Critical Raw Materials: the EU approach

Vítor Correia, MSc, MBA, EurGeol
European Federation of Geologists
International Raw Materials Observatory, Brussels
1983 G7 summit

context the EU response
SIGNING CEREMONY ON CHINA'S ACCESSION TO THE WTO
11 November 2001, Doha
Iron is gold

Prices, $ terms

Vale’s share price
$40

Iron ore price
cents per dry tonne unit

1999 2001 03 05 07 09 10

Sources: IMF; Thomson Reuters

Rarity value
Rare-earths price index*, January 2002=100

2002 03 04 05 06 07 08 09 10

Source: Kaiser Bottom-Fish

*Composite of ten metals
The raw materials initiative — meeting our critical needs for growth and jobs in Europe
The raw materials initiative — meeting our critical needs for growth and jobs in Europe
EU “Raw Materials Initiative”

- **Aim:** securing sustainable supplies of raw materials
- Launched in 2008, consolidated in 2011
- Non-energy, non-agricultural raw materials
- Connecting EU external and internal policies
- Integrated strategy (3 pillars)

**Diagram:***

1. Foster sustainable supply from European sources
2. Boost resource efficiency and recycling
3. Ensure level playing field in access to resource in third countries
Addressing the targets (56 projects)

Technology (267.5 M€)

- Extraction: 75.30
- Exploration: 46.96
- ERA-NET: 5.00
- Waste management: 13.40
- Substitution: 18.68

Non-technology (28.3 M€)

- Knowledge base: 8.16
- Framework conditions: 10.09
- Waste management: 10.03

International cooperation (7.5 M€)

- International dialogue: 4.08
- Global material flows: 1.00
- World forum: 1.14
- Skills: 127

Credits: EASME
context

the EU response

Source: http://vamos-project.eu/
context

the EU response

Source: http://vamos-project.eu/
honest broker acting as an impartial international mediator specialised in the minerals value chain to support international cooperation
Enhancement of the EU response
Economic Importance

\[(EI) = \Sigma (Ass \times Qs) \times SIEI\]

where:
- \( EI \) = economic importance;
- \( As \) = the share of end use of a raw material in a NACE Rev. 2 (2-digit level) sector;
- \( Qs \) = the sector’s VA at the NACE Rev. 2 (2-digit level);
- \( SIEI \) = the substitution index of a raw material related to economic importance;
- \( s \) denotes sector.
End uses of tungsten applications

- Aeronautics and energy uses: 5%
- High speed steels applications: 7%
- Lighting and electronic uses: 6%
- Catalysts and pigments: 7%
- Mining and construction tools: 21%
- Mill and cutting tools: 31%
- Other wear tools: 17%

Total consumption: 19,500

Tungsten applications, 2-digit NACE sectors, and value added per sector

<table>
<thead>
<tr>
<th>Applications</th>
<th>2-digit NACE sector</th>
<th>Value added of NACE 2 sector (millions €)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mill and cutting tools</td>
<td>C28 - Manufacture of machinery and equipment n.e.c.</td>
<td>191,000</td>
</tr>
<tr>
<td>Mining and construction tools</td>
<td>C28 - Manufacture of machinery and equipment n.e.c.</td>
<td>191,000</td>
</tr>
<tr>
<td>Other wear tools</td>
<td>C28 - Manufacture of machinery and equipment n.e.c.</td>
<td>191,000</td>
</tr>
<tr>
<td>Catalysts and pigments</td>
<td>C20 - Manufacture of chemicals and chemical products</td>
<td>110,000</td>
</tr>
<tr>
<td>Lighting and electronic uses</td>
<td>C26 - Manufacture of computer, electronic and optical products</td>
<td>75,260</td>
</tr>
<tr>
<td>High speed steels applications</td>
<td>C25 - Manufacture of fabricated metal products, except machinery and equipment</td>
<td>159,513</td>
</tr>
<tr>
<td>Aeronautics and energy uses</td>
<td>C28 - Manufacture of machinery and equipment n.e.c.</td>
<td>191,000</td>
</tr>
</tbody>
</table>

Supply Risk

\[ SR = [(HHI_{WGI}, t)GS \cdot IR^2 + (HHI_{WGI}, t)EUsourcing(1-IR^2)] \cdot (1-EoLRIR) \cdot SISR \]

where:
- \( SR \) = supply risk;
- \( GS \) = global supply, i.e. global suppliers countries mix;
- \( EUsourcing \) = actual sourcing of the supply to the EU, i.e. EU domestic production plus other countries importing to the EU;
- \( HHI \) = Herfindahl-Hirschman Index (used as a proxy for country concentration);
- \( WGI \) = scaled World Governance Index (used as a proxy for country governance);
- \( t \) = trade parameter adjusting \( WGI \);
- \( IR \) = import reliance;
- \( IR \) = import reliance;
- \( EOLRIR \) = end-of-life recycling input rate;
- \( SISR \) = substitution index related to supply risk.
**Global mine production** of Antimony ores, average 2010–2014 (Data from BGS, 2015)

