

Overview

Mining and metals:

Priority actions towards a nature-positive future

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Introduction

As most economic sectors rely on metal and mineral commodities[1], the mining and metals sector has a considerable impact on both the economy and the natural world. Overall, 9.6 billion tonnes of metal ores were extracted in 2020 alone[i], equivalent to 10% of global material extraction. Demand has grown steadily at an average annual rate of 2.6% over the last 50 years, where extraction of iron ore was the fastest growing, driven by rising demand for steel in the construction sector and a second wave of urbanization in the Global South.

Future demand growth will also be driven by the clean energy transition, given requirements for metals and minerals such as aluminium, copper, cobalt, nickel, lithium and rare earth elements in clean energy infrastructure and electrifying transport[1]. Indeed, the global demand for critical minerals is expected to multiply by four to six by 2040[2].

Meanwhile, the mining and metals sector continues to contribute to drivers of biodiversity loss, such as land use change and ecosystem disturbance, pollution, water abstraction and greenhouse gas (GHG) emissions. Indeed, mining operations are estimated to cover up to 100,000 km² of the world's surface[3ii], including in areas of high biodiversity value. 8% of global mining properties coincide with IUCN Protected Areas[4], 16% of critical mineral mines[iii] are located in highly water-stressed areas[5], and over half of energy transition mineral resources[iv] are located on or nearby Indigenous Peoples' lands[6].

It has become imperative for mining and metals companies to prioritize sustainability actions. In particular, they need to balance meeting new critical mineral demands with negative impacts on nature, and shift towards circular models across the value chain.

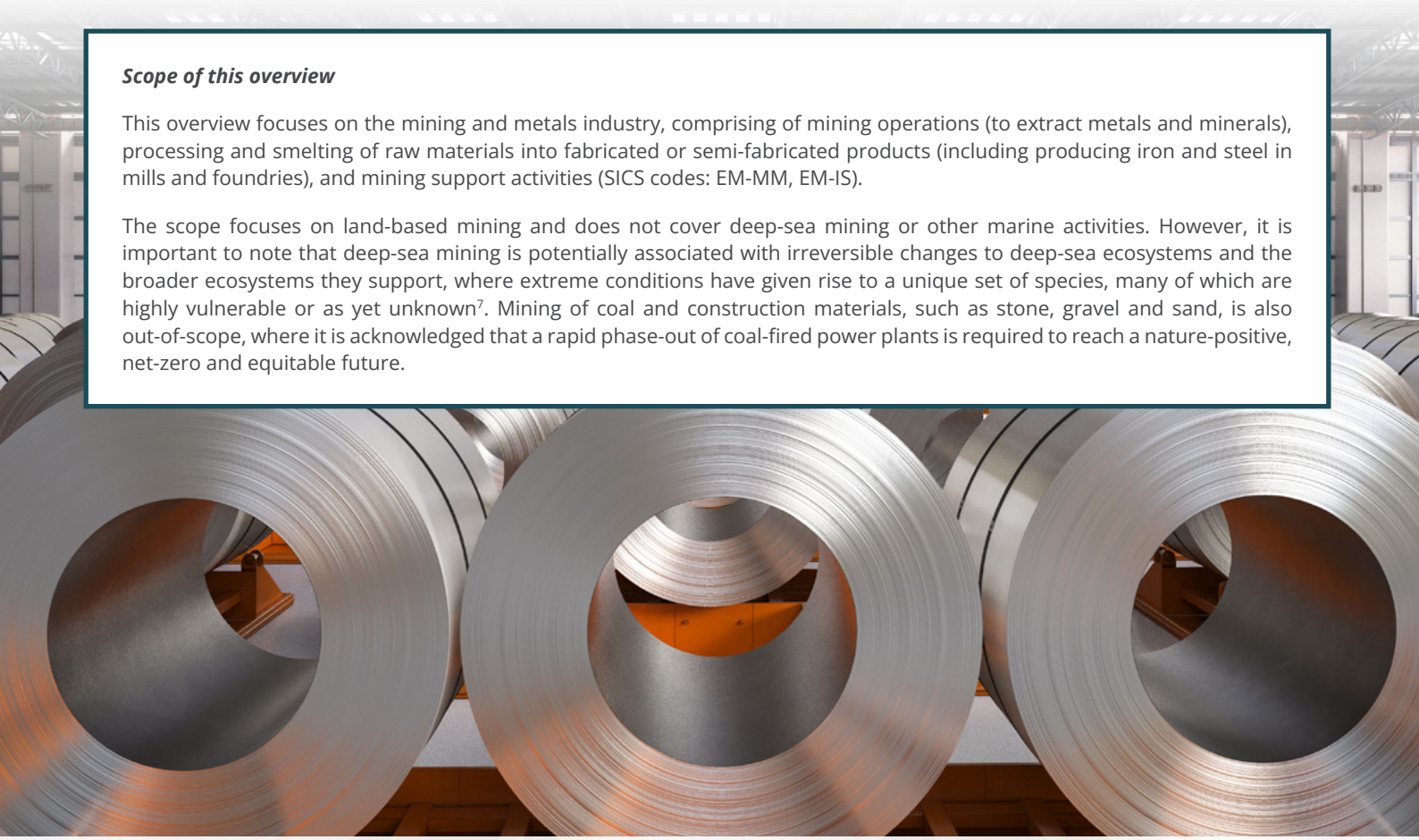
To complement ongoing sustainability initiatives, businesses across the sector should use The Nature Strategy Handbook – that draws on the **A**ssess, **C**ommit, **T**ransform, and **D**isclose framework (ACT-D high-level business actions on nature) to help businesses understand their relationship with nature and develop a credible nature strategy. The Handbook forms the basis of 'It's Now for Nature', a global campaign to rally all businesses to act on nature. It helps companies to acknowledge the value of nature to their business; identify, assess, and measure their impacts and dependencies on nature; set transparent, time-bound, science-based targets; take actions to address their key impacts and dependencies and transform their businesses; and publicly disclose performance and other relevant nature-related information.

