Support companies in the tin supply chain are advised to comply with the OECD Due Diligence Guidance, including the sections on bribery, money laundering and disclosure of payments in line with the EITI Principles.	Yes	Focuses on Burundi, the DRC, Rwanda and Uganda, therefore relevant to EITI implementation in the DRC and Uganda.
London Metal Exchange[137]	Financial crime and corruption are addressed through the requirement to make disclosures under the EITI in EITI member countries. Brands sourcing from non-EITI member countries are also encouraged to make disclosures in line with the EITI Principles.	Yes	Relevant to all EITI implementing countries producing bauxite/aluminium, copper, zinc, nickel, tin, cobalt, molybdenum and lithium, as well as minerals trading and importing countries (e.g. Germany, Norway and the UK).

134 IRMA (2018), *IRMA Standard for Responsible Mining IRMA- STD 001*. Retrieved from https://responsiblemining.net/wp-content/uploads/2018/07/IRMA_STANDARD_v1.0_FINAL_2018-1.pdf.

135 International Tin Supply Chain Initiative, Providing Support for Due Diligence to Enable Responsible Trade. Retrieved from https://www.itsci.org/about-itsci/.

136 This initiative is involved in an OECD alignment assessment process. For more information, see: OECD, Alignment assessment of industry programmes with the OECD minerals guidance. Retrieved from http://mneguidelines.oecd.org/industry-initiatives-alignment-assessment-minerals.htm.

137 LME (2019), Responsible sourcing. Retrieved from https://www.lme.com/en/company/responsibility/responsible-sourcing; This initiative is involved in an OECD alignment assessment process. For more information, see: OECD, Alignment assessment of industry programmes with the OECD minerals guidance.

Standard or initiative	Relevant requirements	EITI mentioned	Uptake in EITI countries
OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas[138]	Annex II, 11 regarding bribery and fraudulent misrepresentation of the origin of minerals; 12 regarding money laundering; and 13 regarding payment of taxes, fees and royalties due to governments advise committing to disclosing such payments in accordance with the EITI Principles. Risk mitigation guidance for upstream companies includes supporting implementation of the EITI.	Yes	Relevant to all EITI implementing countries where there are transition minerals in conflict-affected and high-risk areas, as well as transition minerals trading and importing countries.
Responsible Minerals Initiative (RMI) Cobalt Refiner Due Diligence Standard[139, 140]	Bribery and fraudulent misrepresentation of the origin of minerals; corruption, money-laundering, non-payment of taxes and royalties to governments.	No	EITI implementing countries where cobalt is refined (e.g. DRC and Zambia), and countries importing cobalt for EV batteries (e.g. Germany).
RMI Joint Due Diligence Standard for Copper, Lead, Nickel and Zinc[141, 142]	Business integrity, transparency and disclosure are requirements. Companies should publicly support the implementation of the EITI and report where appropriate.	Yes	Relevant to EITI implementing countries producing copper, nickel and zinc (e.g. the DRC, Indonesia, Mongolia, Peru, Philippines, PNG and Zambia).

138 OECD (2016), *OECD Due diligence guidance for responsible supply chains of minerals from conflict-affected and high-risk areas (Third Edition)*, OECD Publishing, Paris. Retrieved from http://dx.doi.org/10.1787/9789264252479-en.

139 ComplianceXL (2021), Everything about revised cobalt refiner supply chain due diligence standard. Retrieved from https://beta.compliancexl.com/everything-about-revised-cobalt-refiner-supply-chain-due-diligence-standard/.

140 This standard is involved in an OECD alignment assessment process. For more information, see: OECD, Alignment assessment of industry programmes with the OECD minerals guidance.

141 The Copper Mark (2021), Joint due diligence standard for copper, lead, nickel and zinc. Retrieved from https://coppermark.org/standards/due-diligence/.

142 This standard is involved in an OECD alignment assessment process. For more information, see OECD (2018), Alignment assessment of industry programmes with the OECD minerals guidance.

Standard or initiative	Relevant requirements	EITI mentioned	Uptake in EITI countries
The Copper Mark Criteria for Responsible Production Chain of Custody Standard[143]	The Criteria for Responsible Production include business integrity, to implement a management system that prohibits and effectively prevents bribery (including facilitation payments), corruption and anti-competitive behaviour. Transparency and disclosure: to report annually on ESG performance in line with internationally recognised standards (e.g. GRI) and to publicly support the implementation of the EITI, and report where appropriate.	Yes	Relevant to EITI implementing countries producing copper (e.g. the DRC, Indonesia, Mongolia, Peru, Philippines, PNG and Zambia).
Towards Sustainable Mining Responsible Sourcing Alignment Supplement[144]	Responsible Sourcing Alignment Supplement, Section 1 Corporate governance and ethical conduct; 1.3 combatting bribery and corruption; 1.5 transparency of taxes, ownership and transfer pricing, including public support for the implementation of the EITI.	Yes	Uptake by Australian and Canadian mining companies, including junior exploration and mining companies in EITI implementing countries in Africa, Asia Pacific and Latin America.

143 Responsible Mining Initiative (2019), Risk readiness Assessment, Issue areas and Industry Norms. Retrieved from https://www.responsiblemineralsinitiative.org/minerals-due-diligence/risk-management/risk-readiness-assessment-(rra)/.

144 The Mining Association of Canada (2021), *Towards sustainable mining: Responsible sourcing alignment supplement*. Retrieved from https://mining.ca/resources/guides-manuals/tsm-responsible-sourcing-alignment-supplement/.

4. Recommendations for strengthening governance of transition mineral value chains

THE EITI STANDARD IS FAR-REACHING in its approach to strengthening resource governance in the dimensions outlined in this report. This section outlines how the multi-stakeholder approach, public policy, reporting and due diligence could be adopted more effectively by a range of stakeholders to address the specific and heightened governance risks identified in transition mineral value chains in the current global context.

4.1 Recommendations to governments

Governments of countries producing transition minerals:

1. **Explicitly address governance and corruption risks in transition mineral strategies.** As minerals-producing governments increasingly devise strategies on how to develop their mining sector and capitalise on growing demand, due consideration should be given to governance and anti-corruption safeguards. Government strategies should include plans for identifying and mitigating risks in areas such as licensing and contracting, procurement, state participation and commodity trading through mechanisms like contract, payment and beneficial ownership transparency.

2. **Require more detailed public reporting of transition mineral reserves** – both from exploration activities and existing mining projects. This could be done, for example, by using the EITI's reporting of exploration data and adopting the CRIRSCO standards for reporting mineral resources and reserves.

3. **Provide clear justifications for the use of "fast-tracked" license awards processes.** Where governments deviate from normal licensing procedures in order to expedite awards, they should commit to disclosing the rationale for doing so, as well as details on the procedures and criteria used and the outcomes of the process.

4. **Ensure sufficient time and resources are allocated to conducting due diligence checks in awards processes.** To support these efforts, governments should maintain a public register of beneficial ownership information and use this data to inform checks for conflicts of interest and corruption risks, particularly when "fast-tracked" procedures are used. Apart from licensing and contracting, strict due diligence checks should also be carried out in the awards of other business opportunities, for example in SOE procurement processes and commodity trading deals.

5. **Build up an understanding of the revenue potential of the transition minerals sector and adopt policies to support effective long-term economic planning.** To support these efforts, governments could model the revenue implications of different mineral price and energy transition scenarios and use this to inform the design of the mining sector's fiscal regime as well as decisions around how to spend the sector's revenues. For example, governments could consider using a sliding royalty, for which the rate changes with respect to a change in commodity price.

Governments of countries importing transition minerals:

6. **Ensure trade agreements on transition minerals balance the interests of producers and importers.** Such agreements should include reciprocal support for the low-carbon energy transition in countries supplying minerals. The agreements should also emphasise strong ESG expectations, particularly around governance.

7. **Build strategic partnerships with producing countries that promote transparency and governance reforms in the mining sector.**

8. **Ensure that responsible sourcing laws and regulations include strong governance safeguards**, alongside environmental and social requirements.

4.2 Recommendations to companies

All companies in transition mineral value chains:

9. **Integrate governance risk assessment and business integrity principles across all business units**, including, but not limited to finance, social investment, procurement, community and government relations functions. This should include measures to reduce the use of agents and intermediaries in securing business opportunities. Companies should regularly update corporate governance policies to reflect leading practices set out in responsible mining standards and minerals due diligence initiatives.

10. **Commit to transparency on revenue flows and financial relationships between upstream and downstream companies along the value chain.** This should include public disclosures related to offtake agreements and/or vertically integrated value chains.

Mining companies:

11. **Engage early and often in community consultations to build trust in transition minerals projects, including before entering offtake agreements with downstream companies.** Companies should ensure that their discussions with potential buyers of minerals do not pre-empt FPIC procedures. Companies should commit to proactive and comprehensive disclosures related to their stakeholder engagement activities, as well as on their environmental and social impacts.

12. **Partner with CSOs to support capacity building and financial management training** for local governments and communities to spend revenues and corporate social investments effectively.

Downstream companies:

13. **Ensure corruption and governance safeguards are properly considered in supply chain due diligence processes,** alongside environmental and social requirements. This should include using beneficial ownership information and taking appropriate measures when conflicts of interest or corruption risks are identified.

4.3 Recommendations to civil society

14. **Disseminate EITI disclosures to local communities to strengthen understanding of governance risks and opportunities in the transition minerals sector.** For example, EITI Requirement 5.2 on subnational transfers could be used to monitor revenue flows to local governments. Disclosures under Requirement 6.1 could be used to shed light on social payments being made by companies to communities.

15. **Analyse mining contracts to check whether any deals deviate from industry norms; give unduly favourable treatment to companies; or have insufficient ESG safeguards.** Contract disclosures could also be used to verify whether companies are complying with contractual obligations in practice.

16. **Analyse production and revenue disclosures to identify corruption risks and potential revenue losses.** For example, CSOs could compare production, export and revenue data to pinpoint inconsistencies. To reduce misappropriation risks, CSOs could track payments to ensure they end up with the intended recipient.

4.4 Recommendations to EITI multi-stakeholder groups

17. **Review awards processes to check for corruption risks, especially when "fast-tracked" procedures are used.** In particular, EITI Requirement 2.2 (contracts and license allocations), Requirement 2.4 (contracts transparency) and Requirement 2.5 (beneficial ownership) could help to shed light on potential risks.

18. **Require more in-depth reporting on state participation.** In particular, EITI Requirement 2.6 (state participation) and Requirement 4.5 (payments or transfers from SOEs to government) could be used to shed light on SOE involvement in the mining sector and to ensure investment decisions are aligned with public interests.

19. **Support more timely data disclosures to ensure reporting remains relevant in the rapidly evolving transition minerals sector.** EITI Requirement 4.8 (data timeliness) and Requirement 4.9 (data quality and assurance) are particularly relevant in this regard.

20. **Include midstream and downstream companies in MSGs, either as observers or representatives.** These stakeholders could make a valuable contribution to the governance of transition mineral value chains and inform the MSG on risks and opportunities for the energy transition. This recommendation is most relevant to countries with transition minerals processing and transformation, such as refineries and smelters, green energy and EV manufacturers. EITI implementing countries with few midstream or downstream industries could invite external buyers of their transition minerals to brief the MSG on governance risks and opportunities in their transnational mineral value chains. Note that EITI Requirement 1 does not restrict industry representatives on the MSG to the extractive industries.

4.5 Recommendations to the EITI International Secretariat and the EITI Board

21. **Engage with other sustainability standards and supply chain due diligence initiatives to strengthen alignment in approaches and to ensure governance challenges are given due consideration**. Efforts to strengthen coordination should include EITI and non-EITI implementing countries producing and importing transition minerals; upstream, midstream and downstream business entities; and the relevant global standards for mining and due diligence standards for mineral value chains.

22. **Engage with key stakeholders working on climate policy to ensure mineral governance's significance to the success of the energy transition is better understood.** Building such links at national and global levels will be crucial to supporting efforts to fight climate change.

Appendix 1: List of organisations that participated in this research[145]

Category	Organisations
Government agencies	Argentina Undersecretariat of Mining Development in the Ministry of Productive Development European Commission Peru's Ministry of Economy and Finance Peru's Ministry of Environment United States Geological Survey (USGS)
Business organisations	ABECEB Business Consultancy, Argentina Anglo American ICMM MMG
Civil society organisations	First Peoples Worldwide Law, Environment and Natural Resources (DAR), Peru Project on Organizing Development Education and Research (PODER), Mexico Southern Africa Resources Watch Transparency International, Accountable Mining Programme
Voluntary standards and initiatives	ASI EITI Indonesia Papua New Guinea EITI (PNGEITI) Zambia EITI (ZEITI) Initiative for Responsible Mining Assurance (IRMA) Intergovernmental Forum on Mining, Minerals and Metals and Sustainable Development (IGF) Mining Shared Value Initiative, Engineers Without Borders The Copper Mark, Responsible Minerals Initiative
Research and policy experts	BloombergNEF Columbia Center for Sustainable Investment Levin Sources Norwegian Institute of International Affairs U4 Anti-Corruption Research Centre

145 Interview participants working for the organisations listed expressed opinions in an individual capacity, which do not necessarily represent the official position of these organisations.

