Easier Access to Arctic Hydrocarbons and Mineral Resources?

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German Raw Materials Imports in 2006

- **2003:** 55 Bill. €
- **2004:** 60 Bill. €
- **2005:** 77 Bill. €
- **Provisional data:**
  - **2007:** 105 Bill. €
High Commodity Prices on World Market

Probably high market prices for the next years ↔ other than normal cyclic development of markets

Limited capacities for extraction, processing and transport ↔ no problems regarding geological availability

Strong international competition over resource deposits (even in politically unstable regions)

Investment strategies China / India: Securing own national resource supply

Oligopolisation trend in the international mining industry: Impact on commodity price development

Security related impacts: Supply disruptions?
German Raw Material Summit in March 2007: New Raw Material Strategy

Coordination of different policy fields with respect to raw materials
Counteract trade distortions
Integration of mineral policy issues in development policies
Support EITI: Extractive Industries Transparency Initiative
Certification of production / processing / trade chain: Pilot project Africa
Support backward integration of German metal working industries
Knowledge and use of potential of mining within Germany
Enhance international raw material data base
Raw material efficiency, substitution, recycling
Diversification of raw material supply sources by
  • State guarantees
  • Reconnaissance / exploration in frontier areas
  • R & D: Exploration methodologies

Definition of a (new) German / European foreign minerals policy
Three different definitions:

1. astronomical boundary: Arctic circle, 66° 32’ 51" N
2. climatologic-geographical boundary: 10°C-July isotherm
3. ecological boundary: outer edge of the continuous permafrost zone
Arctic – present and future raw material potential

Energy resources
- Oil
- Gas
- Coal
- Uranium

Metal ores
Minerals
The Last Giant Oil Frontier
Access to a Trillion Dollars in oil and natural gas!

The Arctic sea bed holds billions of barrels of oil and natural gas-up to 25 percent of the World’s undiscovered reserves according to the U.S. Geological Survey - with experts calling the region... the next Saudi Arabia.

National Geographic News
Oil and gas potential of the Arctic

"Arctic oil bonanza"

22 percent of world resources could be found in these areas

Source: USGS
Oil and gas potential in the arctic

Discovered

Yet to Find

Quelle: Shell & modified USGS data
Barents Sea – a future oil and gas province

Quelle: Upstream
Metals in the Arctic

- High Lake (Cu, Au)
- Hope Bay (Au)
- Mary River (Fe)
- Ambler (Cu, Zn)
- Red Dog (Zn, Pb)
- Skaergaard (Au, Pt)
- Aitik (Cu, Au)
- Keivitsa (Ni, Cu)
- Kola (Ni, Cu)
- Malmbjerg (Mo)
- Taimyrsky (Ni, Cu)
- Norilsk (Ni, PGM)
- Oktyabr (Ni, Cu)
- Talmyrsky (Ni, Cu)
- Skalisty (Ni, Cu)
- Olkon / Kovdorsky / Zhdanovskoye (Ni, Cu, Fe)

- in operation
- exploration project

Legend:
- Gold
- Blei
- Kupfer
- Zink
- Eisenerz
- PGM
- Molybdän
- Nickel

Map showing locations such as Hope Bay in Alaska, Red Dog in Alaska, and Ambler in the state of Alaska, along with other important mining sites in the Arctic region.
Metal ore deposit exploration in the Arctic

- Increasing number of exploration targets / projects

- E. g. Greenland: Exploration licences
  2004: 22 Concessions
  2008: 77 Concessions

- Metal ore production of existing deposits will contribute significantly to world supply in the near future, e. g.:
  - **Malmbjerg-project** (Quadra Mining): planned 10,000 t/a molybdenum, ca. 5.6 % of world production (begin of production in 2010 / 2011).
  - **Finland, Keivitsa-project** (Scandinavian Minerals): one of the worlds largest sulfidic nickel deposits (begin of production in 2010).

- German interests in the **Mary-River-Project** (Canada): Letter of Intent between ThyssenKrupp Steel and Baffinland Iron Mines Corp. on more than 3 mill. tonnes of iron ore/a (beginning in 2013).
Potential of non metallic mineral deposits in the Arctic

Kirovsk
Kovdor
Purnu
Oksedal Bredehorn
Karstryggen
Eqalussuit
Kovdor aus dem All

Industrial minerals of national interest
- In production
- Possible future production

Norway north of the arctic circle
Russia
1954 discovery of first kimberlite pipe in Jakutia
1958 begin production Mirny GOK
1992 foundation of ALROSA AG (77 % state owned)

Canada:
Ekati Mine (80 % BHP Billiton)
1991 discovery, 1998 begin production
Reserves: 54 Mio. ct.

Diavik Mine (60 % Rio Tinto, 40 % Harry Winston Diamond Corp.)
1994 discovery, 2003 begin production
Reserves: 82 Mio. ct.

Jericho Mine (100 % Tahera Diamond Corp.)
1998 discovery, 2006 begin production
Reserves: 3 Mio. ct.

Snap Lake (De Beers)
1996 discovery, 2008 begin production
Reserves: 39 Mio. ct.

Finland:
1980er beginning exploration for diamond
Deposits by junior mining companies
Observations and scenarios on the future of the arctic ice shield

1979 (observed)

2003 (observed)

2010-2030 (forecast)

2040-2060 (scenario)

2070-2090 (scenario)

Quelle: ACIA
Transport routes for mineral resources from the Russian Arctic

- **Transportation:**
  - Crude oil from Arkhangelsk, Vitino, Indiga, Varandey, Prirazlomnoye, Dikson, Obskaya Guba to Oilfields of the Western Siberia
  - Nickel, copper, platinoids from Dudinka (Norilsk Nickel)
  - Timber from Arkhangelsk Igarka

- **Ports of the North-Western Europe:**
  - Rotterdam, London, St. Petersburg, Moscow, Helsinki, Stockholm, Oslo, Murmansk, Indiga, Varandey, Prirazlomnoye, Dikson, Dudinka, Yamburg
Northern sea routes:

- NE-passage
- NW-passage
BGR research projects in the Arctic

Joint study on petroleum potential of Russian circum-arctic basins between BGR and Karpinsky Institute (VSEGEI, St.Petersburg)
Russian Federation considers the Lomonosov-ridge to be a „submarine elevation“

Rechtlicher Festlandsockel der Russischen Föderation im arktischen Ozean wie in der Submission an UN-CLCS im Jahre 2001 beansprucht - Die UN-CLCS hat Wiedervorlage mit „major revisions“ verlangt.
Arctic - challenges and problems

- Long distances between production sites and industry customers
- Difficult climatic and environmental situation
- Access restrictions
- Lack of infrastructure
- Changes of permafrost conditions
- Influence of climate change
- Uncertainties on territorial claims: foreign policy implications and security risks
Chances vs. risks

**Challenges:**

*Distances to customers, access, lack of infrastructure, climatic conditions, change of permafrost*

Chances:

- Diversification of resource sources
- Access to new deposits
- Maritime technologies
- International trade routes
- Strategic partnerships
- R & D

Risks:

- Sensitive environment
  *Arctic Council Oil and Gas Assessment*
- Territorial claims
- Climate change
- Meteorological development

*P. JONES, M. SALOMON (Sept. 2007)*
Conclusion

• The Arctic has a highly interesting potential for oil / gas and mineral deposits

• Easier access to these deposits caused by climate change is not predictable

• But: Economical developments (e.g. market prices) and technological innovations (e.g. sub-ice production facilities) will open up new possibilities for energy resources and minerals extraction in the Arctic