

How can the Swedish mining cluster strengthen Europe's supply of metals and minerals?

Monday 17 February 2025



Kungl. Ingenjörsvetenskaps
Akademien

Welcome

Prof Sylvia Schwaag Serger

President of the Royal Swedish Academy of
Engineering Sciences (IVA)



IVA

For 105 years the Royal Swedish Academy of Engineering Sciences (IVA) has been a meeting place for Sweden's future.

IVA builds bridges between the business community, academia and policy makers.

We bring together the expertise and experience of about 1.300 Academy Fellows and 250 member companies.



Royal Swedish Academy of
Engineering Sciences

Roadmap for Metals and Minerals

Prof Charlotte Andersson

Program Director, Swedish Mining
Innovation, Professor in Process
Metallurgy, Luleå University of Technology.
IVA Fellow.

The purpose of the IVA-project is to contribute to secure long-term, sustainable access to the metals and minerals needed for the green transition for a competitive Sweden and Europe.

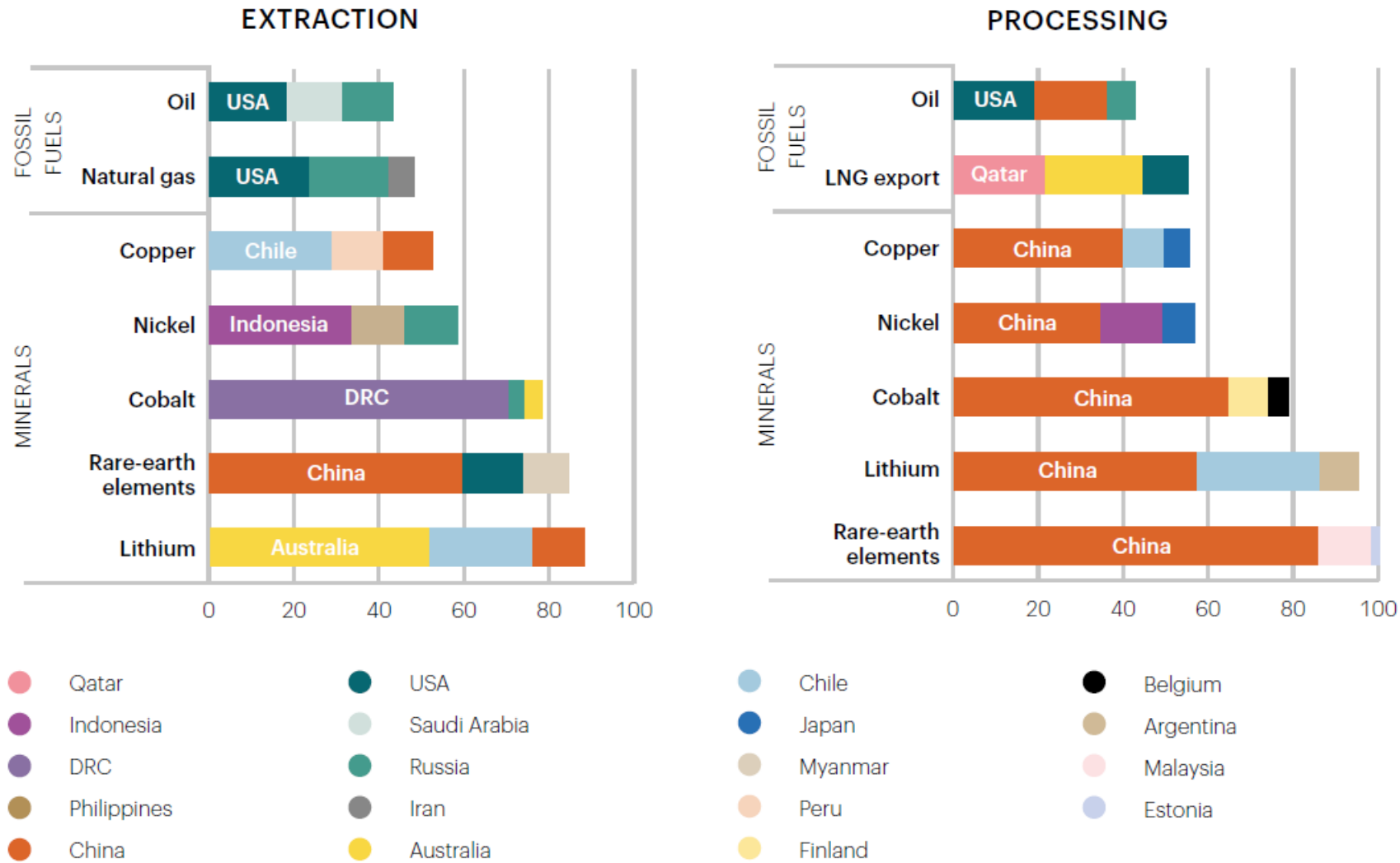




Challenges

- The demand for metals and minerals is increasing.
- Europe has a significant dependency on imports, and global value chains are vulnerable.
- There is a high market concentration for critical raw materials and components.
- To secure the necessary investments in Sweden and Europe is complex.
- The recycling rate is almost non-existent for many critical metals and minerals.

