

Strengthening Europe's Mineral Raw Materials Competitiveness Through Strategic Skills Development and Expanded Value-Chain Funding

A Position Paper of the ETP SMR

Key Recommendation

- *Create an EU-backed network of joint MSc programmes in mineral raw materials with 10-year funding commitments.*
- *Ring-fence substantial, annual FP10 R&I budgets across the entire raw materials value chain, including a dedicated allocation of at least EUR 4 billion.*
- *Guarantee pilot and demo funding (TRL 6–8) via Innovation Fund, InvestEU, REsourceEU and the CRM financing hub, with strong links to CRMA Strategic Projects.*
- *Align skills and R&I actions with the EU economic security agenda and regional cohesion policies.*

ETP SMR welcomes the European Commission's REsourceEU Action Plan and its strengthened commitment to delivering the Critical Raw Materials Act (CRMA). The Plan rightly identifies the urgent need to accelerate Europe's capabilities in the mineral raw materials sector. However, ETP SMR wants to highlight two structural gaps that could undermine the Union's ability to achieve its objectives. The EU's strategic ambitions for critical raw materials (CRM) will not be met without:

1. **EU-supported MSc programmes** that secure the specialised workforce required across the entire mineral raw materials value chain (exploration, mining, mineral processing, metal extraction and refining, secondary raw materials recovery, advanced recycling, and mine closure).
2. **A significant expansion of EU Research & Innovation (R&I) funding in FP10** and annualization of EU calls across the entire mineral raw materials value chain.

These two measures are foundational to ensuring the EU's ability to secure raw materials to strategic value chains – these gaps must be addressed through decisive, long-term EU action.

Higher education policy and funding primarily lie within the competence of the Member States. The measures proposed in this position paper therefore focus on EU level incentives and long term co funding that respect national responsibilities while supporting those countries and universities that choose to reinforce raw materials education.

The role of EU instruments should therefore be to provide long term co funding and clear strategic signals that raw materials skills are a European priority, enabling interested Member States and higher education institutions to strengthen, modernise or rebuild relevant programmes on a voluntary basis. Rather than replacing national responsibilities, EU support would de risk and stabilise a small number of Pan European MSc programmes that serve the Union's collective needs. The objective is to support modern programmes that integrate responsible raw material supply, circularity and environmental performance with cutting edge engineering, digitalisation and automation.

Establish EU-supported Master's programmes to secure the future skills base

Europe's transition toward climate neutrality, digital leadership, and industrial resilience depends fundamentally on secure, sustainable and responsible access to mineral raw materials, yet the educational foundations required to support these ambitions are critically underfunded and at risk of further erosion. Dedicated, EU-supported master's programmes in raw materials are critical for maintaining a sustainable talent pipeline across all stages of the mineral raw materials supply chain, including also capabilities in remote and autonomous operations and data-driven optimisation that determine productivity, safety and sustainability in modern mining and downstream processing. The sector already faces major skills shortages due to earlier deindustrialisation and because many universities have closed or downsized upstream raw materials programmes. Without decisive action, Europe risks a structural skills deficit that will compromise its strategic autonomy and sustainability goals. The skills shortages will deepen further as the EU accelerates its domestic CRM ambitions. This challenge is well documented, including in the European Training Foundation's report Skills for Critical Raw Materials¹, which identifies persistent gaps in higher education and advanced technical skills as a key bottleneck for scaling up domestic CRM value chains. The Commission also recognised the severity of the skills gap in its RESourceEU Action Plan, which highlights the urgent need for a large-scale skills partnership and the creation of a Raw Materials Academy² to support workforce development across the CRM value chain. More broadly, the EU identified skills development as a key enabler for building competitive CRM value chains by, prioritising reskilling, strategic partnerships and new initiatives such as the Raw Materials Academy implemented by the European Institute of Innovation and Technology and supported with EUR 10 million from the Single Market Programme and Horizon Europe. While this represents an important and welcome step, the measures have primarily been oriented towards upskilling and lifelong learning and will not be sufficient to meet the long-term need for higher education and academically trained professionals in the sector. These initiatives aim at training a large number of learners. They cannot replace the deep expertise developed through rigorous, long-term academic programmes. **Sustainable funding for existing master's programmes must therefore be ensured, or at minimum a dedicated budget line for Master's level education within the mineral raw materials sector should be established.**

