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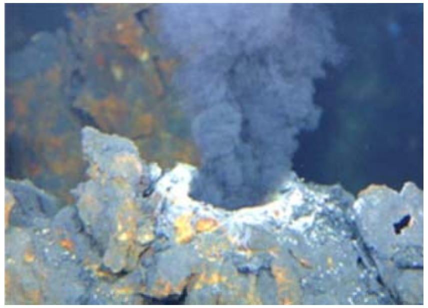
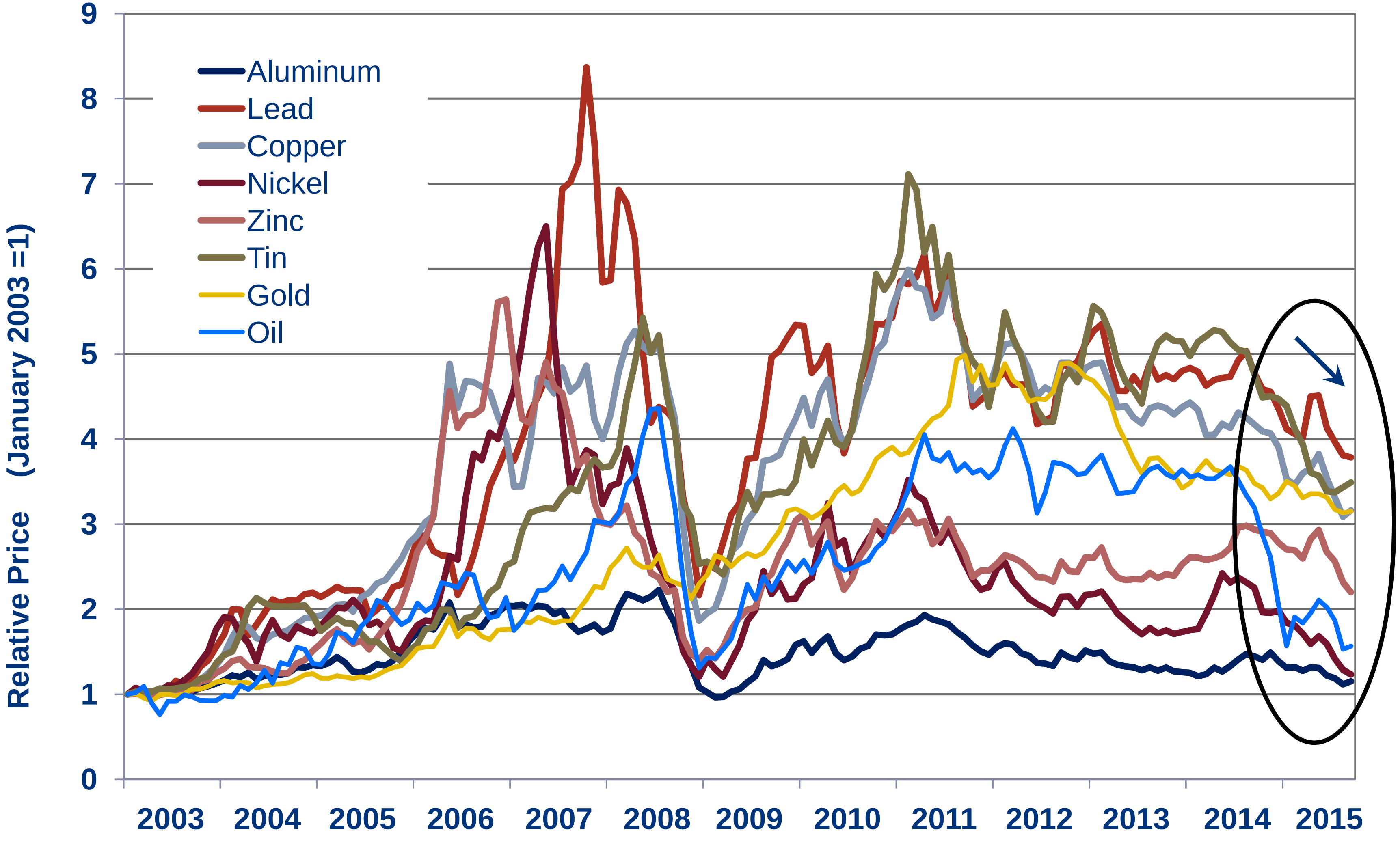



Raw Materials Situation across the World

Prof. Dr. Hans-Joachim Kümpel
Bundesanstalt für Geowissenschaften und Rohstoffe (BGR)

