

Critical Raw Materials

Euromines Conference

9 March 2012

‘Critical & Essential Materials’

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Natural Resources GP

Contents

1. **Conference Motivation/ Purpose**
2. **‘Critical’ vs. ‘Essential’ Materials -- the Fundamental Distinction**
3. **Which are the “Critical” Materials? EU 14, US DOE, Japan..**
4. **Which are the “Essential” Materials?**
5. **Where are Critical and Essential Materials Used?**
6. **International Policy Initiatives**
7. **Recent Developments / Events**

Conference Motivation - Purpose

Objective

- **Show to the downstream industry the availability and progress on exploration of deposits, mines and quarries on CRM**
- **Identify obstacles: Access to resources, awareness, mining industry a possible generator for economic growth & employment**
- **Exchange views on technical, commercial, financial and political aspects of CRM**

Participants

European downstream industry and European institutions

EU+EFTA, the US, Japan, and Canada

- **Governments and other policy-makers, the EC, Associations, producing & consuming companies, research organizations, specialists, academics**
- **Also of interest to Australia, Brazil, CIS countries, India, Russian Federation**

'Critical' vs. 'Essential' Materials

Fundamental Distinction

- Security of supply + Importance of applications
- **Critical:** medical, defense, aerospace, high-tech, green-energy; plus political risk in supply or 'blood minerals'
- **Essential:** day-to-day life [agriculture, construction, basic industries] but with no visible political risk in the supply; however, if access becomes restricted [permit delays?] → essential can become critical

Criticality Criteria

Technical, commercial and political factors

- Entire cycle: Extraction > Processing > Components > End-Use Technologies > Recycling and Reuse
- Economic Importance
- Import Dependence
- Supply Risk, Country Risk
- Recycling
- Substitutability
- Environmental Data
- Policies: Emerging economies pursuing industrial development strategies [trade, taxation, investment instruments] to reserve resource base for exclusive use
- Hence: shortages for the EU [and the 'West' in general]

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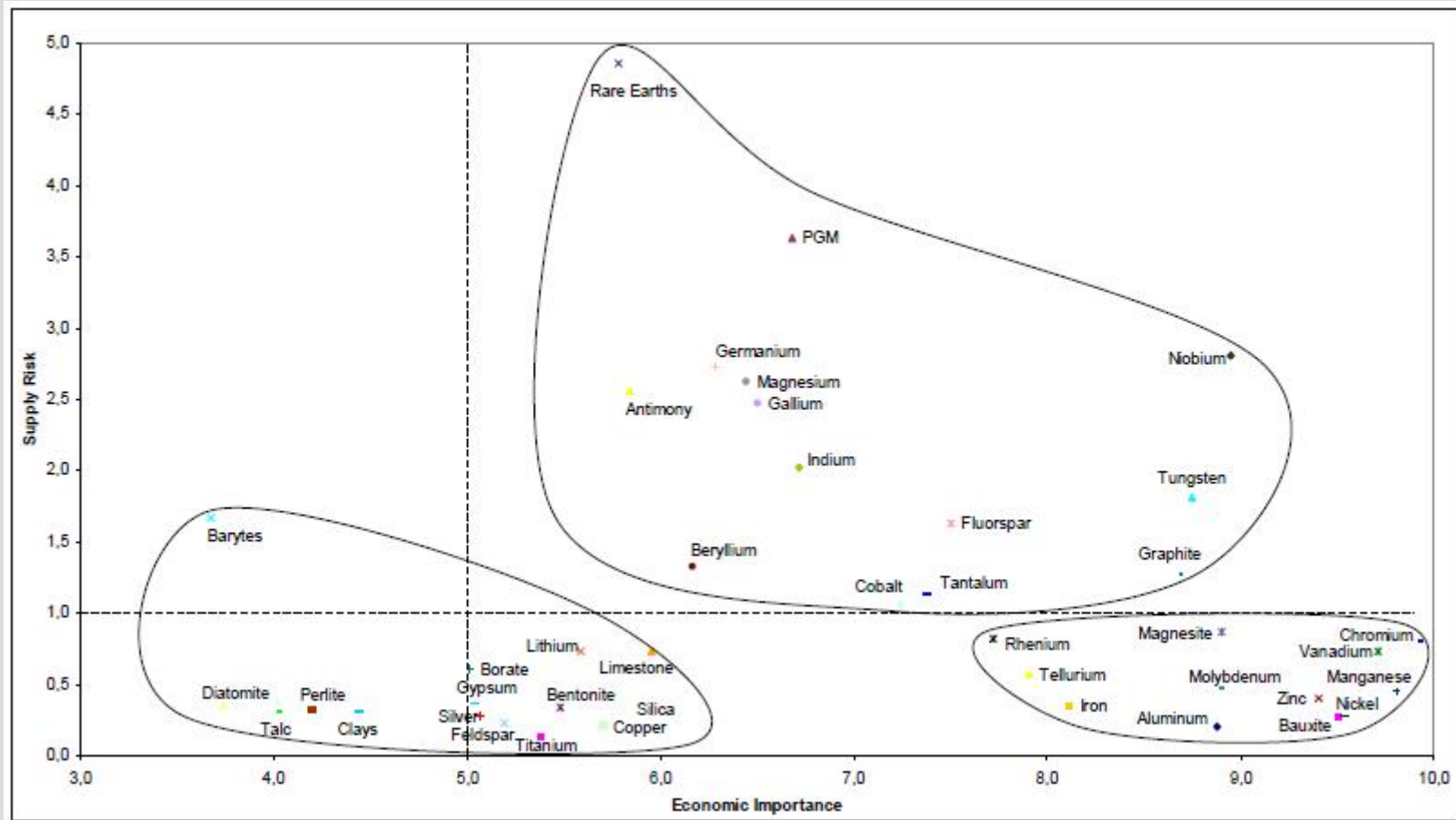
History