This overview provides a non-exhaustive, sector-level summary of potential key impacts and dependencies on nature. Importantly, it also sets out the priority actions that leading businesses in the sector should take now to transform and ensure the mining and metals sector plays its part in meeting the global goal to halt and reverse nature loss by 2030 - the mission at the heart of the Kunming-Montreal Global Biodiversity Framework.

Scope of this overview

This overview focuses on the mining and metals industry, comprising of mining operations (to extract metals and minerals), processing and smelting of raw materials into fabricated or semi-fabricated products (including producing iron and steel in mills and foundries), and mining support activities (SICS codes: EM-MM, EM-IS).

The scope focuses on land-based mining and does not cover deep-sea mining or other marine activities. However, it is important to note that deep-sea mining is potentially associated with irreversible changes to deep-sea ecosystems and the broader ecosystems they support, where extreme conditions have given rise to a unique set of species, many of which are highly vulnerable or as yet unknown[7]. Mining of coal and construction materials, such as stone, gravel and sand, is also out-of-scope, where it is acknowledged that a rapid phase-out of coal-fired power plants is required to reach a nature-positive, net-zero and equitable future.



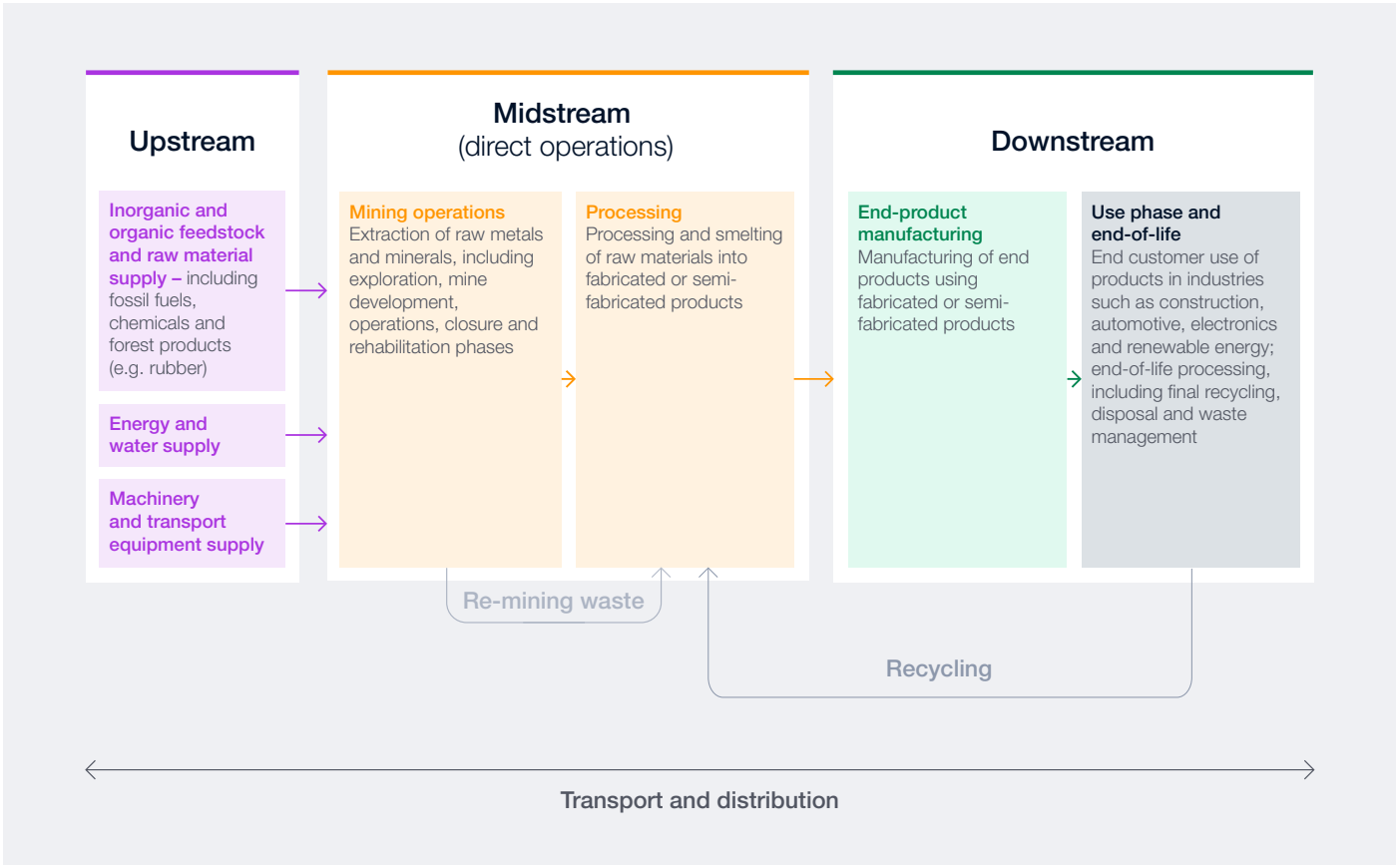
[i] *Includes iron, aluminium, copper and other non-ferrous metals, estimated based on the Global Material Flow Database.*

[ii] *Includes large-scale mining and artisanal and small-scale mining.*

[iii] *Includes mines, deposits and districts.*

[iv] *Includes both current and future possible mines.*

Mining and metals value chain





Nature-related impacts

To protect and enhance ecosystems on which they depend, businesses in the mining and metals sector should direct their efforts towards addressing the most significant impacts on nature in their operations and value chains, namely:

- **Land use change and ecosystem disturbance** – Mining operations, the development of supporting infrastructure (including linear transport infrastructure and pipelines), and upstream industry activities can result in land clearance and ecosystem fragmentation, soil degradation and erosion, disruption or diversion of water systems, increase in non-natural fires and landslides, and the introduction of non-native species. The area of influence of mining operations is generally larger than the physical footprint, due to indirect and cumulative impacts. For example, infrastructure development can attract human populations, exacerbating threats such as over-exploitation (e.g. hunting, fishing and logging) and habitat loss for other land uses (e.g. agricultural expansion and illegal mining) . Mining can also violate the rights of Indigenous Peoples, and the rights of local communities, for example, where mining expansion or processing affects areas of high ecological, cultural or community significance[v].
- **Pollution** – Activities across the sector's value chain can lead to four main types of pollution, particularly in jurisdictions where regulatory standards and enforcement are weak: 1) land, freshwater and ocean pollution (incl. toxic chemicals, heavy metals and saline or acidified wastewater); 2) atmospheric pollution (incl. dust and particulate matter, nitrogen oxides and sulphur dioxide); 3) waste (incl. tailings and slags); and 4) noise and light pollution. Pollution is caused by both large-scale and small-scale mining and can impact local communities, for example, through contamination of drinking water. Unremediated mine pollutants have the potential to alter the geochemistry of watersheds over large footprints, and acidic conditions and toxic elements can persist long after a mine has been abandoned.
- **Water abstraction** – The sector withdraws and uses water across its entire value chain, from upstream industries and mining operations to downstream manufacturing, such that it has a CDP Water Watch impact rating of "critical", its highest category[9]. Mining accounts for 2 to 4.5% of global water use[10], and can have significant environmental and social impacts on water resources at a local level, especially in water-scarce areas.
- **Greenhouse gas (GHG) emissions** – The mining and metals sector is responsible for 2 to 3% of global GHG emissions[11], and iron and steel production is responsible for an additional 7% of global GHG emissions[12]. In mining operations, these emissions are primarily driven by diesel and non-renewable electricity use, extraction processes such as comminution, and energy-intensive metal production. Companies and industry associations in the sector are setting targets to reduce Scope 1 and 2 emissions in line with Net Zero by 2050[13].



[v] *These impacts can be more pronounced when local communities and rightsholders are not meaningfully engaged, when Indigenous Peoples' rights to self-determination and Free, Prior, and Informed Consent are not respected, or when robust human rights due diligence activities are not undertaken to avoid causing or contributing to negative human rights impacts.*

Nature-related dependencies

Like many sectors, the mining and metals sector and value chain is highly dependent on a number of environmental assets and ecosystem services to function and grow. In particular, these include:

- **Metal, mineral and energy resources** – The sector relies on the continued provision of metal and mineral resources to mine, alongside a stable supply of energy to operate (with an increasing shift towards renewable sources).
- **Cultivated biological resources** – Forest products are a key input into mining operations, and other organic resources such as seeds are needed for rehabilitation.
- **Freshwater** – Mining operations depend on water for ore processing and refining, dust suppression, cooling and lubrication of machinery, and slurry transportation to tailings dams. Indeed, the mining and metals sector suffered over $20 billion in water-related financial impacts in 2018 alone according to CDP[14vi].
- **Soil and sediment retention, and flood protection** – Mass stabilization, erosion control and green infrastructure[15vii] protect roads, camps and infrastructure leading to mines from landslides and other natural hazards.
- **Global climate regulation** – Mining operations depend on climate regulation in terms of temperature, precipitation and hydrological regime, and an absence of extreme events such as heatwaves or floods. Climate regulation is an ecosystem service provided by nature, due to the long-term storage of carbon dioxide in soils, vegetable biomass and the oceans.

These dependencies strengthen the business case for investing in the protection and restoration of nature.



[vi] *Scope of assessment includes iron ore mining, precious metals mining, other non-ferrous ore mining and other non-metallic minerals mining; impacts include increased operating costs, reduction or disruption in production capacity, and fines or penalties.*

[vii] *Green infrastructure has been defined as "A strategically planned network of natural and semi-natural areas with other environmental features, designed and managed to deliver a wide range of ecosystem services, while also enhancing biodiversity".*

Priority actions and opportunities

To reduce negative impacts on nature, mitigate risks to operations and unlock commercial opportunities, mining and metals companies should prioritize five key actions:

1. **Avoid then reduce impacts of mining operations and restore across the mine lifecycle in accordance with the mitigation hierarchy –** Follow the mitigation hierarchy (avoid, reduce, restore, compensate)[16] sequentially at site level and in a landscape context, taking into consideration direct, indirect and cumulative impacts. Align efforts with a No Net Loss or Biodiversity Net Gain ambition for each project.