Berlin, 10.11.2015

Relative Prices: LME Metals and Oil since 2003



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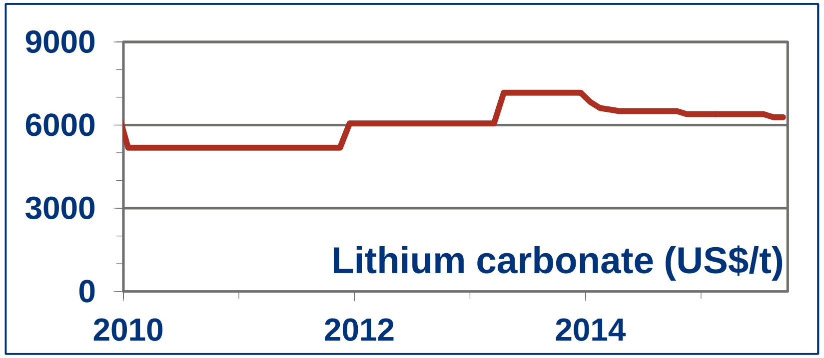
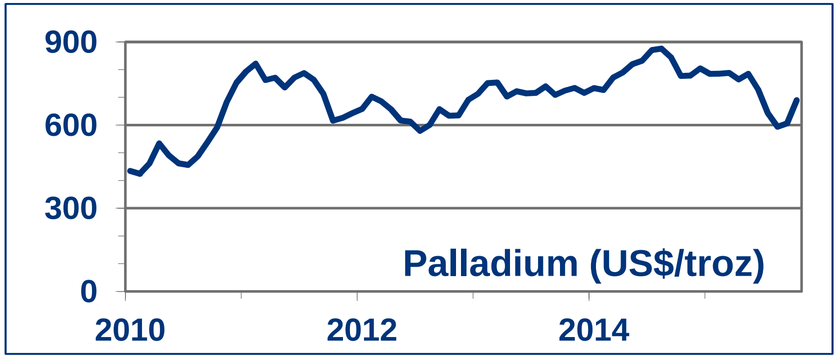
source: DERA, 2015