Appendix 2: Minerals and materials identified as "critical"

Minerals are **highlighted** if they are present across all the four lists.

EU (2020) list of critical raw materials[146]	US (2022) list of critical minerals[147]	Japan (2020) list of critical and rare metals[148]	Australia (2022) list of critical minerals[149]
Antimony	Aluminium	**Antimony**	High-purity alumina
Baryte	**Antimony**	Barium	**Antimony**
Bauxite	Arsenic	**Beryllium**	**Beryllium**
Beryllium	Barite	**Bismuth**	**Bismuth**
Bismuth	**Beryllium**	Boron	Chromium
Borate	**Bismuth**	Carbon	**Cobalt**
Cobalt	Cerium	Caesium	**Gallium**
Coking coal	Caesium	Chromium	**Germanium**
Fluorspar	Chromium	**Cobalt**	Graphite
Gallium	**Cobalt**	Fluorine	Hafnium
Germanium	Dysprosium	**Gallium**	Helium
Graphite	Erbium	**Germanium**	**Indium**
Hafnium	Europium	Hafnium	**Lithium**
Heavy rare earth elements	Fluorspar	**Indium**	**Magnesium**
Indium	Gadolinium	**Lithium**	Manganese
Light rare earth elements	**Gallium**	**Magnesium**	**Niobium**
Lithium	**Germanium**	Manganese	**Platinum group metals**
Magnesium	Graphite	Molybdenum	**Rare earth elements**
Natural rubber	Hafnium	Nickel	Rhenium
Niobium	Holmium	**Niobium**	Scandium
Phosphate rock	**Indium**	**Platinum group metals**	Silicon
Phosphorus	Iridium	Rare Earth Elements	**Tantalum**
Platinum group metals	Lanthanum	Rhenium	**Titanium**
Scandium	**Lithium**	Rubidium	**Tungsten**
Silicon	Lutetium	Selenium	Vanadium
Strontium	**Magnesium**	Silicon	Zirconium

146 European Commission, *Critical Raw Materials Resilience: Charting a Path towards greater Security and Sustainability*.

147 USGS, Final List of Critical Minerals.

148 Agency for Natural Resources and Energy (2020), Japan's new international resource strategy to secure rare metals; Nakano, J., *The Geopolitics of Critical Minerals Supply Chains*. Report prepared for Center for Strategic & International Studies.

149 Australian Government, *2022 Critical Minerals Strategy*.

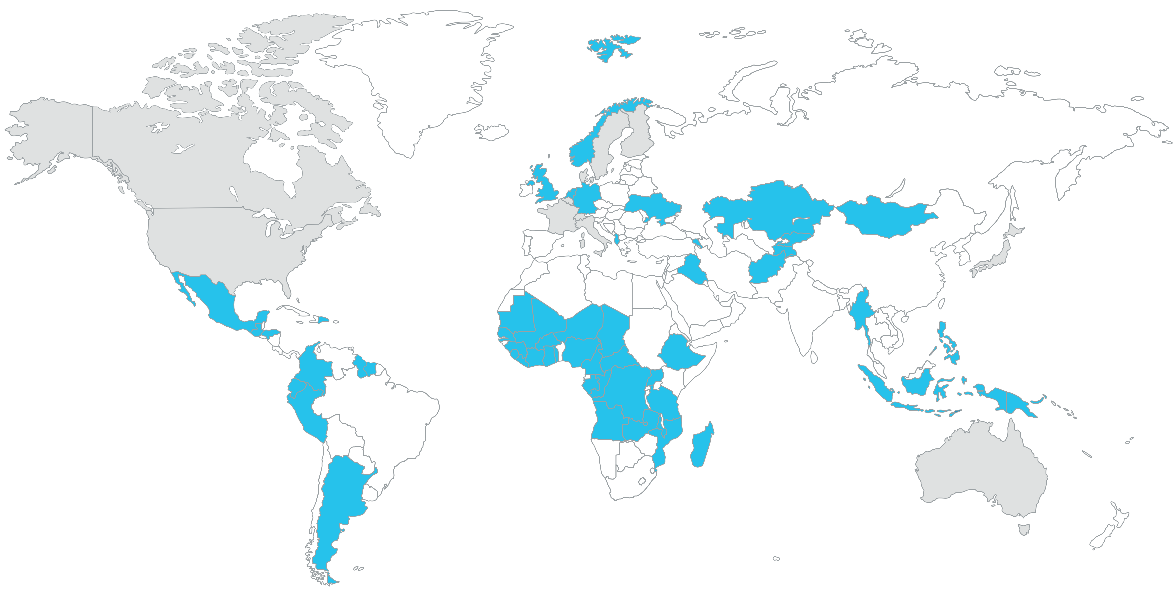
EU (2020) list of critical raw materials	US (2022) list of critical minerals	Japan (2020) list of critical and rare metals	Australia (2022) list of critical minerals
Tantalum	Manganese	Strontium	
Titanium	Neodymium	**Tantalum**	
Tungsten	Nickel	Tellurium	
Vanadium	**Niobium**	Thallium	
	Palladium	**Titanium**	
	Platinum	**Tungsten**	
	Praseodymium	Vanadium	
	Rhodium	Zirconium	
	Rubidium		
	Ruthenium		
	Samarium		
	Scandium		
	Tantalum		
	Tellurium		
	Terbium		
	Thulium		
	Tin		
	Titanium		
	Tungsten		
	Vanadium		
	Ytterbium		
	Yttrium		
	Zinc		
	Zirconium		

Appendix 3: Mapping transition mineral value chains

This section presents an analysis of global value chains of selected minerals as applicable to EITI implementing countries. The analysis compiles publicly available data (USGS, UN Comtrade) and data from reporting by EITI countries on mineral resources and reserves; mineral production; smelting and refining; and export and import in raw material and mineral products.

FIGURE 17

EITI implementing and supporting countries



EITI implementing countries

Afghanistan
Albania
Angola
Argentina
Armenia
Burkina Faso
Cameroon
Central African Republic
Chad
Colombia
Côte d'Ivoire
Democratic Republic of the Congo
Dominican Republic
Ecuador
Ethiopia
Gabon
Germany
Ghana
Guatemala
Guinea
Guyana
Honduras
Indonesia
Iraq
Kazakhstan
Kyrgyz Republic
Liberia
Madagascar
Malawi
Mali
Mauritania
Mexico
Mongolia
Mozambique
Myanmar
Netherlands
Niger
Nigeria
Norway
Papua New Guinea
Peru
Philippines
Republic of the Congo
Senegal
Seychelles
Sierra Leone
Suriname
São Tomé and Príncipe
Tajikistan
Tanzania
Timor-Leste
Togo
Trinidad and Tobago
Uganda
Ukraine
United Kingdom
Zambia

EITI supporting countries

Australia
Belgium
Canada
Denmark
Finland
France
Germany
Japan
Norway
Sweden
Switzerland
Netherlands
United Kingdom
United States

Bauxite

Reserves and mining

Estimates of bauxite resources range from 55 billion to 75 billion tonnes. The reserves are significant and could last 250 to 340 years. EITI implementing countries with significant reserves are **Guinea** (23% of the world's reserves); **Indonesia** (4%); and **Kazakhstan** (0.5%). In 2021, Guinea reported mining 85 million tonnes of bauxite, or 22% of global production; Indonesia reported 18 million tonnes, or 5%; and Kazakhstan reported 5.2 million tonnes, or 1.3%.

Some of the largest bauxite mines among EITI countries are in Guinea: Sangaredi mine (with 49% ownership by the Guinean State, and remaining by Rio Tinto Group, Alcoa, Alumina, Dadco Investments) contributes to about 5.8% of global production and the Kindia mine (a subsidiary of RUSAL, the Russian aluminium company) contributes to 1.3% of global production. Another significant mine is Krasno-Oktyabrsk (Eurasian Resources Group) in Kazakhstan, contributing to 1.6% of global production.

Smelting and refining

In 2021, over 50% of global alumina production was concentrated in **China**. EITI implementing countries that reported alumina production in 2021 are **Germany** (1.4%); **Ukraine** (1.3%); **Indonesia** (1.1%); **Kazakhstan** (1.1%); **Guinea** (0.3%); and **Tajikistan** (0.07%).

Despite considerable bauxite reserves and mining in **Guinea**, there is only one alumina refinery in the country (Friguia refinery owned by RUSAL). The Guinean government seeks to expand domestic processing to extract greater economic gains.

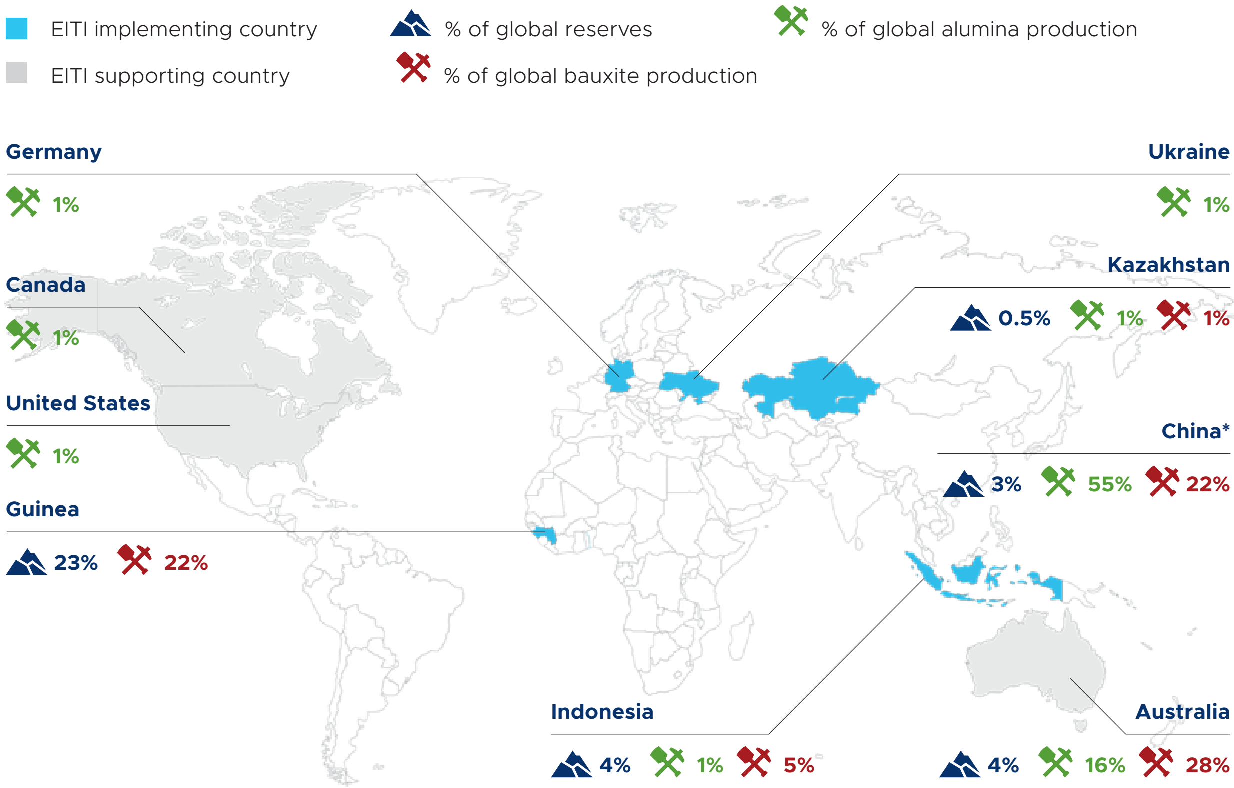
Indonesia is another EITI country that pursued control of the domestic aluminium supply chain, with the government banning bauxite export in 2014 and again in 2022.[150] Companies have established significant alumina refining capacity in Indonesia since the first export ban, including PT Borneo Alumina Indonesia (located in Mempawah), which will be the largest smelter grade alumina refinery in Indonesia.

Although **Germany**, **Tajikistan** and **Ukraine** have considerable aluminium smelting capacity, they rely on imported ore. For example, the state-owned Tajik Aluminium Company, the largest industrial enterprise in Tajikistan, sources bauxite from multiple destinations to produce aluminium, which is the country's main export commodity.

150 EITI Indonesia (2021), *Report of EITI Indonesia 2018*. Retrieved from https://eiti.org/documents/indonesia-2018-eiti-report.

FIGURE 18

Bauxite reserves and production in EITI countries



**Not an EITI implementing or EITI supporting country*

Trade and manufacturing

Among EITI implementing countries, the major bauxite exporters are **Guinea** and **Indonesia**. **China**'s imports account for 70% of the global bauxite trade. Between 2015 and 2021, on average, the major EITI trade flows were between Indonesia and China (18% of global export), followed by export from Guinea to **Germany**, **Ireland**, **Spain**, **Ukraine** and the **US** (in total 15%).

Aluminium ore is shipped to smelters, where alumina is smelted and metal is alloyed. The resulting material is used in a wide variety of applications, including energy transition uses in electricity networks and battery production. While aluminium cable wire production is common around the world (some of the largest manufacturers are **China**-based HongFan Holdings; **India**-based Vedanta Resources; **Netherlands**-based Vimetco; **Norway**-based Norsk Hydro; and **Russia**-based RUSAL), EV battery manufacturing is concentrated in China (about 80%); followed by the **US** (6%); **Hungary** (4%); **Poland** (3%); **South Korea** (2.5%); and **Japan** (2.4%).

