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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

- Proxy-based records
- Thermometer-based records

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

Warming projected by 2100:
- +2.9°C High
- +2.6°C Low
- 2030 targets only
  - +2.4°C
- Pledges & targets
  - +2.0°C
- Optimistic scenario
  - +1.8°C
- 1.5°C compatible

Historical

Global GHG emissions GtCO₂e/year

2030 target gap: 19 – 22 GtCO₂e
2030 Implementation gap: 23 – 27 GtCO₂e
Metals and non-metals used in transport and power generation

Key clean technologies by 2030 in the net zero pathway

<table>
<thead>
<tr>
<th>Technology</th>
<th>Capacity Additions (GW)</th>
<th>Electric Car Sales (Millions)</th>
<th>Energy Intensity of GDP (MJ per USD ppp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind</td>
<td>x 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solar PV</td>
<td></td>
<td>x 18</td>
<td></td>
</tr>
<tr>
<td></td>
<td>800 (2030)</td>
<td>60 (2030)</td>
<td>2.5 (2030)</td>
</tr>
</tbody>
</table>

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

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

Revenue from production of coal and selected energy transition minerals

Supply chains of oil & gas and selected clean energy technologies

Greenhouse gas emissions, by industry, by type, megatons per year of \( \text{CO}_2 \text{e} \)

**Source:** Climate risk and decarbonization: What every mining CEO needs to know. 2020
Annual CO$_2$ emissions savings in the net zero pathway, relative to 2020

EY top 10 business risks and opportunities for mining and metals

“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

Water management: 76%
Decarbonization: 55%
Climate change: 46%
Green production: 35%
Scope 1 and 2 emissions: 31%
Diversity, equity and inclusion: 27%
Scope 3 emissions: 15%
Biodiversity: 13%
Modern slavery: 4%
Child labor: 1%

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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