Issue surfaces with ‘Security of Supply’ and seller’s markets + new/sophisticated applications developed

- **Paley Commission, 1952: US President's Materials Policy Commission**
- **National Security Study Memorandums (NSSM), 1974: The Critical Imported Materials**
- **European Community 1975: The Supply of the Community**
- **National Research Council, 2007: Minerals, Critical Minerals, and the U.S. Economy**
- **Resource Efficiency KTN, 2008: Material Security -Ensuring resource availability for the UK economy**
- **European Commission, 2010-2011: See below**
- **RPA study Jan '12 adds AQ aggregates, Cu, Nb, Li and Wood [!].**
- **US, Japan etc. CRM lists slightly different from EU**

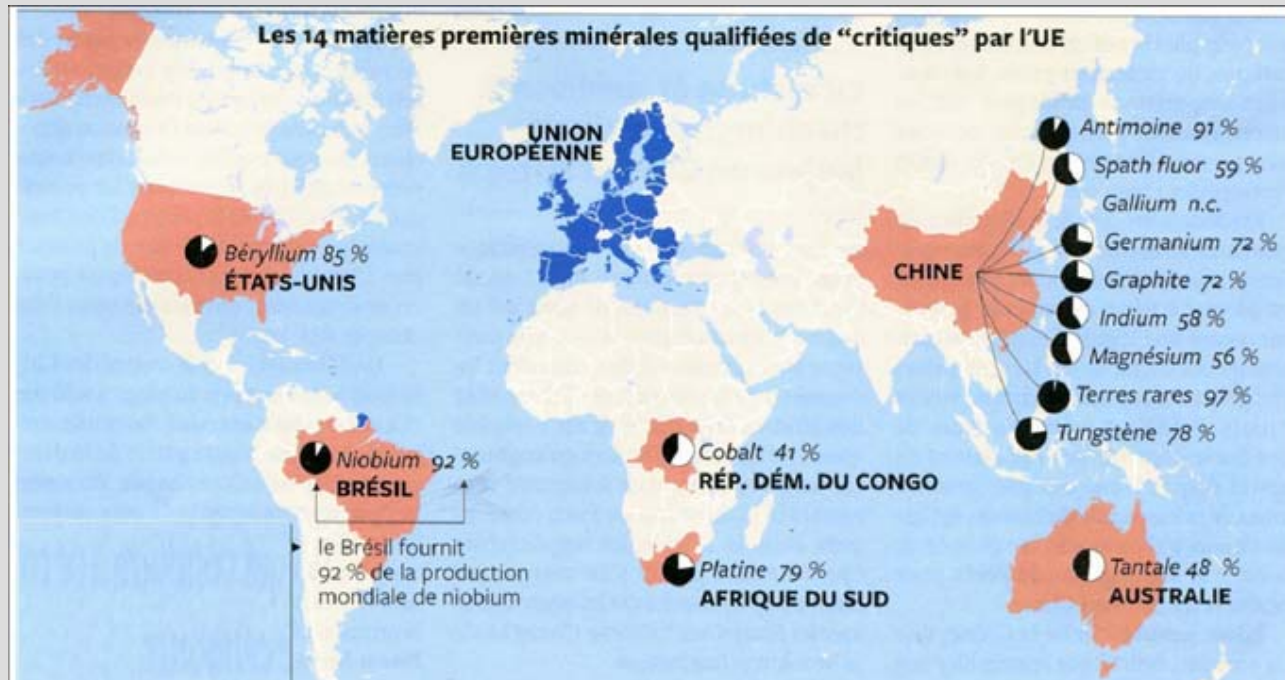
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The EU 14 CRM



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Location of 14 EU CRM



China: RE 97%, Sb 91% of int'l supply!

Brazil: Nb 92%

US: Be 85%

Uses of 14 EU CRM...

Element	Main Uses
Antimony	Flame retardants, Batteries, Glass, Semiconductors, Alloys
Beryllium	Electronic equipment and Domestic Appliances (40%), Construction
Cobalt	Rechargeable batteries, Superalloys/ wear resistant alloys, Hard metals, Catalysts, Magnetic alloys
Fluorspar	Chemicals, Steel, Aluminum, Glass, glass fibers, Cement
Gallium	Integrated circuits, Laser diodes, photo-detectors, solar cells
Germanium	Fiber optic systems (30%), Infrared optics (25%), Polymerisation catalysts (25%), Parts for electrical and solar equipment (15%)
Graphite	Steel, Refractories, Foundries, Crucible production, Electrical applications

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10

... Uses of 14 EU CRM

Element	Main Uses