Chromium

Reserves and mining

World resources are abundant and account for 12 billion tonnes of chromite, the main source of the metal chromium. Reserves are highly concentrated (95%) in **Kazakhstan** and **South Africa**.

Kazakhstan ranks first in chromite reserves (362.7 million tonnes, largely found in the Aktobe region) and third in global production (7 million tonnes in 2021, Donskoy and Voskhod mines). In its latest EITI report, Kazakhstan reported low exploration activity and insufficient replenishment of spent reserves.[151]

Other EITI countries that report chromite extraction are **Albania** (1.3 million tonnes in 2018);[152] the **Philippines** (0.5 million tonnes in 2018, including through small-scale mining); and **Madagascar** (0.1 million tonnes in 2018).[153]

Smelting and refining

In **Kazakhstan**, the main actor is the transnational corporation Kazchrom, a subsidiary of Eurasian Resources Group. Kazchrom is vertically integrated, comprising of mining, processing and ferroalloy plants, and has been granted the Responsible Chromium award by the International Chromium Development Association.[154] **Albania** has reported a steady increase in production of ferro-chromium, an alloy between chromium and iron.

Trade and manufacturing

For chromium ores and concentrates, among EITI implementing countries, the major exporters are **Kazakhstan** (8% of global trade); **Albania** (4%); **Madagascar** (1%); and the **Philippines** (1%). Between 2015 and 2021, on average, the major EITI trade flows were between Kazakhstan and **Russia** (5% of the global trade); the Philippines and **China** (0.8%); and Kazakhstan and China (0.7%).

For ferro-chromium, the major EITI exporters are **Albania**, **Kazakhstan** and the **Netherlands**, with major EITI trade flows being from Kazakhstan to **China**, **Germany**, **Indonesia**, **Japan**, **South Korea** and the **US**.

The world's largest importer of chromium ores and ferro-chromium is **China** (about 85% of global chromium trade), which is also the world's largest stainless-steel producer (60% of global production). Chromium is key to producing stainless and specialised steel needed in wind (wind turbines), solar (concentrated solar power), hydro, geothermal and nuclear energy generation.

151 Kazakhstan EITI (2019), *15th National Report*. Retrieved from https://eiti.org/documents/kazakhstan-2019-eiti-report.

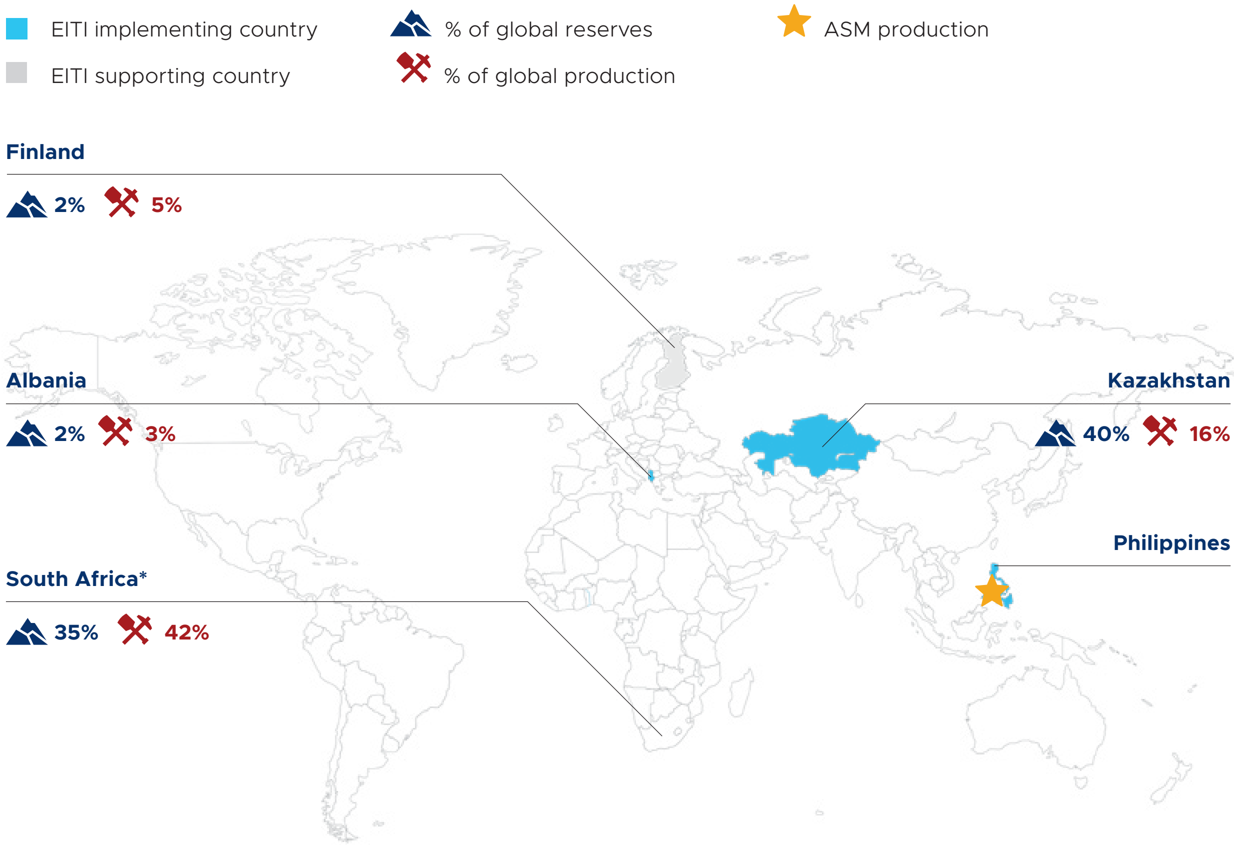
152 EITI Albania (2020), *Report for the years 2017 and 2018*. Retrieved from https://eiti.org/documents/albania-2017-2018-eiti-report.

153 Philippines EITI (2015), *Philippines EITI scoping study on small-scale metallic mining*. Retrieved from https://eiti.org/sites/default/files/attachments/philippines_eiti_scoping_study_on_small-scale_metallic_mining_web_version.pdf.

154 ERG's Kazchrome awarded ICDA's Responsible Chromium Label (2021, September 23). *Eurasian Resources Group*. Retrieved from https://www.eurasianresources.lu/en/news/ERG%E2%80%99s%20Kazchrome%20awarded%20ICDA%E2%80%99s%20Responsible%20Chromium%20Lab.

FIGURE 19

Chromium reserves and production in EITI countries



**Not an EITI implementing or EITI supporting country*

Cobalt

Reserves and mining

Cobalt is largely produced as a co-product of copper or nickel mining, and only about 2% of cobalt production originates from mines that extract cobalt as the main product.

Cobalt reserves (46%) and global production (70%) are highly concentrated in the **DRC**. Major cobalt-bearing projects in the DRC are Kamoto (23,000 tonnes produced in 2021, or 17.2% of global production) owned by Glencore and Gécamines, the DRC's state-owned mining company. Another significant project is the expansion of Tenke Fungurume (15,000 tonnes in 2021, or 11.1% of global production) owned by China Molybdenum Co and Gécamines. Other projects include Mutoshi (Chemaf), Mutanda (Glencore), Katanga (Glencore), and new cobalt production at Kinsevere (MMG). Gécamines holds shares in most of the large copper-cobalt projects in the DRC.

Between 20% and 40% of cobalt mined in the copper-cobalt belt of Katanga province in southern **DRC** is mined from ASM.[155]

Among other EITI countries, cobalt is mined as a by-product of copper or nickel in the **Philippines** (4.5 million tonnes per year); **PNG** (3 million tonnes); **Madagascar** (2.5 million tonnes); and, increasingly, **Indonesia** (2.1 million tonnes). Some of the largest mines in these countries are the Ramu mine (Metallurgical Corp. of CN, a **Chinese** state-owned metallurgic enterprise, 2.1% of global production) in PNG; Ambatovy (Sumitomo and Korea Resources, 2.1%) in Madagascar; Taganito and Rio Tuba (Nickel Asia, Pacific Metals and Sojitz, 1.8% and 1.4%) in the Philippines; and Sorowako (PT Vale Indonesia, 0.7%) in Indonesia.

Smelting and refining

The capability to refine cobalt in EITI countries is relatively low. Several smelters operate in the **DRC** (Kamoto Copper Company, Sicomines, Mutanda Mining, Tenke Fungurume Mining), and one smelter operates in **Zambia** (the Chambishi plant sources cobalt feed from the DRC). **China** is the world's leading producer of refined cobalt (72% of global production), led by China Nonferrous Mining Corporation, Huayou Cobalt, Power China and many other Chinese traders and refiners. Aside from China, cobalt sourcing and refining is managed by multinational **Belgium**-based Umicore (with refinery in Finland); **Luxembourg**-based Traxys; **Singapore**-based Trafigura; **Switzerland**-based Glencore (with refinery in Tanzania); Switzerland-based IXM; and **US**-based Electra.[156] **Indonesia** is the largest growth market for refined cobalt production after China.

Trade and manufacturing

Among EITI countries, the major exporters of cobalt ores and concentrates are the **DRC** (75% of global trade) and **Zambia** (11%). Between 2015 and 2021, on average, the major EITI trade flows were from the DRC to: **China** (44% of global trade); Zambia (30%); and the **United Arab Emirates** (17%).

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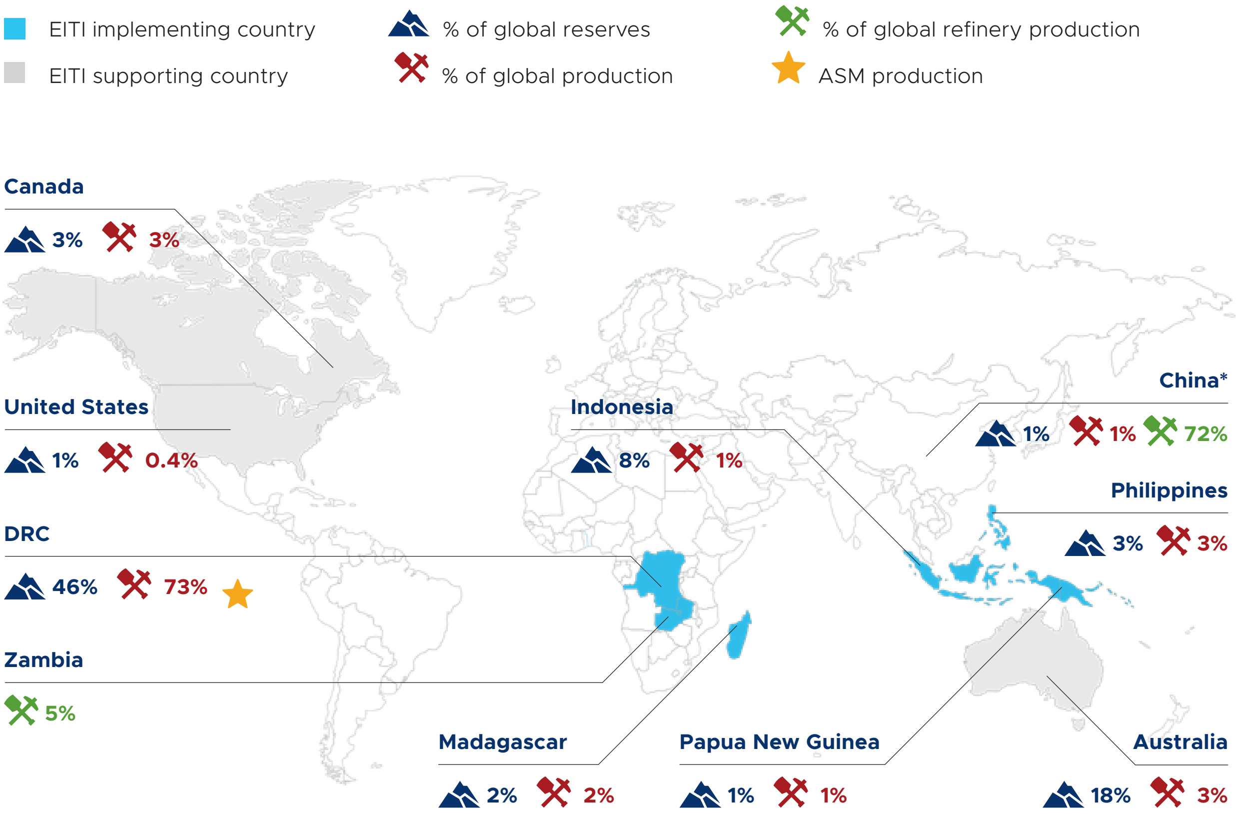
155 Trafigura, *Report on state of the artisanal and small-scale mining sector*.

