Resource security

The security of supply with resources

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introduction
definition
policies
examples
recommendations
drivers of „crisis“

commodity prices

Graph shows commodity prices from 1955 to 2010, with a significant increase around 2007.

Pie chart indicates the distribution of commodity prices with:
- Energie: 17.6%
- Getreide & Ölsaaten: 17.6%
- Edelmetalle: 17.6%
- Industriematerialien: 11.8%
- Lebendvieh: 11.8%
- Softs: 23.5%

Stand 21.06.2011
consumption

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population – policy – industry - aspirations

motor vehicles per 1000 people (2008)
13 % of chinese people have a car

the day after tomorrow?
economic growth
minerals production

China 2008: 3,725 bn t (cons. EU 2,262 bn t)

Weber et. al. (2011)
minerals production

political stability

Weber et. al. (2011)
market concentrations

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iron ore (2008)

<table>
<thead>
<tr>
<th>Total prod.</th>
<th>956 Mio. t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vale</td>
<td>301 Mio. t</td>
</tr>
<tr>
<td>Rio Tinto</td>
<td>171 Mio. t</td>
</tr>
<tr>
<td>BHP</td>
<td>114 Mio. t</td>
</tr>
<tr>
<td>Kumba</td>
<td>41 Mio. t</td>
</tr>
<tr>
<td>LKAB</td>
<td>28 Mio. t</td>
</tr>
<tr>
<td>SNIM</td>
<td>15 Mio. t</td>
</tr>
<tr>
<td>Sesa Goa, Sail, Essar</td>
<td>110 Mio. t</td>
</tr>
<tr>
<td>Rest</td>
<td>176 Mio. t</td>
</tr>
</tbody>
</table>

3 enterprises are producing 60 %
market distortions

financial speculation
market distortions

climate change – natural catastrophies
developments

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studies

Critical raw materials for the EU

Report of the Ad-hoc Working Group on defining critical raw materials

The ad-hoc Working Group is a sub-group of the Raw Materials Strategy Group and is chaired by the European Commission.

Note: The full report will be available on the European and Industry Digital Library website: http://ec.europa.eu/research/depolymerisation/files/materials/finn sürdürmen_index.pdf
EU-policy

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

THE RAW MATERIALS INITIATIVE — MEETING OUR CRITICAL NEEDS FOR GROWTH AND JOBS IN EUROPE

(COM(2008) 2741)


TACKLING THE CHALLENGES IN COMMODITY MARKETS AND ON RAW MATERIALS

Brussels, 2.2.2011
COM(2011) 25 final
developments – EU (RMI)

14 critical commodities
developments – EU (RMI)

\[ EI_i = 1/GDP \sum A_{is}Q_s \]

- \( EI_i \) Economic Importance
- \( A_{is} \) Share of consumption of material in a given end-use sector
- \( Q_s \) economic importance of each sector that requires raw material \( i \), measured by its value added

\[ SR_i = \sigma_i (1 - \rho_i) HHI_{WGI} \]

- \( SR_i \) supply risk index
- \( \sigma_i \) substitutability
- \( \rho_i \) recycling rate
- \( HHI \) Herfindahl-Hirschmann-Index
- \( WGI \) World Governance Indicator
monitoring critical raw materials

regularly updates
future orientation EU-RMI

fair and sustainable supply of raw materials from global markets (1st pillar)

- development policy and sustainable supply
- reinforcing raw material trade strategy

(Dodd-Frank-Act/USA: transparency measure)
future orientation EU-RMI

fostering sustainable supply within the EU (2nd pillar)

➢ national minerals policies
future orientation EU-RMI

boosting resource efficiency and promoting recycling (3rd pillar)

- EU-waste legislation
- R & D
- ecodesign
- improving competitiveness of recycling industry
recommendations

reducing consumption (primary production)

- enhancing resource efficiency and recycling
- safeguarding national deposits by land-use measures
- elimination of trade barriers and distortion of competition
- R&D (unconventional sources, recycling, substitution)
Intro
## annual demand of metals

