IMWA 2026
Jeongseon

Research Center of Post-Mining
Technische Hochschule Georg Agricola

CRMsDataSpace RFCS PROJECT

Revalorization of Coal Waste Facilities

The CRMsDataSpace EU Approach

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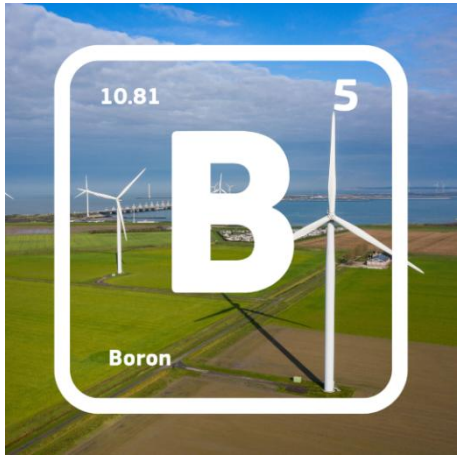
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Technische Hochschule Georg Agricola
GIG National Research Institute
Universidad de Oviedo
INSEMEX INSTITUTUL NAȚIONAL DE CERCETARE - DEZVOLTARE PENTRU SECURITATE MINIERĂ ȘI PROTECȚIE ANTIEXPLOZIVĂ
Research Fund for Coal & Steel
Co-funded by the European Union