156 Resource Matters (2022), Cobalt supply chain. Retrieved from https://supplychains.resourcematters.org/.

FIGURE 20

Cobalt reserves and production in EITI countries



Not an EITI implementing or EITI supporting country

China is the leading importer of cobalt (63% of global demand in 2021), with over 80% of cobalt supplies used in the battery industry. Recently, there have been domestic and international bottlenecks, mainly affecting transportation, caused by COVID-19 restrictions, inconsistent levels of demand and civil unrests (for example in South Africa in 2020 slowing shipment).

According to the Cobalt Institute,[157] batteries account for top consumption of cobalt (57%), with large growth potential. After refining, cobalt is used in the manufacturing of precursors (concentrated in **China**, **Finland**, **Japan**); cathodes (China, Japan, **South Korea**); battery cells (China, **Germany**, **Hungary**, **Poland**, **Slovakia**, **Spain**, **US**); and battery packs (China, **France**, Germany, Japan, US) used in electric cars and scooters (China, France, Germany, Japan, **UK**, US). Other consumption streams are nickel-based alloys (13%); tool materials (8%); pigments (6%); catalysts (5%); magnets (4%); and others. Portable electronics (48%) and the automotive industry (26%) hold the largest shares in finished products from cobalt.

157 Cobalt Institute (2022), Cobalt Value Chain Mapping, Retrieved from https://www.cobaltinstitute.org/responsible-sourcing/cobalt-value-chain-mapping/.

Copper

Reserves and mining

Copper resources are abundant, with 2.1 billion tonnes of identified resources and an estimated 3.5 billion tonnes of undiscovered resources. Current global reserves are estimated at 880 million tonnes. Globally, reserves and production of copper are not highly concentrated. EITI implementing countries with large reserves and resources are **Peru** (9% of the world's copper reserves, 56 active projects); **Mexico** (6%, 47 active projects); the **DRC** (4%, 40 active projects); **Indonesia** (3%, seven active projects); and **Zambia** (2%, 34 active projects).[158]

Among EITI implementing countries, **Peru** (10.3% of global production); the **DRC** (8.5%); **Zambia** (3.9%); **Indonesia** (3.8%); **Mexico** (3.4%); **Kazakhstan** (2.4%); and **Mongolia** (1.4%) are important producers of copper. Some of the largest projects in these countries are in Peru: Antamina (Glencore, BHP Group, Tech Resources, and Mitsubishi Corporation, 1.8% of global production); the Las Bambas Mine (MMG, 1.5%); and one of the world's largest copper mines, Cerro Verde (Freeport-McMoRan, 1.7%). Cerro Verde is a participating site of the Copper Mark conforming with the Copper Mark Responsible Production Criteria.[159]

Some other large mines in EITI implementing countries are the Buenavista mine (Southern Copper, 2.1% of global production) in **Mexico**; the Grasberg mine (Freeport-McMoRan, 1.8%) in **Indonesia**; Tenke Fungurume (China Molybdenum, Gécamines, 0.9%) in the **DRC**; Zhezkazgan Complex (Cuprum Holding, 0.7%) in **Kazakhstan**; and Oyu Tolgoi (Turquoise Hill Resources, 0.7%) in **Mongolia**. Artisanal and small-scale miners are involved in copper mining in the DRC (Haut-Katanga and Lualaba) and **Zambia**. Zambia plans to triple the amount of copper produced in its Copperbelt region by 2030.[160]

Smelting and refining

China accounts for the world's largest refinery production (40%). Among EITI implementing countries, the **DRC** (China Nonferrous Mining Corp's Lualaba smelter); **Mexico** (La Caridad copper smelter); and **Zambia** (Chambishi and Kansanshi copper smelters) operate a number of smelters and refineries. Although copper smelting is established in **Peru** (Southern Copper's Ilo smelter), its capacity is significantly lower than the country's copper production volumes. Development of copper smelting is underway in **Indonesia**.

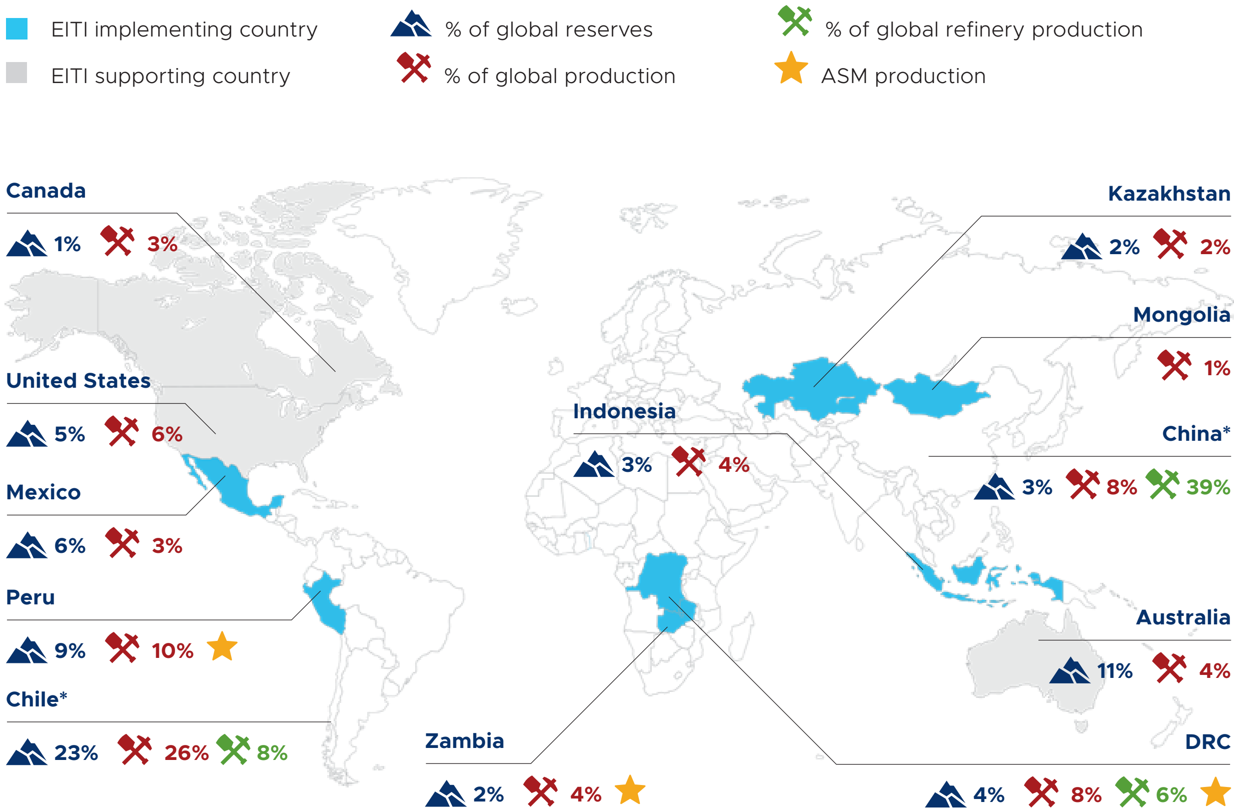
158 Owen, J., Lèbre, E. and Kemp, D. (2022), Energy Transition Minerals (ETMs): A global dataset of projects. *The University of Queensland*. Retrieved from https://doi.org/10.48610/12b9a6e. This dataset contains records for geolocated mining projects (resources and reserves) extracting or projecting to extract ETMs.

159 The Copper Mark (2022), Recipients of the Copper Mark. Retrieved from https://coppermark.org/participants-home/participants/.

160 Parliament of Zambia (2021), 2022 Budget Address. Retrieved from https://www.parliament.gov.zm/sites/default/files/images/publication_docs/BUDGET%20SPEECH%20_%202022.pdf.

FIGURE 21

Copper reserves and production in EITI countries



**Not an EITI implementing or EITI supporting country*

Trade and manufacturing

With limited refining capacity, **Peru** is the largest exporter of copper ore and concentrate (3%, or 6 million tonnes per year) among EITI implementing countries, primarily sold to **China** (65% of Peru's copper ore and concentrate export); **Japan** (12%); **South Korea** (9%); and **Germany** (3%). Significant smelting and refining capacity is concentrated at LS Nikko Copper (South Korea); Mitsubishi Materials Corp. and JX Metals Smelting Co. (Japan); and Aurubis AG (Germany). **Indonesia** exports copper concentrate and, increasingly, copper cathodes.

Key manufacturing actors are concentrated in Europe (**Germany** and **Italy**), **China** and the **US**. For example, copper is sourced by numerous car manufacturers (such as BMW, Daimler, Renault-Nissan-Mitsubishi Alliance and Tesla). A wide range of companies that source copper are Copper Mark partners.[161] Copper is essential for almost all electricity-related technologies, such as electricity networks (power lines), solar photovoltaics (solar PV), EVs, wind and nuclear energy infrastructure.

161 The Copper Mark (2022), Partners. Retrieved from https://coppermark.org/participants-home/partners/.

Graphite

Reserves and mining

The world's natural graphite resources account for 800 million tonnes. EITI implementing countries with established reserves and resources of natural graphite are: **Madagascar** (26 million tonnes of reserves, six projects); **Mozambique** (25 million tonnes, nine projects); **Tanzania** (18 million tonnes, eight projects); **Ukraine** (reserves unreported, six projects); and, with smaller quantities, **Guinea**, **Indonesia**, **Malawi** and **Norway**.[162] The Balama project (**Australia**-based Syrah Resources) in Mozambique is the largest natural graphite mine globally (about 20% of the world's resources and reserves). Another Australia-based company, Battery Minerals, is developing Balama Central and Montepuez mines in the northernmost province of Cabo Delgado. Several projects are being developed in Madagascar: Molo (**Canada**-based NextSource Materials) and Graphmada (Australia-based Greenwing Resources Ltd).

China is the world's largest producer of natural graphite, with over 80% of the world's total mine production in 2021. Among EITI countries, natural graphite is produced in **Mozambique** (30,000 tonnes in 2021); **Madagascar** (22,000 tonnes); **Ukraine** (17,000 tonnes); **Norway** (12,000 tonnes); and **Mexico** (3,500 tonnes). Some of the largest operating mines in these countries are Balama (**Australia**-based Syrah Resources); Zavalievsky (Australia-based Volt Resources) in Ukraine; and Traelen (Australia-based Mineral Commodities) in Norway.

Smelting and refining

China holds the dominant position in global graphite processing, mainly concentrated in Jixi city area, producing flake graphite, amorphous graphite, spherical graphite, and battery anodes. **Australia**-based Syrah Resources owns graphite processing in the Vidalia plain in the state of Louisiana, **US** (to process **Mozambique**-mined graphite), which will be enlarged with support from the US government under supply deals with Ford and Tesla.

Trade and manufacturing

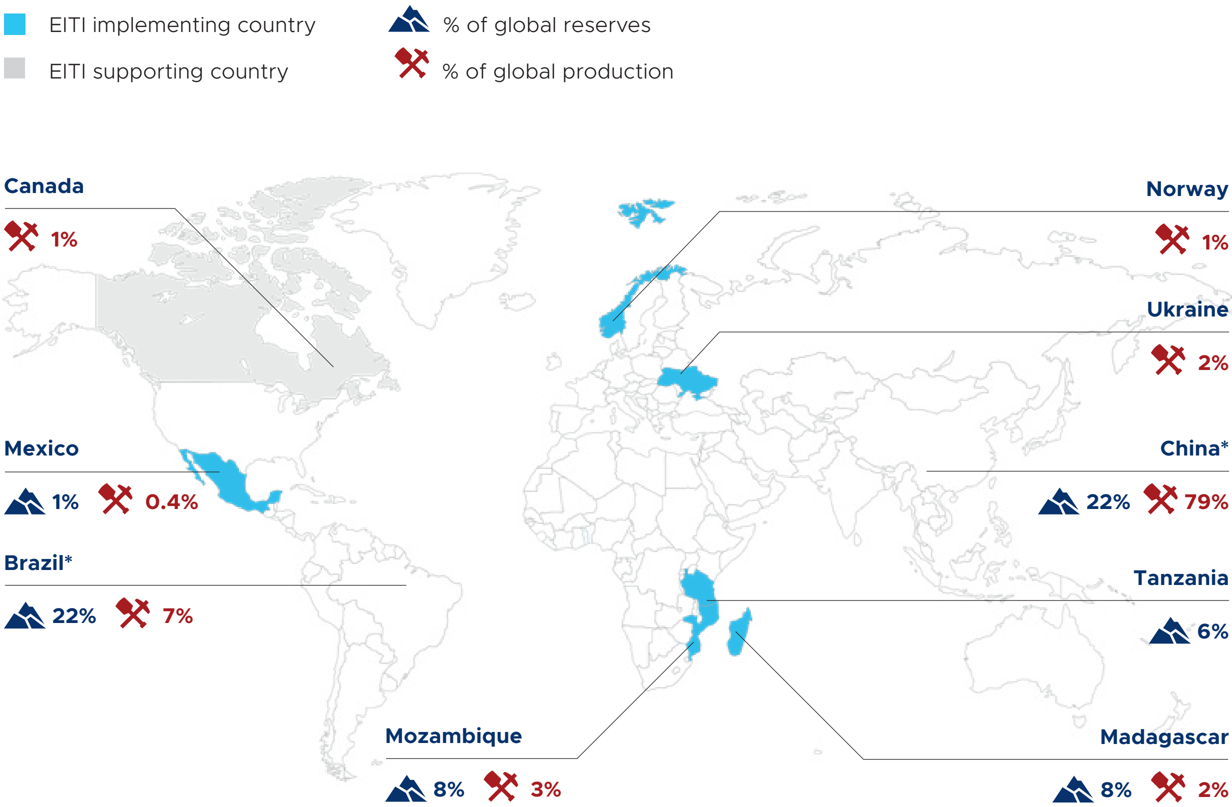
China is the world's largest exporter of natural graphite, followed by **Madagascar** (exporting to China, Germany, India, the US); **Mozambique** (exporting to China, Germany, Japan, Slovenia); and **Ukraine** (exporting to **Austria**).

