



Policy Brief: Importance of training and research to the supply of critical raw materials in Europe*



Prof. Koen Binnemans (KU Leuven)
General Coordinator EREAN, REDMUD and DEMETER

*Adapted version as presented during “Critical Raw Materials in Everyday Applications” workshop, Brussels, 26-27 September 2016



Executive Summary

At the height of the rare-earth crisis in 2011, it became evident that Europe has lost most of its expertise in the recovery of rare earths from ores, the separation of mixtures of rare earths into the individual elements and the transformation of rare-earth oxides into magnet alloys or other rare-earth compounds, due to the more than 20 years of monopoly of China in the field of rare earths. Most of the experts in the European rare-earth industry had moved to other fields or had retired.

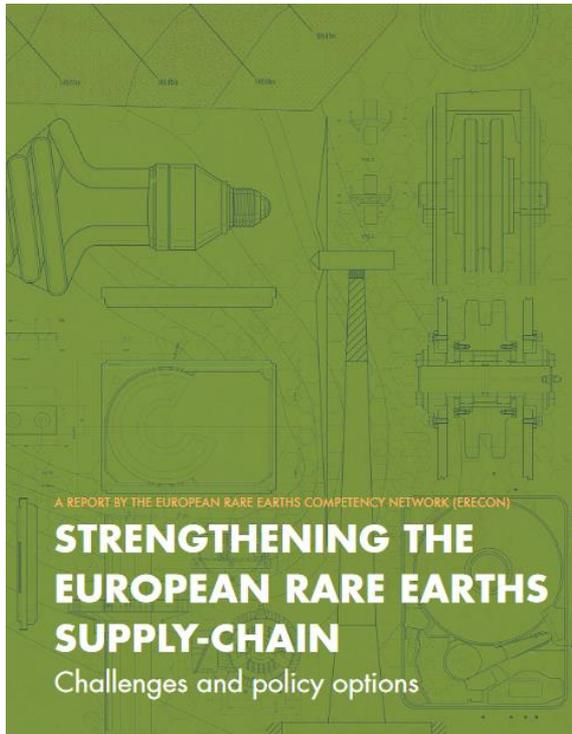
The EC has made large investments in FP7 and Horizon2020 project to secure the supply of rare earths and other critical raw materials in Europe. Many new technologies have been developed thanks to this EC funding. Unfortunately, the inventors are facing huge difficulties to further develop these technologies and to bring these to the market, due to the current low prices of the rare earths and other critical metals.

However, Europe must draw lessons from the past and must not make the mistake of losing the expertise and knowledge that has been built up during the last few years. Therefore, it is strongly recommended that the EC continues to support project proposals to further develop new technologies in the field of critical raw materials to prepare the European companies for the next rise in the prices of the rare earths, which can surely be expected in the near future.

ERECON final report

- In 2013, the European Rare Earths Competency Network (ERECON) was set up by DG Enterprise and Industry (Growth) at the request of the European Parliament.
- 80 experts from industry, academia and policy world
- EREAN team has essential role in ERECON
 - Allan Walton (University of Birmingham)
 - Koen Binnemans (KU Leuven)
 - Matthias Buchert (Öko Institut)
 - Oliver Gutfleisch, Roland Gauss (Darmstadt/Fraunhofer)
 - Alain Rollat, Olivier Larcher (Solvay)

ERECON final report



https://ec.europa.eu/growth/sectors/raw-materials/specific-interest/erecon_en

ERECON recommendations

- Mapping of the urban mine is urgently required to assess the potential for recycling of all REEs
- Eco-design should be promoted in order to enable easier recycling of the REEs
- Take back & buy back schemes should be evaluated to stimulate collection REE materials
- Regulations surrounding recycling targets for REE containing products are often based on weight percentages for the whole product, which does not promote recycling of the small quantities of rare earths. Therefore regulations should be fine-tuned to emphasize the importance of the minor metals including for example REEs