Several established master's programmes, including AMIR, EMerald, TIMREX and others, were initiated as part of the EIT RawMaterials educational offer and labelled by EIT. However, a large share of these programmes rely on funding from the EU's Erasmus+ Programme, which lacks long-term financial security and therefore cannot guarantee any continuity. Despite their strategic importance for the CRMA, education programmes in Earth sciences, mining engineering, metallurgy and mineral processing remain small in scale and are extremely vulnerable to funding models based on short-term profitability and large student numbers. However, these disciplines generate disproportionate long-term value, as small groups of highly specialised experts enable mineral discoveries that support extensive downstream activity across mining, refining, manufacturing and recycling. Unlike more generalist professions, this expertise is highly specialised and difficult to rebuild once lost, meaning that the steeply declining educational capacity is weakening Europe's future raw material supply chains and industrial resilience.

From the perspective of ETP SMR, these programmes should therefore be viewed not through short-term enrolment metrics, but as strategic investments in Europe's industrial competitiveness and long-term economic security. Furthermore, when programmes reapply for funding, their previous track records and demonstrated excellence are not specifically taken into consideration. Ensuring sufficient higher education capacity is a prerequisite for strengthening the EU's self-sufficiency in CRM. ETP SMR therefore recommends allocating dedicated funding to support existing master's programmes covering the entire mineral raw materials value chain, from exploration through processing and refining to recycling and mine closure.

ETP SMR Call for Action 1

The ETP SMR calls for the **establishment of pan-European network of MSc programmes** supported by a sustained **funding over a minimum period of 10 years**, and recommends the following structure:

- Creation of **long-term European support structure** enabling established MSc programmes in mineral raw materials chain to consolidate and operate sustainably beyond project-based funding cycles.
- **Annual student intakes with scholarship- and mobility grants** to increase attractiveness and pan-European participation.
- Curricula dedicated to **exploration, mining, mineral processing, metallurgy, secondary raw materials recovery and recycling** demonstrating a strong emphasis on sustainability, integrating environmental and operational monitoring techniques and making use of the most advanced digitalisation and artificial intelligence tools. Several MSc programmes will be needed for proper coverage of the whole value chain.
- **Strong industrial integration, stakeholder participation and innovation ecosystem alignment**, including industry and SME collaboration, field excursions, applied research projects and MSc theses connected to real industrial and societal challenges. This should include stronger and more systematic integration between universities, industry, SMEs, research organisations and innovation environments so that education, research, pilot activities and deployment pathways are better connected.

- **Joint degrees delivered by leading EU universities** establishing a European University network for mineral raw materials.

Dedicated actions to **strengthen the attractiveness of raw materials education among EU students**, while **maintaining openness to international cooperation and students from strategic partner countries**. The ETP SMR believes that these measures should include Science, Technology, Engineering, and Mathematics (STEM) outreach, improved awareness of mineral raw materials value chains in education, alumni and industry engagement, and role-model initiatives highlighting the sector's importance for Europe's green and digital transitions. This could be implemented through a dedicated FP10 action with a clearly earmarked budget line for joint MSc programmes in mineral raw materials. As an indicative ambition, the EU should aim to support at least 5 joint MSc programmes offering an EU-wide mobility scheme with a total annual intake of around 15-20 students for each program, sufficient to stabilise and gradually rebuild upstream raw materials expertise.

Significantly increase EU research and innovation funding across the entire raw materials value chain

The EU has made important investments in mineral raw materials research and innovation since 2009 and onwards, enabling the formation of networks and foundational capacity. Replacing the ERA-NET ERA-MIN with the co-funded Raw Materials Partnership for the Green and Digital Transition (RAMP) is a crucial step in securing continued research at early and low-TRL stages, where small, dedicated cross-border consortia are particularly important. The outcomes envisaged from RAMP projects should subsequently be able to scale up within larger Horizon Europe calls, pilot and demonstration and innovation funds.