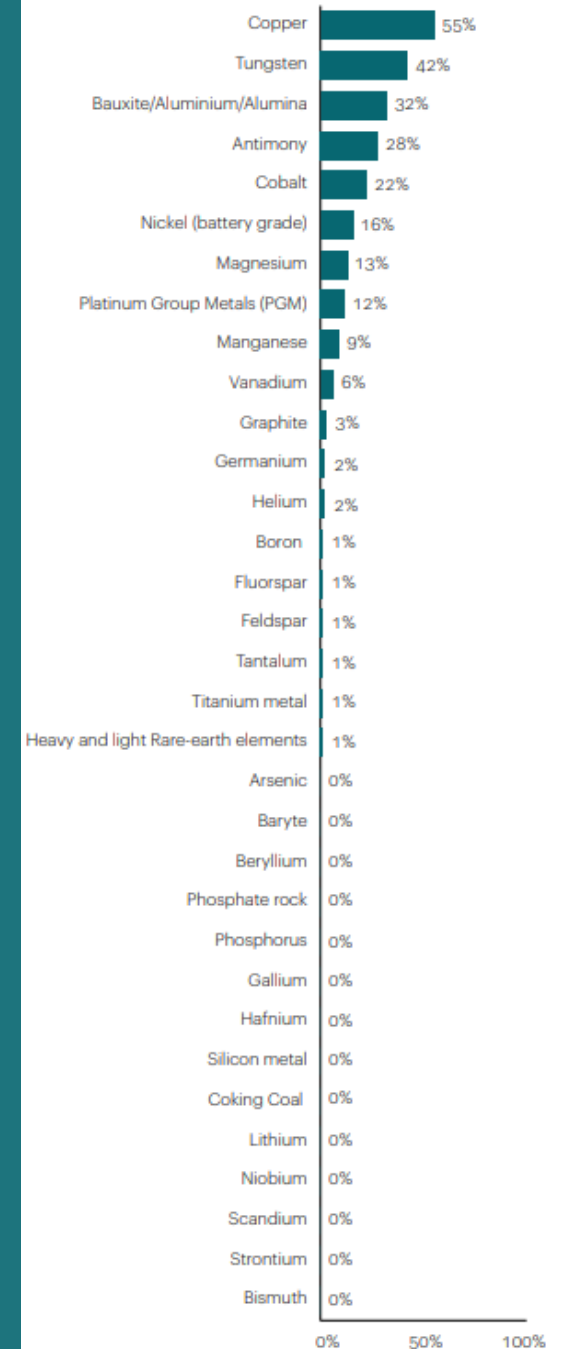
The market concentration



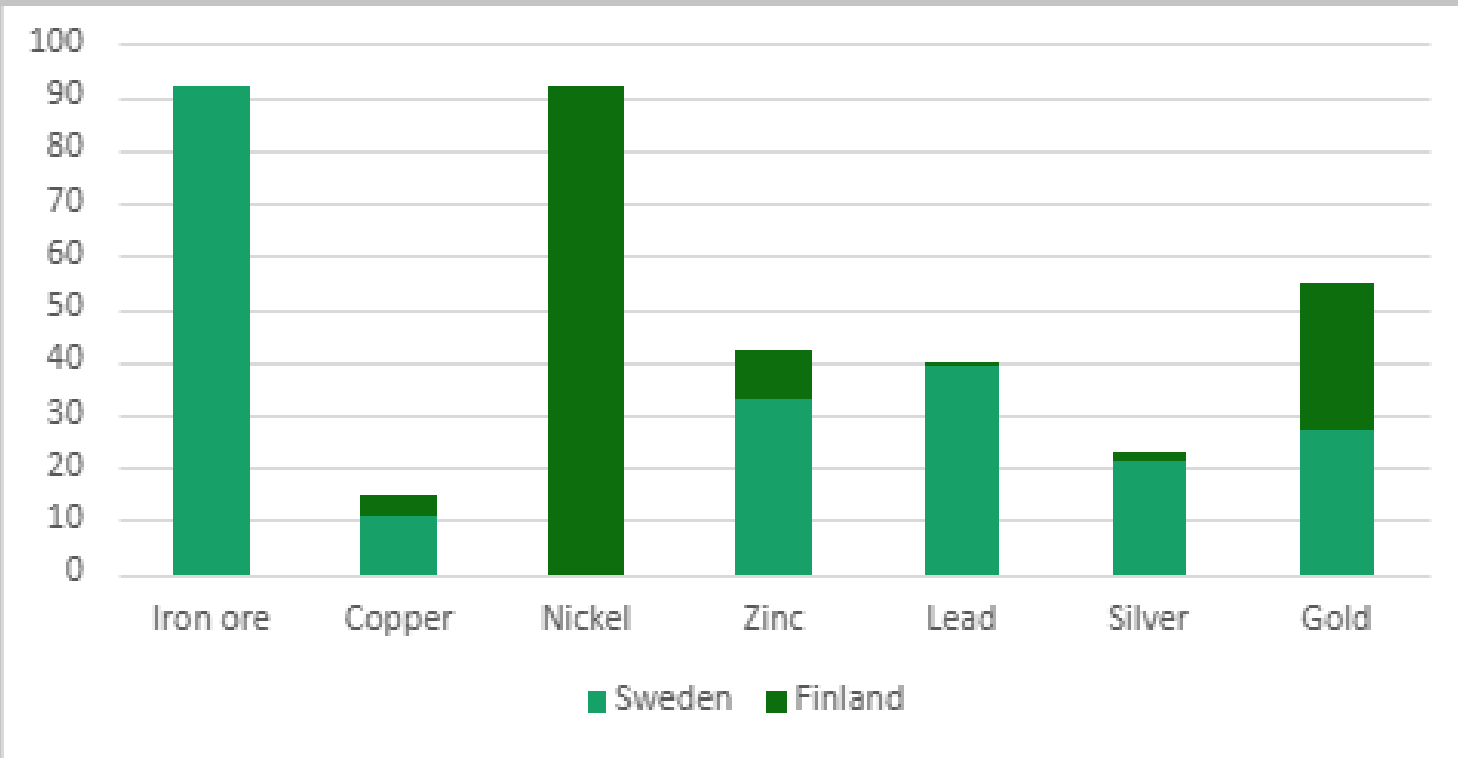
Recycling rate for critical raw materials

