MINING PHILIPPINES 2023

Towards a Transformative and Sustainable Mineral Resources Development for Climate Action

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Mining and its Environmental and Climate Change Impacts

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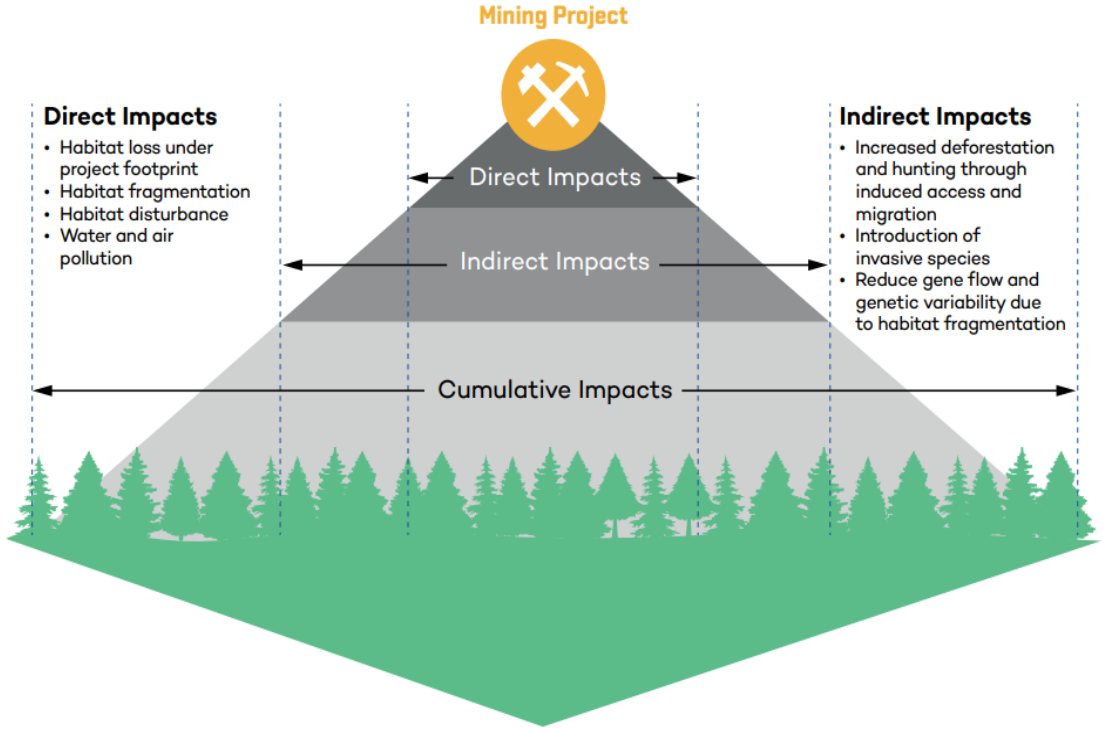
Mining operations can influence local and national biodiversity and ecosystem services

Different Types of Impacts that Mining Can Have on Biodiversity



Source: Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF). (2021). IGF Guidance for Governments: Environmental management and mining governance. Winnipeg: IISD.

Mining activities can have adverse effects on the environment

Geomechanical: rock shattering by explosions, topographical changes, deforestation, and disfigurement of surface terrain.

Hydrological: changes in groundwater reserves, movement, quality and levels, release of harmful substances from the surface and subsoil into water

Noise pollution and soil vibration

Chemical: changes in atmosphere and hydrosphere composition and properties (acidification, salinization, water and air pollution).

Physical and mechanical: environmental pollution by dust, changes in soil properties