Why this matters now

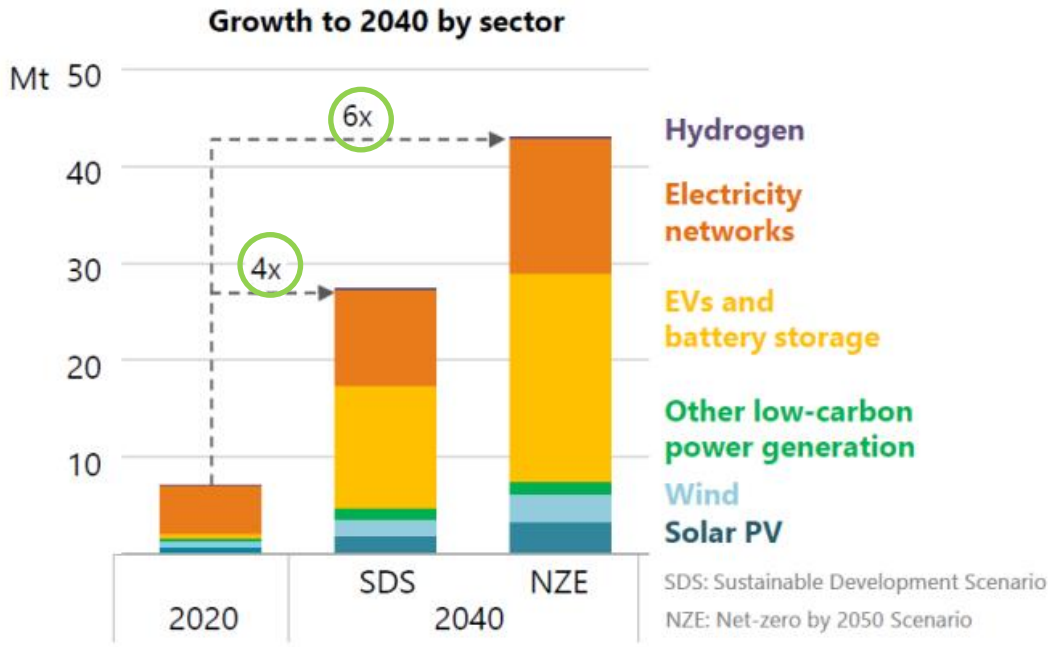








Mineral demand for clean energy technologies is increasing



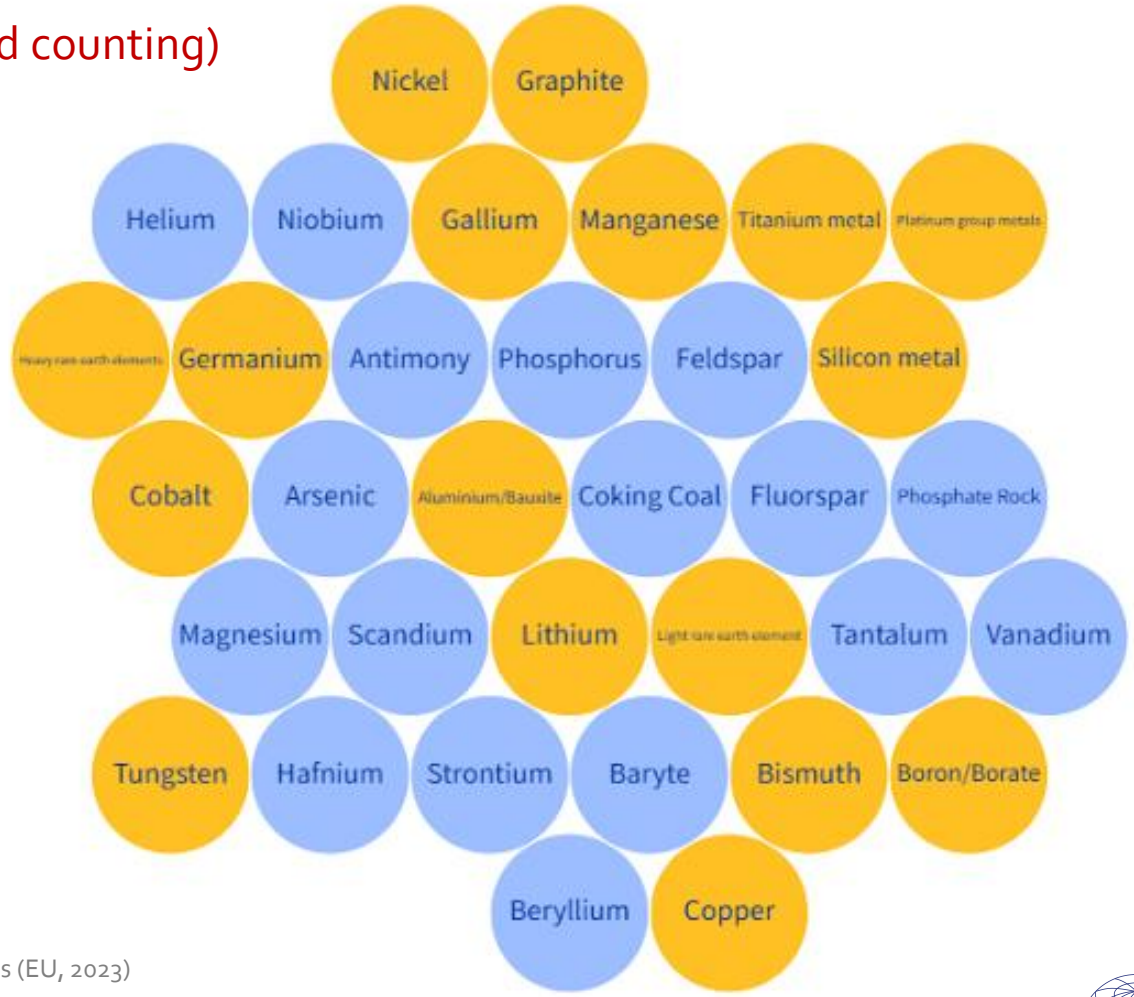
Source: Adopted from Peter Tom Jones (2023). IEA, The Role of Critical Minerals in Clean Energy Transitions, 2021. ECRMA, 2025

Critical Raw Materials and strategic pressure

In 2023, a fifth list of 34 CRMs was published (… and counting)

The EU assesses the criticality of materials according to:

Supply risk
and **Economic importance**



17 are considered strategic (yellow) due to their high economic importance and critical role in industry, technology, and green transition

Source: Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (EU, 2023)