The figure illustrates the End-Of-Life Recycling Input Rate for EU's critical raw materials (*the proportion of these materials within the EU production system that are sourced from the recycling of post-consumer scrap*).

Source: Study on the Critical Raw Materials for the EU 2023, Grohol & Veeh, 2023.



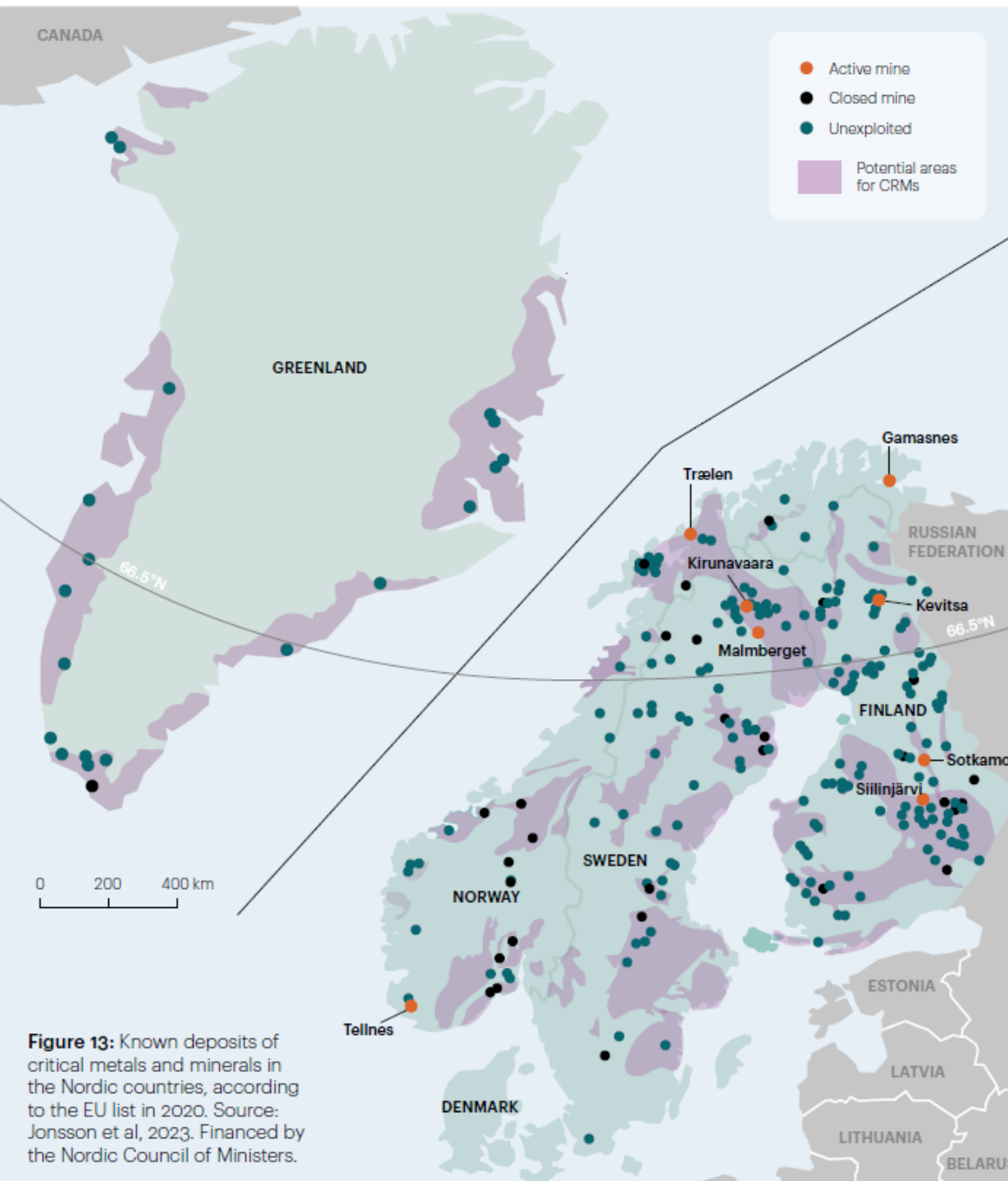
Sweden and Finland's contribution to EU's production



Sweden and Finland's contribution to the EU27's production of copper, zinc, lead, iron ore, gold, and silver.

Source: Bergverksstatistik, SGU, 2023.

Known deposits of critical metals and minerals in the Nordic countries



New mining projects in Sweden:

Rare earth elements:

LKAB has Europe's largest deposit of REE in Kiruna.