**Global production** of unwrought antimony metal, average 2010–2014 based on reconstructed trade data (Data from UN Comtrade database)

Countries accounting for largest share of global supply of CRMs

Countries accounting for largest share of EU supply of CRMs

Russia
- Scandium 67%
- Tungsten 50%
- Vanadium 60%

Finland
- Cobalt 66%

Norway
- Silicon metal 23%

France
- Hafnium 43%

Morocco
- Phosphate rock 27%

Turkey
- Borate 98%

Kazakhstan
- Phosphorus 77%

Indonesia
- Natural rubber 32%

China
- Antimony 90%
- Baryte 44%
- Bismuth 84%
- Cerium 62%
- Dysprosium 40%
- Europium 40%
- Gadolinium 40%
- Gallium 36%
- Germanium 43%
- Holmium 40%
- Indium 28%
- Lanthanum 40%
- Lutetium 40%
- Magnesium 94%
- Natural graphite 69%
- Neodymium 40%
- Praseodymium 40%
- Terbium 40%
- Thulium 40%
- Ytterbium 40%
- Yttrium 40%

USA
- Erbium 40%
- Helium 51%
- Samarium 40%

Mexico
- Fluorspar 27%

Brazil
- Niobium 71%

Nigeria
- Tantalum 43%

## 40. TUNGSTEN

### Key facts and figures

<table>
<thead>
<tr>
<th>Material name and Element symbol</th>
<th>Tungsten, W</th>
<th>World/EU production (tonnes)$^1$</th>
<th>82,000 / 2,175</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent group</td>
<td>N/A</td>
<td>EU import reliance$^1$</td>
<td>44%</td>
</tr>
<tr>
<td>Life cycle stage/material assessed</td>
<td>Mine production/Ore</td>
<td>Substitution index for supply risk [SI(SR)]$^1$</td>
<td>0.97</td>
</tr>
<tr>
<td>Economic importance (EI) (2017)</td>
<td>7.3</td>
<td>Substitution Index for economic importance [SI(EI)]$^1$</td>
<td>0.94</td>
</tr>
<tr>
<td>Supply risk (SR) (2017)</td>
<td>1.8</td>
<td>End of life recycling input rate (EOL-RIR)</td>
<td>42%</td>
</tr>
<tr>
<td>Abiotic or biotic</td>
<td>Abiotic</td>
<td>Major end uses in EU$^1$</td>
<td>Mill and cutting tools (31%), Mining and construction tools (21%), Other wear tools (17%),</td>
</tr>
<tr>
<td>Main product, co-product or by-product</td>
<td>Main product</td>
<td>Major world producers$^1$</td>
<td>China (84%), Russia (4%),</td>
</tr>
<tr>
<td>Criticality results</td>
<td>2011</td>
<td>2014</td>
<td>2017</td>
</tr>
<tr>
<td></td>
<td>Critical</td>
<td>Critical</td>
<td>Critical</td>
</tr>
</tbody>
</table>

$^1$ average for 2010-2014, unless otherwise stated;

### 2017 CRMs (27)

<table>
<thead>
<tr>
<th>CRMs</th>
<th>2017 CRMs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antimony</td>
<td>Fluorspar</td>
</tr>
<tr>
<td>Baryte</td>
<td>Gallium</td>
</tr>
<tr>
<td>Beryllium</td>
<td>Germanium</td>
</tr>
<tr>
<td>Bismuth</td>
<td>Hafnium</td>
</tr>
<tr>
<td>Borate</td>
<td>Helium</td>
</tr>
<tr>
<td>Cobalt</td>
<td>HREEs</td>
</tr>
<tr>
<td>Coking coal</td>
<td>Indium</td>
</tr>
</tbody>
</table>

*HREEs=heavy rare earth elements, LREEs=light rare earth elements, PGMs=platinum group metals*
Supporting information
Study on the review of the list of Critical Raw Materials 2017
Critical raw materials factsheets 2017
Non-critical raw materials factsheets 2017
Executive summaries: list of critical raw materials 2017
Report on Critical Raw Materials for the EU 2014
Annex to the Report on Critical Raw Materials for the EU 2014
Critical Materials Profiles 2014
Non-Critical Materials Profiles 2014
Study on Critical Raw Materials at EU Level 2014
Report on Critical Raw Materials 2010

Contact INTRAW
www.intraw.eu
@vitor_eurgeol