The growth in demand for natural graphite is driven by automakers that use graphite for lithium-ion batteries (as anode). EV battery (lithium-ion) manufacturing is dominated by **China** (about 80%), followed by the **US** (6%); **Hungary** (4%); **Poland** (3%); **South Korea** (2.5%); and **Japan** (2.4%). The top 10 manufacturers are based in China, Japan and South Korea. Graphex Group Limited (a Cayman Island company with offices in Hong Kong) is among the top suppliers of graphite to the EV industry globally.

162 Owen, J., Lèbre, E. and Kemp, D. (2022), Energy Transition Minerals (ETMs): A global dataset of projects.

FIGURE 22

Graphite reserves and production in EITI countries



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Lithium

Reserves and mining

Identified resources of lithium total about 89 million tonnes and continue to grow due to increased exploration. The largest resources are established in **Bolivia** (21 million tonnes); **Argentina** (19.3 million tonnes); and **Chile** (9.8 million tonnes), known as the "lithium triangle".

Argentina is the only EITI implementing country with significant lithium mining, ranking fourth in global lithium production (6,200 tonnes in 2021, or 8% of global mine production), after **Australia**, **Chile** and **China**. In Argentina, lithium mines currently in operation (using brine to produce lithium carbonate) are Salar del Hombre Muerto – also known as Fenix or Phenix – (Livent Corp, 4.7% of global production); Cauchari-Olaroz (Ganfeng Lithium, 3.4%); and Salar de Olaroz (Orocobre Ltd, 2.1%). These companies are part of the International Lithium Association aiming to provide a sustainable and reliable supply of responsible lithium.[163] Jujuy Energia and Mineria is a state-run mining company of the Government of Jujuy, holding shares in major lithium projects. There are 20 projects in feasibility and advanced exploration stages across three Argentinian provinces (Catamarca, Jujuy and Salta), many developed by junior mining companies.[164]

Among other EITI countries, the **DRC** (Manono); **Germany** (Zinnwald and Vulcan); **Ghana** (Ewoyaa); **Mali** (Goulamina, Bougouni); **Mexico** (Sonora); and **Peru** (Macusani Plateau) have identified lithium resources and are seeking to develop them. In 2022, Mexico nationalised its lithium industry, elevating lithium to the category of "strategic minerals".[165]

Smelting and refining

The global smelting and refining capability for lithium is largely concentrated in **China**, which accounts for about 60% of global lithium chemical production. **Argentina** refines all of the produced brine at the mining site, ranking second largest globally in refinement capacity.

Trade and manufacturing

Argentina ranks second in exports of lithium carbonates. Argentina's leading lithium export partners are **Japan** (38%); the **US** (25%); **China** (20%); and **South Korea** (11%).[166]

China is the world's largest lithium importer, followed by **South Korea** and **Japan**, all battery-producing countries. Battery production dominates total lithium use and China accounts for about 80% of the world's battery production.

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163 International Lithium Association (2022), Home page. Retrieved from https://lithium.org/.

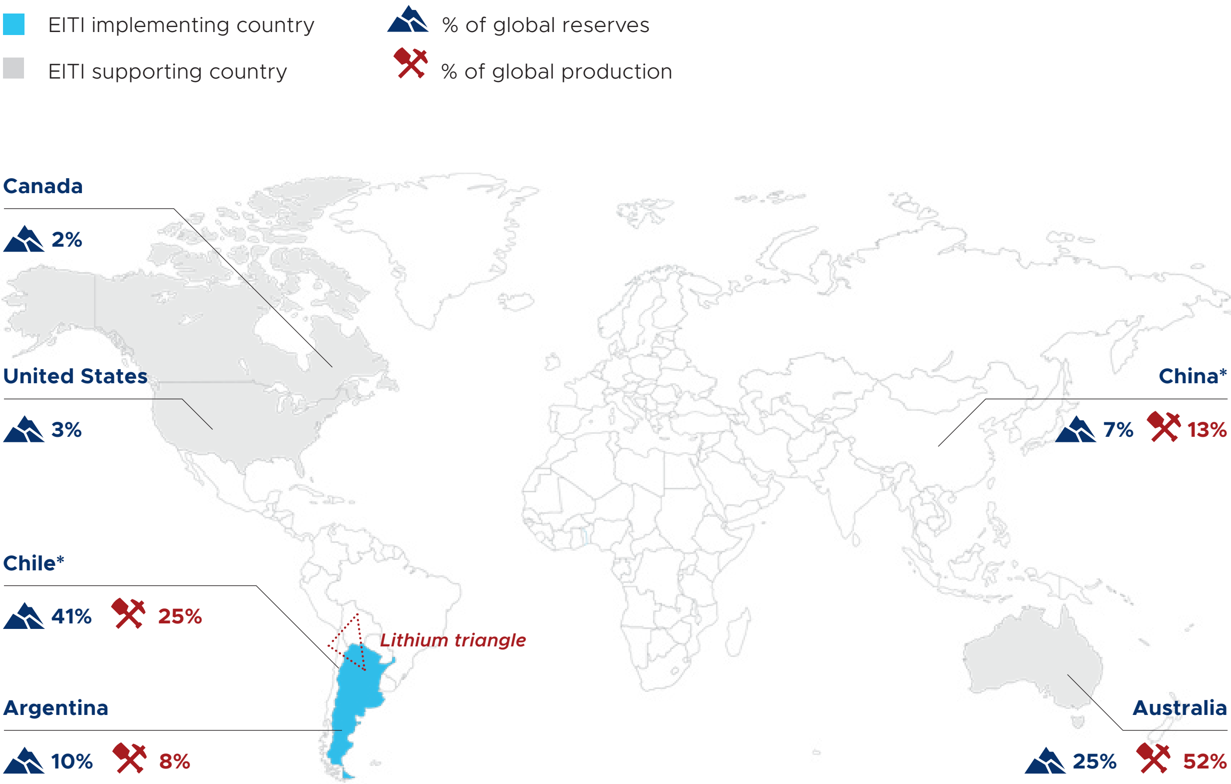
164 EITI Argentina (2019), *Reporte Argentina Segundo Ciclo*, p. 107. Retrieved from https://eiti.org/documents/argentina-2019-eiti-report.

165 Attwood, J. and Averbuch, M. (2022, February 2), Mexico says lithium is too strategic for private investors. *Bloomberg*. Retrieved from https://www.bloomberg.com/news/articles/2022-02-02/mexico-declares-lithium-too-strategic-for-private-investors.

166 EITI Argentina (2019), *Reporte Argentina Segundo Ciclo*.

FIGURE 23

Lithium reserves and production in EITI countries



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Specific end uses of lithium are battery cathodes and consumer electronics. Manufacturers that use lithium are electronics and electric mobility companies, such as Apple, Tesla, Volkswagen and many others, largely sourcing lithium from mainland China.[167] While some manufacturers do not source raw materials directly,[168] others make deals with mining companies to secure reliable supplies of minerals.[169]

167 Apple Inc. (2021), Smelter and Refiner List. Retrieved from https://www.apple.com/supplier-responsibility/pdf/Apple-Smelter-and-Refiner-List.pdf

168 Volkswagen Group (2021), *Responsible Raw Materials Report 2021*. Retrieved from https://www.volkswagenag.com/presence/nachhaltigkeit/documents/supply-chain/Volkswagen-Group-Responsible-Raw-Materials-Report-2021.pdf.

169 Araujo, G. (2022, May 6), Brazil's Vale signs long-term deal to supply Tesla with nickel. *Reuters*. Retrieved from https://www.reuters.com/technology/brazils-vale-signs-long-term-deal-supply-tesla-with-nickel-2022-05-06/.

Manganese

Reserves and mining

Although manganese resources are abundant, they are irregularly distributed and not well explored. For example, in **Kazakhstan**, manganese reserves are large but of poor quality.[170]

Among EITI implementing countries, manganese reserves are established in **Côte d'Ivoire** (two active projects on different stages of resource development or production); **Gabon** (four projects); **Ghana** (one project); **Indonesia** (four projects); **Kazakhstan** (six projects); **Mexico** (four projects); and **Ukraine** (two projects). Gabon is the largest manganese producer among EITI countries (3.6 million tonnes, or 18% of global production), ranking second globally after **South Africa** (37%). Manganese mining also takes place in Ukraine (0.67 million tonnes produced in 2021); Ghana (0.6 million tonnes); Côte d'Ivoire (0.5 million tonnes); **Myanmar** (0.25 million tonnes); Mexico (0.2 million tonnes); and Kazakhstan (0.16 million tonnes). ASM of manganese has been reported in Indonesia, **Nigeria** and **Zambia**.[171] The largest manganese mines in these countries are Moanda (ERAMET) in Gabon; Nsuta (Ningxia Tianyuan Manganese) in Ghana; Nikopolskoye (Privat-Holding Group) in Ukraine; and Molango (Compañía Minera Autlán) in Mexico.

Smelting and refining

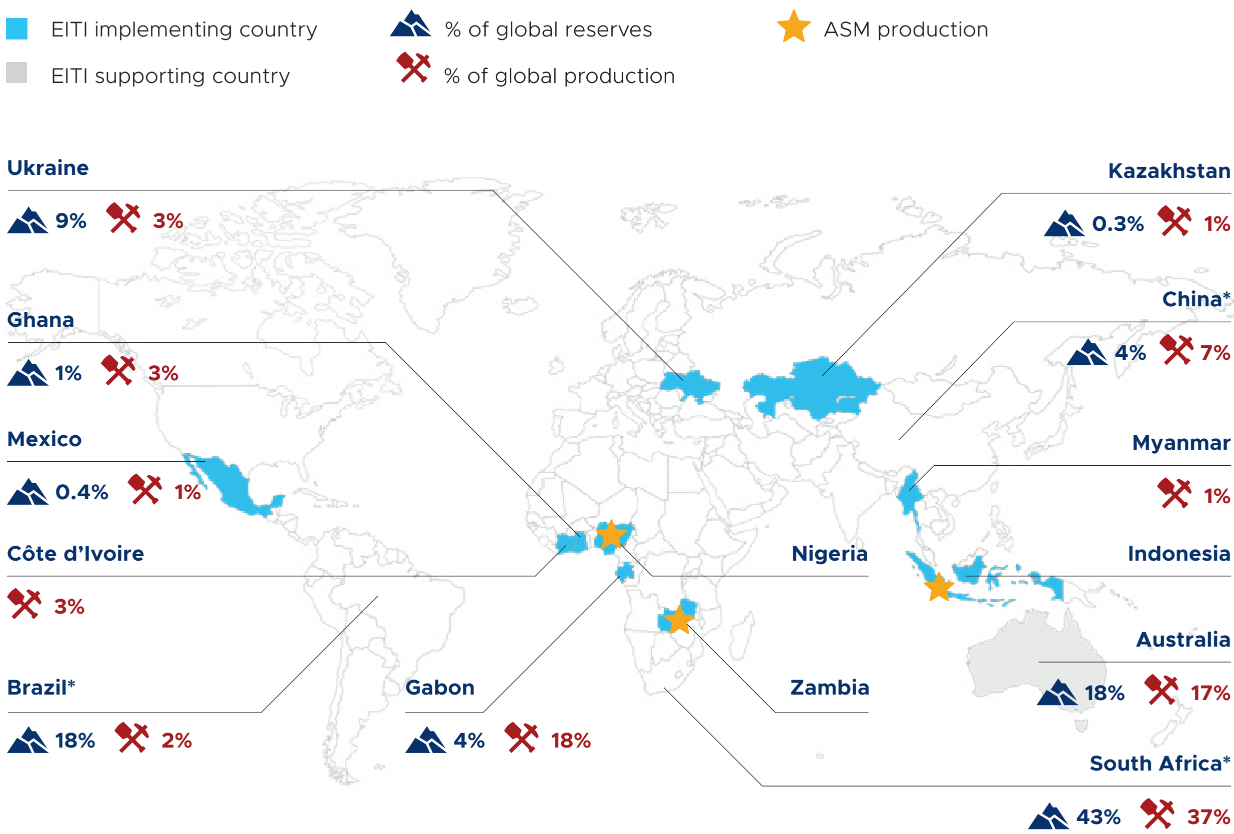
After being extracted, manganese ore is processed into manganese flakes, alloys (ferromanganese and silicomanganese) and chemicals. **China** produces over 90% of the world's manganese products, led by Ningxia Tinyuan Manganese Industry (the world's largest producer of electrolytic manganese metal), Hunan Southern Manganese, Wuling Manganese and eight other major Chinese producers working under a strategic cooperation agreement known as the Manganese Innovation Alliance. Outside China, producers of manganese metal are in **Gabon**, **Indonesia** and **South Africa**.