(Norra Kärr, Jönköping)

Graphite:

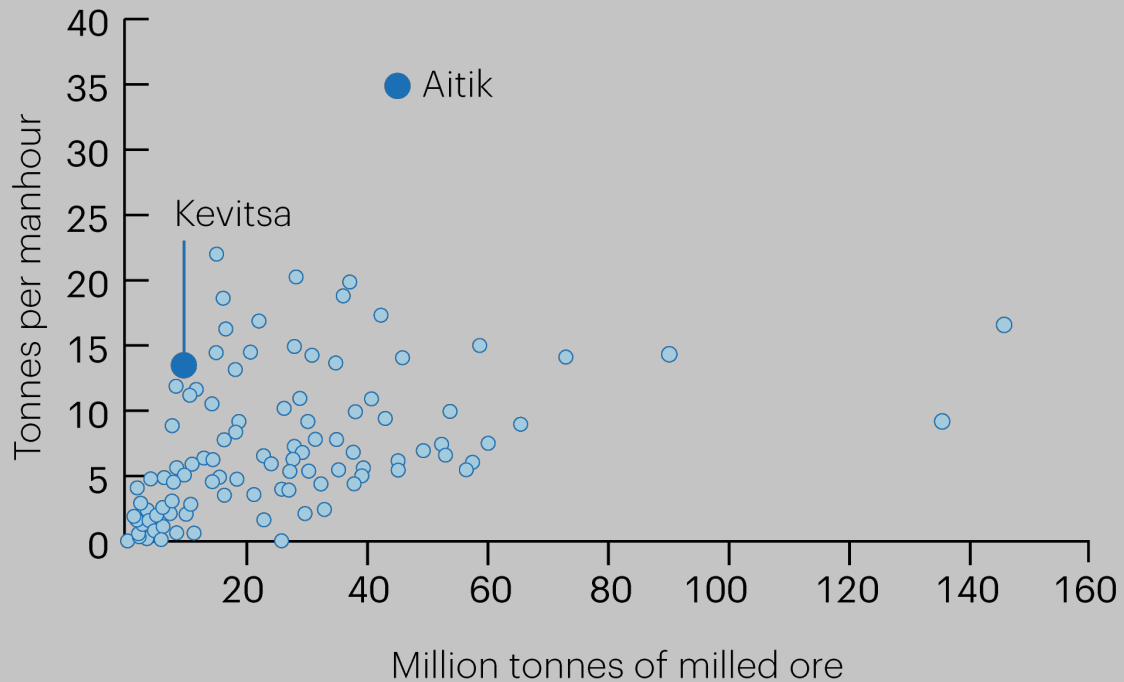
Resume operations at the Kringle mine in Hälsingland.

Nunasvaara graphite in Vittangi, deposit outside Kiruna.

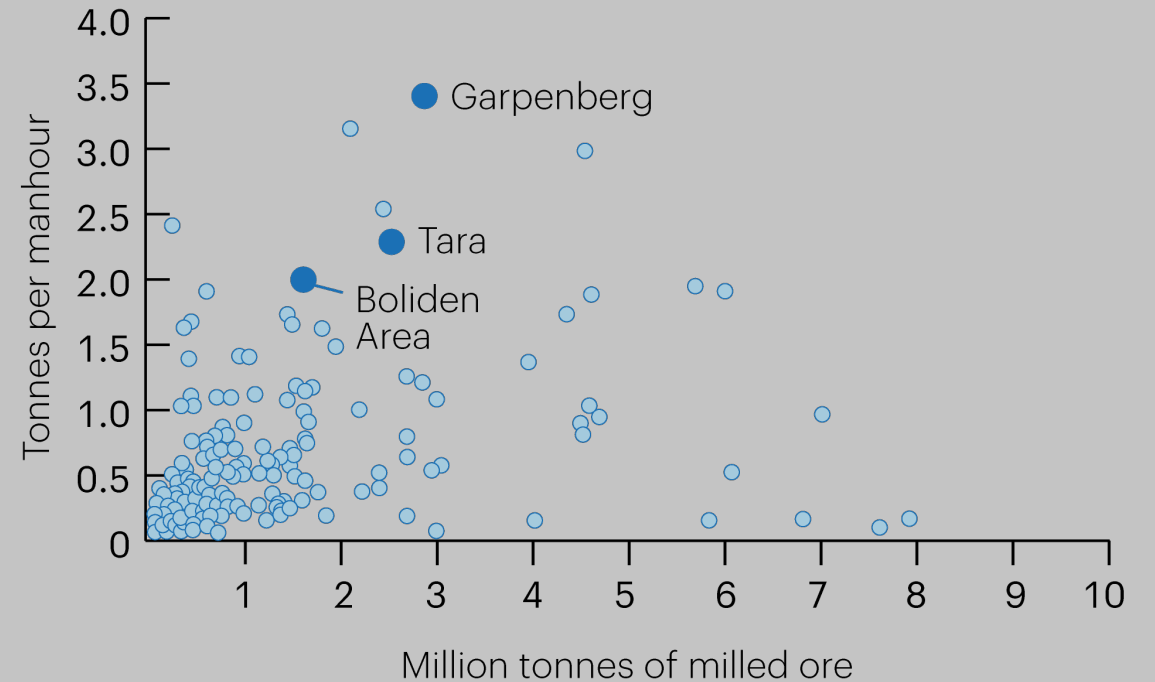
Figure 13: Known deposits of critical metals and minerals in the Nordic countries, according to the EU list in 2020. Source: Jonsson et al, 2023. Financed by the Nordic Council of Ministers.

