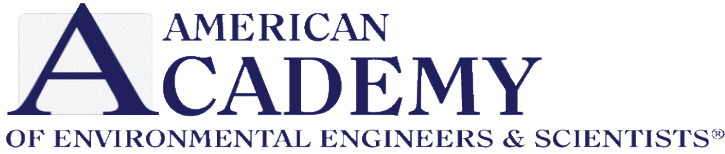


Thank you to our Patrons

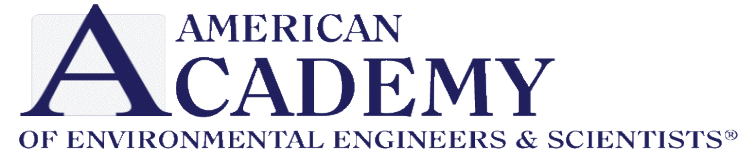


We will begin our presentation in a few minutes...



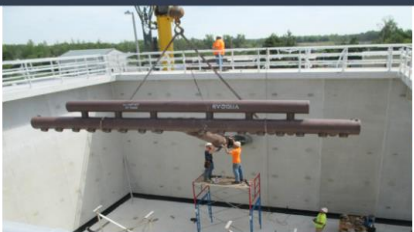
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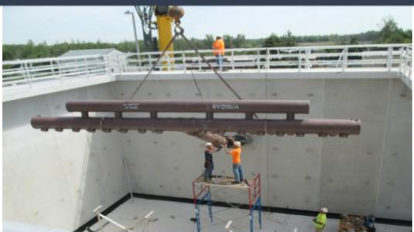


Leadership and Excellence in Environmental Engineering and Science

The Role of Mining in Combating Climate Change

Vini Floris, PhD, PE, CSP, BCEE

April 26, 2023



Safety Moment

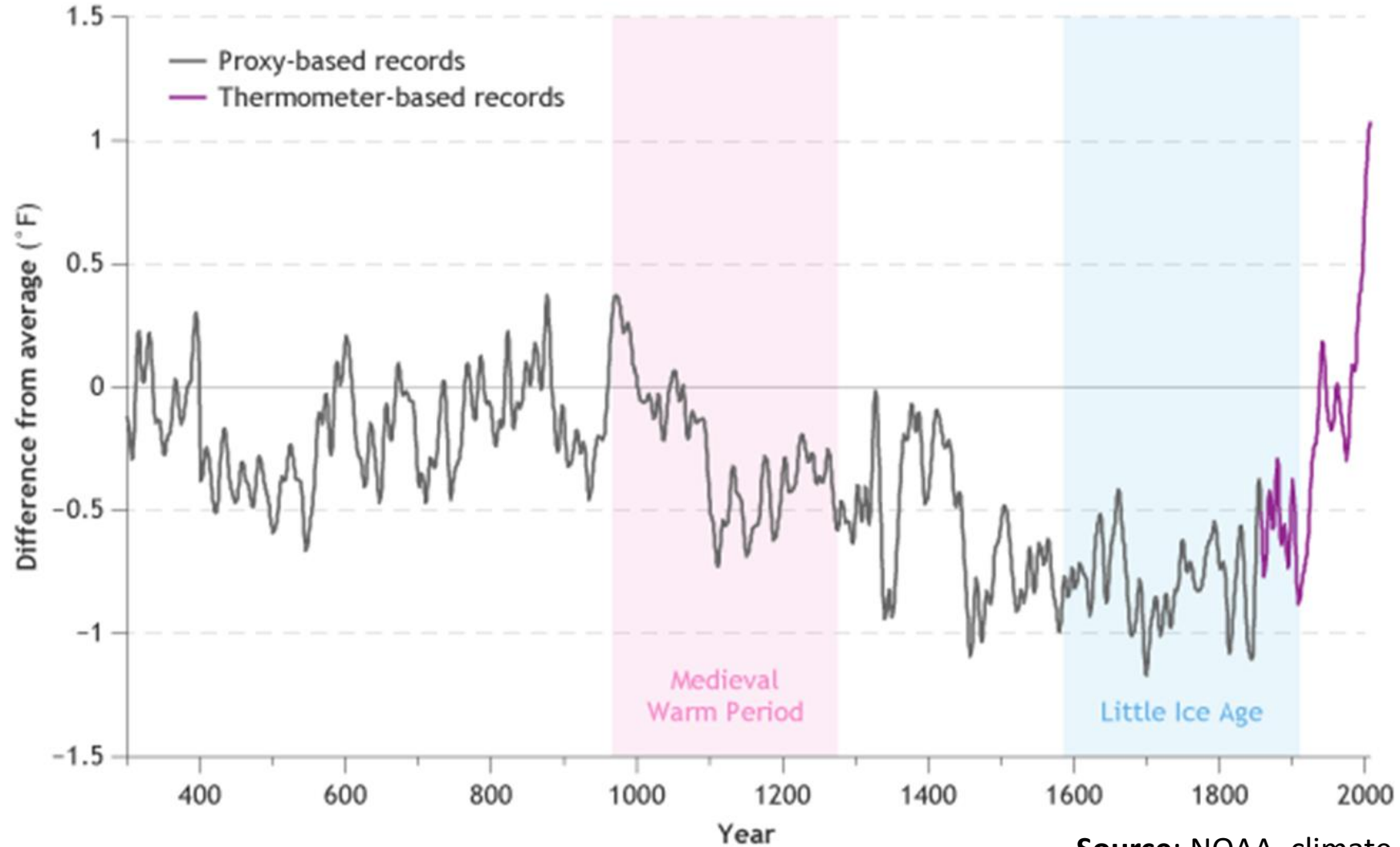


Agenda

- The challenges of Climate change
- Minerals required for the energy transition
- ESG and a sustainable and responsible mining approach
- Quellaveco: a sustainable mining approach
- Conclusions

