SUPPLY CHAINS AND RECYCLING OF CRITICAL RAW MATERIALS

SUMMARY

NTNU | Strategic Research Area Energy
Energy Transition Initiative

Summary of workshop held 31 March 2025 at the
NTNU Energy Transition Week, Trondheim Norway

Link to workshop programme

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Note:
This report should not be used as scientific facts and conclusions, but rather as a summary of important issues and aspects discussed at the workshop.

TEASER

The transition to a low-carbon economy is driving demand for critical raw minerals (CRM) like lithium, cobalt, and rare earth elements essential for clean technologies. China's targeted policies have established a CRM integrated ecosystem, dominating large parts of the global supply chains. Whereas the EU's limited domestic capacity in mining and processing has created strong dependencies and supply risks from geopolitical tensions and market volatility. In response, the EU adopted the Critical Raw Materials Act in 2024 to boost domestic extraction, processing, and recycling. However, implementation faces several obstacles including funding shortages, public opposition to mining, and recycling limitations.

To set the scene and enlighten the upstream and downstream challenges in establishing secure supply chains for critical raw materials, the following experts shared from their insights and further deepened through ensuing moderated dialogues:

Peter Handley (Founder, Advisory Services Europe 32 – UK & The Hague Centre for Strategic Studies - NL), **Maria Lauritzen** (Deputy Director-General, Direktorat for Mineralforvaltning - NO), **Marzia Sesini** (Research Team Leader at Florence School of Regulation, European University Institute - IT), **Yanan Liang** (PostDoc Researcher, Leiden University - NL), **Børre Stokholm** (Senior Manager Business Development, Equinor - NO), **Carl Johannes Muth** (Coordinator at Climate Neutral Energy Systems and Society, Tampere University - FI), **Daniel Scholten** (Research Associate Clingendael - NL & Professor, Delft University of Technology - NL), **Robert Pell** (Founder & CEO, Minviro - UK), **Sebastian Zwickl-Bernhard** (PostDoc Researcher, TU Wien - AT & NTNU - NO), **Mats Ingulstad** (Professor, NTNU Department of Modern History and Society - NO) and **Hans Auer** (Professor TU Wien – AT & NTNU – NO).

SUMMARY

The workshop addressed **both upstream and downstream challenges** in establishing secure supply chains for critical raw materials to enable the transition to a low-carbon economy. The importance of strategic resources and minerals/materials not only was put in a historical context (first lists were kept already in World War I), but also the latest global strategic partnerships have been emphasized in this context; mainly from a European perspective.

In a keynote presentation, the cornerstones of the recently published Critical Raw Materials Act (CRMA) of the EU, the associated actions already in place, and the upcoming plans in the EU political cycle in the upcoming years were outlined (incl. a Circular Economy Act planned in Q4/2026). It was pointed out that **supply and value chains of raw materials in an increasingly unpredictable and multi-lateral world not only address green and digital transition, but also competitiveness of the industry as a whole as well as the defence industry.**

In this context, not only **EU's 2030 benchmarks** for Strategic Raw Materials (SRM) for future technologies were highlighted, but also the first list of **associated EU's strategic projects** (47 in total; announced on 25 March 2025) were discussed, Figure 1. These first projects mainly focus on the battery value chain (lithium, nickel, cobalt, graphite, manganese), copper, rare earths as well as magnesium and tungsten for the defence industry. By 2030, the EU wants to reach at least 10% of the EU's annual consumption for extraction, 40% for processing, and 15% for recycling. In addition to that the EU wants to limit the dependence of each SRM at any stage of processing to 65% from a single third country.

Other excellent contributions to this workshop emphasized the **importance of involving all stakeholders** at various levels from the outset, especially the local population, before a potential mining or processing project is launched at a promising site. Both positive and negative examples from the recent past in Europe were presented along the CRM value chain as to how existing problems or scepticism could (or could not) be solved. Moreover, learnings from other industries (e.g. onshore wind development) were also discussed in terms of their applicability in this new field. Furthermore, a very specific European lithium extraction project of a stakeholder was presented, in which all important development and implementation steps, including economic viability and risk considerations, were outlined.

On the downstream side, the workshop focused not only on the **processing of raw materials** and assembling of green technologies in Europe, but also on **strategies for stockpiling** of them as well as **capacity building** for a manufacturing and recycling-based remanufacturing industry. It was emphasized that capacity building is not limited to production capacities but also includes human capital and technical experts in all areas of the value chain. Finally, first modelling results were presented and discussed how a future EU policy could look like in order to optimally implement the targeted benchmarks for SRM and to build up a recycling industry for scrapped green technologies and components.

Concluding, as a key outcome of this workshop, there was a strong consensus that major European R&D efforts must be made in all areas of the value chain and that strategies and incentives to attract industries, and skilled professionals must also be developed in order to achieve the ambitious European targets.

