Developments and Trends in the German Mineral Resources Sector

German Day at PDAC 2014

The Mineral Resources Value Adding Chain – More Efficiency with German Technology

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Germany’s Exports and Imports of Raw Materials

- Potash: 432%
- Sulphur: 308%
- Gypsum/anhydrite
- Aggregates
- Rock Salt
- Limestone and dolomite
- Lignite
- Kaolin
- Feldspar
- Lead*
- Aluminium*
- Bentonite
- Copper*
- Copper
- Hard coal
- Fluorite
- Baryte
- Natural gas
- Petroleum
- Talc
- Magnesite
- Phosphate
- Graphite
- Metal ores and concentrates

(2010; BGR database)
German Raw Materials Imports in 2012

- Imports 2012: 320.3 m t
- Value: 150.5 bn €

- Steel alloys: 1%
- Iron and steel: 15%
- Non-ferrous metals: 4%
- Hard coal: 14%
- Gas: 29%
- Oil: 29%

- Value: 40% Gas
- Value: 13% Oil
- Value: 7% Precious metals
- Value: 5% Steel alloys

(BGR database)
Germany is Costumer Throughout the World 2011

(BGR database)
Share of Global Demand

Industrialised countries’ average shares of total world demand for aluminium, steel, copper, zinc and tin

(University of Bonn, M. Stürmer, study commissioned and funded by DERA, 2012)
BRIC states' average shares of total world demand for aluminium, steel, copper, zinc and tin

(University of Bonn, M. Stürmer, study commissioned and funded by DERA, 2012)
What Are the Problems for the German Companies?

- Fluctuating prices for raw materials and energy: 92%
- Insecurity of supply: 50%
- Currency risks: 50%
- Economic risks: 38%
- Shorter economic cycles: 30%
- Political risks: 26%

(poll by Inverto, 2012)
High-tech Metals are Important for Functionality & Performance

Today: powerful computer chips consist of up to 60 elements

(T. McManus, Intel Corp., 2006)
Market Penetration of New Products

Market penetration times on the US market (Berner 2000)

- Radio (40 years)
- Phone (90 years)
- TV (15 years)
- Cable TV (10 years)
- Internet (<5 years)
- Personal computer
- Mobile phone
- Tamagotchi (15 months)
Future Demand - The Influence of Emerging Technologies: Breakthrough Difficult to Predict

For selected emerging technologies
- Possible demand 2030
- Demand 2006
- Possible demand 2025
- Demand 2010

Expected increases in demand for selected raw materials in correlation to the current supply and the corresponding supply risks

(Tercero Espinoza (2012): „The role of emerging technologies in a rapidly changing demand for mineral raw materials“, Polinares)
Germany’s Dependence on Imports in 2012

BGR database
## DERA-Raw Materials List 2012 – Country Concentration and Risk of Mining Production

<table>
<thead>
<tr>
<th>Material</th>
<th>HHI</th>
<th>GLR</th>
<th>Concentration</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rare Earths</strong></td>
<td>9,520</td>
<td>-0.56</td>
<td>USA, Russia, China</td>
<td>99.9%</td>
</tr>
<tr>
<td>Niobium</td>
<td>8,563</td>
<td>0.10</td>
<td>Nigeria, Canada, Brasil</td>
<td>99.6%</td>
</tr>
<tr>
<td>Antimony</td>
<td>8,041</td>
<td>-0.47</td>
<td>Tadschikistan, Australia, China</td>
<td>93.7%</td>
</tr>
<tr>
<td>Tungsten</td>
<td>7,468</td>
<td>-0.41</td>
<td>Russia, Canada, China</td>
<td>92.8%</td>
</tr>
<tr>
<td>Graphite</td>
<td>4,361</td>
<td>-0.44</td>
<td>Brasil, India, China</td>
<td>83.8%</td>
</tr>
<tr>
<td>Magnesite</td>
<td>3,227</td>
<td>-0.34</td>
<td>Turk, Russia, China</td>
<td>76.3%</td>
</tr>
<tr>
<td>Zirkonium</td>
<td>2,930</td>
<td>0.62</td>
<td>China, South Africa, Australia</td>
<td>84.6%</td>
</tr>
</tbody>
</table>

- **High Risk**
- **Medium Risk**
- **Low Risk**
Main Services of the German Mineral Resources Agency (DERA) at the BGR

- **DERA Industry Workshops**
  - Specific advice for the industry
- **DERA Raw Materials List**
  - Assessment and recommendations
  - Detailed raw materials risk analysis
Federal Government Exploration Support Programme

• BMWi-Program to foster exploration

• to improve the supply for Germany and the EU with critical non-energy mineral commodities:
  Antimony, Beryllium, Cobalt, Fluorspar, Gallium, Germanium, Graphite, Indium, Magnesium, Niobium, PGMs (Platinum Group Metals), Rare Earths, Tantalum and Tungsten

• instrument to stimulate German enterprises, to invest in the national and international mining sector on a long-term basis (to reduce risks of project start-up)

• effective since: January 1st, 2013
• term: 3 years for the time being
• volume 27.5 m €
• disbursed as a conditionally repayable loan
Diversification of Supply – Bilateral Raw Materials Partnerships
Deep-sea mining of mineral resources
– chances and challenges of a new field with economic potential
Conclusions

• Germany depends on the global raw materials markets; unrestricted, far and transparent markets are mandatory
• options: strengthen international cooperation (e.g. bilateral raw materials partnerships), explore domestic potential (e.g. exploration support programme)
• No shortages with respect to geological availability
• Shortages are caused by the market situation; country concentration, geostrategic risks
• High-tech metals are mostly by-products; their production depends on the production of major elements (like Pb, Zn, Cu)
• Need for new technologies for better by-product production (e.g. Ge from coal ash and slags)
• Development of unconventional deposits (marine mineral resources)
• Research/development of recycling technologies for high-tech metals