The Green Transition Paradox

to decarbonize our economies, we must extract more raw materials…



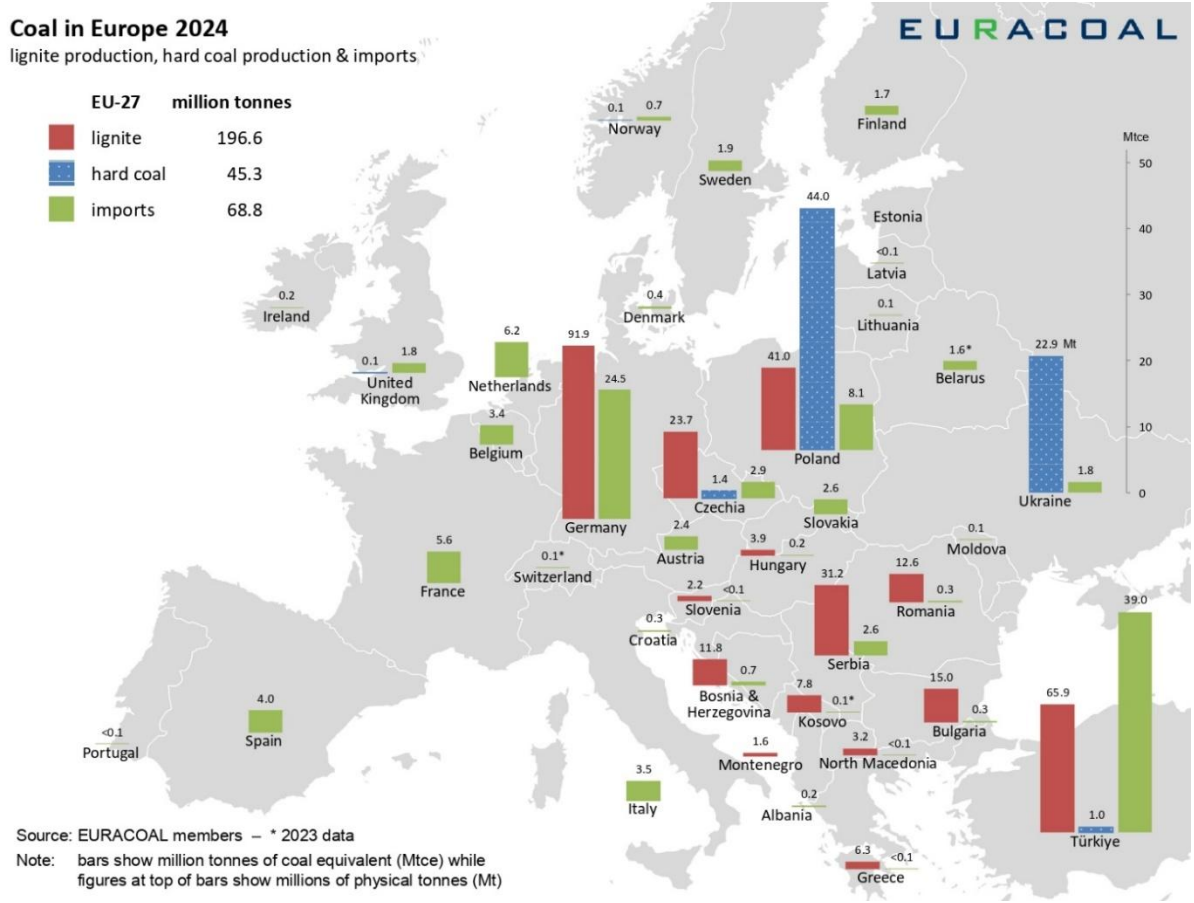
How to solve?

1. Circular Economy & Recycling
2. Responsible Mining
3. Use of Secondary Resources

REMINING PATHWAY

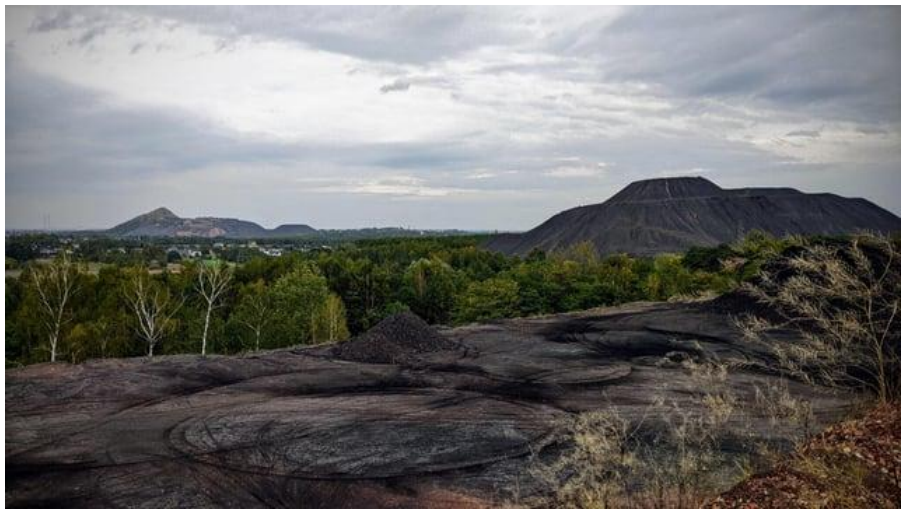
Coal phase-out as opportunity

from environmental liabilities to strategic assets



Source: EURACOAL, 2024; Ghebreigziabiher, 2024

Only in EU, around **4.7 Bt of waste** is generated each year and placed into repositories or landforms