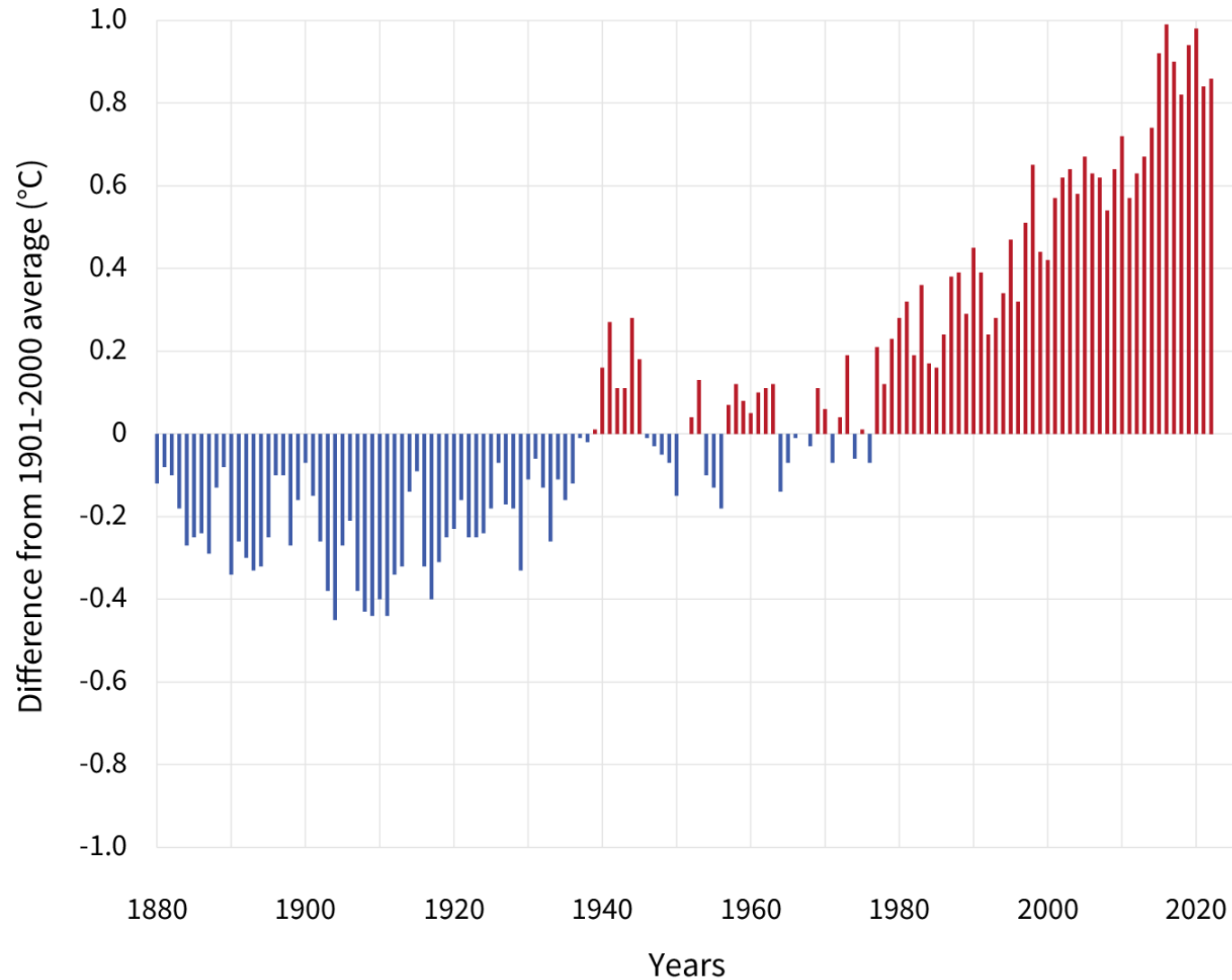
Reconstructed paleoclimate data

Global temperatures over the past 1,700 years



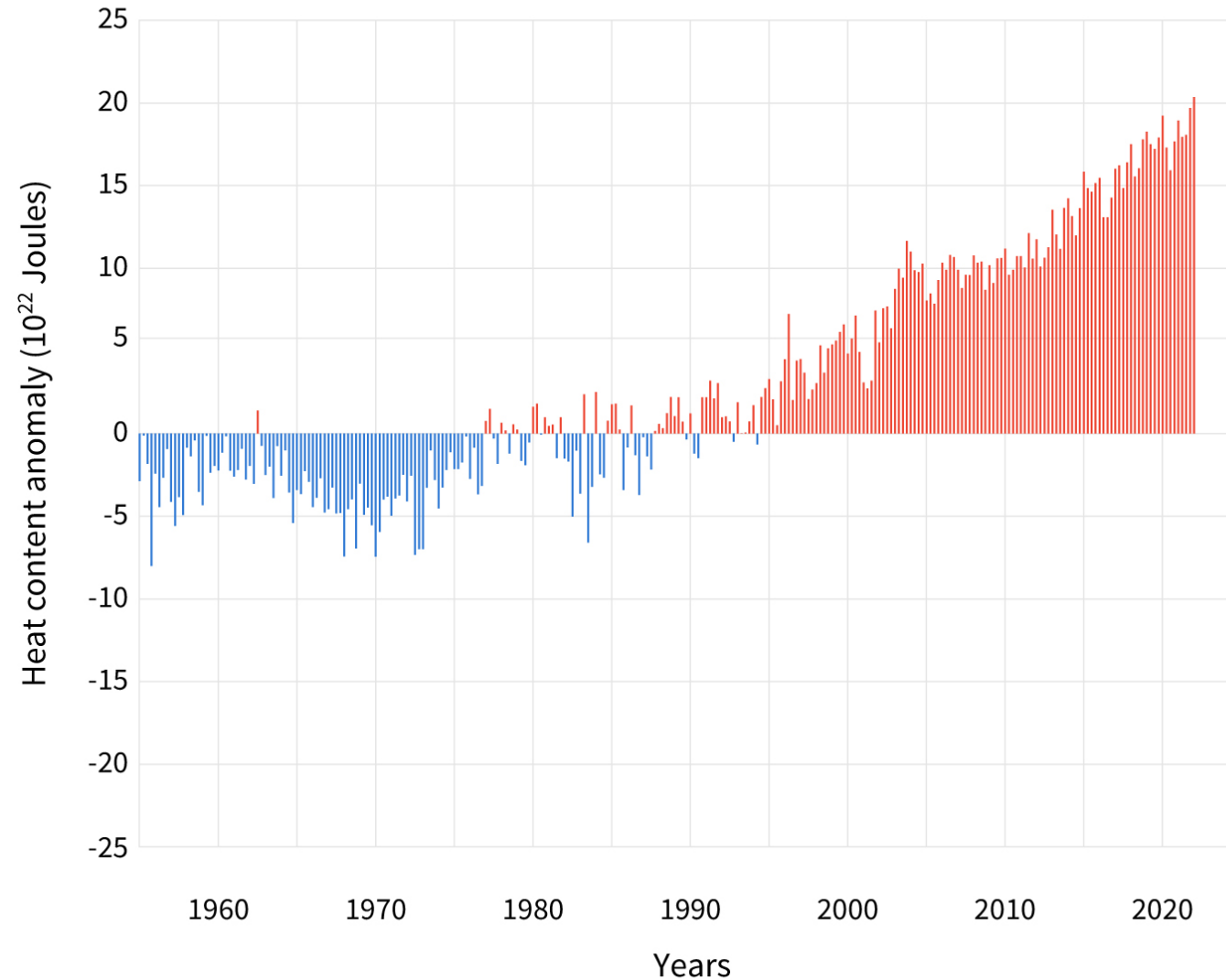
Source: NOAA, climate.gov

Global average surface temperature



Source: NOAA, climate.gov

Ocean heat compared to average



