

ROBOMINERS

2030

2050

Robotics

**Demonstrator for modularity, self-assembly, perception and navigation
Resilience in underground environments**

First industrial pilot, tethered, semi-autonomous operation

Full autonomy, self-reconfigurability, self-awareness, collective robots

Selective mining

New mineral perception, detection and classification, new production tools

First industrial pilot application in "small deposit scenario" or "abandoned mine scenario" coupled with on-site minerals processing

Autonomous mining

Mining ecosystem

**Study of a new mining ecosystem
Identify research challenges for logistics, environment, mineral processing and others**

First industrial application in a small deposit scenario with onsite minerals processing

**Industrial applications in ultra-depth scenarios
Small mines deliver a considerable share of EU's critical minerals production**

Sustainability assessment

**Financial viability assessment
Sustainability, environmental and ethical considerations
Research roadmap for development of supporting technologies**

**Permitting procedures for small-scale mining
Supporting policy and legal framework for small-scale mining**

New innovation ecosystem: SME's and entrepreneurs are working towards further miniaturisation and versatility