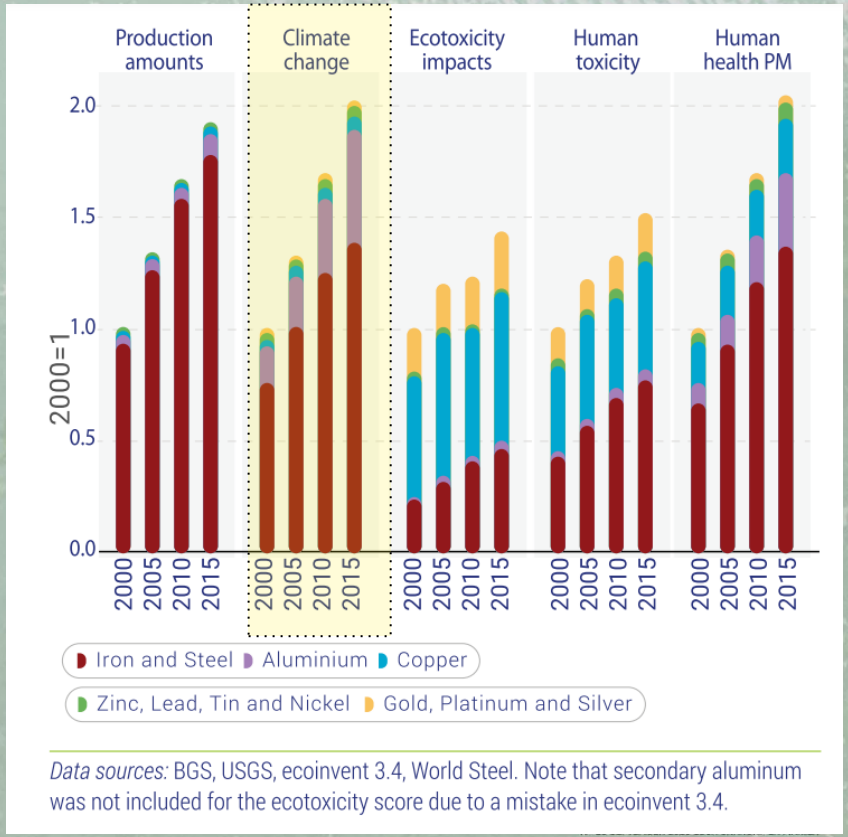
Source: Environmental and Climate Change Impacts of Extractive Industries and the Extractive Industries Transparency Initiative (EITI) Research (2020)

Mining and Climate Change

Insights from the **Global Resources Outlook 2019** by UNEP:

- In 2011, metals were responsible for 18% of resource-related climate change impacts and 39% of PM health impacts
- **Iron and steel industry** is responsible for the greatest share of climate change impact, as it is the most power consuming
- Significant contributions arise from **aluminium production**, due to considerable production amounts and high-energy requirements for the smelting of aluminium via electrolysis

Metal production amounts and environmental impacts of metal mining and processing from 2000 to 2015



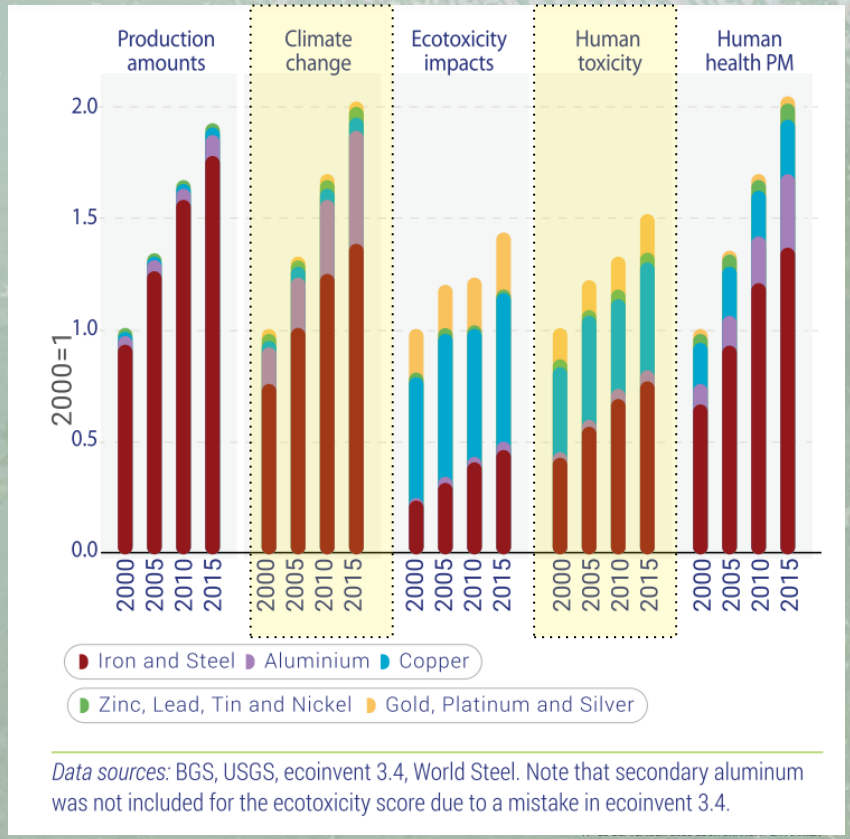
Data sources: BGS, USGS, ecoinvent 3.4, World Steel. Note that secondary aluminum was not included for the ecotoxicity score due to a mistake in ecoinvent 3.4.