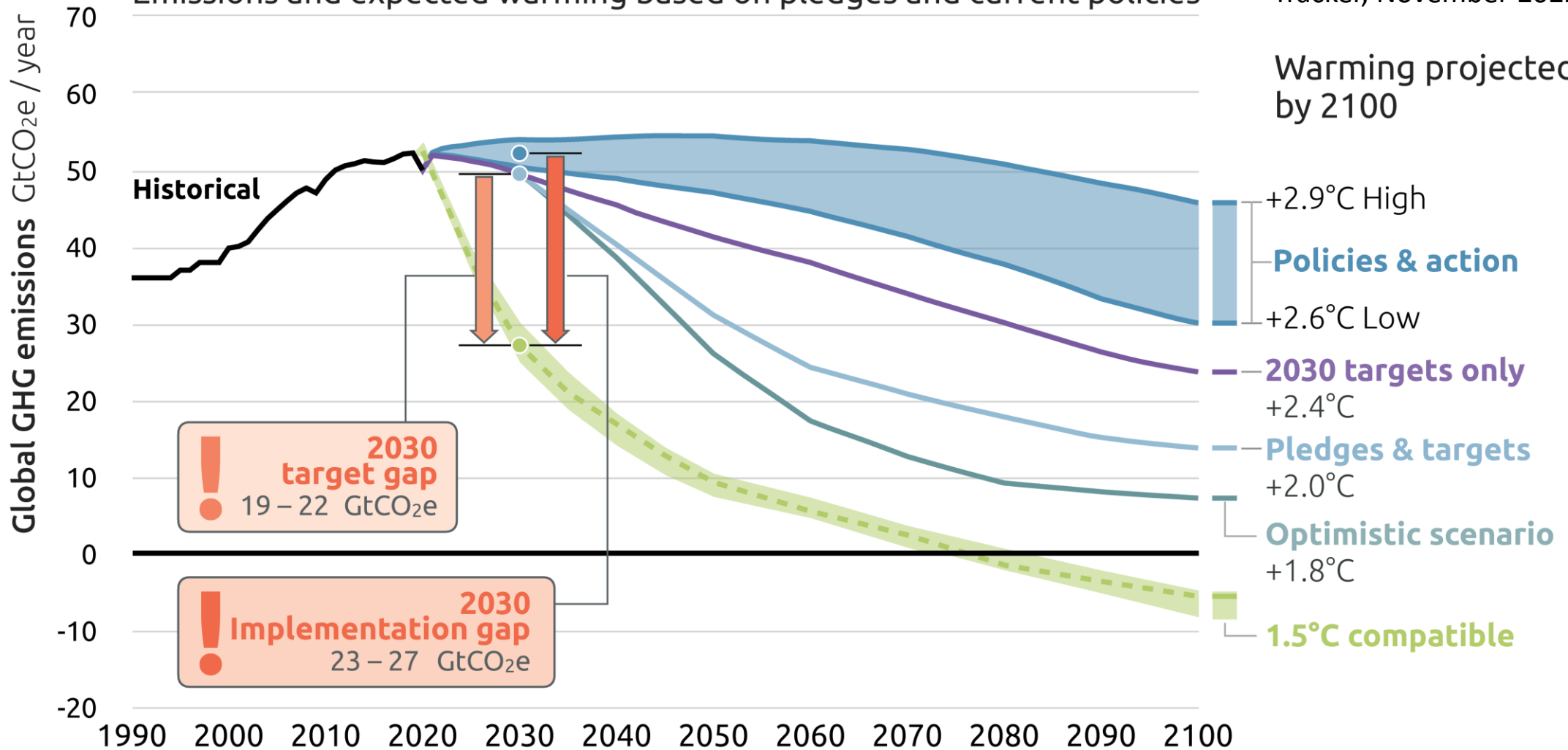
Source: NOAA, climate.gov

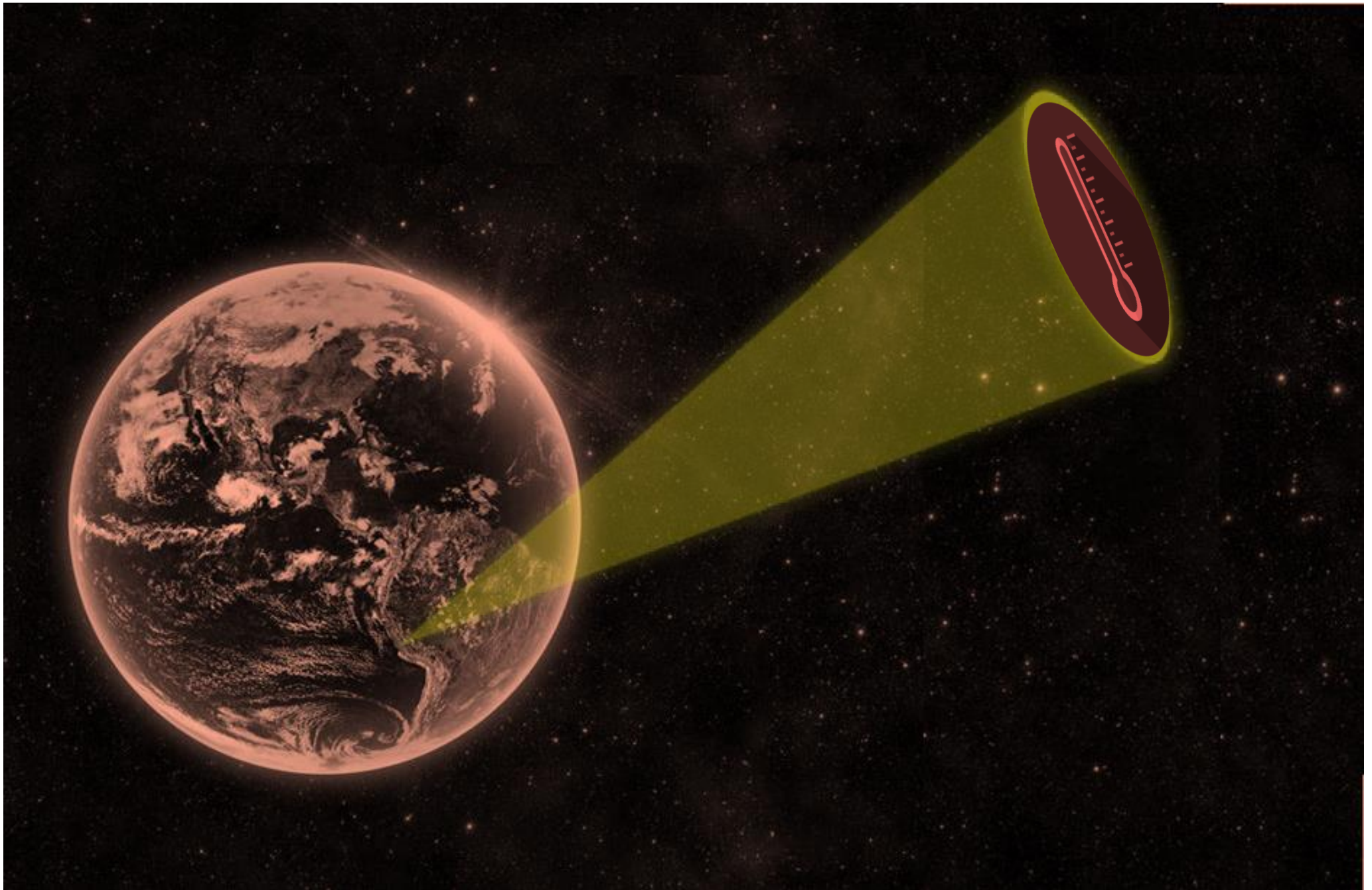
The challenges of climate change

2100 WARMING PROJECTIONS

Emissions and expected warming based on pledges and current policies

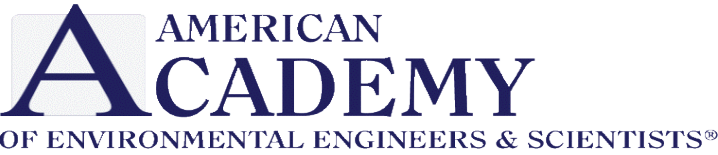
Source: Climate Action Tracker, November 2022