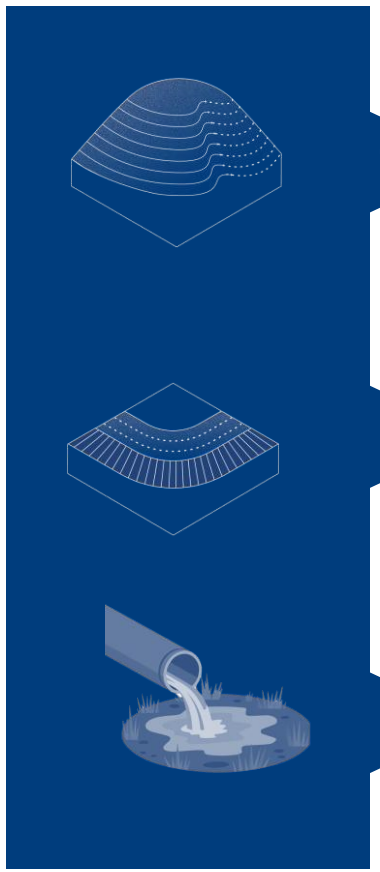


©Reddit, 2025

Highest coal mine waste pile in EU (134 m), Szarlota, Silesia Poland

What types of waste are we talking about?

Over more than 70 years of activity, the cumulative volumes become enormous



1 **Mine Dumps**

Overburden, Waste Rock, Mine Heaps

2 **Tailings**

Tailings & Fine-Grained Processing Waste

3 **Mine Water**

Mine Water and Water-Derived Sludges

Estimated Coal-Waste Stocks in Europe

Mine Dumps	15 – 25 billion tones
Tailings	1.5 -3 billion tones
Mine Water	100 – 300 million tones SOLID; 20 – 40 billion m^3 billion tones LIQUID

Historical extraction ignored CRMs, natural geology concentrates them, and modern technologies now make their recovery technically and economically viable

Source: Kinnuen; 2019; EU Parlament, 2019

Legacy + active sites; EU + UK + Western Balkans; all coal type

Why CRM potential remains uncertain



Main EU law governing how mining and quarrying waste (including coal mining waste) must be managed

Operators must:

- Secure financial guarantees
- Monitor waste facilities after closure
- Ensure long-term stability

Source: EWD, 2016

Mine wastes are not consistently analysed !

❌ No harmonized inventory of coal waste quantities

❌ Poor characterization → CRM potential largely unknown

❌ Low automation & limited use of multi-scale data

❌ Fragmented data; no EU-level digital infrastructure

❌ Limited decision-support for **coal regions in transition**

The CRMsDataSpace solution

CRMsDataSpace RFCS PROJECT

WHAT?

Establish a secure, fair, and interoperable **European Data Space for CRMs**



WHY?

Support the EU Green Deal and CRM Act by improving access to reliable, harmonized data on mining, post-mining, and recycling



HOW?

Integrating datasets from different sources (geological, mining, industrial, environmental) **into a shared online platform**



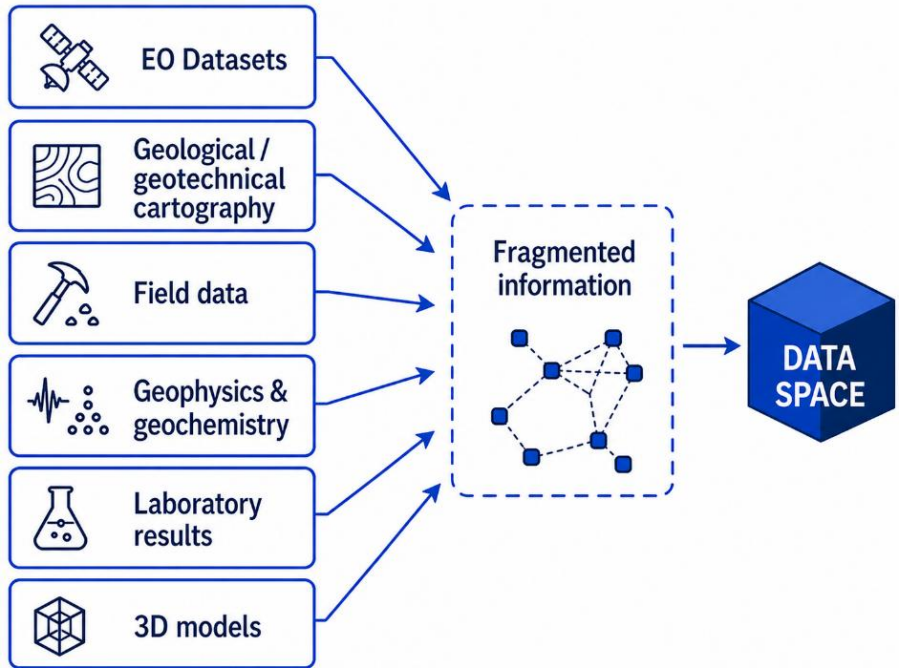
Why a Data Space?