Mining and Climate Change

Insights from the **Global Resources Outlook 2019** by UNEP:

- Mining and processing of **copper and precious metals cause high toxicity impacts** compared to their production amounts, attributed to sulfidic mining tailings
- Gold and precious metals are mined at much lower concentrations than bulk metals such as iron or aluminium
- Artisanal and small-scale gold mining is considered to be the largest anthropogenic source of Hg emissions, accounting for about 37% of annual emissions in 2010

Metal production amounts and environmental impacts of metal mining and processing from 2000 to 2015



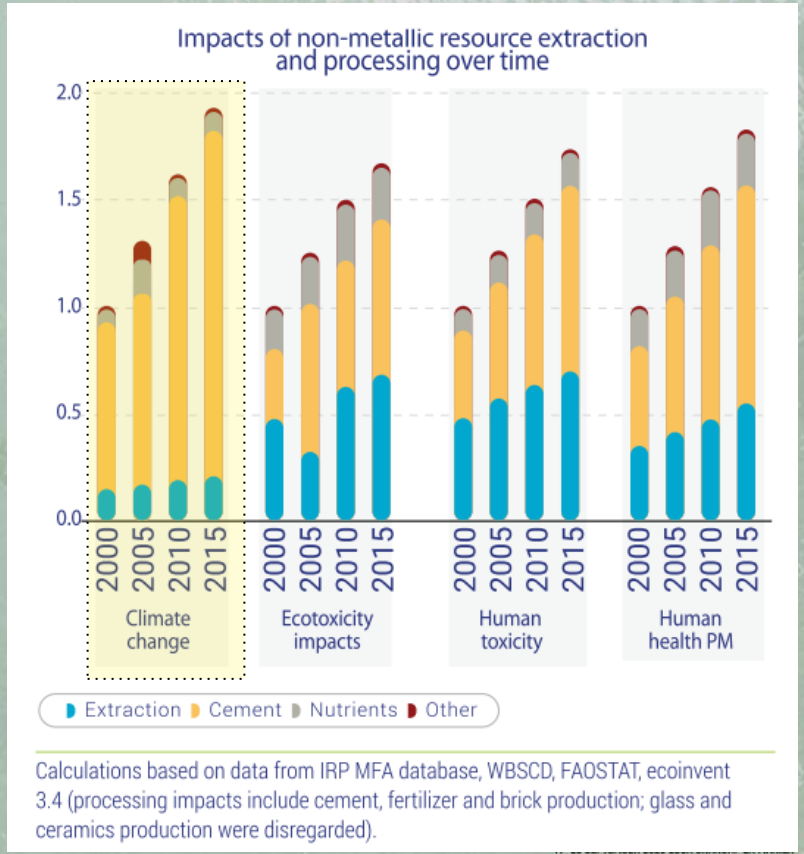
Data sources: BGS, USGS, ecoinvent 3.4, World Steel. Note that secondary aluminum was not included for the ecotoxicity score due to a mistake in ecoinvent 3.4.

Mining and Climate Change

Insights from the **Global Resources Outlook 2019** by UNEP:

- For **Non-metallic mineral resources**, majority of impacts come from their processing, not extraction
- The **production of clinker**, the main ingredient of cement, is responsible for the greatest share of climate change impact and a substantial share of the other impacts
- Sand mining may have local impacts on ecosystems

Climate change and PM health impacts of Non-metallic minerals extraction



Changing **climatic conditions will have both direct** (operational and performance-based) **and indirect** (securing of supplies and rising energy costs) **impacts on the mining sector**

(Sharma et al. 2013)

Key climate risks to mining

- Increased demand for water conservation during droughts
- Increased demand for emergency services during flood events
- Reduced asset operating life
- Health and Safety risks for workforce
- Inability to meet performance targets resulting in impacts on share prices
- Increased demand for changing infrastructure design standards
- Increase in costs of water
- Disrupted access routes
- Conflicts with other water users
- Force Majeure
- Supply chain breakdowns