Indium	Flat display panels (74%), Low melting point and minor alloys, Compounds
Magnesium	Casting alloys (50%), Structural components of automobiles and machinery, Construction
Niobium	Ferroniobium for steel, Construction, Alloys
Platinum Group Metals (PGM)	Autocatalysts, Jewelry, Electronics and electrics, Dental alloys, Catalysts
Rare Earth Elements	Catalysts, Magnets, Polishing and Glass, Batteries, Metallurgy
Tantalum	Capacitors (60%), Medicine, Alloys:
Tungsten	Cemented carbides (60%, metalworking, mining, construction), lighting, electronic, electrical heating

“Essential” Materials

- **Salt**
- **Potash**
- **Bauxite and Aluminium**
- **Iron ore**
- **Ferroalloys**
- **Magnesite**
- **Gypsum**
- **Many industrial minerals,...**

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“Essential” Materials – Uses

- **Agriculture** Minerals for Fertilizers & Animal Feed
- **Basic industry** Chemicals, Refractories, Ceramics
- **Construction** Fe for Steel, Limestone/Lime, Aggregates, Gypsum
- **Environmental Protection & Restoration** Caustic Soda, Magnesia
- **Energy & Transport** Cu, Al

EU Policy Initiatives

EU: RMI

- **2010 1st EC Report on Critical Raw Materials**
Euromines welcomed but: 'not all minerals assessed, no differentiation between critical & essential, no assessment of the impact of legislation on future criticality, no identification of political risks or EU policy options for changing these risks'
- **Undertaking study of economical RE deposits**
- **Examining raw materials stockpiling**
- **Working on R&D in reducing the need for RE and developing substitutes for them**
- **2012 DG Enterprise call to review 1st report, refine methodology, include new raw materials, present revised study for 2013**

