Market Dynamics and Technological Innovations of Critical Raw Materials

---

A paradigm shift needed?

Christophe XERRI
President and Senior Consultant
The Sailing Brain Consulting
We all know this: more electricity needed! And let’s have it no / low carbon.

IEA / WEO scenarii

BP Outlook

The Sailing Brain Consulting
We are all aware of this:
Low Carbon energies need mineral resources
And we are talking big!!!
Here is Growth of Mineral Demand

Projected trends in mineral demand for clean energy technologies by scenarios
Source: ESCAP 2023 based on IEA Scenarios: Stated Policies Scenario (STEPS); Sustainable Development Scenario (SDS)

The Sailing Brain Consulting
So we are all aware of this: Supply risk must be managed

The Sailing Brain Consulting
Where are investments going?

• Solar and wind electricity generation
  • Permitting are slowing down projects’ schedules
  • But also costs and concerns of availability of raw materials
• Batteries GigaFactory and R/D
  • Trend: geographical diversification / on-shoring

Is that enough to reach the target? What about upstream and downstream?
Upstream: a gap to close!

In the ground: OK!

Manufacturing plants: OK!

There or can be easily added
Address long lead schedule to be on time

Investment needed NOW

Enabler for success of next steps of supply chain

The Sailing Brain Consulting

10 to 15 years
EV / Batteries: towards vertical integration?

Should VC enter the mining world to secure their investment portfolio?
What UNMRS brings: more information, more trust

• A way to address all dimensions of resources: exploration, mining, and circularity

• An approach to discuss environmental and social issues
What UNMRS shall develop: an international CRM information dashboard

- Voluntary contribution from all interested parties
- A trusted reference for all stakeholders
- A transparency framework
- An enabler of global cooperation

The UNRMS based dashboard should help VCs and Financing Institutions to invest in mining in line with their sustainability criteria.

First step: mining – resources in the ground
Second step: processing - resources in the supply chain
Third step: in-service resources in products

The Sailing Brain Consulting
What about Technology and Use?

What happens in the “above the ground” space is as important as what happens in the “below the ground” space of geology and mining.
Technology Improvements can be expected at each stage to make the best use of a finite resource

- Recovery of low-grade deposit
- Efficiency of refining and processing
- Energy density / efficiency
- LCA, no waste, .....

Strengthening R/D is on-going

Source: EC Horizon Program
Servitization as a driving force

- Work on DESIGN !!! Do it NOW !!!
  - Think of resource as a service provider
  - Optimize material and energy requirement

- Develop recovering and next use technologies
  - Be ready to recover when resources will become available in large quantities
    - end of life of the first use
  - Investigate the new services and use a given material can offer

- Incentivize recycling for critical material resources’ partner countries
  - Two steps royalties (primary use, next use) enabled by blockchain traceability
  - Localize manufacturing and then recycling technologies for low carbon systems (batteries, solar panel, wind mills, etc ...)

The Sailing Brain Consulting
The Real Paradigm Shift

- Green Renewable Energies
- Red Critical Raw Material

Investments needed on both sides

UNRMS based dashboard to facilitate VCs and IDBs financing of CRM projects

Servitization and circular economy to be developed now, to provide additional CRM resources tomorrow as demand will increase