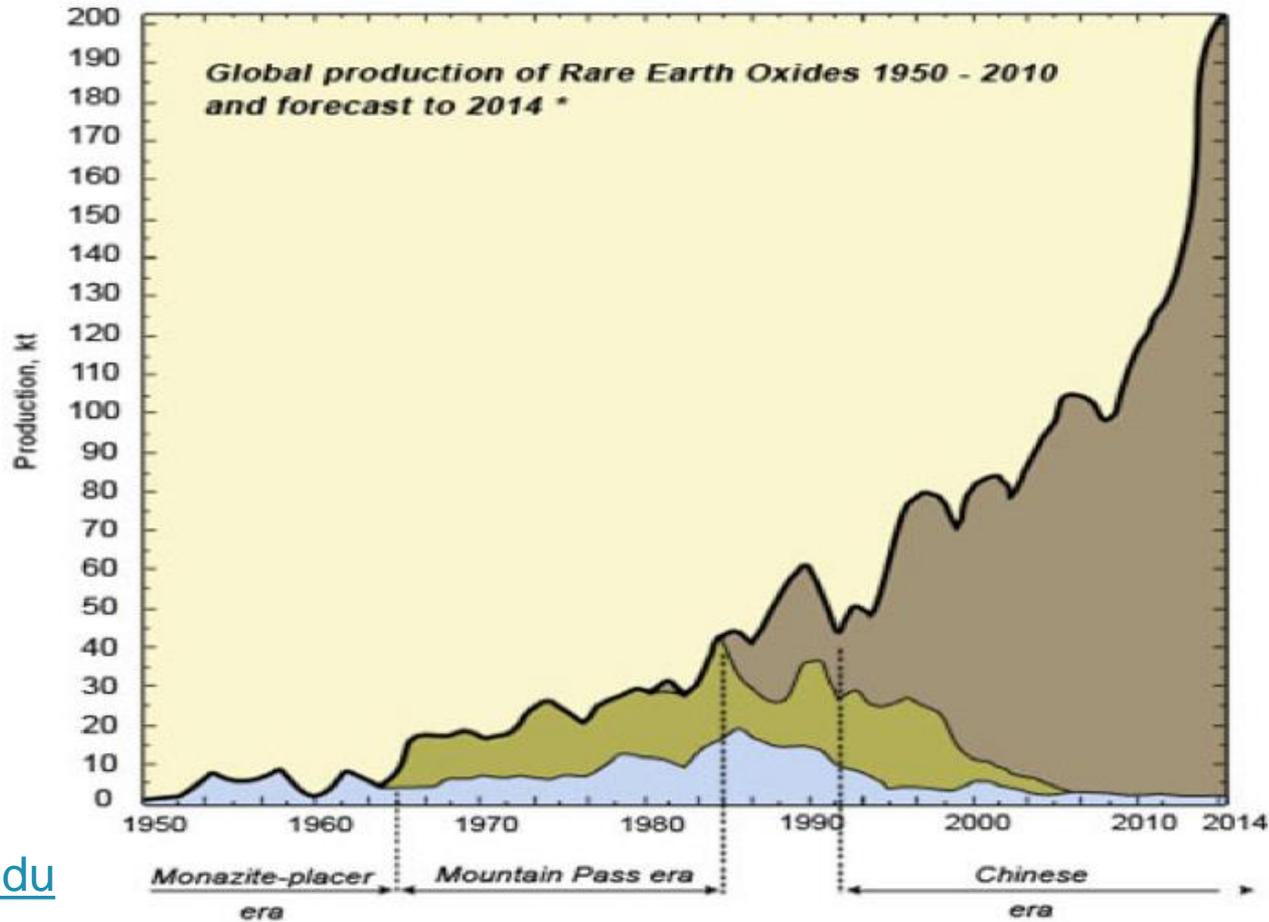
ERECON and REE recycling

- Priority for recycling
 1. Permanent magnets – Nd, Pr, Dy, Tb, Sm
 2. Phosphors – Eu, Tb, Y, Ce, Gd, La
 3. Batteries – La, Ce, Nd, Pr
 4. Polishing compounds – Ce
 5. Catalysts – La, Ce, Pr, Nd, Y
- List based on criticality of the rare earths, future demand, value of the waste stream, size of the sector and potential for substitution

What can we learn from history?