Source: Climate Change and Mining: A Foreign Policy Perspective (2016) by Lukas Rüttinger (adelphi)Vigya Sharma (University of Queensland)

Mining and Low-Carbon and Green Technology Development

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Responsible mining is critical to realize a low-carbon future

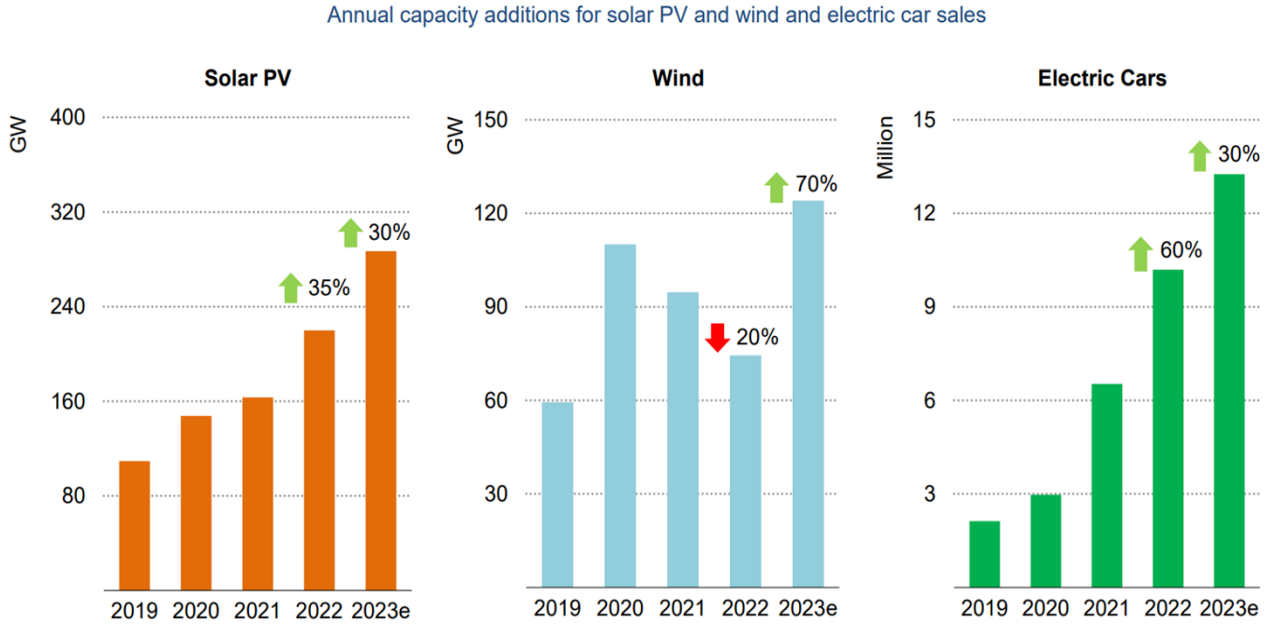
1. Green energy technologies required for a low-carbon future will lead to a **growth in demand for a wide range of minerals and metals**

2. The shift to a low-carbon future will result in significant **opportunities for resource-rich countries**

1. Increase in metals demand depends on both **inter-technology choices**, such as the balance between wind and solar power, and **intra-technology choices**, such as the type of wind technology used (onshore or offshore)

Source: Arrobas,Daniele La Porta; Hund,Kirsten Lori; Mccormick,Michael Stephen; Ningthoujam,Jagabanta; Drexhage,John Richard. The Growing Role of Minerals and Metals for a Low Carbon Future (English). Washington, D.C. : World Bank Group.