170 Kazakhstan EITI (2019), *15th National Report*.

171 Siwale, T. (2019, November 6), The current state of artisanal and small-scale mining in Zambia. *International Growth Centre*. Retrieved from https://www.theigc.org/blog/the-current-state-of-artisanal-and-small-scale-mining-in-zambia/.

FIGURE 24

Manganese reserves and production in EITI countries



**Not an EITI implementing or EITI supporting country*

Trade and manufacturing

Manganese ore dominates the main market for manganese. The largest exporters of manganese ores and concentrates among EITI implementing countries are **Côte d'Ivoire**, **Ghana**, **Kazakhstan** and **Zambia**. The major importers are **China**, **India**, **Japan**, **Malaysia**, **Norway** and **South Korea**. Between 2015 and 2021, on average, the major trade flows from EITI implementing countries were between Ghana and China (4% of global trade); Ghana and **Ukraine** (1.4%); and Côte d'Ivoire and China (1%).

The dominant use of manganese is in steelmaking, accounting for 90% of demand, which is largely concentrated in **China**. Steel is used in many low-carbon technologies, including wind and hydro power. Another application important for the energy transition is manufacturing of battery-grade compounds used in EVs and electric devices. Manganese is a key element in alkaline and lithium-ion batteries acting as a cathode material (about 3% of global demand). Some of the major producers of manganese-based cathode materials (such as nickel manganese cobalt oxide) are 3M (**US**); Mitsubishi Chemical Holdings (**Japan**); POSCO (**South Korea**); Sumitomo (**Japan**); and Umicore (**Belgium**).

Molybdenum

Reserves and mining

Molybdenum occurs as principal mineral in molybdenum deposits and as an associated mineral in copper deposits. Identified resources of molybdenum is about 20 million tonnes. Significant reserves (over 50%) and mine production (over 40%) are concentrated in **China**.

Among EITI implementing countries, **Peru** is the largest producer of molybdenum (32,000 tonnes in 2021, or 11% of global production). Major molybdenum producing mines in Peru are the Cerro Verde (Freeport-McMoRan, Compañía de Minas Buenaventura, Sumitomo Metal Mining, 2.8% of global production) and Toquepala (Southern Copper, 1.9%) copper mines. Other EITI implementing countries that produce molybdenum are **Mexico** (6% of global production); **Armenia** (3%); and **Mongolia** (1%). The largest projects in these countries are the La Caridad copper mine (Southern Copper, 3.5% of global production) in Mexico; the Zangezur copper mine (Zangezur Copper Molybdenum, 1.9%) in Armenia; and Erdenet copper mine (Government of Mongolia, Mongolian Copper Corp, 0.7%) in Mongolia.

Smelting and refining

As molybdenum is largely extracted as a by-product of copper mining, it is being recovered from copper-molybdenum concentrates produced at a concentrator. In **Mexico** and **Peru**, molybdenum concentrate is produced at Southern Copper Corporation operations. In Armenia, four smelting plants produce ferromolybdenum using ores mined by Zangezur Copper Molybdenum, the major copper and molybdenum producer and exporter, and one of the largest companies in the country.

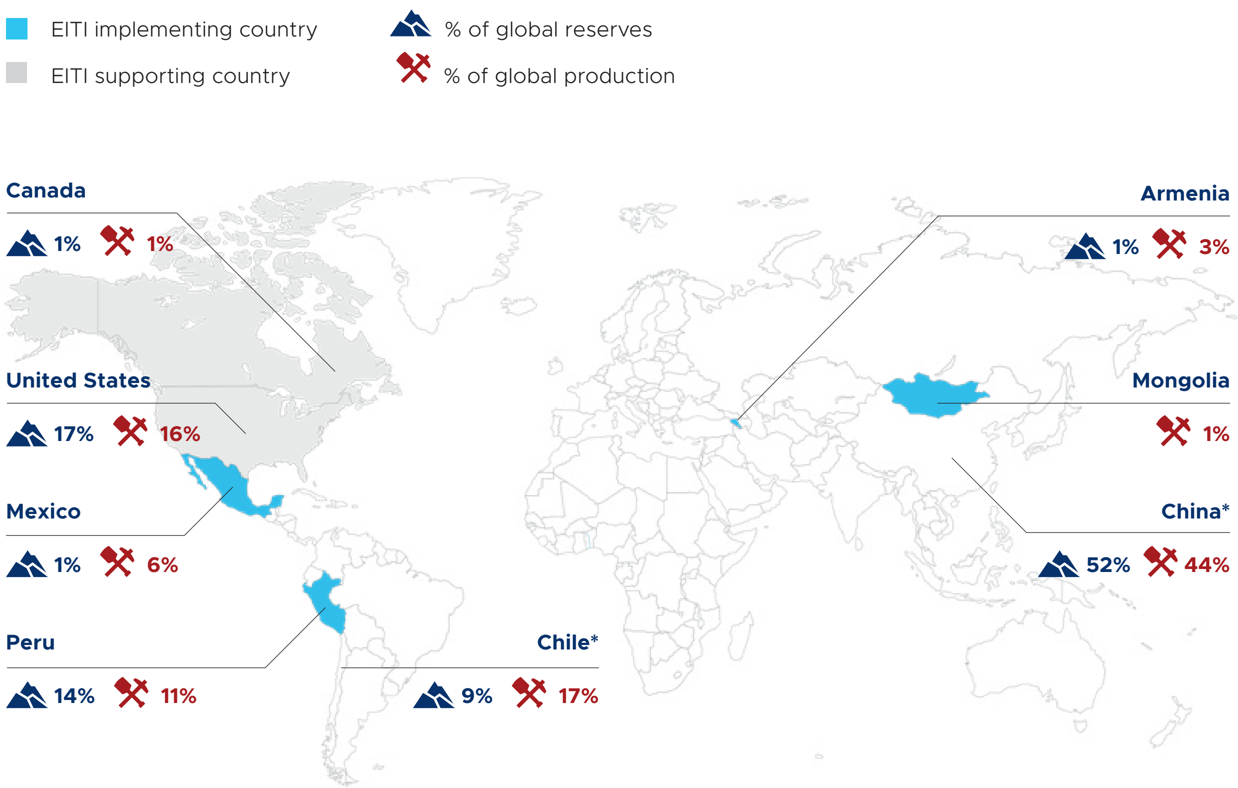
Trade and manufacturing

Among EITI countries, **Armenia**, the **Netherlands** and **Peru** are the major exporters of molybdenum ores and concentrates, after **Chile** and the **US**. Between 2015 and 2021, on average, the major flows from EITI countries were between Peru and the US (6% of global trade); Peru and Chile (5%); Armenia and **China** (1%); **Mongolia** and China (1%); and Peru and the Netherlands (1%). China, Chile, the Netherlands and **South Korea** were the major molybdenum importers in 2021.

Molybdenum is used to produce highly specialised steel (corrosion resistant alloys) needed in hydro, solar PV and nuclear power, but especially wind and geothermal energy technologies. Molybdenum-enriched steel is used by wind turbine manufacturers (such as Gamesa, GE Energy, Goldwind and Vestas) and geothermal power plant technologies (such as Sandvik Materials Technology and Tenaris,). Key manufacturing sites of wind turbines are in **China**, **Brazil**, **India** and the **US**.

FIGURE 25

Molybdenum reserves and production in EITI countries



**Not an EITI implementing or EITI supporting country*

Nickel

Reserves and mining

Nickel resources are estimated at about 300 million tonnes. **Indonesia** and the **Philippines** account for 45% of global nickel output. Indonesia holds the world's largest reserves (18 active projects) and is the world's leading producer of nickel (1 million tonnes annually, or 37% of global production). Sorowako nickel and cobalt mine (PT Vale Indonesia) is the largest mine in Indonesia in terms of production (3% of global production). There are 38 active nickel projects in the Philippines, the second largest nickel producer (370,000 tonnes, 14% of global production). The major producing mine in the Philippines is the Taganito nickel and cobalt mine (Nickel Asia, Pacific Metals, Sojitz Corp, 1,3%).

Other EITI countries with active production of nickel are **Guatemala** (Guaxilan and Mayaniquel mines, 2.2% of global production); **Colombia** (Cerro Matoso mine, 1.5%); **PNG** (Ramu mine, 1.4%); **Madagascar** (Ambatovy mine, 0.4%); and **Zambia** (Munali, 0.1%). Significant reserves are also being developed in **Côte d'Ivoire** (Biankouma-Sipilou mine) and **Tanzania** (Kabanga mine).

Smelting and refining

Nickel ore is primarily processed into nickel pig iron and nickel metal. **China** accounts for 30% to 40% of nickel processing, followed by **Indonesia** (10% to 20%). Until 2016, Indonesia had minimal nickel refining activities which have increased rapidly over the past five years. In 2021, about 29 nickel smelters (in Banten, East Java, Maluku and Sulawesi) produced nickel matte, ferronickel and nickel pig iron, and more plants were under construction. The Indonesian government attributes this development to its export ban strategy, with the raw nickel export ban first introduced in 2014 (revoked in 2017) and re-introduced in 2020.

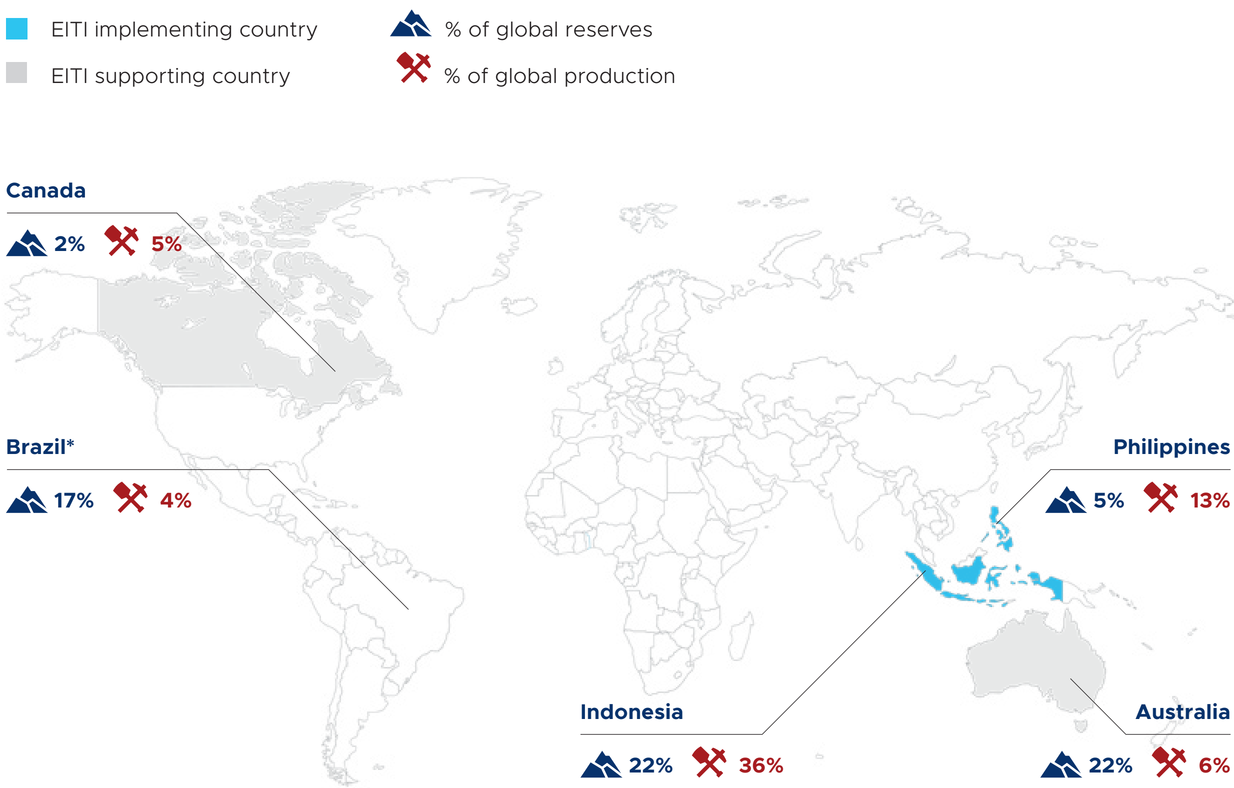
Trade and manufacturing

Indonesia and the **Philippines** are the major exporters of nickel ores and concentrates, with the major trade flows between the Philippines and China (29%) and Indonesia and China (13%). Indonesia is the world top exporter of nickel matte and ferronickel.

China is the top importer of nickel, accounting for the highest nickel demand worldwide. Nickel is mainly used for production of stainless steel required in a wide range of low-carbon energy technologies, primarily wind, geothermal, and energy storage (cathode in nickel manganese cobalt (NMC) oxide and nickel cobalt aluminium (NCA) oxide batteries). China is the world's largest steel producer, accounting for 60% of global production. Batteries account for 6% of nickel use, sourced by battery cell producers.