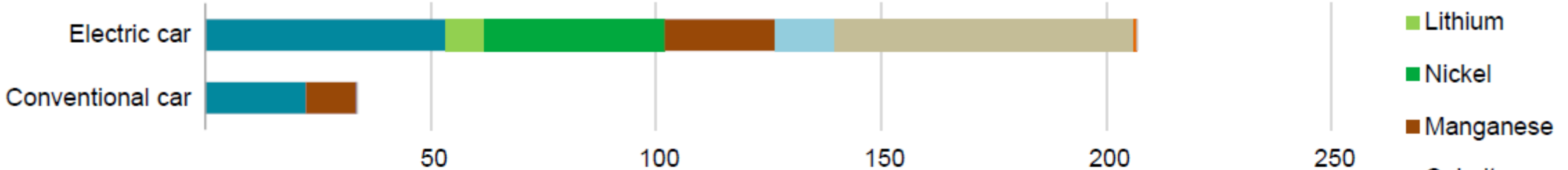




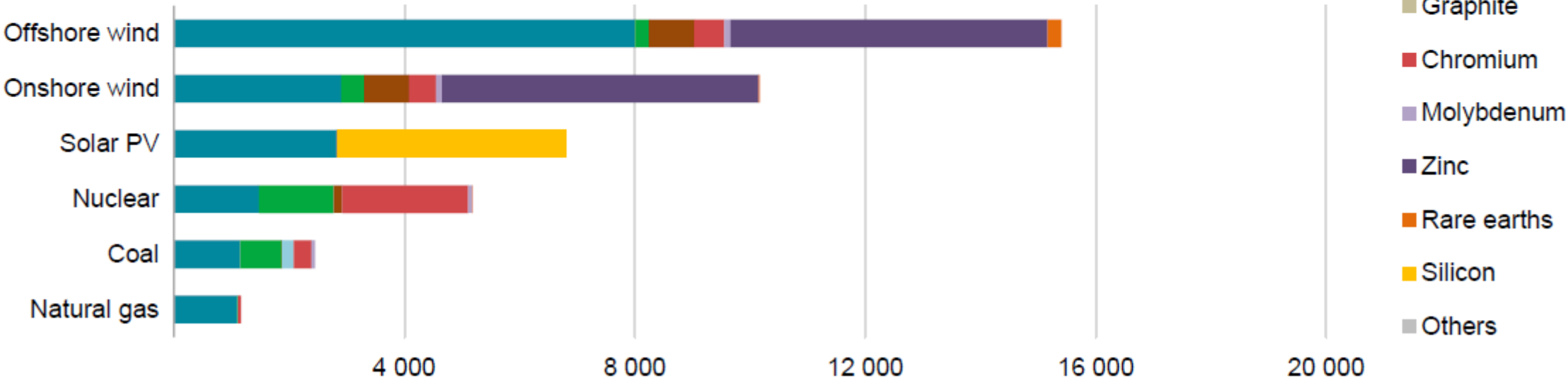
Metals and non-metals used in transport and power generation



Transport (kg/vehicle)

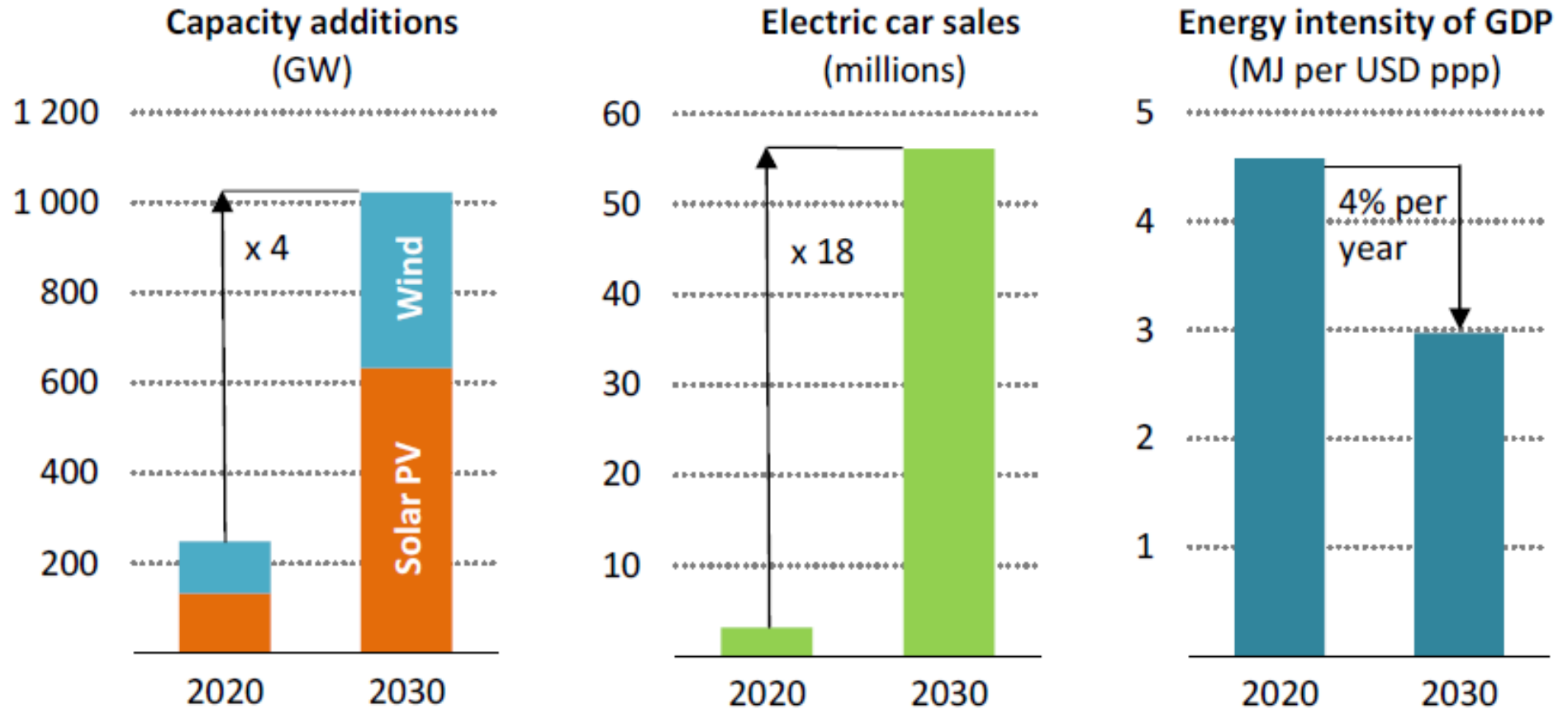


Power generation (kg/MW)



Source: International Energy Agency, The Role of Critical World Energy Outlook Special Report Minerals in Clean Energy Transitions, 2022.