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14

Chinese Policies - Facts

- **Cut export quotas**
- **No new mining licenses to 2015**
- **Consolidating the number of their companies**
- **Co-ordinated pricing**
- **VAT rebate on exports withdrawn**
- **Tougher EHS**
- **Increasing taxation for Chinese producers**
- **Assistance in R&D**
- **Stockpiling strategic reserves**

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15

Chinese Policies - Analysis

- **Most policies are against Chinese producers!**
- **For many years exporting at very low prices, causing local environmental damage & at expense of domestic consumption**
- **Inflation, rising labor costs**
- **Power shortages**
- **Lifton: 'We effectively told them in the past that we wanted them to produce our RE. Now, we are saying why did you do this to us?'**
- **Quota cuts only apply to raw minerals, not processed forms eg magnets: strategy to develop Chinese domestic manufacturing industry [owned or not by Chinese] + trading 'resources for technology'**

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16

ROW Policies

US, aiming at energy independence:

- 'Promotion of alternative sources of power generation is crucial'
- House of Representatives RE and Critical Materials Revitalisation Act 'reestablish US as leading REE producer, self-sufficient, never depend on China for national security'
- US Pentagon distancing from 'strategic danger' rhetoric

Japan, world's largest REE importer, to lose more

+ROK

- establishing jv and supply agreements w/ 3rd countries
- strategic stockpiles outside China
- economizing/substituting/recycling

Non-Chinese companies secure RE by operating in China, benefiting from cheaper RE prices, eg Rhodia processing near Baotou

Stimulating supply outside China, discovery & devt REE domestically or through international cooperation agreements

WTO

- **US/EU/Mexico etc complaint on '1st wave' of minerals**
- **'Raw Materials: What Role for the WTO in Tackling Export Restrictions? Four proposals for A Transatlantic Agenda', Transatlantic Academy, '11**
- **China argued environmental grounds justify their policies...but lost the case** early '12
- **EU considering a '2nd wave' that might include RE etc**
- **'China Asserts Rare Earths Export Policy In spite WTO Ruling', Feb '12**

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18

Recent Developments / Events

- **European Technology Platform on CRM, Wroclaw, Poland 10/11**
- **EU JRC: 'Critical Metals in Strategic Energy Technologies', 10/11**
- **'Proposed German Industrial Alliance to Secure CM Supply' 11/11**
- **PRC Min. of Commerce 'Commodities in Export Licensing' 1/12**
- **'Merkel Strikes Kazakh RE Accord' 2/12**
- **'China Graphite Producers Want Government Protection' 2/12**
- **'EU Launches Innovative Group in Raw Material Production' 3/12**
- **'US Industry Calls for US Critical Minerals Strategy' 3/12**
- **EU/China Working Group on Raw Materials 30 March '12**

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19

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- **‘Refractory Ceramics & Industrial Minerals: Critical for the European Industry’ PRE-Europe Report, 2010**
- **European Commission Report on Critical Raw Materials, by Ad Hoc Group of the Raw Materials Supply Group, June 2010**
- **‘Rare Earths Worldwide: An Industry and Policy Analysis’, Natural Resources GP Report, 2011**
- **Nicoletopoulos V., ‘Raw Materials for Tomorrow’s Ceramics’, Confindustria Ceramica, Bologna, Italy, Sept. 2011**
- **US DoE ‘Critical Materials Strategy - Clean Energy Economy’ Dec ’11**
- **OECD: ‘Measures Restricting Industrial Raw Materials Export’ Feb ’12**
- **Nicoletopoulos V., ‘Afghanistan’s Mineral Plan’, Industrial Minerals, Feb. 2012**

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20

- **Thank you!**
 - **We wish you a productive conference!**
- Vasili Nicoletopoulos**