Swedish mines – among the most efficient

COPPER – OPEN PIT MINES

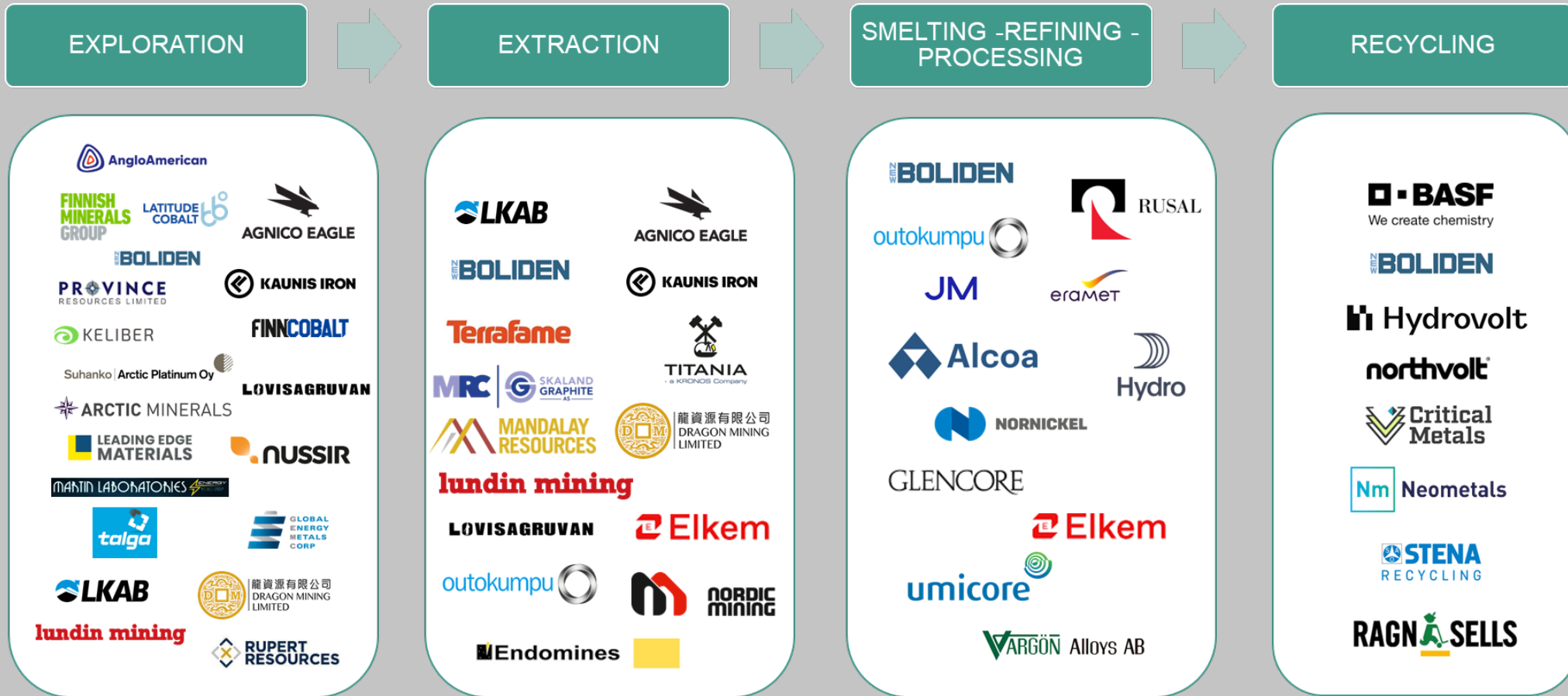


ZINC – UNDERGROUND MINES



Source: Boliden 2024

The Nordic mining cluster



NORDIC MINING EQUIPMENT SUPPLIERS



Main conclusion

The Swedish mining cluster can create increased value for Sweden and Europe, and can contribute to the sustainable mining and recycling of metals and minerals in other parts of the world.

The investments involved can also strengthen Sweden's position in global and European cooperation.

New green business opportunities open up in the entire value chain, from exploration to recycling.



Metals and Minerals for Sustainable Development and Strengthened Competitiveness

1. Sweden should take a leading role in Europe's supply of metals and minerals.
2. Strengthen the Swedish mining, mining technology and recycling industries.
3. Simplify for reuse and material recycling.
4. Create new international strategic partnerships and strengthen existing ones.
5. Develop and streamline authorisation processes and tools to manage conflicts of objectives and interests.
6. Wide-ranging investment in knowledge, research, and innovation in metals and minerals.

How can the Swedish mining cluster strengthen Europe's supply of metals and minerals?

