Defining Critical Raw Materials in the EU: Information Gaps and Available Solutions

Security of Supply and Scarcity of Raw Materials:
A Methodological Framework for Supply Chain Sustainability Assessment
Joint Research Centre
Ranco, Italy, 13 September 2012

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European Commission, DG Enterprise and Industry
Integrated strategy

- Three pillars approach
- Area of non-energy, non-agricultural raw materials
- Launched Nov. 2008
- Reinforced Feb. 2011
- Primary and secondary raw materials
- Connecting EU external and internal policies

Ensure level playing field in access to resource in third countries

Foster sustainable supply from European sources

Boost resource efficiency and recycling
Criticality assessment

Critical raw materials list as a policy tool:

• Monitor issues of critical raw materials to identify priority actions

• Policy actions not limited to critical raw materials exclusively
Scope

Materials covered: 41 raw materials selected
Time horizon: 10 years window

<table>
<thead>
<tr>
<th>Material</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminium</td>
<td>Lithium</td>
</tr>
<tr>
<td>Antimony</td>
<td>Magnesite</td>
</tr>
<tr>
<td>Barytes</td>
<td>Magnesium</td>
</tr>
<tr>
<td>Bauxite</td>
<td>Manganese</td>
</tr>
<tr>
<td>Bentonite</td>
<td>Molybdenum</td>
</tr>
<tr>
<td>Beryllium</td>
<td>Nickel</td>
</tr>
<tr>
<td>Borates</td>
<td>Niobium</td>
</tr>
<tr>
<td>Chromium</td>
<td>Perlite</td>
</tr>
<tr>
<td>Clays (and kaolin)</td>
<td>Platinum Group Metals¹¹</td>
</tr>
<tr>
<td>Cobalt</td>
<td>Rare earths¹²</td>
</tr>
<tr>
<td>Copper</td>
<td>Rhenium</td>
</tr>
<tr>
<td>Diatomite</td>
<td>Silica sand</td>
</tr>
<tr>
<td>Feldspar</td>
<td>Silver</td>
</tr>
<tr>
<td>Flourspar</td>
<td>Talc</td>
</tr>
<tr>
<td>Gallium</td>
<td>Tantalum</td>
</tr>
<tr>
<td>Germanium</td>
<td>Tellurium</td>
</tr>
<tr>
<td>Graphite</td>
<td>Titanium</td>
</tr>
<tr>
<td>Gypsum</td>
<td>Tungsten</td>
</tr>
<tr>
<td>Indium</td>
<td>Vanadium</td>
</tr>
<tr>
<td>Iron ore</td>
<td>Zinc</td>
</tr>
<tr>
<td>Limestone (high grade)</td>
<td></td>
</tr>
</tbody>
</table>
Relative concept of criticality:
«Critical» when risks of supply shortage and their impacts on the economy are higher compared with most of the other raw materials

Assessment components:
- Economic importance
- Supply risk (and environmental country risk)

Features:
- Pragmatic approach
- Indicators-based
- Dynamic concept
- Primary and secondary RM
Assessment components

**Economic importance**
- Importance of a raw material per economic sector & importance of the sector in the EU economy

**Supply risk**
- Political and economic stability
- Level of production concentration
- Potential for substitution
- Recycling rate

**Environmental country risk**
- Risk of environmental protection measures by supplier countries
Assessment components

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Measuring economic importance

- Breakdown into two dimensions: material & sector
- Based on use of each material per sector weighted by the value added of the sector that uses this materials as production input
- “Megasectors” to approximate value added

Towards a dynamic view:
- Technological advances and new uses taken into account
  -> towards a dynamic view
## Emerging technologies

<table>
<thead>
<tr>
<th>Raw material</th>
<th>Production 2006 (t)</th>
<th>Demand emerging tech. 2006 (t)</th>
<th>Demand emerging tech. 2030 (t)</th>
<th>Demand/prod 2006</th>
<th>Demand/prod 2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gallium</td>
<td>152</td>
<td>28</td>
<td>603</td>
<td>0.18</td>
<td>3.97</td>
</tr>
<tr>
<td>Indium</td>
<td>581</td>
<td>234</td>
<td>1.911</td>
<td>0.40</td>
<td>3.29</td>
</tr>
<tr>
<td>Germanium</td>
<td>100</td>
<td>28</td>
<td>220</td>
<td>0.28</td>
<td>2.20</td>
</tr>
<tr>
<td>Neodymium</td>
<td>16.800</td>
<td>4.000</td>
<td>27.900</td>
<td>0.23</td>
<td>1.66</td>
</tr>
<tr>
<td>Platinum</td>
<td>255</td>
<td>very small</td>
<td>345</td>
<td>0</td>
<td>1.35</td>
</tr>
<tr>
<td>Tantalum</td>
<td>1.384</td>
<td>551</td>
<td>1.410</td>
<td>0.40</td>
<td>1.02</td>
</tr>
<tr>
<td>Silver</td>
<td>19.051</td>
<td>5.342</td>
<td>15.823</td>
<td>0.28</td>
<td>0.83</td>
</tr>
<tr>
<td>Cobalt</td>
<td>62.279</td>
<td>12.820</td>
<td>26.860</td>
<td>0.21</td>
<td>0.43</td>
</tr>
<tr>
<td>Palladium</td>
<td>267</td>
<td>23</td>
<td>77</td>
<td>0.09</td>
<td>0.29</td>
</tr>
<tr>
<td>Titanium</td>
<td>7.211.000</td>
<td>15.397</td>
<td>58.148</td>
<td>0.08</td>
<td>0.29</td>
</tr>
<tr>
<td>Copper</td>
<td>15.093.000</td>
<td>1.410.000</td>
<td>3.696.070</td>
<td>0.09</td>
<td>0.24</td>
</tr>
</tbody>
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Assessment components