Key clean technologies by 2030 in the net zero pathway

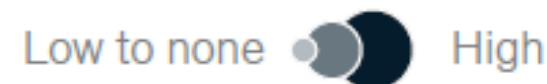


Note: MJ = megajoules; GDP = gross domestic product in purchasing power parity.

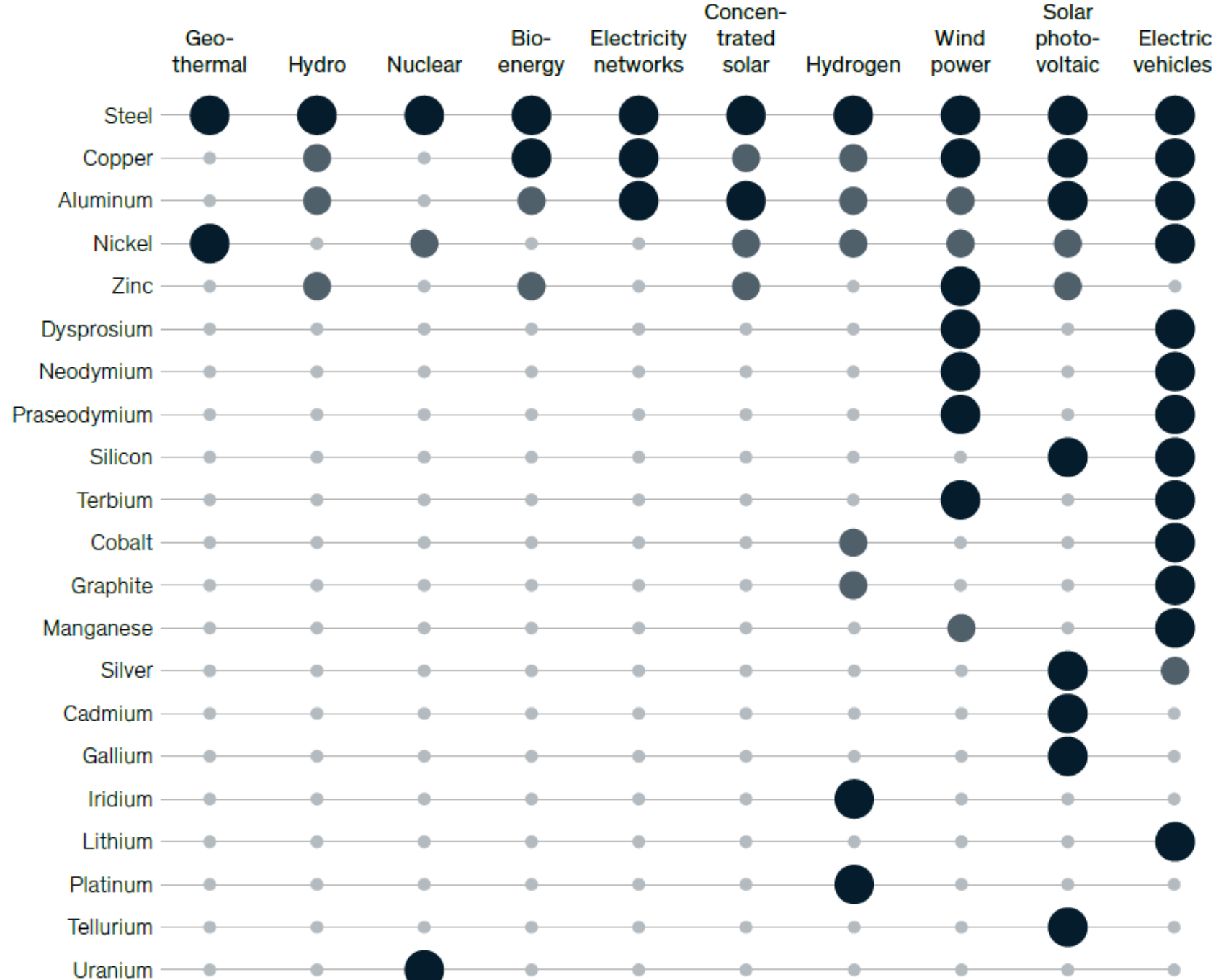
Source: International energy Agency. Net Zero by 2050 A Roadmap for the Global Energy Sector. 2022.

Materials critical for transition to a low-carbon economy, by technology type

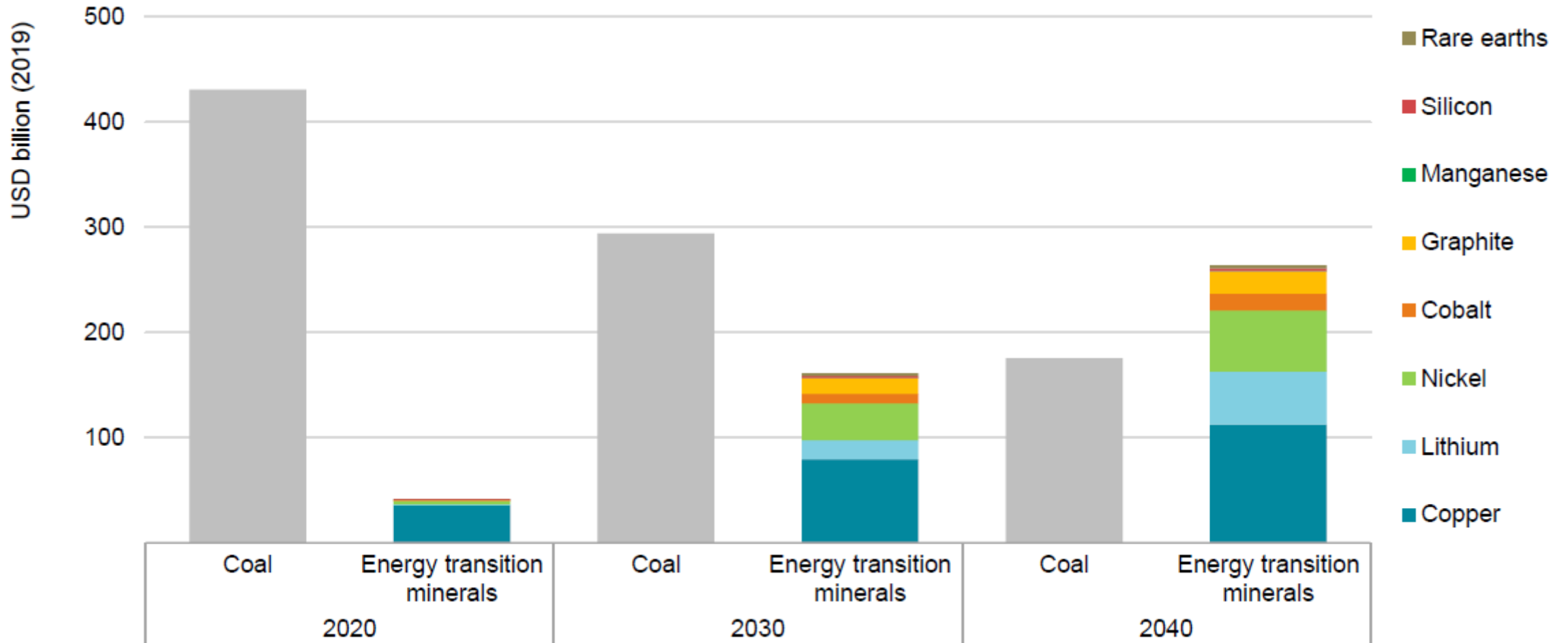
Importance



Source: McKinsey, The raw-materials challenge: How the metals and mining sector will be at the core of enabling the energy transition. 2022.