A Data Space is needed to turn scattered datasets into comparable, decision-ready information.

Site comparison
Compare sites across different formats, scales, and terminology

Evidence integration
Combine EO, field data, laboratory analyses, and legacy records.

Decision support
Translate observations into CRM assessment indicators.



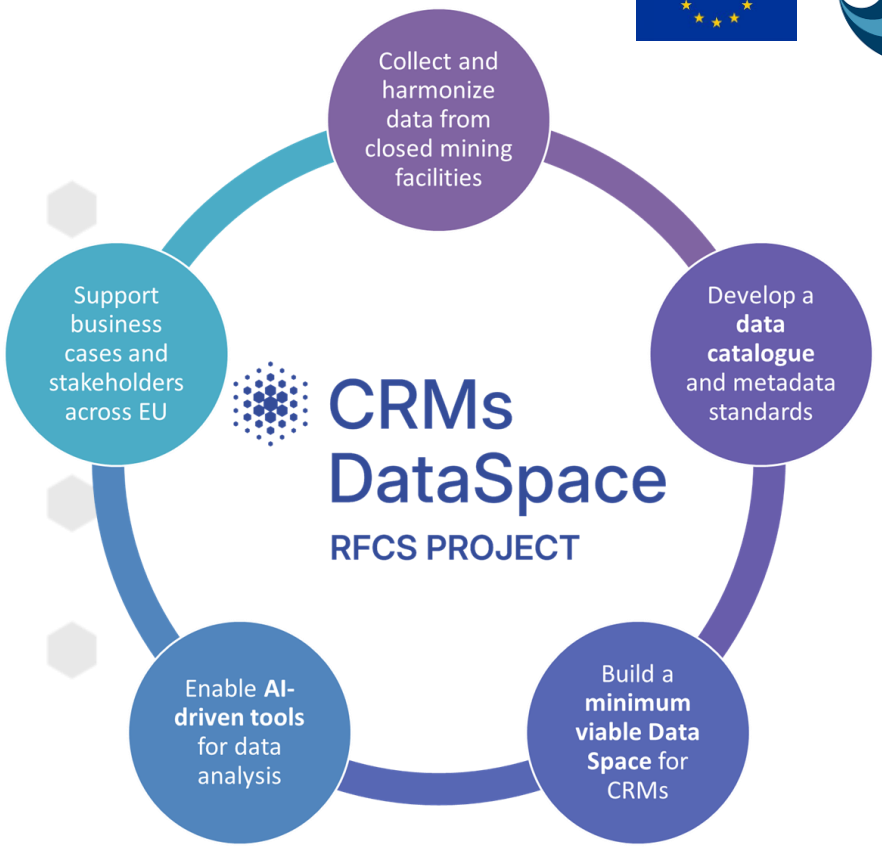
Source: Flores, et al. 2026

Project structure and partners

Grant Agreement No. 101216677
Budget: 3.966.876 €

Research Fund for Coal & Steel

2025-2028



POLAND

PROJECT COORDINATOR

GIG National Research Institute

SPAIN

Universidad de Oviedo

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DEX Desarrollo de Estrategias Exteriores