FIGURE 26

Nickel reserves and production in EITI countries



**Not an EITI implementing or EITI supporting country*

Rare earths

Reserves and mining

Although rare earth resources (comprising of 15 elements in the lanthanoid group, yttrium and scandium) are abundant, they are rarely concentrated in mineable deposits. **China** accounts for over 30% of world's reserves and about 60% of global production.

Among EITI implementing countries, mine production takes place in **Myanmar** (26,000 tonnes of rare earth oxide in 2021, primarily dysprosium and terbium, or 9% of global production). Among other EITI countries, reserves are being developed in **Angola** (Longonjo); **Madagascar** (Ampasindava); and **Tanzania** (Ngualla-Teesside project).

Smelting and refining

Ores of rare earth metals are processed into alloys which are used as the raw material of permanent magnets. Processing is highly concentrated in **China** (over 90%).

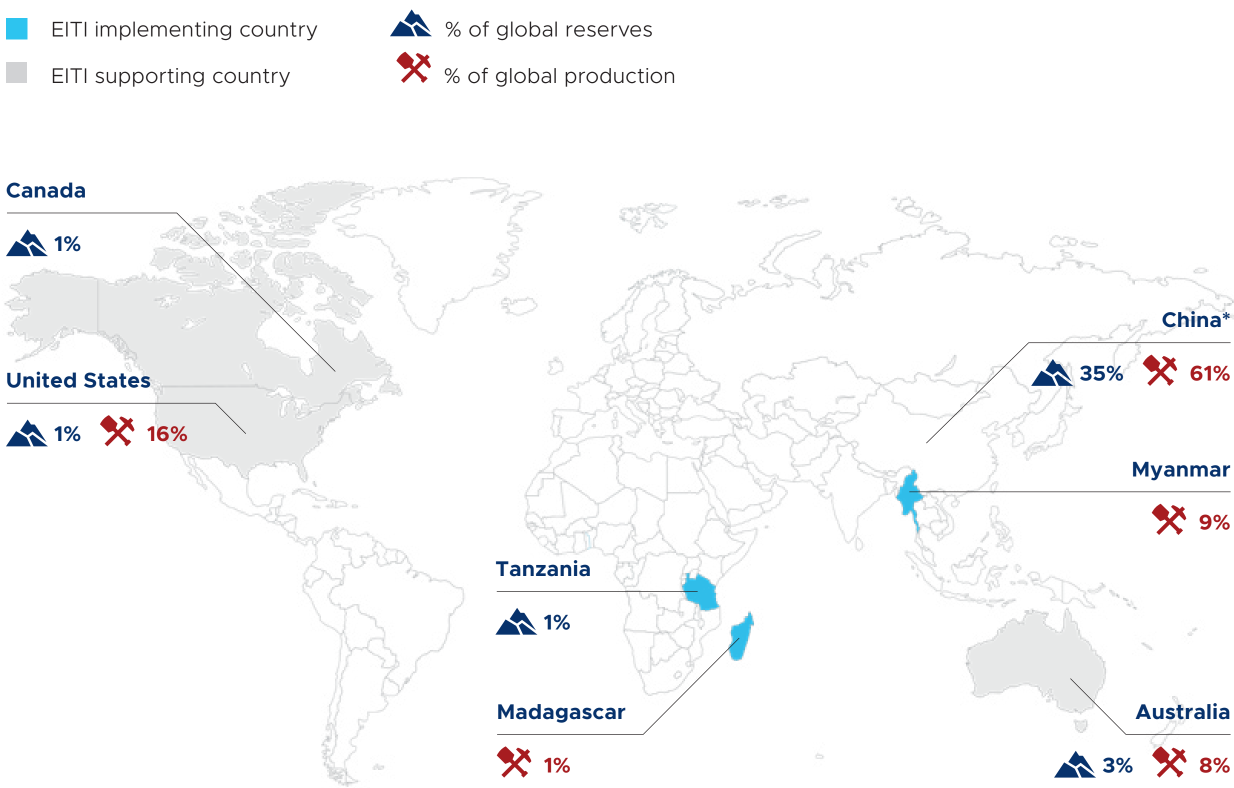
Trade and manufacturing

Myanmar exports rare earths to **China.** Rare earths are used for permanent magnets required in wind turbines and EV motors, and China is the leading manufacturer of these products. China is the single largest supplier of rare earths, and the Chinese government has constrained exports to Japan and the US in the past.

Many countries that plan to expand EV use are seeking to diversify supply of rare earths. The UK-based company Pensana is planning to build a rare earth separation facility in the UK sourcing ore from its Longonjo project in **Angola**, with investment from the Angola wealth fund. Australia-based Peak Rare Earths also intends to construct a rare earth refinery in the UK, using neodymium praseodymium oxide from its Ngualla mine in **Tanzania**.

FIGURE 27

Rare earths reserves and production in EITI countries



*Not an EITI implementing or EITI supporting country

Tantalum

Reserves and mining

Tantalum is commonly extracted from an ore known as coltan (columbite-tantalite). Identified resources of tantalum are concentrated in **Australia**, **Brazil**, **Canada** and the **US**. In other jurisdictions, tantalum reserves and resources are not well established.

Among EITI implementing countries, tantalum production was reported in the **DRC**, **Ethiopia**, **Mozambique** and **Nigeria**. Active reserve development projects are also located in **Madagascar** (Tantalus) and **Malawi** (Kanyika).

The **DRC**'s EITI Report estimates that in 2018, 1,800 thousand tonnes of coltan were produced artisanally, and even more (2,200 thousand tonnes) were exported.[172] **Nigeria** also reported ASM tantalum mining.[173]

Smelting and refining

Coltan ore is processed through smelting, separating all minerals in the concentrate and upgrading them to oxides. In the **DRC**, trade of coltan is complex and lacks transparency, even after years of supply chain due diligence initiatives. Coltan may be sold to traders or it may be illegally exported to **Rwanda** and other nations in Central Africa, to then be sold to foreign refineries.

Trade and manufacturing

In 2021, **China** recorded imports of tantalum (combined with niobium and vanadium, which are reported together with tantalum) ores and concentrates from the **DRC**, **Ethiopia**, **Madagascar**, **Mozambique**, **Nigeria** and **Sierra Leone**.

Tantalum is a highly resistant mineral used in the manufacturing of electronics (mobile phones and laptops) and superalloys, and will potentially be increasingly used in EV batteries (depending on the technology development and deployment of alternative zero-cobalt batteries). Apple[174] and Volkswagen Group[175] identified a range of smelters and refineries where they are sourcing tantalum, located in **China**, **Brazil**, **Estonia**, **Germany**, **India**, **Japan**, **Kazakhstan**, **Mexico**, **Russia**, **Thailand** and the **US**.

172 ITIE-RDC (2021), *Rapport Assoupli ITIE-RDC 2018, 2019 et 1er Semestre 2020*. Retrieved from https://eiti.org/documents/democratic-republic-congo-2018-2020-eiti-report-1st-semester.

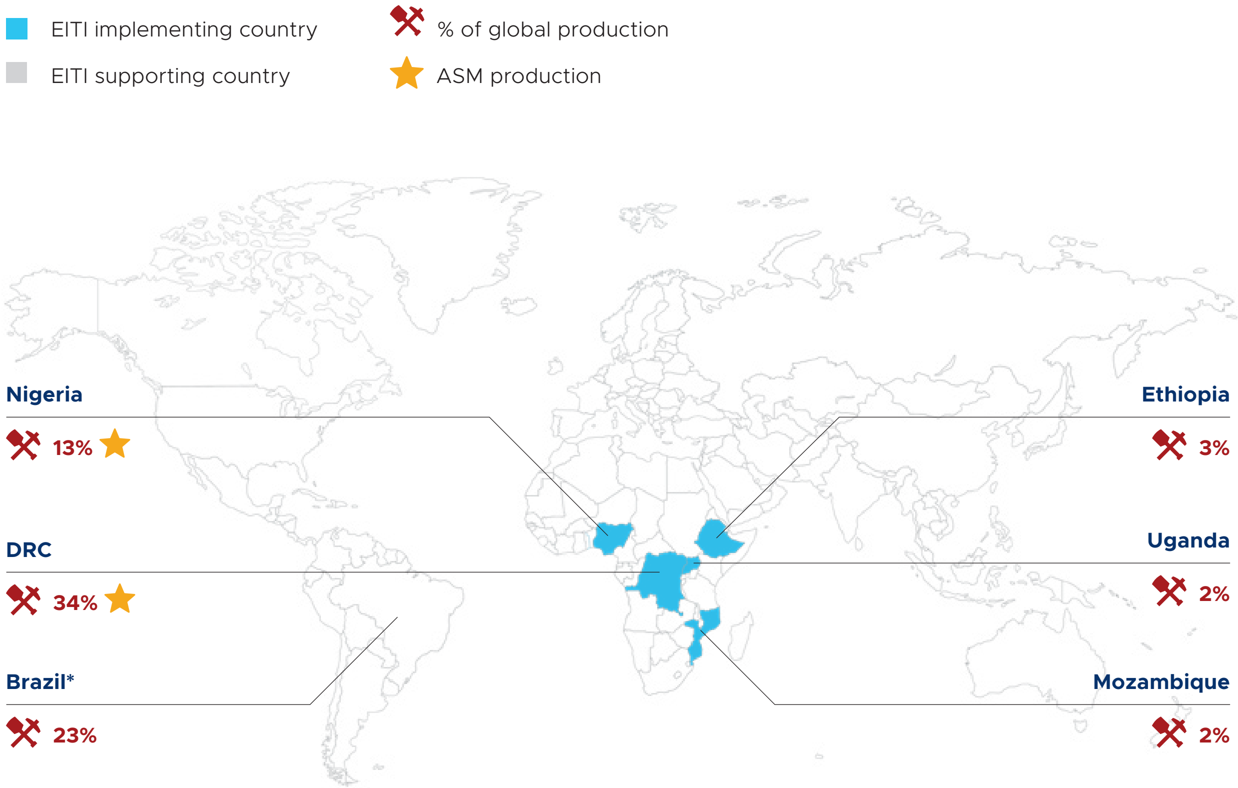
173 Nigeria EITI (2022), *Solid Minerals Industry Report 2020*. Retrieved from https://eiti.org/documents/nigeria-2020-eiti-report-mining.

174 Apple Inc. (2021), Smelter and Refiner List.

175 Volkswagen Group (2021), *Responsible Raw Materials Report 2021.*

FIGURE 28

Tantalum reserves and production in EITI countries



**Not an EITI implementing or EITI supporting country*

Tin

Reserves and mining

Tin resources are extensive but need to be developed further to satisfy future demand. The largest tin reserves are located in **China** (22% of the world's reserves), followed by **Indonesia** (16%) and **Myanmar** (14%).

Among EITI implementing countries, tin production exists in **Indonesia** (24% of global production); **Peru** (10%); **Myanmar** (9%); and the **DRC** (5%). Almost 40% of the world's refined tin has its origins in ASM,[176] with some of the largest ASM tin mining located in the DRC and Indonesia (Bangka Belitung tin production region). The DRC's 2021 EITI Report estimates that in 2018, 16,000 tonnes of cassiterite (the main ore of tin) were produced, of which 13,000 tonnes were exported.[177] Peru's sole tin producer is the San Rafael mine (Peru-based Minsur). Due to gradual reserve depletion, Minsur is planning to recover tin from mine tailings.

Smelting and refining

During smelting, tin ore is processed into tin metal. Apple,[178] Volkswagen Group[179] and the Responsible Minerals Initiative[180] identified over 20 tin processing facilities where they are sourcing tin located in **Indonesia**, 16 facilities in **China**, and numerous other countries (the **US**, **Brazil**, **Japan**, **Peru**, **Thailand**, **Rwanda** and **Myanmar**).

Trade and manufacturing

Export of tin in 2021 was recorded from **Bolivia**, **Colombia**, **Mongolia**, **Myanmar**, **Nigeria**, **Peru** and **Tanzania**. **Indonesia** did not report tin export data to the UN Comtrade in the past five years. However, in its latest EITI Report, Indonesia reported exporting 83,000 tonnes of tin in 2018. In 2021, the major tin importers were **Belgium**, **Brazil**, **China** and **Malaysia**.

Tin is used in production of solar PV, as a solder in electrical connections, and as a coating to provide corrosion resistance to iron and steel required for wind energy technologies. Manufacturing of solar panels is concentrated in **China** (about 70%); followed by **Vietnam** (8%); **South Korea** (5%); **Malaysia** (4%); and the **US** (3%). China is the world's largest steel producer, accounting for 60% of global production.

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176 International Tin Association (2022), *Artisanal and Small Scale Mining Policy*.

177 ITIE-RDC (2021), *Rapport Assoupli ITIE-RDC 2018, 2019 et 1er Semestre 2020*.

178 Apple Inc. (2021), Smelter and Refiner List.

179 Volkswagen Group (2021), *Responsible Raw Materials Report 2021*.

180 Responsible Minerals Initiative (2022), RMAP Assessment Introduction. Retrieved from https://www.responsiblemineralsinitiative.org/responsible-minerals-assurance-process/.