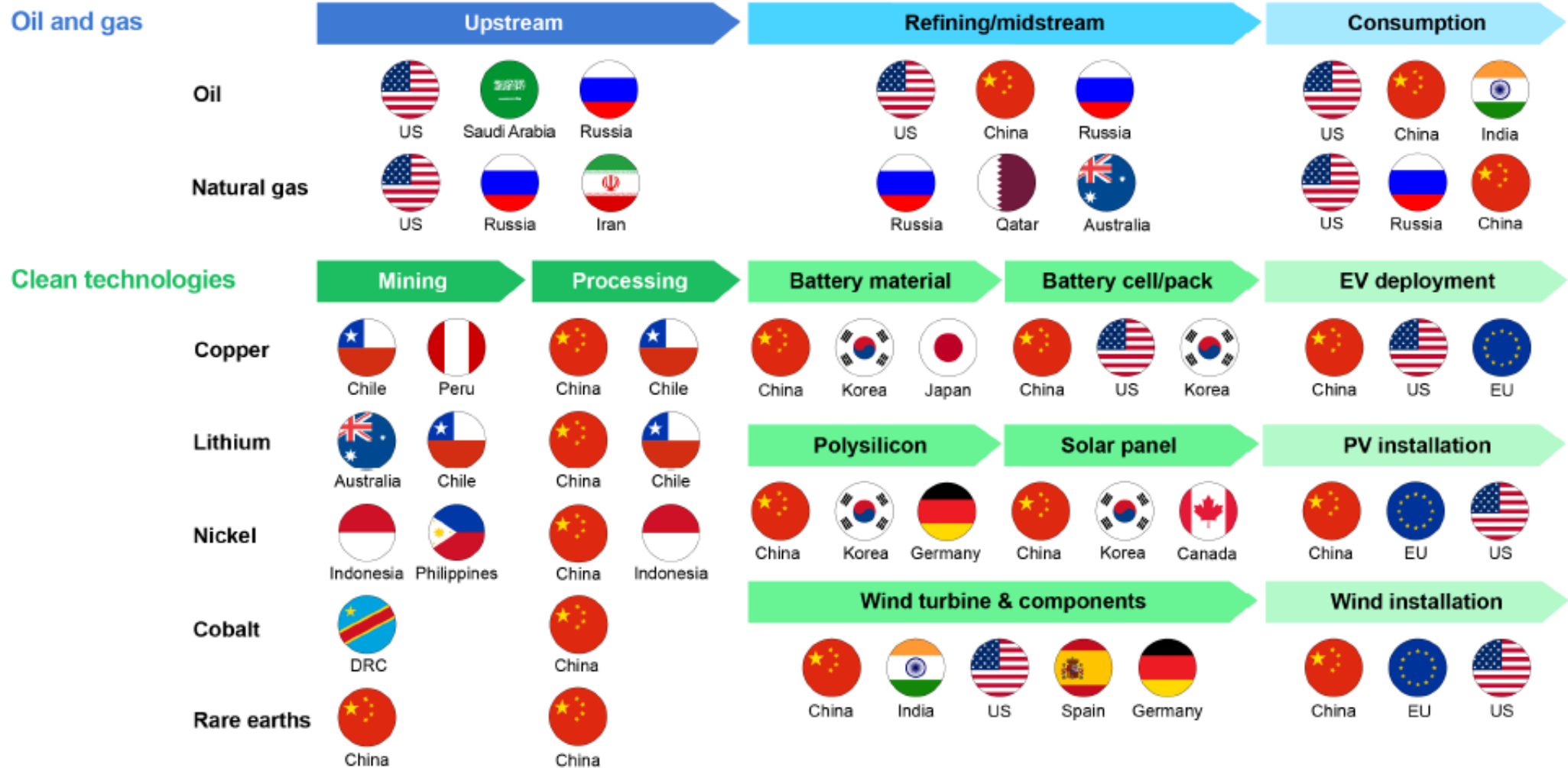


Revenue from production of coal and selected energy transition minerals



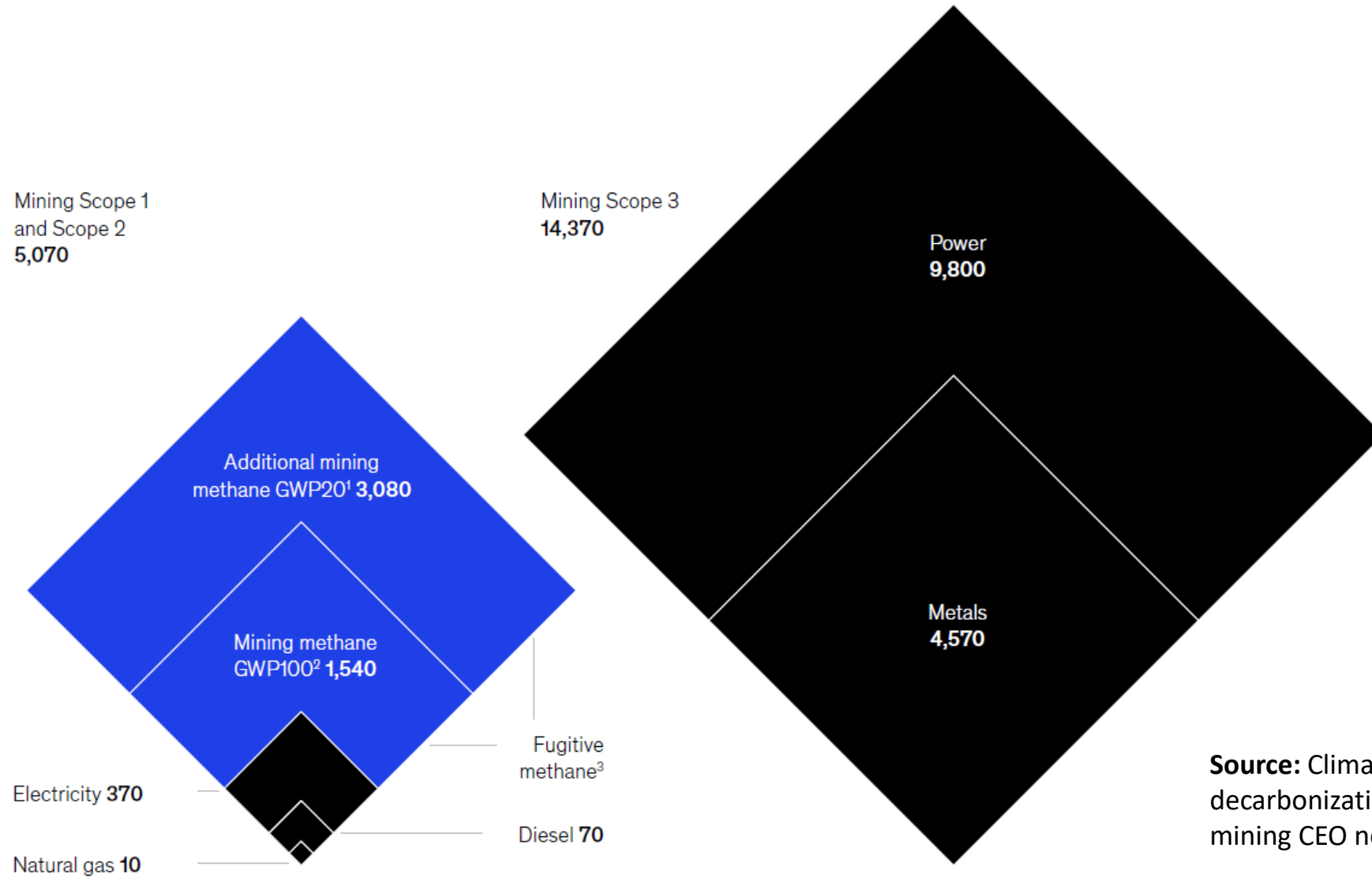
Source: International Energy Agency, The Role of Critical World Energy Outlook Special Report Minerals in Clean Energy Transitions, 2022.