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BELGIUM

EURACOAL

GERMANY

Technische Hochschule Georg Agricola

Academia & Industry partnership

Demonstration sites / pilot cases



Germany – Ibbenbüren, NRW
Mine-water sludge ponds





Poland – Libiąż, Lesser
Coal waste dump



Spain – San Nicolás, Asturias
Coal waste dump



Romania – Petrila, Jiu Valley
Coal waste dump

Assessment Activities

PILOT CASES

- SPAIN
- GERMANY
- POLAND
- ROMANIA



Field sampling — representative material collection

Chemical & mineralogical analyses — CRM screening

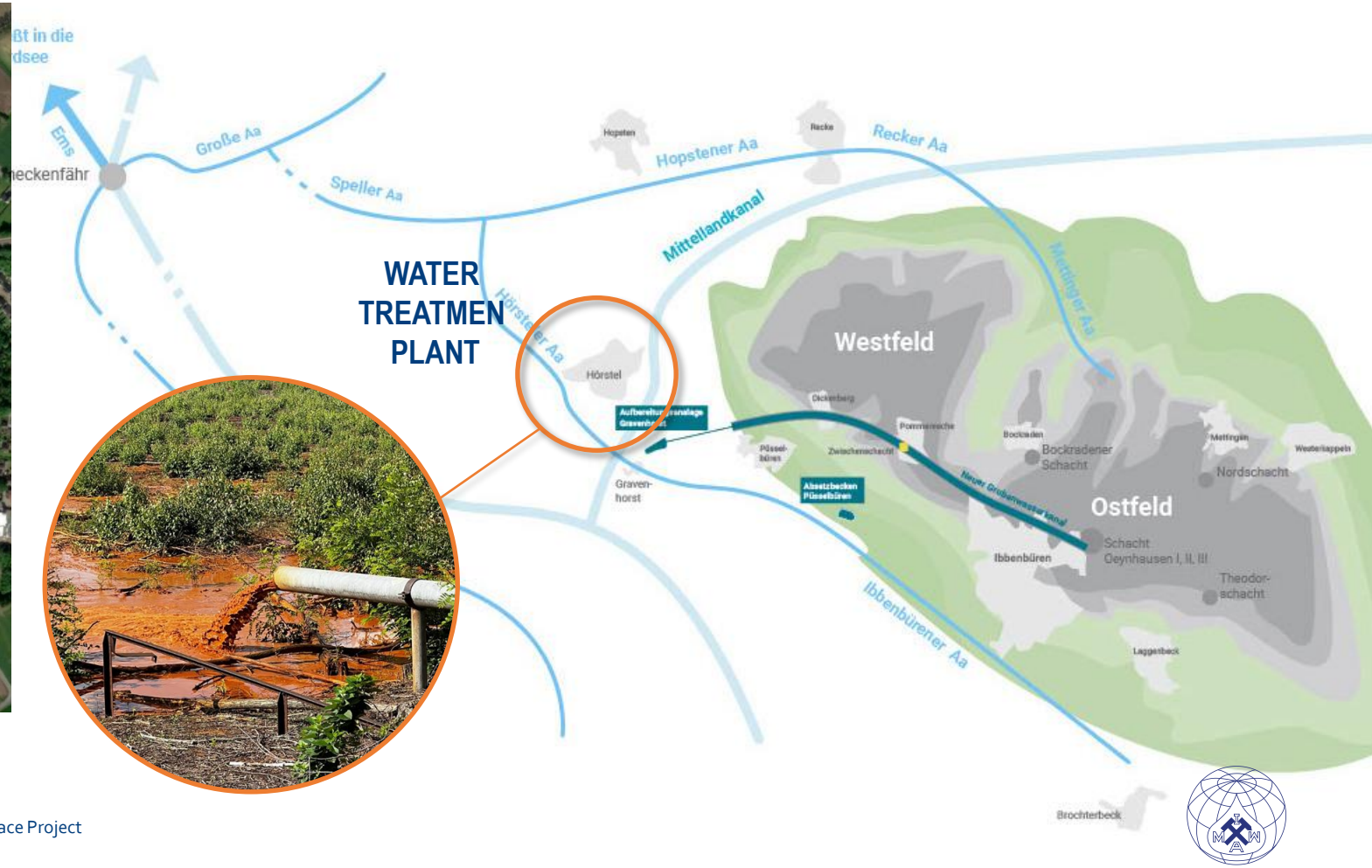
Recovery tests — hydrometallurgical evaluation

Drilling & resource estimation — where applicable

Tailings Sludge Ponds in Germany

Sludge ponds contain a big volume of sludge, which has been deposited since the early 1980s