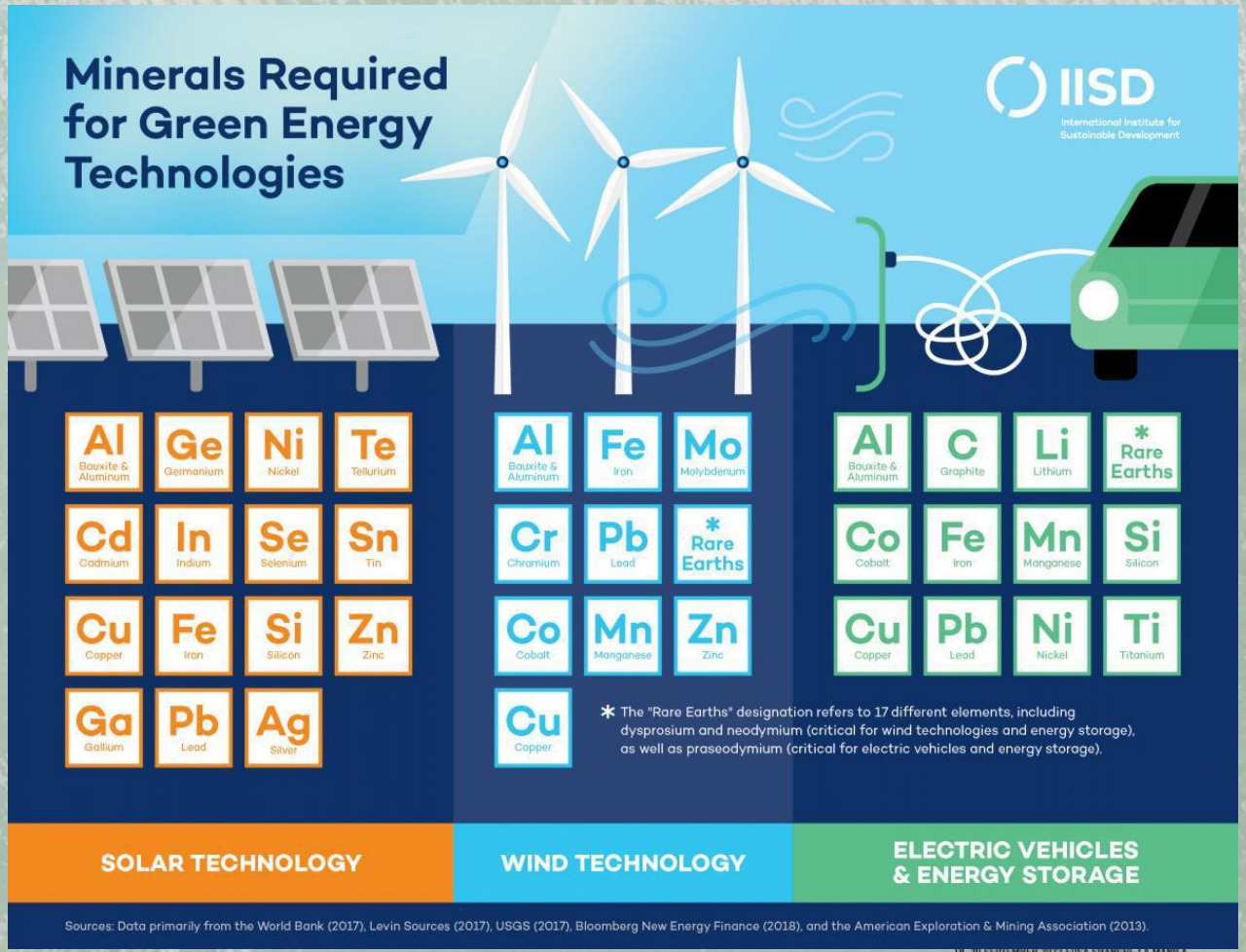
Critical Minerals Market Review 2023



Source: International Energy Agency

Clean energy technology deployment continued its upward march in 2022, **with momentum expected to continue through 2023 and beyond**

Why will low-carbon future be more mineral intensive?



What critical minerals do we have?

In 2022, out of the total mineral production value, **74.89% belongs to metallic minerals** and 25.11% belongs to non-metallic minerals

Efforts on critical minerals development

- The DENR-Mines and Geosciences Bureau, through its **National Mineral Reservation Program**, is currently undertaking advanced exploration of proposed Mineral Reservation areas in the Philippines to look for possible local sources of rare earth elements (REEs) and other critical minerals.