However, the mineral raw materials sector remains dramatically underfunded relative to the scale of EU's CRM ambitions. The current level of support is insufficient to cover the full value chain or support the scaling required. Europe's dependency on China for CRM is driven not only by access to raw materials, but by structural weaknesses in research, innovation and technological capacity, particularly in processing and refining. Long-term resilience cannot be achieved without sustained investment in research, innovation and skills development. Strengthening R&I capacity for the mineral raw materials sector should therefore be regarded as a key policy lever to reduce strategic dependencies, support industrial competitiveness and ensure secure access to CRM in the context of the green and digital transitions. This should include technologies and competences that jointly improve productivity, safety, environmental performance and resilience across European value chains, including automation, digital integration, electrified systems and circular material flows. The EU's dependency on concentrated suppliers poses severe risks to economic security, industrial competitiveness and defence readiness.

From the perspective of ETP SMR, increased funding should be provided across the entire mineral raw material value chain including exploration, mining, mineral processing, metal extraction and recycling—**through annual calls covering all stages of development.**

ETP SMR Call for Action 2

To ensure sustained and strategically aligned progress, ETP SMR recommends that the European Commission consider the following measures:

1) Establish annual calls under Horizon Europe’s remaining Work Programmes and under the future FP10, covering topics along the entire raw material value chain inclusive horizontal topics such as:

- Exploration and resource characterisations
- Mining
- Mineral processing
- Metallurgy and metals recovery
- Decarbonization of operations in highly intensive process chains (smelting, refining, hydrometallurgy)
- Advanced recycling, circularity, secondary raw materials, traceability and resilient value chains
- Digitalisation, automation, artificial intelligence, modelling, mining software, remote operations and data-driven optimisation across exploration, mining, processing, refining and recycling
- Electrified mining systems, autonomous and remotely operated mining, and integration of equipment, software and data systems
- Environmental sustainability, social performance, societal acceptance and resilient regional development

ETP SMR also stresses the importance of annual R&I calls for all types of actors across the value chain. In particular, these calls and related funding instruments should remain accessible to SMEs and mid-caps, including technology providers and junior exploration companies, recognising their critical role in driving innovation and strengthening European value chains.

2) Allocate substantially higher budgets for Research and Innovation calls to ensure that calls across the value chain are not competing internally for limited funds. Budgets for raw materials calls should at least double compared to Horizon Europe levels, with a clear ring-fenced amount along the value chain. ETP SMR recommends allocating at least **EUR 4 billion** to mineral raw materials R&I.

3) Guarantee funding for pilot and demonstration projects (TRL 6–8) through the Innovation Fund, InvestEU, RESourceEU, the European Competitiveness Fund and the CRM financing hub, ensuring projects reach industrial scale in Europe. To accelerate deployment and industrial uptake, stronger synergies with regional and interregional instruments such as the European Regional Development Fund (ERDF) and the Interregional Innovation Investments Instrument (I3) are also required. Where relevant, R&I projects should be designed so that successful pilots can transition into CRMA Strategic Projects, benefitting from streamlined permitting and blended financing instruments.

4) Ensure alignment with the EU’s economic and defence security agendas, particularly the need to reduce dependency on high-risk suppliers and secure resilient magnet, battery, dual-use and defence value chains. Access to mineral raw materials is a critical linchpin for Europe’s industrial resilience: without

secure and timely access to raw materials, entire value chains across the technology, automotive and defence industries risk being disrupted.

ETP SMR highlights the importance of recognising that raw materials education and research are not niche concerns, but rather cornerstones of Europe’s industrial future, environmental transition and geopolitical resilience. Short-term initiatives alone will not suffice. Only sustained, predictable, and ambitious investment in higher education and research can ensure that Europe develops the expertise and knowledge required to meet its own policy objectives. We therefore call for immediate action to secure long-term financial support for raw materials education and research across Europe.

ETP SMR stands ready to collaborate with the European Commission, Member States and industry partners in operationalising these priorities.

References

1. European Training Foundation (2025), Skills for critical raw materials, Turin, Italy.
2. The European Economics And Social Committee And The Committee Of The Regions - A secure and sustainable supply of critical raw materials in support of the twin transition COM(2023) <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52023DC0165>