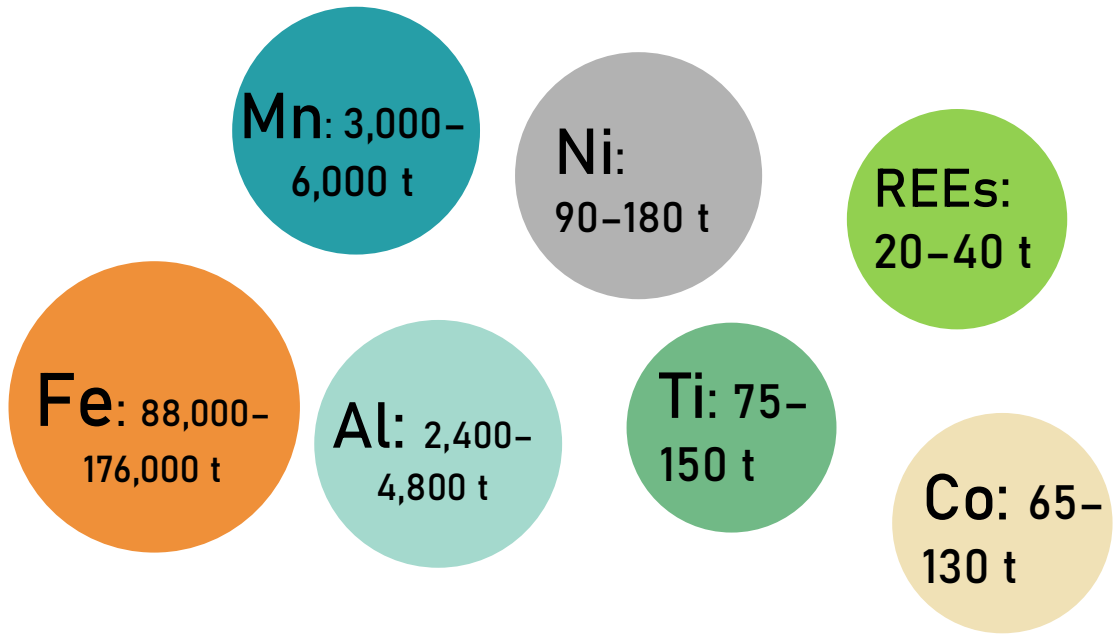


Tailings Sludge Ponds in Germany

New sampling campaign on June 2026



RECOVERABLE METAL ESTIMATES



Sludge depth is between 2 m and 4 m

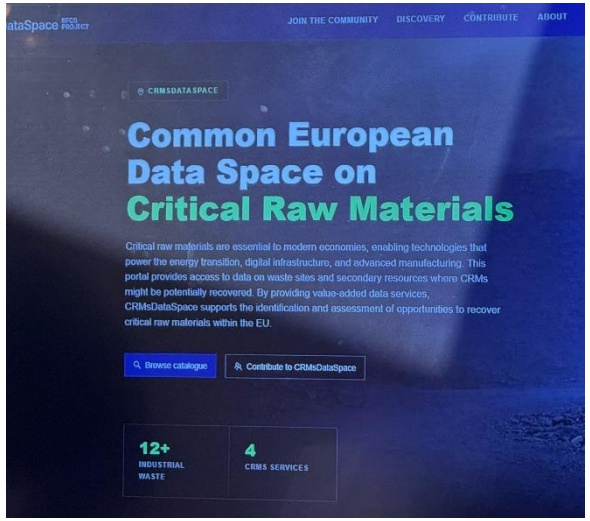
Reker et al., 2025

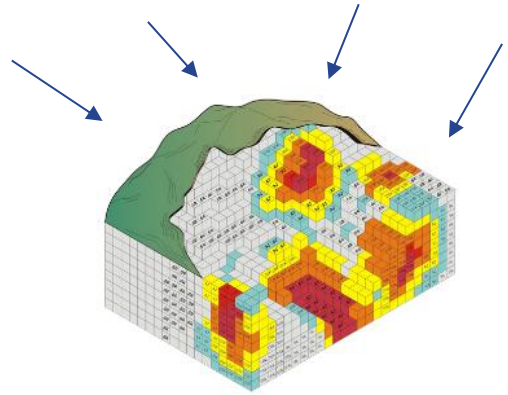
Data catalogue and decision support

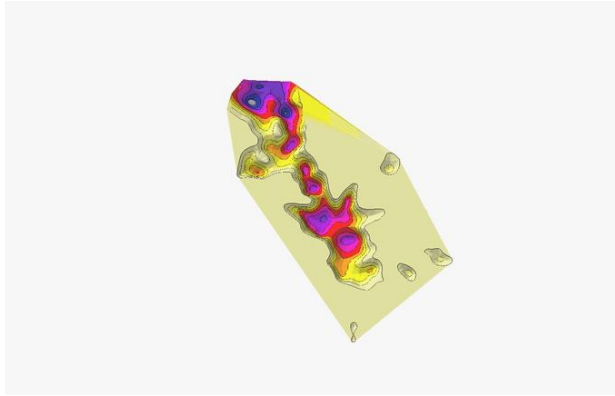
Secure data access — controlled and protected information sharing across partners and stakeholders