- Critical minerals policy objectives:
  1. Provide a **sustainable supply of critical minerals** for both local and global markets and
  2. **Establish value-adding downstream mineral processing industries** for critical minerals

Efforts on critical minerals development

- Continuous **updating of mineral resource and reserve inventory**
- Expand collection of offshore and onshore mineral resource information through **Government-led exploration**
- Prioritize **sustainable development of critical minerals within existing mineral reservations** and fast-track the assessment, endorsement and declaration of proposed mineral reservations with identified critical minerals sources
- **Streamlining of mining permit and contracts applications** process and enhancement of environmental, social and governance standards
- **Research and development** activities for critical minerals

Adaptation and Mitigation Strategies for Mining

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Decarbonization

Cleaning up electricity supply; adopting transport innovations (electrification and automation); installation of clean, renewable energy sources, such as solar panels

Resource Efficiency

Sustainable development principles throughout the life cycle of minerals and metals; improve operational efficiency; international practices for water control in mine design; invest in technologies that result in more effective recycling operations and waste reduction

Resilient Mining Infrastructure

Regional/site-level modeling to identify and quantify physical risks and opportunities; build local infrastructure that considers climate change risks; ensure integrity of mining installations, the slopes of open pits, and tailings storage facilities

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Digital Transformation

Internet of Things (IoT) devices to generate the vast amounts of data needed for advanced analytics for asset management; use of unmanned aerial vehicles (UAVs) for stockpile assessments, site surveying, and operations planning for blasting and rehabilitation; real-time monitoring of tailings facilities

Promoting Local Sustainability

Consider current and anticipated climate conditions when exploring regenerative agricultural practices, revegetation, water availability, and exposure to extreme events; initiate nature-based projects; develop biodiversity conservation programs, including marine and coastal resources protection

Advancing Gender Equality

Concretize SDG 5 Gender Equality Targets in mining projects; implement gender-responsive projects in the Social Development Management Programs (SDMPs); prioritize and capacitate women in sustainable, more responsive socio-civic engagements

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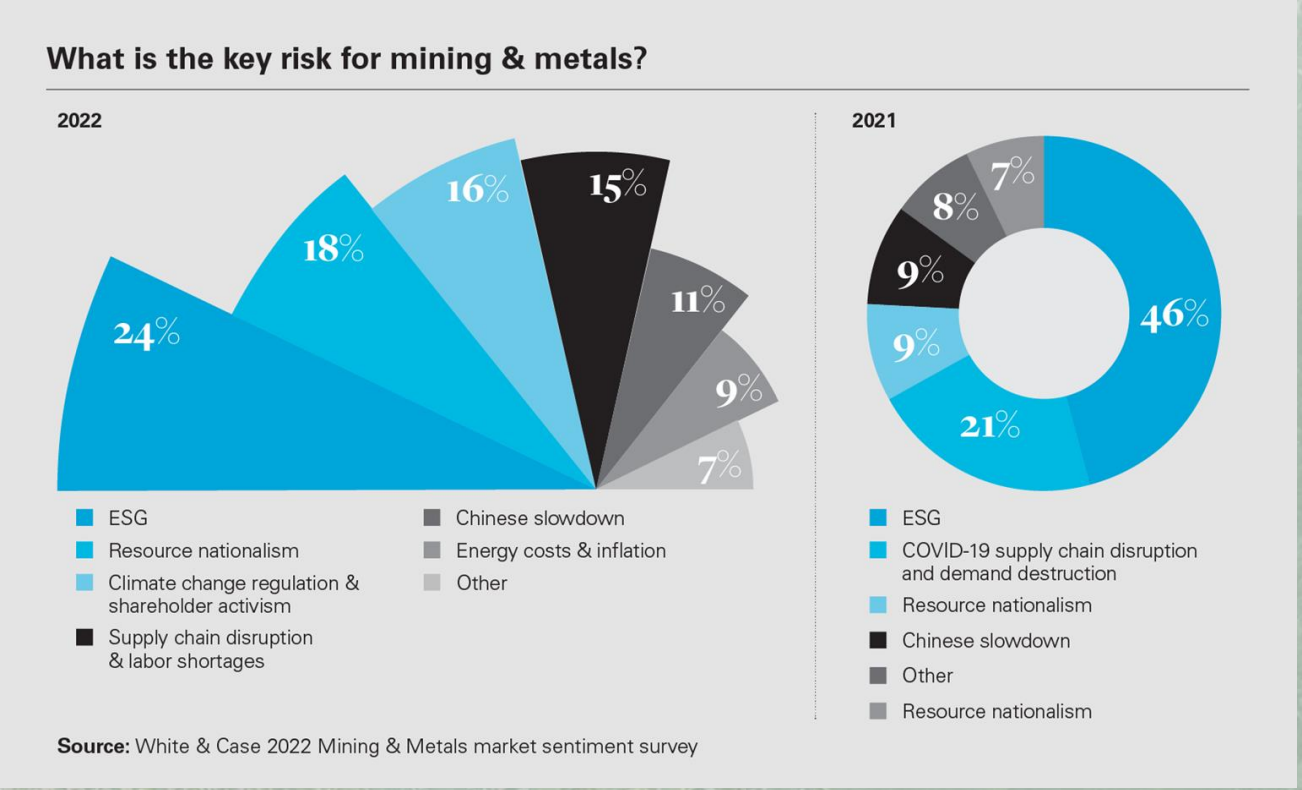
Opportunities in ESG