- Main REE manufacturers in 1989
 - Europe:** Rhone-Poulenc (France), Rare Earth Products (UK), Treibacher CW (Austria), Megon (Norway)
 - USA:** Molycorp, Research Chemicals, Grace
 - Japan:** Santoku Metal, Mitsui Mining Smelting, Nippon Yttrium, Shinetsu Chemical, Nissan Kingensu
 - China:** about 10 plants
- In the late 1980s, early 1990s, most of the companies went out of business by very low REE prices (dumping prices by Chinese producers)

What can we learn from history?



web.mit.edu

11/11/2016

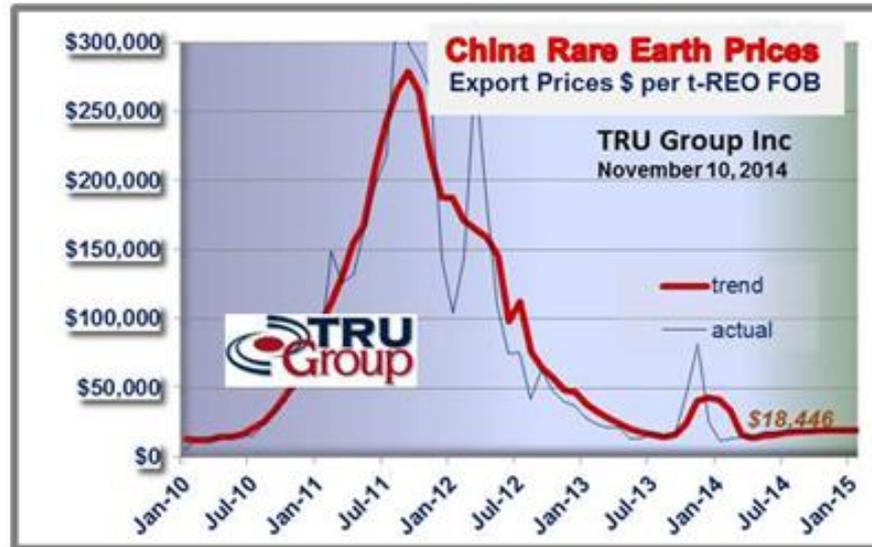
Policy Brief EREAN, REDMUD & DEMETER

8

KU LEUVEN

SUSTAINABLE INORGANIC
MATERIALS MANAGEMENT

What can we learn from history?



Bloomberg ▼ Molycorp Files for Bankruptcy as Rare-Earth Prices Drop

Molycorp Files for Bankruptcy as Rare-Earth Prices Drop

by Dawn McCarty and Simon Casey

June 25, 2015 – 10:15 AM CEST Updated on June 25, 2015 – 3:32 PM CEST



Importance of training and research

- Many specialists active in the European REE industry in the 1980s-1990s had retired at the time of the 2011 rare-earth crisis
- Europe could not react adequately to the REE crisis because of lack of trained personnel and mature technologies or mining projects
- EC has invested a lot in critical raw materials projects (FP7, Horizon2020)
- At the current low REE prices, it is very difficult to set up a profitable REE supply chain in Europe
- There is again the danger of loss of competency in the field

Importance of training and research

- EC cannot subsidise directly REE-producing companies due to free market (state-controlled REE industry in China)
- EC can invest in new projects on REE and other critical raw materials (e.g. antimony)
 - Train new scientists and engineers
 - Keep competence in critical raw materials technology active in Europe
 - Develop new breakthrough technologies
- Re-introduce Experienced Researchers (ERs) in the MSCA ITN project – more easily hired by companies

Conclusions

- Companies in Europe struggle because of low prices of REEs (kept artificially low by China)
- We must learn from history
- EC must invest in new projects on training of scientists/engineers and on development of new technologies in the field of critical raw materials
- Re-introduce Experienced Researchers (ERs) in the MSCA ITN project – more easily hired by companies
- We must keep knowledge and expertise in Europe
- Learn from the REE crisis and anticipate to new supply risks (e.g. antimony)