

# DeCARBMINE

[ CHALLENGE ]



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**Technical Data Sheet**  
DecarbMine Challenge  
**Copper**

# Challenge 1



## Critical Inputs and Strategic Materials for Copper Mining

Reagents, consumables, and circular materials for Scope 3 decarbonization

### Background

The copper industry currently faces a significant challenge in reducing its carbon footprint, with an emerging focus on Scope 3 emissions, which represent more than 50% of the sector's total emissions. These emissions are partly associated with the production, transportation, use, and end-of-life management of critical inputs and strategic materials used throughout the mining value chain.

These inputs include reagents, grinding media, explosives, and other operational consumables, as well as high-volume and frequently replaced materials such as end-of-life tires, decommissioned conveyor belts, metallic components, and other relevant industrial materials.

Several sector analyses indicate that these inputs and materials have high carbon intensity during manufacturing and replacement, mainly due to energy consumption, the use of virgin raw materials, and specific logistics chains. At the same time, structural factors such as declining ore grades, increased ore hardness, higher impurity levels, and greater mineralogical complexity tend to increase the specific consumption of operational inputs and the replacement frequency of materials, intensifying both direct and indirect emissions.

In this context, the transition toward more sustainable inputs and circular economy models—based on reuse, valorization, advanced recycling, and closed-loop systems—becomes a key enabler for reducing Scope 3 emissions, optimizing resource use, reducing dependence on virgin raw materials, and strengthening the sector's operational resilience.

Leading copper companies have prioritized the development and adoption of solutions capable of significantly reducing these emissions, aligned with their 2030 emissions-reduction commitments and 2050 carbon-neutrality targets, while maintaining safety, operational continuity, and metallurgical performance, and simultaneously promoting collaborative innovation, validation, and industrial scaling frameworks.

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### Objective

To promote Scope 3 decarbonization in copper mining through the development, validation, and adoption of reagents, consumables, and strategic materials with a lower environmental footprint, as well as the implementation of efficient-use systems, continuous reuse, and closed-loop models that reduce emissions associated with the manufacturing and procurement of new raw materials.

### Scope

The challenge considers solutions applicable to processes and operations associated with copper mining, both at the mine and processing plant, including, but not limited to:

- **Chemical Reagents and Process Raw Materials**, used in comminution, flotation, leaching, SX-EW, process control, water treatment, and tailings management, including sulfuric acid, lime, flotation reagents, and other critical chemical inputs.
- **Strategic Operational Inputs and High-Turnover Consumables**, such as steel grinding balls and rods, explosives, diesel fuel, lubricants, mill liners, and refractory bricks, whose manufacturing, transportation, and replacement represent a significant share of Scope 3 emissions.
- **Strategic Materials and Industrial Components**, including end-of-life tires, conveyor belts, ferrous scrap, metallic components, and other relevant industrial materials, with potential for optimization, reuse, or integration into closed-loop models.

Proposed solutions may address one or more of the following action areas:

- **Reduction of carbon footprint and other environmental impacts**, associated with the production, manufacturing, transportation, or logistics of inputs and materials.
- **Process and operational optimization**, aimed at reducing the specific consumption of inputs within the process or in downstream stages, through improvements in process control, stage integration, operational efficiency, or loss reduction.
- **Reduction in specific consumption or extension of the service life of inputs and materials**, through design improvements, enhanced performance, maintenance strategies, or asset management practices.
- **Reuse, advanced recycling, and development of closed-loop systems**, enabling materials to be reincorporated into the value chain and reducing demand for virgin raw materials.
- **Substitution of conventional materials with lower-impact or more circular alternatives**, while maintaining or improving technical and operational performance..



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### General Requirements

Proposed solutions should generally meet the following requirements:

- 1. Decarbonization Impact and Scope 3 Emissions Management:** Demonstrate a potential or proven reduction in carbon footprint compared to conventional solutions, ideally supported by Life Cycle Assessment (LCA), product carbon footprint analyses, or other verifiable environmental indicators. Solutions should also enable measurement, monitoring, and traceability of environmental and operational benefits to support integration into corporate sustainability and decarbonization reporting systems.
- 2. Operational Compatibility:** Be technically compatible with typical copper mining processes and operating conditions (including variables such as pH, temperature, mineralogy, etc.) while ensuring operational continuity and not introducing significant risks to process stability.
- 3. Metallurgical Performance:** Maintain or improve key performance indicators, such as recovery, selectivity, specific consumption, process stability, and final product quality.
- 4. Scalability and Technological Maturity:** Have a technological readiness level that allows validation in industrial or semi-industrial (pilot) environments, with a clear pathway for scaling toward commercial operation.
- 5. Safety and Regulatory Compliance:** Comply with occupational health and safety standards and applicable environmental regulations, including aspects related to handling, storage, transportation, and end-of-life management.
- 6. Social Approach and Local Development (desirable but not mandatory):** Incorporate an approach that contributes to local supplier development and shared value creation with surrounding communities, through productive linkages, capacity transfer, local employment, or collaborative models that strengthen the project's positive social impact.

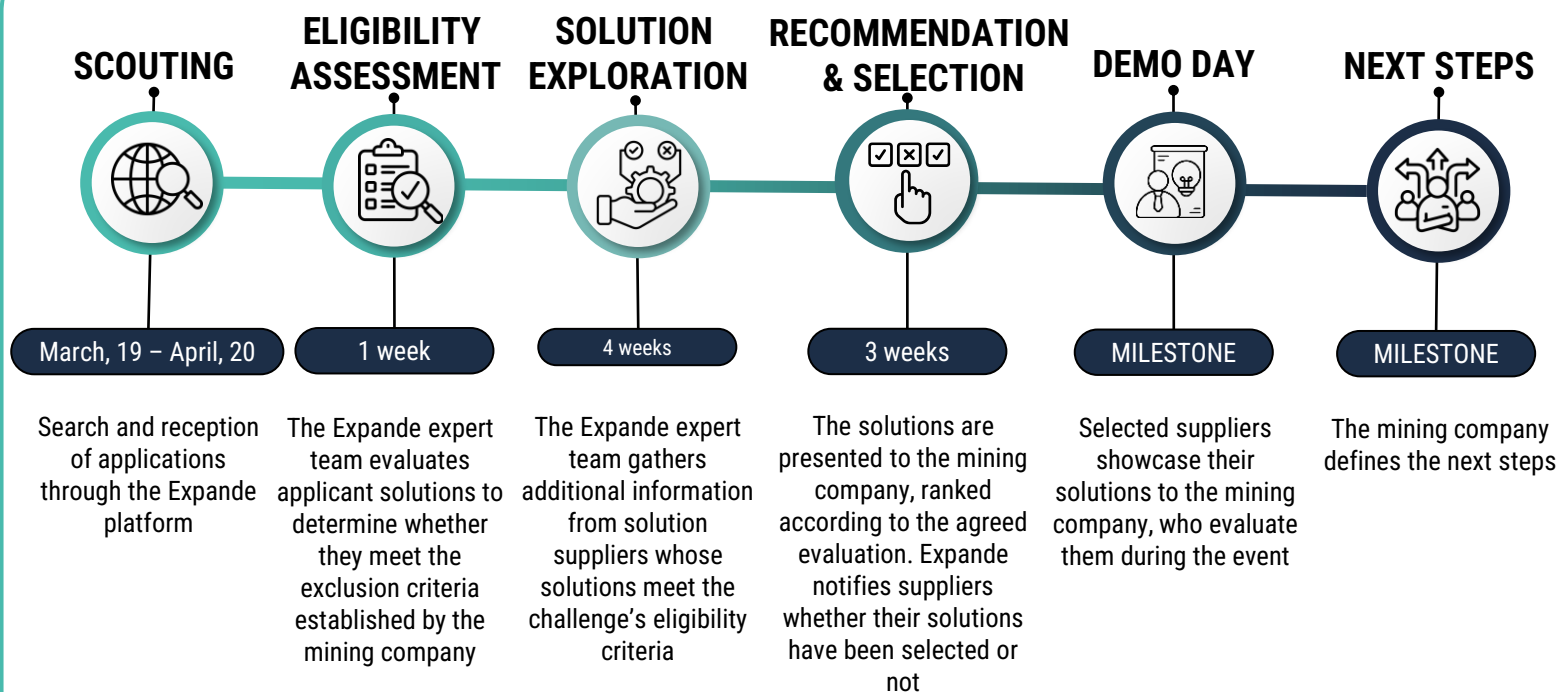
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### Process Timeline



#### **CONFIDENTIALITY:**

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