Data integration — harmonize geological, environmental, laboratory, EO, and site data in one space

3D visualization — explore deposits and site geometry through interactive 3D models and web viewers

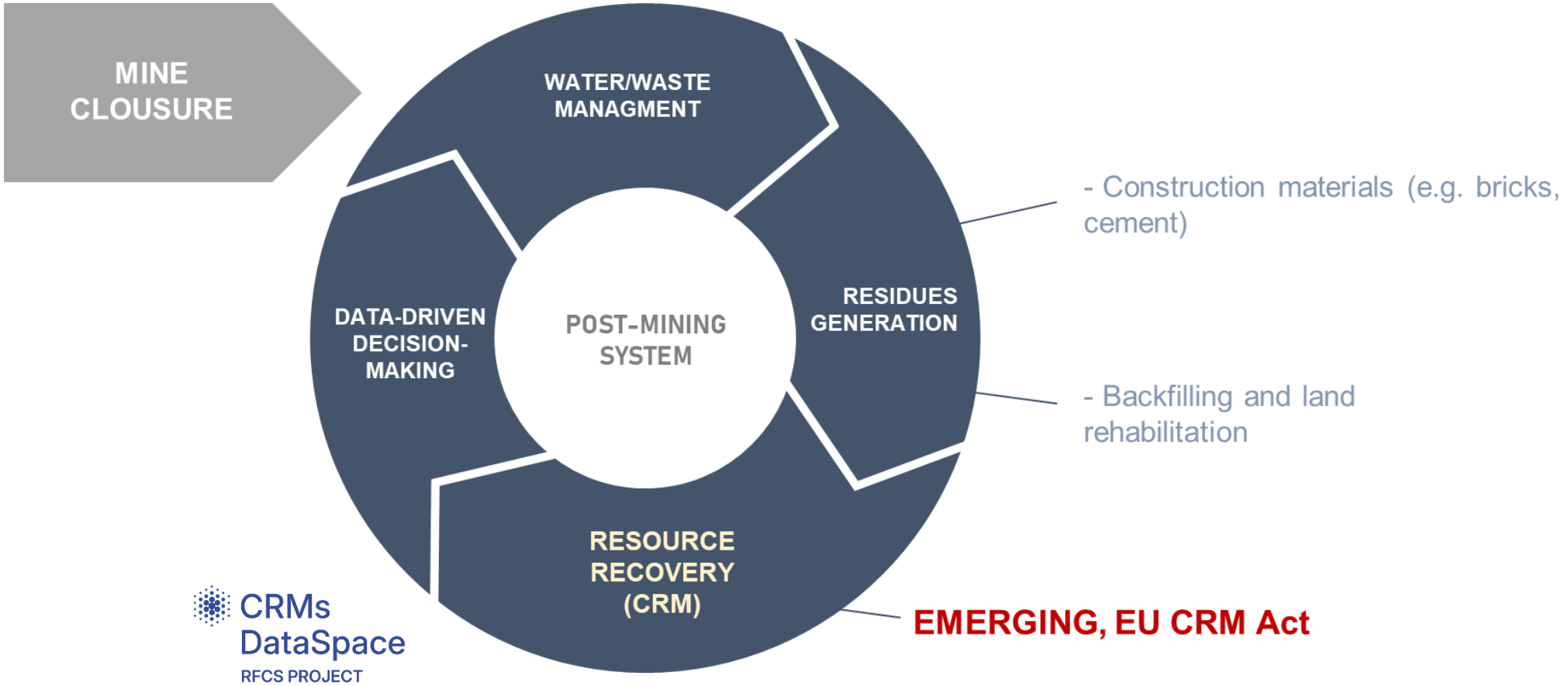






Resource estimation & feasibility support

The future of post-mining must be circular



Thank you!

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