24% of respondents viewed ESG issues as the biggest threat to mining and metals, rising to approximately 40% when climate-related activism and regulation is included.

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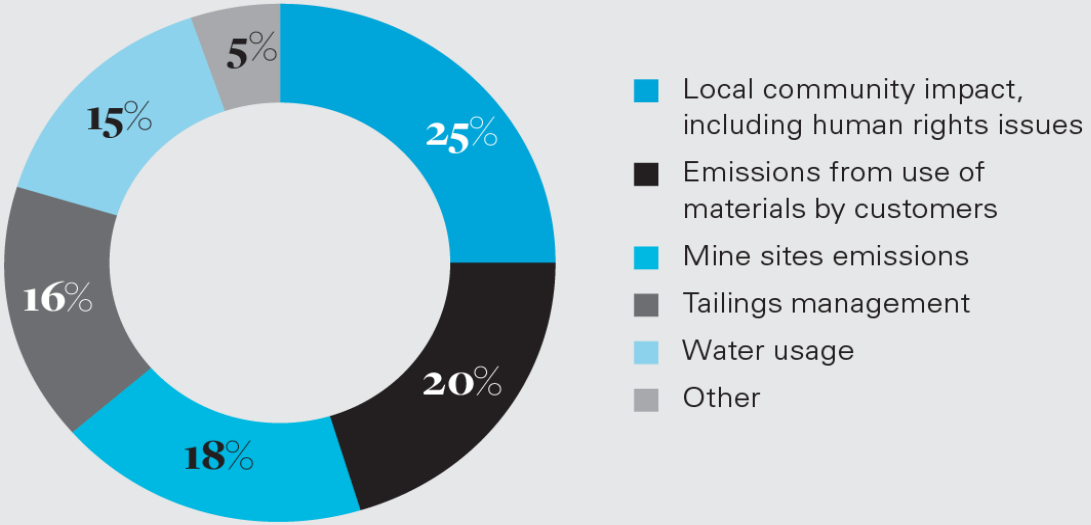
Opportunities in ESG

What area of mining & metals will face the most scrutiny from investors and regulators related to ESG and sustainability issues?



Source: White & Case 2022 Mining & Metals market sentiment survey

Companies have the opportunity to correct decisions in every element of the ongoing battle to reduce their carbon footprint.

If this is achieved, it is possible to envision an energy transition that is aligned with the **ESG** objectives that are now so **fundamental to the operations of a modern mining company**

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Mining and Green Growth

PUBLIC SECTOR

- Facilitate investment in high-value-adding target sectors, whether through incentives, pricing based on the true cost of competing technologies, or setting of targets
- Form policy clusters - reinforcing measures that offer transparent and predictable guidance to investors
- Continued setting and aligning with minimum climate standards, thereby projecting policy stability and encouraging investments

PRIVATE SECTOR

- Organizationally align central office/HQ sustainability and government affairs units with site-level operations
- Shift climate-related resources away from CSR teams and toward site-level resource planning and investment teams
- Continue to focus on “good neighbor zone” activities. Expand metrics tracking to include economic outcomes of green investments
- Aim for scale, and negotiate with governments for such scale

Source: Sekar, S., Lundin, K., Tucker, C., Figueiredo, J., Tordo, S., & Aguilar, J. (2019). Building Resilience A Green Growth Framework for Mobilizing Mining Investment

Mining Industry in Sustainable Future

- Diversity of geographies and commodities produced by the industry
- Mining companies as catalysts for adaptation, not only within their own operations, but in their host communities and among regional businesses. Investment in the resilience of such partners is likely to b as important as ensuring the physical stability and resilience of the corporate value chain
- Sustainable production and consumption
- Transformative - an active driver for change for a sustainable, inclusive and climate-resilient future

Thank you for listening.

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