Prof Magnus Ericsson

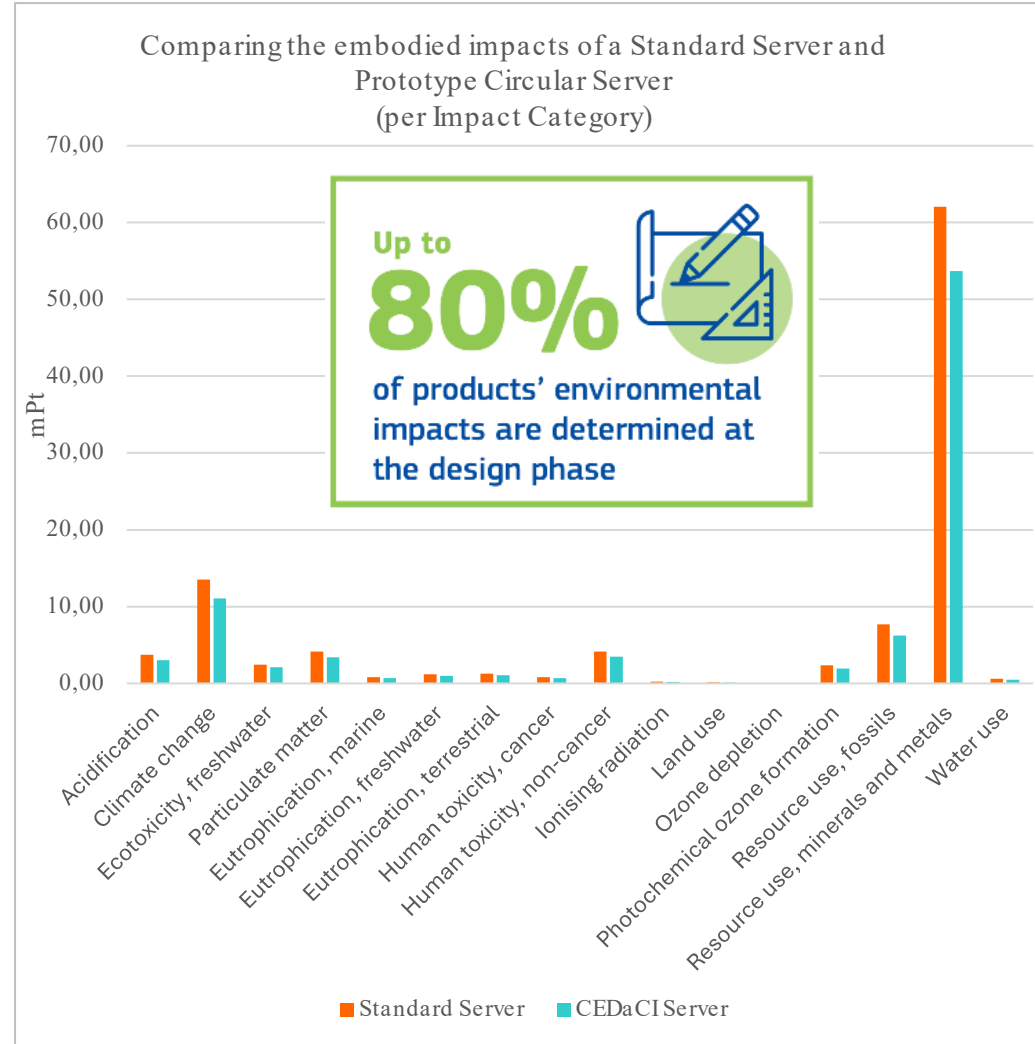
Co-founder, RMG Consulting, Consulting
Professor, Luleå University of Technology.
IVA Fellow.



The perspective of international organizations on Sweden's mining industry and recycling

- **Rod Eggert**, Colorado School of Mines, and Deputy Director, Critical Materials Institute (CMI), USA.
- **Sven Renner**, Program Manager for the World Bank's Extractives Global Programmatic Support (EGPS) Multi-Donor Trust Fund, Energy and Extractives.
- **Deborah Andrews**, Professor of Design for Sustainability and Circularity, London South Bank University, United Kingdom.

CEDaCI prototype circular server



Demand on resources for DCI

Element / material	Critical Raw Materials	Materials recycled & rates – BAU scenario	Materials recycled & rates - CEDaCI scenario
Ag			98%
Al		90%	90%
Au		80%	98%
Ba			
Ca			
Co	X		
Cr			
Cu		80%	98%
Dy	X		
Fe		90%	90%
In	X		
Mg	X		
Mn			
Mo			
Nd	X		
Ni			98%
Pb			90%
Pr	X		
Sb	X		90%
Si	X		
Sn			90%
Sr	X		
Ta	X		90%
Ti	X		
W	X		
Zn			
Zr			



‘Typical’ server –

27 elements / materials / 12 CRM

CRM reclamation ~1-2%

2023 - 14 bn servers shipped =
~280 million tonnes materials

2023 – 630 tonnes CRM recycled

2030 - predicted 12% growth – 1400 tonnes CRM recycled

2025 - AI investment –
predicted growth far exceeds this in EU and USA

Implications for supply chains?

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Permit processes and cooperation

- Dr. Ana Elizabeth Bastida, Centre for Energy, Petroleum and Mineral Law and Policy (CEPMLP), United Kingdom/Argentina.
- Dr. Ian Dover, Corporate Innovation Advisor, Australian Institute of Company Directors, Australia.
- Katherine Gosselin, Director Towards Sustainable Mining, Mining Association of Canada, Canada.

Australian strategies, industry issues and research opportunities...

Australian governments' strategies 2

- New business models aspire to go beyond “digging & shipping” but the “needs are outpacing the reality” in investment and metallurgical capabilities.
- Many countries want Australia to develop its value chains for more boutique critical minerals. The business models for these chains need more collaboration and investment from metals customers eg in Japan, Korea, UK, EU, US.
- Improved prospectivity via Geoscience Australia , State Geological Surveys and University Research (see next slide).