<table>
<thead>
<tr>
<th></th>
<th>mobiles</th>
<th>PC</th>
<th>share of WP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ag</td>
<td>250 mg (ca. 300 t)</td>
<td>1000 mg (ca. 255 t)</td>
<td>2.75%</td>
</tr>
<tr>
<td>Au</td>
<td>24 mg (ca. 85 t)</td>
<td>220 mg (ca. 56 t)</td>
<td>3.5%</td>
</tr>
<tr>
<td>Pd</td>
<td>9 mg (ca. 31 t)</td>
<td>80 mg (ca. 20 t)</td>
<td>23%</td>
</tr>
<tr>
<td>Cu</td>
<td>9 g (ca. 11.000 t)</td>
<td>500 g (ca. 128.000 t)</td>
<td>0.9%</td>
</tr>
<tr>
<td>Co</td>
<td>3.8 g (ca. 4.500 t)</td>
<td>65 g (ca. 6.500 t)</td>
<td>17.7%</td>
</tr>
</tbody>
</table>

HAGELÜKEN, 2009;  
Indium – economic importance

about 1 billion products manufactured per year contain indium

Silver Corporation (2011)
Indium - application

EU-Commission (2010): Critical raw materials for the EU
Indium - application
major drivers for future demand
ITO
CIS thin films for solar cells (copper-indium-selenide)
LED, blue ray discs (indium-gallium-nitride)

Fraunhofer Institut (2009): Rohstoffe für Zukunftsstechnologien
Indium-tin-oxide (ITO) is normally used for the wafer-thin electrode under the glass surface of a touchscreen display - it's excellent at conducting slight currents and lets the colours of the display show through clearly
Indium - occurrence
by-product of Zn-production
no primary mining
## Indium - production

<table>
<thead>
<tr>
<th>Country</th>
<th>Production (in t; 2008)</th>
<th>EU imports (in t; 2006)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>30 5,3%</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>50 8,8%</td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>330 58,1%</td>
<td>47,3 81,3%</td>
</tr>
<tr>
<td>Japan</td>
<td>60 10,6%</td>
<td>0,5 0,9%</td>
</tr>
<tr>
<td>Korea</td>
<td>50 8,8%</td>
<td></td>
</tr>
<tr>
<td>Peru</td>
<td>6 1,1%</td>
<td>1,5 2,6%</td>
</tr>
<tr>
<td>Russia</td>
<td>12 2,1%</td>
<td>1,6 2,7%</td>
</tr>
<tr>
<td>Hong Kong</td>
<td></td>
<td>2,3 4,0%</td>
</tr>
<tr>
<td>Norway</td>
<td>0,6 1,0%</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>2,2 3,8%</td>
<td></td>
</tr>
<tr>
<td>Singapore</td>
<td>2,2 3,8%</td>
<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td></td>
<td></td>
</tr>
<tr>
<td>others</td>
<td>30 5,3%</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>568</strong></td>
<td><strong>58</strong></td>
</tr>
</tbody>
</table>

Source: USGS 2010; trade data provided by ComExt (CN 8112 92 81)

(1) Imports of lead and zinc
**Indium – production problems**

30 % of indium containing base metal concentrates still do not reach indium capable smelters

70 % of indium containing concentrates that do reach indium capable smelters are extracted at a rate of 50 %
Indium – application problems

Sputtering, the process in which ITO is deposited as a thin-film coating onto a substrate, is highly inefficient; approximately 30% of an ITO target material is deposited onto the substrate.

USGS (2011)
**Indium - reserves** (static):
100 years mining reserves at a rate of 500 t of virgin indium per year
30 years residues reserves at a rate of 500 t per year
reclaimed indium
dynamic adaption of reserve quantities by continuous on-going exploration

Indium Corporation (2011)
Substitution of ITO by PET as carrier and mixture of carbon-nanotubes and electrically conducting polymers Sb-Sn-Oxide-coatings
significant impact on the conception of environmental issues

minerals and energy resources would expire within 100 years of publication

gold would run out in 1981, silver and mercury in 1985, zinc in 1990