Supply chains of oil & gas and selected clean energy technologies



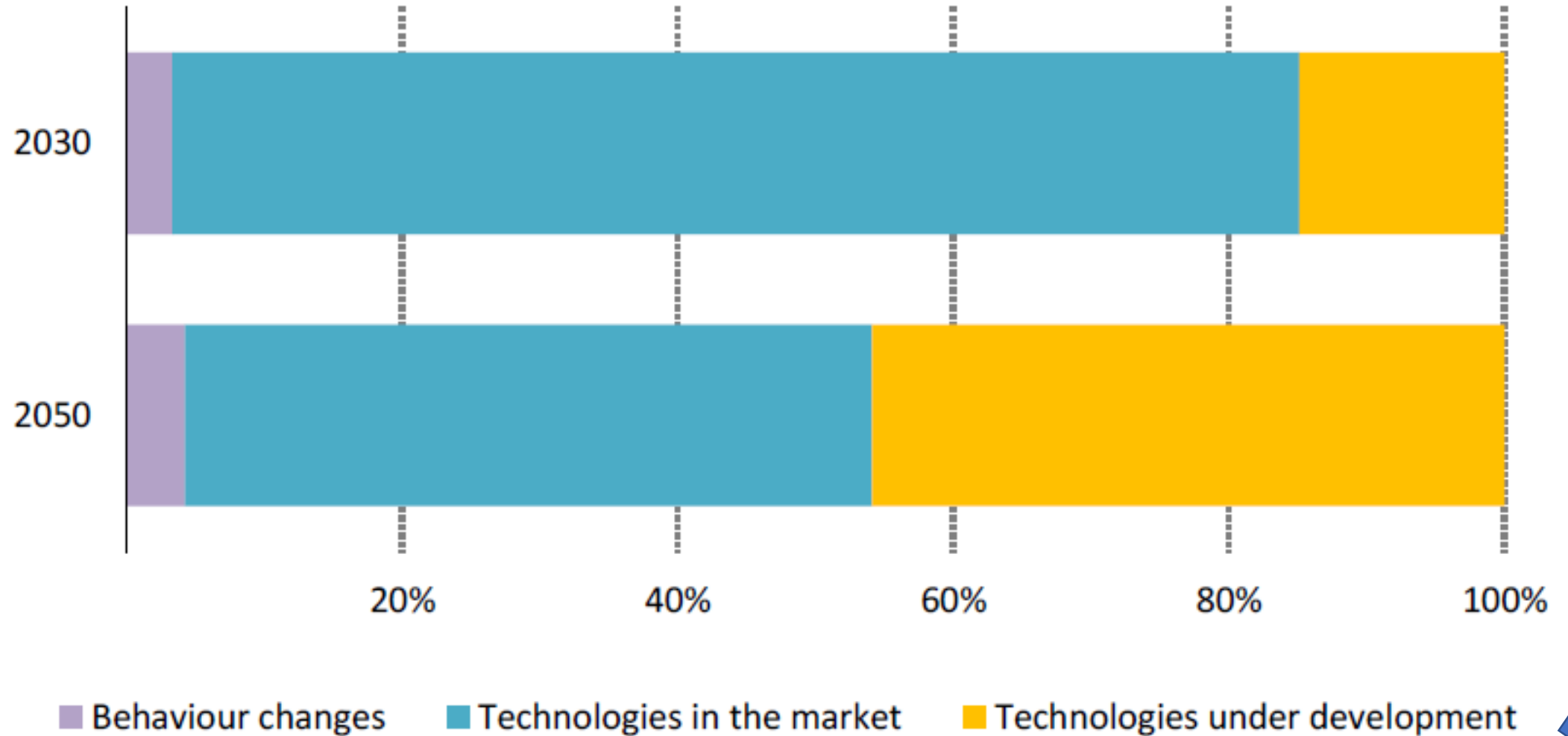
Source: International Energy Agency, The Role of Critical World Energy Outlook Special Report Minerals in Clean Energy Transitions, 2022.

Greenhouse gas emissions, by industry, by type, megatons per year of CO₂e



Source: Climate risk and decarbonization: What every mining CEO needs to know. 2020

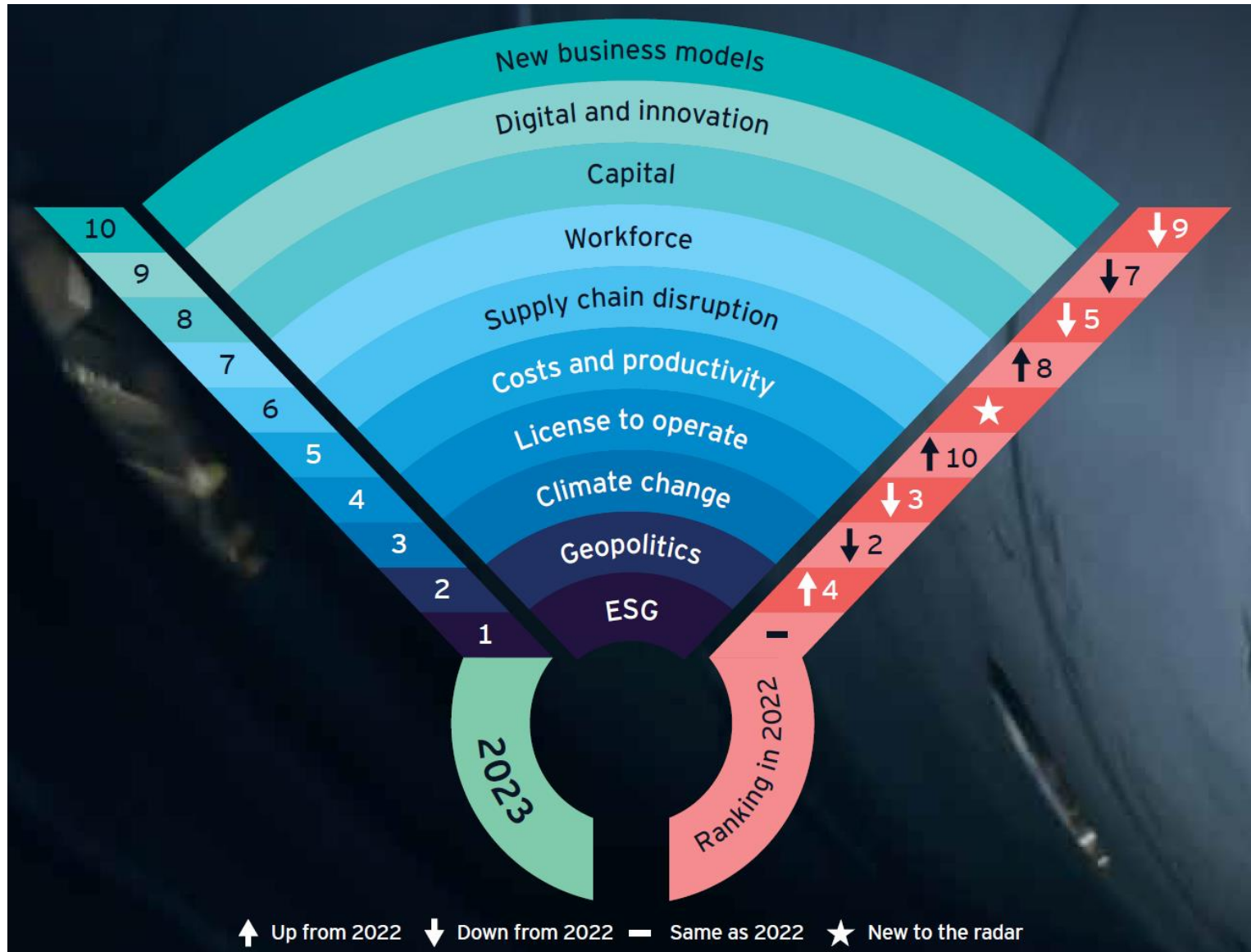
Annual CO₂ emissions savings in the net zero pathway, relative to 2020