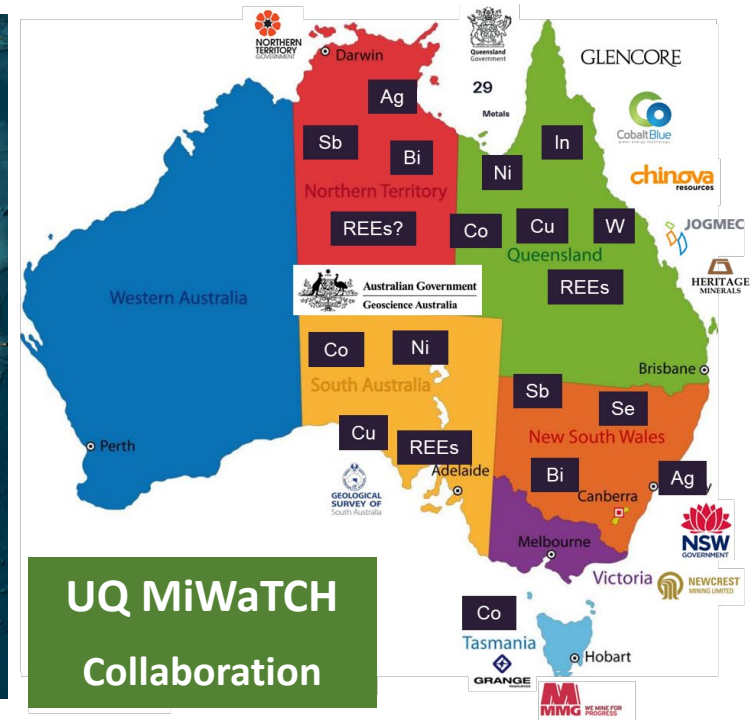
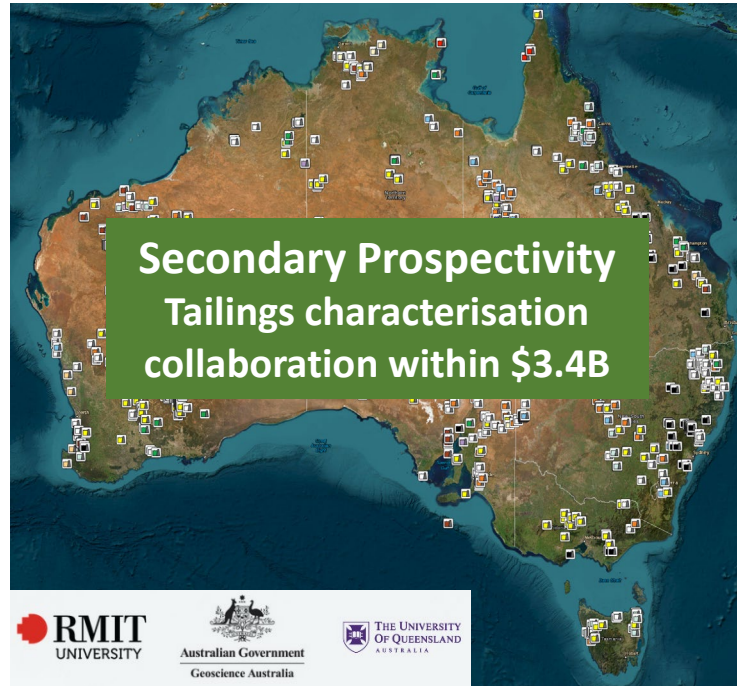
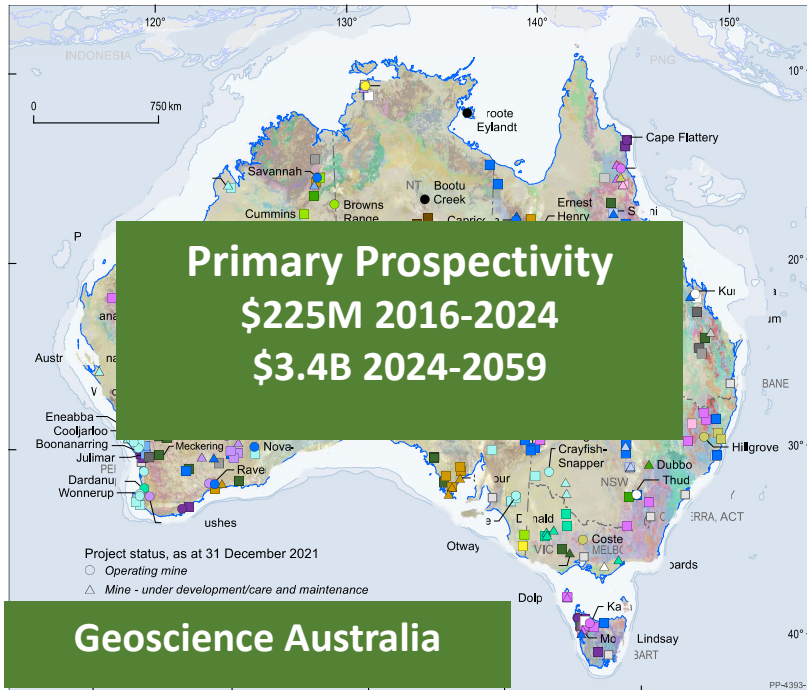
Australian industry issues 2

- Tier 1 miners historically control Cu, NI, Al... but T1 miners' risk strategy is to acquire successful junior CM miners.
- Junior miners are starting to engage in new lower-risk and lower-cost business models eg multi-user processing (V), re-mining waste, Off-take agreements with downstream customers.
- New “affiliated opportunities” for collaboration via Mining Equipment, Technology & Services (METS) firms:
 - tailored W drill-bit development and recycling of longer-life bits for Australian regional markets;
 - Critical minerals & metals recovery from waste eg Ga from alumina refining, Th from monazite;
 - Recycling of off-road tyres... and other supplier-driven innovation.