FIGURE 29

Tin reserves and production in EITI countries

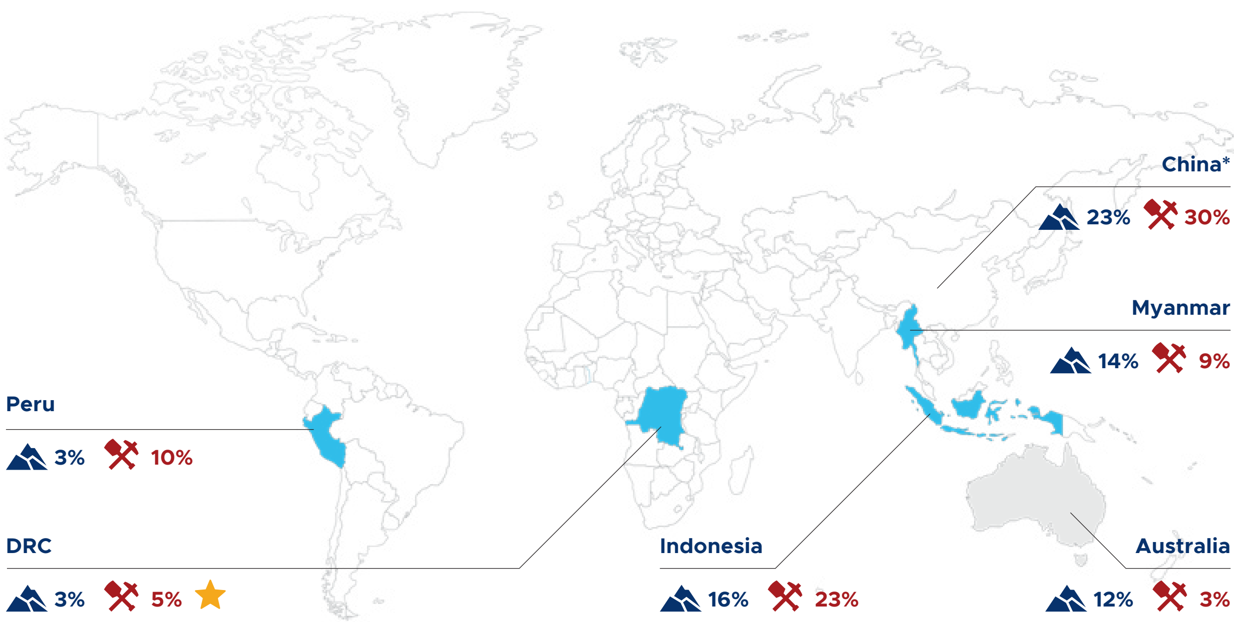
EITI implementing country

EITI supporting country

% of global reserves

% of global production

ASM production



Not an EITI implementing or EITI supporting country

Titanium

Reserves and mining

Global reserves of ilmenite and rutile, the two main minerals of titanium, total more than 2 billion tonnes. Identified reserves are about 740 million tonnes, with sizeable reserves in EITI implementing countries, including **Madagascar** (QMM); **Malawi** (Kasiya); **Mozambique** (Moma, Mutamba, Corridor); **Norway** (Engebo); **Peru** (Guadalupito); **Senegal** (Grande Côte); **Tanzania** (Nyati); and **Ukraine** (Birzulovo). Among EITI implementing countries in 2020, mine production was recorded in Mozambique (11% of global production); Ukraine (6%); Norway (5%); Senegal (4%); and Madagascar (4%).

Smelting and refining

Titanium processing includes the production of titanium sponge metal (5%), but most titanium is used to produce titanium pigments. The majority of metal sponge production occurs in **China** (about 50%), followed by **Japan** (25%) and **Russia** (7%). The largest capacity to produce titanium pigments is concentrated in China (about 45%), followed by the **US** (16%).

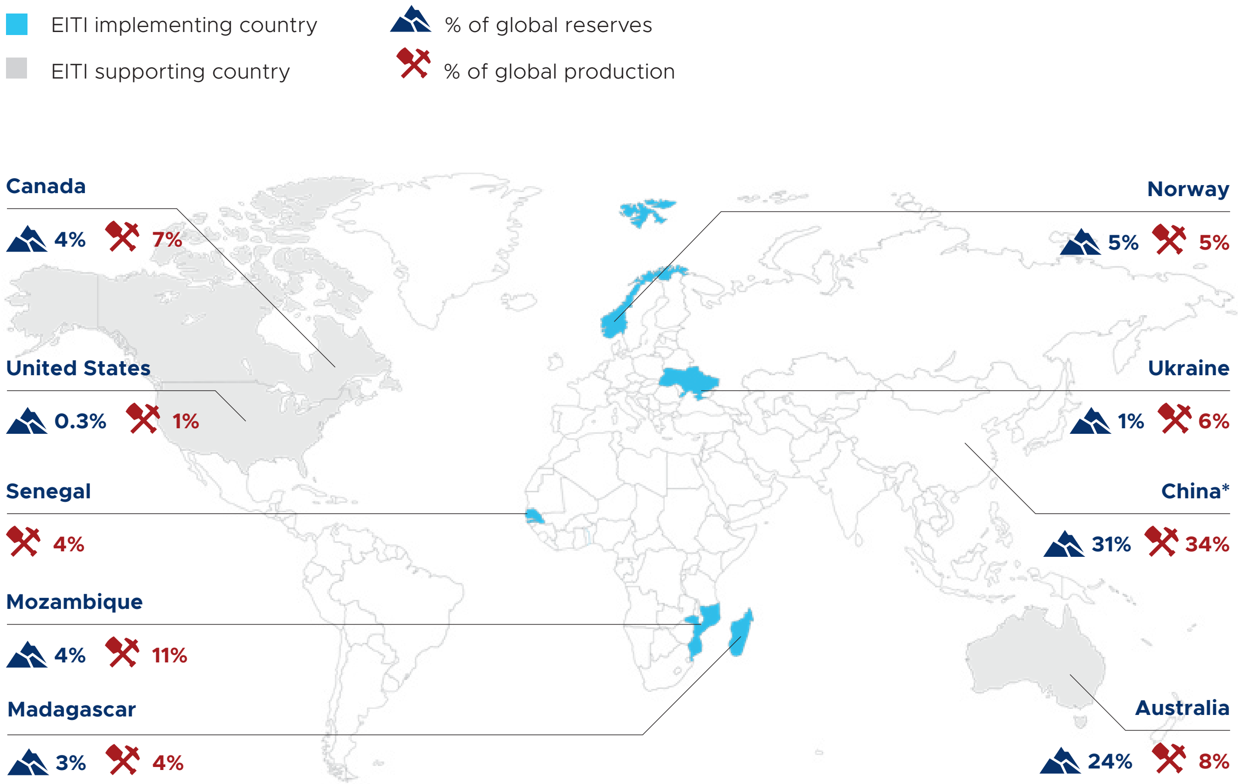
Trade and manufacturing

In 2021, major exporters of titanium ores among EITI implementing countries were **Indonesia**, **Mozambique**, **Senegal**, **Tanzania** and **Ukraine**, with the major trade flows being between Mozambique and **China** (5% of the global trade between 2015 and 2021, on average); Senegal and **Norway** (3%); **Madagascar** and the **US** (3%); and Madagascar and **Canada** (2.5%). The major importers are China, **Germany**, **Japan** and the US.

The majority of titanium metal is used in the aerospace industry. Titanium is also used to produce corrosion-resistant alloys, mainly produced in **China**, required in wind, geothermal, hydro and nuclear energy generation.

FIGURE 30

Titanium reserves and production in EITI countries



Not an EITI implementing or EITI supporting country

Zinc

Reserves and mining

Identified resources of zinc account for 1.9 billion tonnes. Current reserves are estimated at 250 million tonnes.

Among EITI implementing countries, zinc is produced in **Peru** (8% of the world's reserves and 12% of global production); **Mexico** (8% of the world's reserves and 6% of global production); and **Kazakhstan** (5% of the world's reserves and 2% of global production).

In **Peru**, the major zinc project is Antamina mine (427,000 tonnes of zinc in 2021, or 3.4% of global production) operated by Compañia Minera Antamina and owned by BHP Group, Glencore, Mitsubishi Corporation and Teck Resources. In **Mexico**, Industrias Peñoles SAB de CV is the leading producer of zinc. Peñasquito (Newmont Corp.) is Mexico's largest zinc-producing gold mine (172,800 tonnes of zinc in 2021, or 1.4% of global production). In **Kazakhstan**, Kazzinc Consolidated (Glencore) produced 144,600 tonnes of zinc in 2021, or 1.1% of global production.

Smelting and refining

During smelting, zinc ores and concentrates are processed into pure zinc metal through electrolysis or pyrometallurgical (followed by zinc refining) processes. **China** is the world's largest refiner of zinc (about 47%).

Among EITI implementing countries, **Peru**'s major refinery is Cajamarquilla refinery (with a capacity of 330,000 metric tonnes), which produces refined zinc from concentrates supplied by a range of mining companies. In **Zambia**, zinc is being recovered from mine tailings and slag stockpiles at the Kabwe Project and the Sable Zinc refinery.

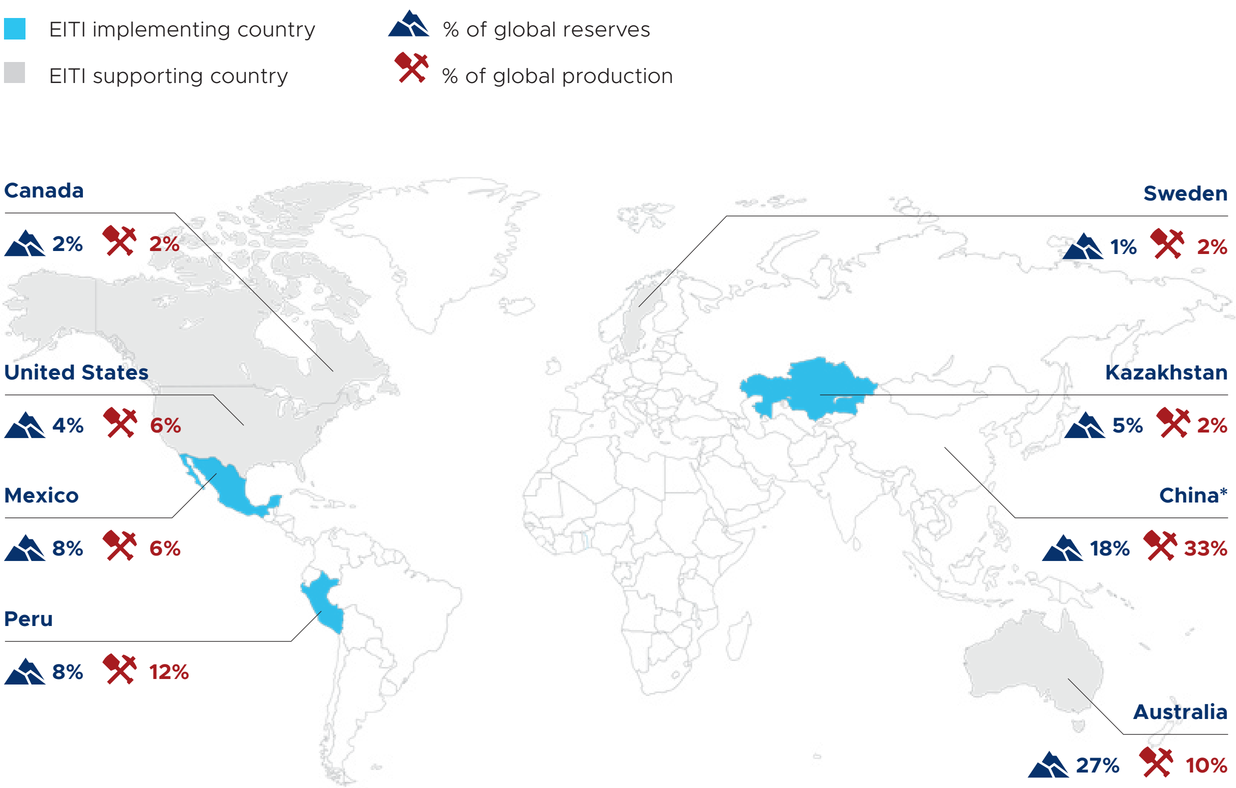
Trade and manufacturing

The major EITI implementing countries exporting zinc are **Peru** (14% of global export); **Mexico** (5%); and **Kazakhstan** (2.5%). Between 2015 and 2021, on average, the major trade flows from EITI implementing countries were between Peru and **China** (5.5%); Peru and **South Korea** (3.2%); Mexico and South Korea (2.9%); Peru and **Spain** (2.7%); and Peru and **Brazil** (2.1%). The largest zinc ore importers are China (23%); South Korea (17%); **Japan** (10%); and Spain (6.1%).

Most of zinc is used to galvanise other metals (iron) and to produce castings which are used in the electrical and automobile industries. Zinc is used in several low-carbon energy technologies, including wind energy (as a protective coating against corrosion) and solar PVs (as zinc oxide to achieve increased energy conversation).

FIGURE 31

Zinc reserves and production in EITI countries



*Not an EITI implementing or EITI supporting country

Extractive Industries
Transparency Initiative

We believe that a country's natural resources belong to its citizens. Our mission is to promote understanding of natural resource management, strengthen public and corporate governance and provide the data to inform greater transparency and accountability in the extractives sector.

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