Source: International energy Agency. Net Zero by 2050 A Roadmap for the Global Energy Sector. 2022.



EY top 10 business risks and opportunities for mining and metals



Source: EY. Top 10 business risks and opportunities for mining and metals in 2023. 2023.

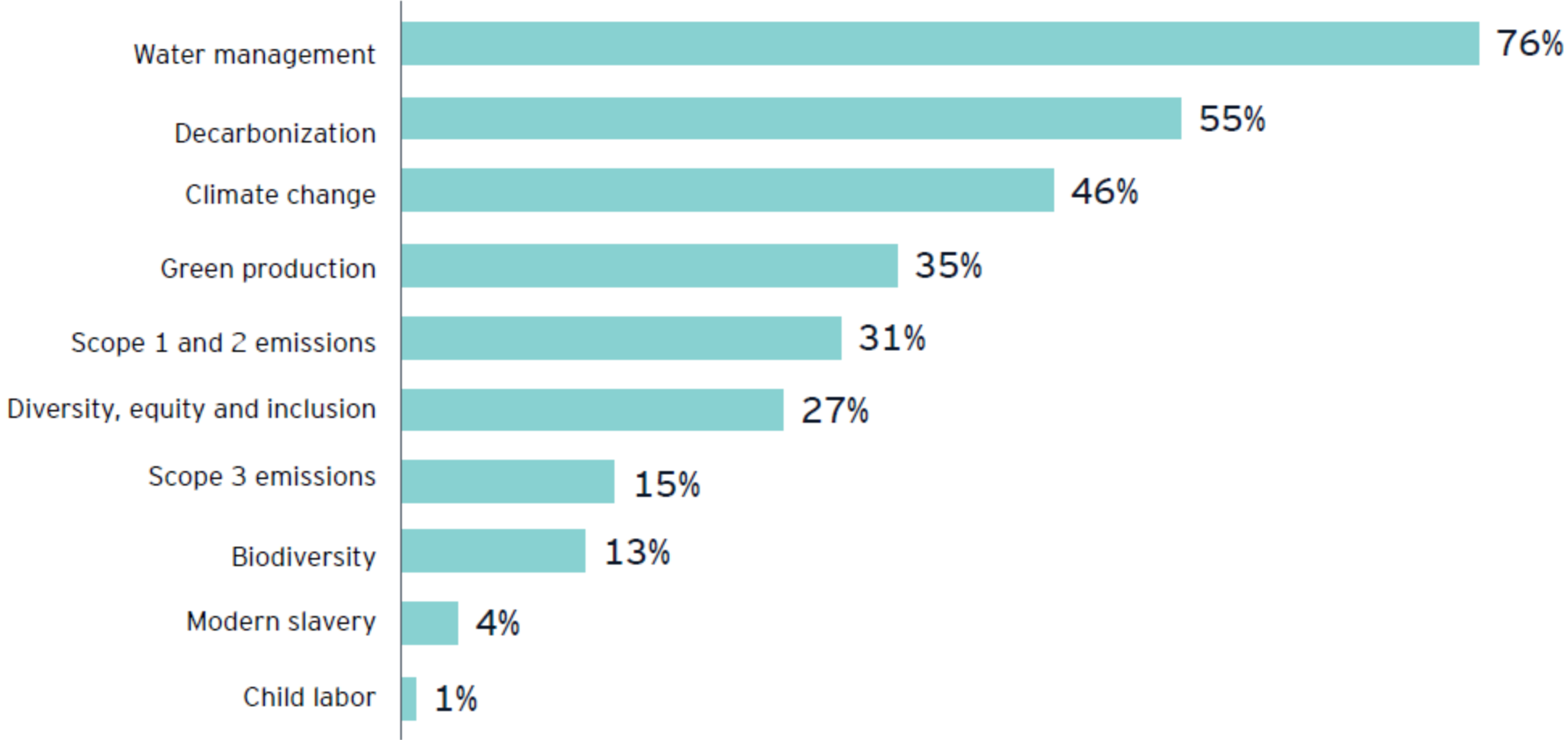
Environmental, Social and Governance (ESG)



“Good governance is always going to be a top trend, but investors and analysts are smarter. It’s no longer a ‘check the box’ exercise”.

-Senior mining executive

Survey results: Top ESG issues that the metals and mining sector will face the most Scrutiny on from investors



Source: EY. Top 10 business risks and opportunities for mining and metals in 2023. 2023.



Quellaveco: A sustainable Mining Approach



Conclusions

- Mining: principal role in decarbonization and energy transition
- Environmentally sustainable mining is key:
 - Can't be a significant source of emissions as demand rises
 - Land use: mitigate displacement of communities and the loss of habitats that are home to endangered species

Conclusions

- Land use: avoid adverse impacts on biodiversity
- Water management: mitigate contamination risks (acid mine drainage), wastewater and disposal of tailings
- Water scarcity: half of lithium and copper production are concentrated in areas of high-water stress
- Waste: avoid tailings and waste rock generated by declining ore quality
- Waste: better management of hazardous by-products

Conclusions

- Socially responsible mining is essential:
 - Governance: invest in economic and industrial growth
 - Governance: eliminate corruption and bribery that pose major liability risks for companies
 - Health & safety: special attention to working conditions and workplace hazards
 - Human rights: eliminate any adverse impacts on the local population such as child or forced labor

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