Industry-based R&D co-operation 3

- More robust value chains via digital twin techniques; Metallurgical research to decrease production costs and raise technical capabilities; Extending existing UQ research with Glencore, Aurubis, Umicore, Boliden, Nyrstar, Rio, BHP.

Australian governments' support for increased prospectivity...



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Nordic cooperation, EU and the industry

- **Riikka Aaltonen**, Board Member, ex-civil servant at the Ministry of Economic Affairs and Employment of Finland, Finland.
- **Maria Nyberg**, Policy Officer, European Commission, EU.
- **Prof Pertti Lamberg**, CEO, Anglo American Sakatti Project, Finland.



Setting Priorities

DEFINING CRITICAL AND STRATEGIC RAW MATERIALS

CRM

Whole EU economy, based on :

- supply risk
- economic importance

SRM

SRM are a subset of CRM:

- Key for strategic technologies (green, digital, defence and space)
- Forecast demand risks outstripping supply

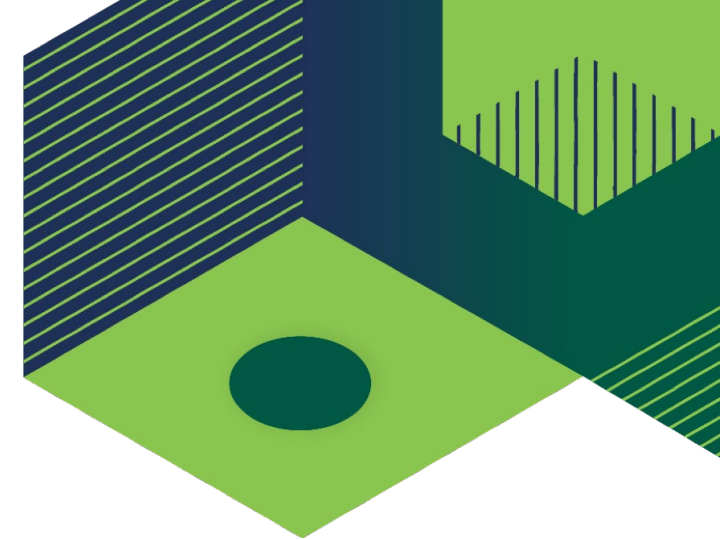
2030 BENCHMARKS

Towards more SRM supply security

- EU's extraction capacity cover at least **10%** of the EU's SRM consumption
- EU's processing capacity cover at least **40%** of the EU's SRM consumption
- EU's recycling capacity cover at least **25%** of the EU's SRM consumption

Towards more diversification of supply

- Not more than **65%** of EU consumption of each SRM should come from a single third country.



Strengthening the value chain STRATEGIC PROJECTS

Implementation - State of play of the Applications

- In response to the first call for applications for Strategic Projects, the Commission has received a total of 170 applications (124 projects in the EU and 46 outside the EU).
- The applications cover all 17 strategic raw materials identified under the CRMA (such as Lithium, Nickel, Cobalt and Graphite for batteries, and Rare Earth Elements for permanent magnets) and all the stages of the value chain: extraction (77 applications), processing (58 applications), recycling (30 applications), and substitution (5 applications).
- Commission decision list of Strategic Projects foreseen for Q1/25.

Risk monitoring and mitigation

Risk monitoring

- **Assessment of critical and strategic raw materials**
- **Towards real time monitoring** (trade flows; demand and supply; concentration of supply; Union and global production)
- **Early warning system**

Risk preparedness:

- **Stress testing**
- Reporting and coordination of **strategic stocks**



Sustainability and circularity of CRM

Strengthen recycling and circularity of CRM

- National measures on CRMs circularity
 - Increase reuse, collection and recycling
 - Increase use of secondary RM
 - Recycling technologies*Implementing Act Q2/25, MS national programmes Q2/27*
- Maximising potential from extractive (active, closed) waste facilities
Obligations for operators + MS 25-27
- Recyclability and recycled content of permanent magnets
*Implementing Act Q4/25 labelling format
Delegated Act Q2/26 calculation + verification rules*

Sustainable choices

- Recognition of certification schemes on the sustainability of CRMs
Implementing Act Q2/27.
- Empowerment to set information requirements on the environmental footprint of CRMs placed in the EU market
*COM reports to co-legislators: priority CRM Q4/25, proportionality assessment Q4/26. COM empowerment
Delegated Act calculation and verification rules for environmental footprint of CRM*

Supported by:

Evidence-based knowledge with expertise from DG JRC, academia (multiple studies launched to bolster preparation of secondary legislation).

CRMA Sub-group circularity, resource efficiency and substitution (survey, discussion)

Summary

Charlotte Andersson, Program Director, Swedish Mining Innovation, Professor in Process Metallurgy, Luleå University of Technology. IVA Fellow.

Magnus Ericsson, Co-founder, RMG Consulting, consulting, Professor, Luleå University of Technology. IVA Fellow.

Reports



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all 4 reports here