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- Potential for substitution
- Recycling rate

**Environmental country risk**
- Risk of environmental protection measures by supplier countries
Production concentration of critical raw mineral materials

- Canada: Cobalt
- Russia: Platinum Group Metals
- USA: Beryllium
- Mexico: Fluorspar
- Brazil: Niobium, Tantalum
- South Africa: Platinum Group Metals
- Democratic Republic of Congo: Cobalt, Tantalum
- Rwanda: Tantalum
- India: Graphite
- Japan: Indium
- China: Antimony, Beryllium, Fluorspar, Gallium, Graphite, Germanium, Indium, Magnesium, Rare earths, Tungsten
Supply risk

Political and economic stability and production concentration

- Estimation with use of Worldwide Governance Indicators “weighted” by share of production coming from each of the countries (concentration)
- High index decreases supply risk

Substitution

- Qualitative assessment of substitution potential in each sector weighted by the share of EU’s use of this raw material by this sector
- High substitution potential decreases the supply risk

Recycling potential

- Measured by the recycling rate
- High recycling rate decreases supply risk
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Environmental country risk

Ranking of Eligible Raw Materials according to their Environmental Country Risk
Outcome
Outcome

Economic Importance vs. Supply Risk

- Rare Earths
- Magnesium
- Gallium
- PGM
- Tellurium
- Aluminum
- Antimony
- Barytes
- Bentonite
- Beryllium
- Clays
- Cobalt
- Copper
- Diatomite
- Feldspar
- Germanium
- Graphite
- Gypsum
- Indium
- Limestone
- Lithium
- Magnesium
- Magnesite
- Manganese
- Nickel
- Niobium
- Molybdenum
- Nickel
- Osmium
- Palladium
- Tantalum
- Tungsten
- Vanadium
- Zinc
- Bauxite
- Titanium

ENTR G3
Critical raw materials list

- Antimony
- Beryllium
- Cobalt
- Fluorspar
- Gallium
- Germanium
- Graphite
- Indium
- Magnesium
- Niobium
- PGMs (Platinum Group Metals)
- Rare earths
- Tantalum
- Tungsten
Input to different policy areas

- Keep raising **attention to policy-makers**
- Promote **coordination of national policies** regarding mineral supply and critical materials
- **Challenge trade distortive measures** regarding critical raw materials
- Analyse the functioning of the **markets**
- Promote **research** (exploration, substitution, recycling)
  In the context of the European Innovation Partnership: substitutes for at least 3 applications of critical raw materials
- Promote access to **deposits in EU**
- Address problem of **illegal exports** end-of-life products containing critical materials
- Measures for specific materials
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EIP – novel concept

European Innovation Partnership on Raw Materials
COM(2012) 82 final - 29 February 2012

Objectives:

- Reduce *import dependency*
- Provide *alternatives in supply*
- Push *Europe to the forefront* in raw materials sectors
- Mitigate negative *environmental impacts*
2020 targets

- EU standardised instruments for the survey of resources/reserves and 3-D geological map

- Dynamic modeling of trends: link demand and supply with reserves and complete LCA

- Up to 10 innovative pilot actions, e.g. demonstration pilot plants → exploration, mining, processing, collecting and recycling

- Substitutes for at least 3 applications of critical raw materials

- Network of Research, Education and Training Centres on sustainable raw materials management

- Pro-active strategy of EU at bilateral and multilateral level
Revising the list of critical raw materials

✓ Update list of critical raw materials at least every 3 years

✓ Expand scope to other materials
  ✓ Nearly critical raw materials: rhenium, tellurium
  ✓ Selected additional materials (e.g. hafnium, selenium, tin – JRC study on critical metals in energy technologies)

✓ Progress regarding statistics
  ✓ General data & information on minerals and metals (input geological surveys)
  ✓ Statistics on value-added manufacturing chain
  ✓ Analytical progress in the area of land-use planning

✓ Technical work to start in September 2012
  ✓ Expanded scope
  ✓ Fine-tuning methodology
  ✓ Expert group

✓ Adoption of new list by Commission end 2013
✓ Possible discussion at Trilateral US-Japan-EU meeting in May 2013
• **EU raw materials webpage**: http://ec.europa.eu/enterprise/policies/raw-materials


• **European Innovation Partnership on raw materials**

Thank you.

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