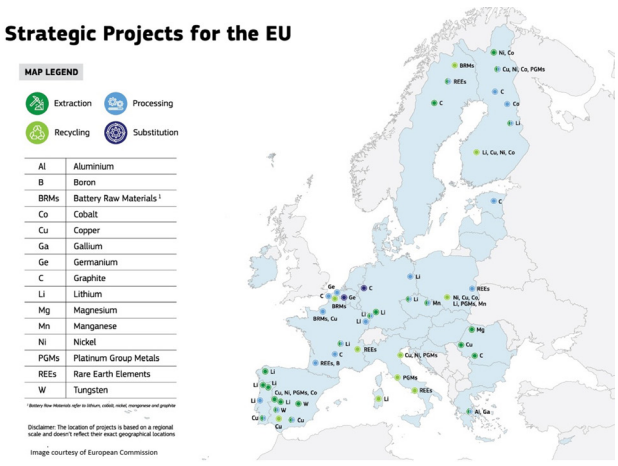
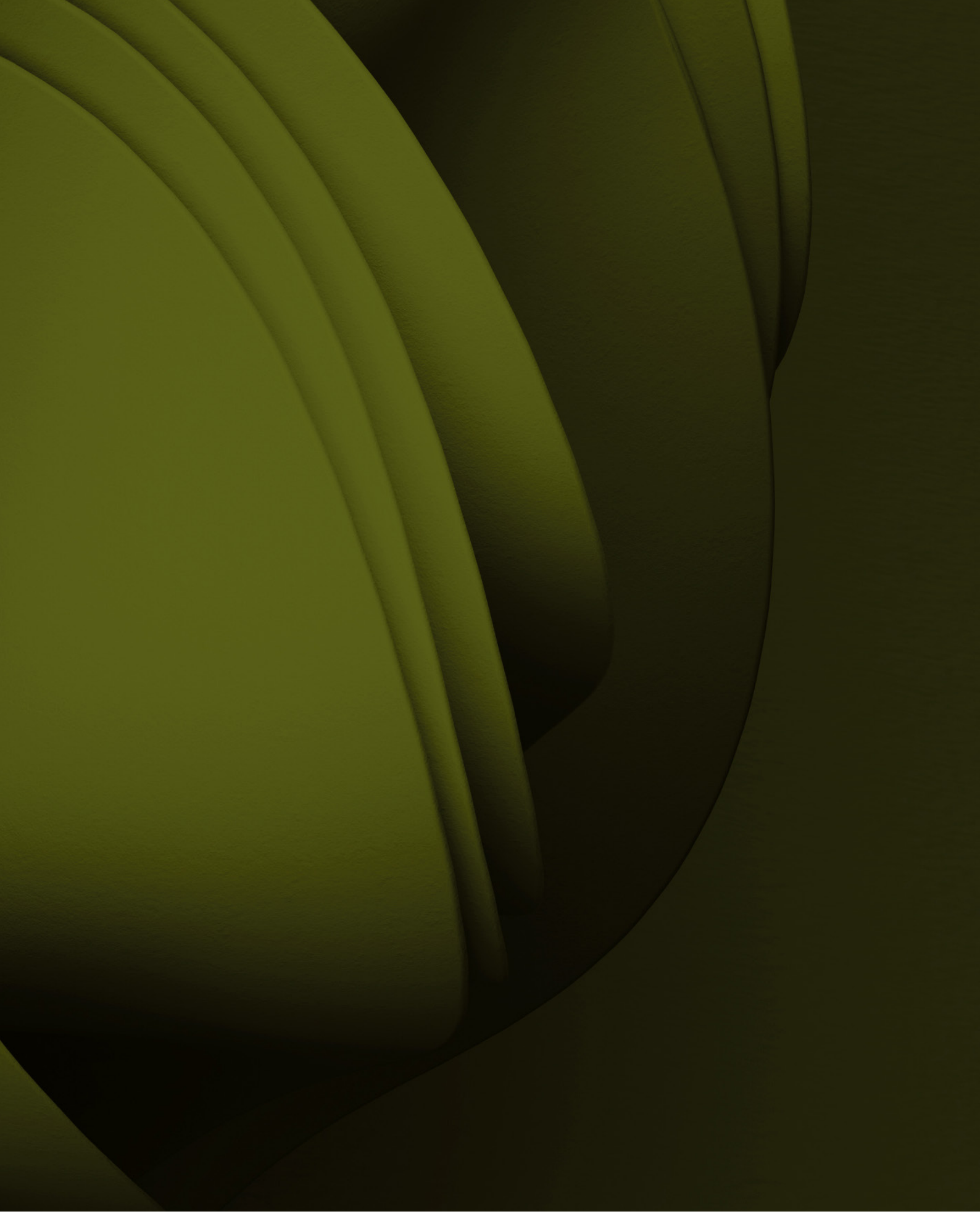


Figure 1: Strategic projects for the EU. (Source: European Commission).



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