   Avoid exploring or mining in biodiversity hotspots, and strengthen biodiversity assessment, planning and management. Do not explore nor mine in IUCN categories Ia and Ib Protected Areas, Alliance for Zero Extinction sites, World Heritage sites or other prohibited areas[viii]. Avoid exploring or mining in critical habitats as defined by IFC Performance Standard 6, IUCN categories II-IV Protected Areas, other Key Biodiversity Areas, and areas of high ecological, cultural or community significance. Conduct meaningful consultations and respect the right to self-determination and Free, Prior and Informed Consent of Indigenous, Tribal and Traditional Peoples with collective land and resource rights, through all stages of exploration and extraction. For new and existing approvals or operations, classify important areas in line IFC Performance Standard 6, then implement safeguards to avoid and minimize negative impacts. Conduct biodiversity assessments and develop management plans aligned to the mitigation hierarchy for all sites (incl. operational and non-operational lands).

   Accelerate GHG emissions abatement by increasing the use of renewables, leveraging novel manufacturing techniques and equipment, and decarbonizing equipment, logistics and transport. Optimize energy use and resource efficiency in mining and production processes. Avoid then reduce land and pollution impacts from exploration, extraction and waste. Invest in innovation, for example, by improving accuracy of exploration location targeting for drilling or developing sustainable chemical or non-chemical extraction techniques. Avoid, reduce, reuse, re-mine and recycle mining and metals waste. Reduce tailings where possible and manage unavoidable tailings safely and efficiently in line with international standards[17].

   Collaborate with other mining companies and industries, local governments, Indigenous Peoples, local communities and academia to identify, assess then address indirect and cumulative impacts across landscapes, including establishing methodologies for measurement and assigning accountability.

   Strengthen rehabilitation and restoration approaches in partnership with local communities. For new mines, establish closure plans in line with industry guidelines[18] and protocol for relinquishment[19]. For existing or inactive mines, implement progressive rehabilitation and restoration throughout the mine lifetime. Provide upfront auditable financial assurance based on realistic and publicly available estimates to cover all closure works, when relevant in co-management with Indigenous Peoples or local communities.

   Following rigorous application of the mitigation hierarchy, compensate for unavoidable impacts as a last resort after all other attempts at avoiding, reducing and restoring have been considered, in alignment with a No Net Loss or Biodiversity Net Gain goal for each project (following industry guidelines[16, 20]).



2. **Avoid then reduce water abstraction in mining operations, and improve water stewardship across landscapes –** Conduct site-level water audits with a catchment-based approach, and establish strategies to sustainably and responsibly manage water supplies, prioritizing water basins facing water stress. Invest in innovation to avoid water use, improve water use efficiency and circularity, switch to alternative water sources, and deploy effective wastewater treatment.

   Partner with environmental NGOs, local governments and communities to improve stewardship and strive for water replenishment across landscapes, for example, by collaboratively monitoring water quality and quantity across basins.

3. **Expand circularity across the value chain, embrace standards and transparency, engage with suppliers and source responsibly, and collaborate with customers –** Adopt new business models for metals to reduce demand for newly mined raw materials. For example by providing recycling services or working with customers to co-design low-impact, longer-life recyclable metals and return end-of-life materials.

   Assess and disclose impacts, dependencies, risks and opportunities across the supply chain, engaging with others to establish metrics, improve access to and quality of data, and enable data sharing.

   Strategically engage with suppliers to drive nature-positive actions and incorporate nature-related performance criteria (for example, deforestation-free inputs) into the supplier management process.

   Collaborate with customers and form strategic partnerships to de-risk commitments and support nature-related investments, starting with a flagship initiative.

4. **Support nature conservation and restoration with local communities, both across and beyond own value chains, and invest in innovative nature financing mechanisms –**Contribute to systems-wide conservation and restoration, for example, by investing in the management of protected areas and credible and effective nature-based solutions[21] or conservation projects, in collaboration with environmental NGOs, local governments, Indigenous Peoples and other local communities. Engage with investors and financial institutions to develop and invest in innovative nature financing mechanisms.

5. **Advocate for policy systems that protect nature, and catalyze cross-sector and cross-industry collaboration –** In collaboration with other mining companies, advocate for governments to develop and implement ambitious national biodiversity strategy and action plans (NBSAPs) including a national sectoral transition pathway. In particular, support policies that help operationalize mining company nature targets (e.g. No Net Loss, Net Positive Impact or Biodiversity Net Gain) and sector-wide adherence to the mitigation hierarchy. Encourage policymakers and regulators to clearly delineate No-Go areas[ix] from mining areas, with a strong bias towards banning exploration or mining in IUCN categories I-IV Protected Areas or equivalent, and avoiding exploration and mining in Key Biodiversity Areas and other areas of high ecological, cultural or community significance wherever possible, leveraging robust permitting and licensing systems; avoid the downgrading, downsizing or degazetting of Protected Areas; set stronger requirements for restoration and relinquishment in closure planning; and improve governance to support artisanal and small-scale mining (ASM) and tackle illegal mining.

   Support knowledge sharing (for example, between junior and major companies, and between leading and lagging regions in terms of nature action) and provide technical and financial support for ASM projects. Collaborate across industrial sectors to harness process efficiencies, for example, by developing industrial hubs.

Importantly, efforts to deliver these priority actions and transform the sector must be delivered in alignment with a just and equitable transition, including meaningful dialogue with affected groups, such as employees, local communities, Indigenous People and marginalized communities.



[ix] *That strictly ban any commercial and/or industrial land use conversion or resource extraction.*

Resources

This summary was derived from the report Nature Positive: Role of the Mining & Metals Sector, written by the World Economic Forum.

The following **sector-specific guidance documents and tools** are currently available to companies in the mining and metals sector:

- Mining and Metals: Trends, Challenges and the Way Forward (World Economic Forum, 2023)
- Securing Minerals for the Energy Transition (World Economic Forum, 2023)
- ENCORE (UN Environment Programme World Conservation Monitoring Centre – UNEP-WCMC)
- Handbook on Environmental Due Diligence in Mineral Supply Chains (Organisation for Economic Co-operation and Development – OECD, 2023)
- Performance Standards 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources and Performance Standard 7: Indigenous Peoples (International Finance Corporation – IFC, 2012)
- Guide on Free, Prior and Informed Consent (Securing Indigenous Peoples' Rights in the Green Economy Coalition – SIRGE, 2023)
- Safety First: Guidelines for Responsible Mine Tailings Management (Earthworks, MiningWatch Canada and London Mining Network, 2022)
- Global Industry Standard on Tailings Management (UN Environment Programme – UNEP, 2020)
- International Principles and Standards for the Ecological Restoration and Recovery of Mine Sites (Society for Ecological Restoration – SER, 2022)
- Relinquishment of Closed Mine Sites: Policy Steps for Governments (Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development – IGF, 2023)
- Towards Sustainable Mining (Mining Association of Canada – MAC)
- Nature: Position Statement (ICMM, 2024)
- Additional sector guidance – Metals and Mining (Taskforce on Nature-related Financial Disclosures – TNFD, 2024)
- Sector Standard for Mining (Global Reporting Initiative – GRI, 2024)

For additional **sector-agnostic resources**, please refer to Business for Nature's High-level Business Actions on Nature and The Nature Strategy Handbook.

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[15] Green Infrastructure (European Commission)

[16] Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (International Finance Corporation – IFC, 2012); Cross-sector Guide for Implementing the Mitigation Hierarchy (Cross-Sector Biodiversity Initiative – CSBI, 2015); Achieving Conservation and Development: 10 Principles for Applying the Mitigation Hierarchy (The Nature Conservancy, 2015)

[17] Safety First: Guidelines for Responsible Mine Tailings Management (Earthworks, MiningWatch Canada and London Mining Network, 2022); Global Industry Standard on Tailings Management (UN Environment Programme – UNEP, 2020)

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