Prices: Precious and special metals

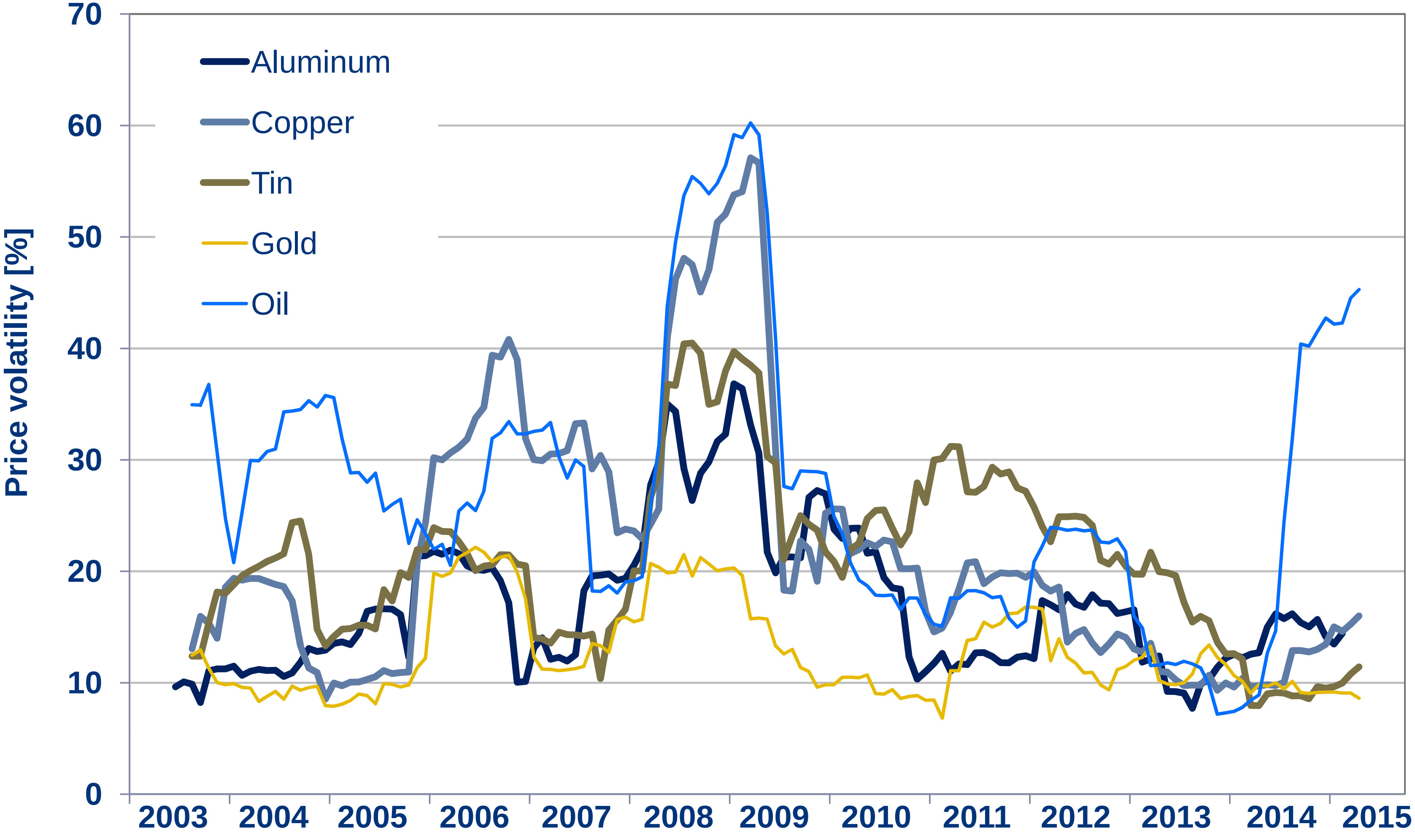




Raw Material / Specification		10/2014 – 9/2015 change compared to 2010 – 2014
Rare Earths:	dysprosium (oxide), min. 99 % fob China	-62.1 %
Selenium:	min. 99.5 %, free market, in warehouse	-54.1 %
Antimony:	regulus, 99.65 %, free market; in warehouse	-27.8 %
Platinum:	99.95 %, London, in warehouse	-26.8 %
Indium:	ingots, min. 99.97 %, free market, in warehouse	-15.8 %
Cobalt:	high grade, min. 99.8 %, MB free market, in warehouse	-12.9 %
Lithium:	carbonate, large contracts, USA, delivered continental	6.7 %
Palladium:	99.95 %, London, in warehouse	7.4 %
Germanium:	dioxide, min. 99.99 %, MB free market, in warehouse	10.9 %

source: DERA, 2015

Price Volatility: LME Metals and Oil since 2004



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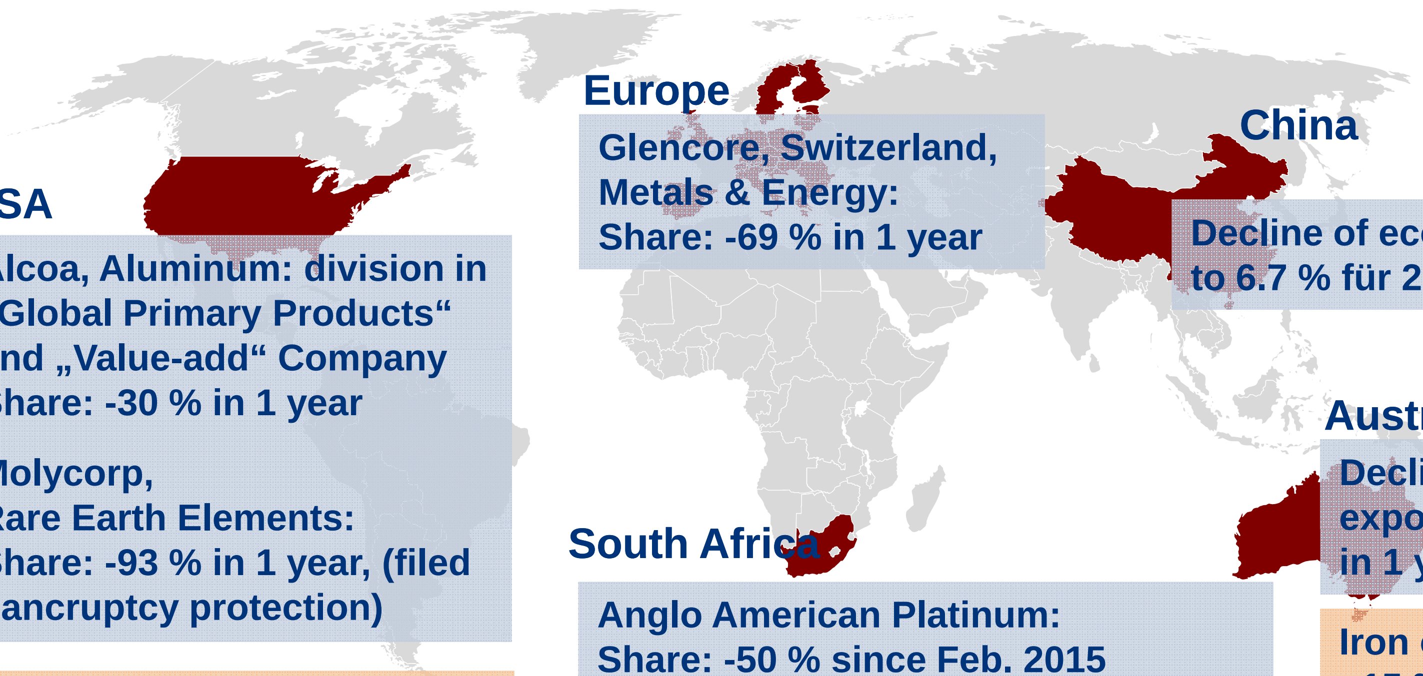
source: DERA, 2015

Raw materials situation across the world:
Current developments at the raw materials markets (selection)



USA

Alcoa, Aluminum: division in „Global Primary Products“ and „Value-add“ Company
Share: -30 % in 1 year

Molycorp,
Rare Earth Elements:
Share: -93 % in 1 year, (filed bancruptcy protection)

Tesla:
Erection of a Gigafactory for batteries in Nevada

Europe

Glencore, Switzerland,
Metals & Energy:
Share: -69 % in 1 year

South Africa

Anglo American Platinum:
Share: -50 % since Feb. 2015
Sale of Rustenburg Operations (PGM) to Sibanye Gold Ltd.
(Share of China 20 %)

China

Decline of economic growth to 6.7 % für 2016 (OECD)

Australia

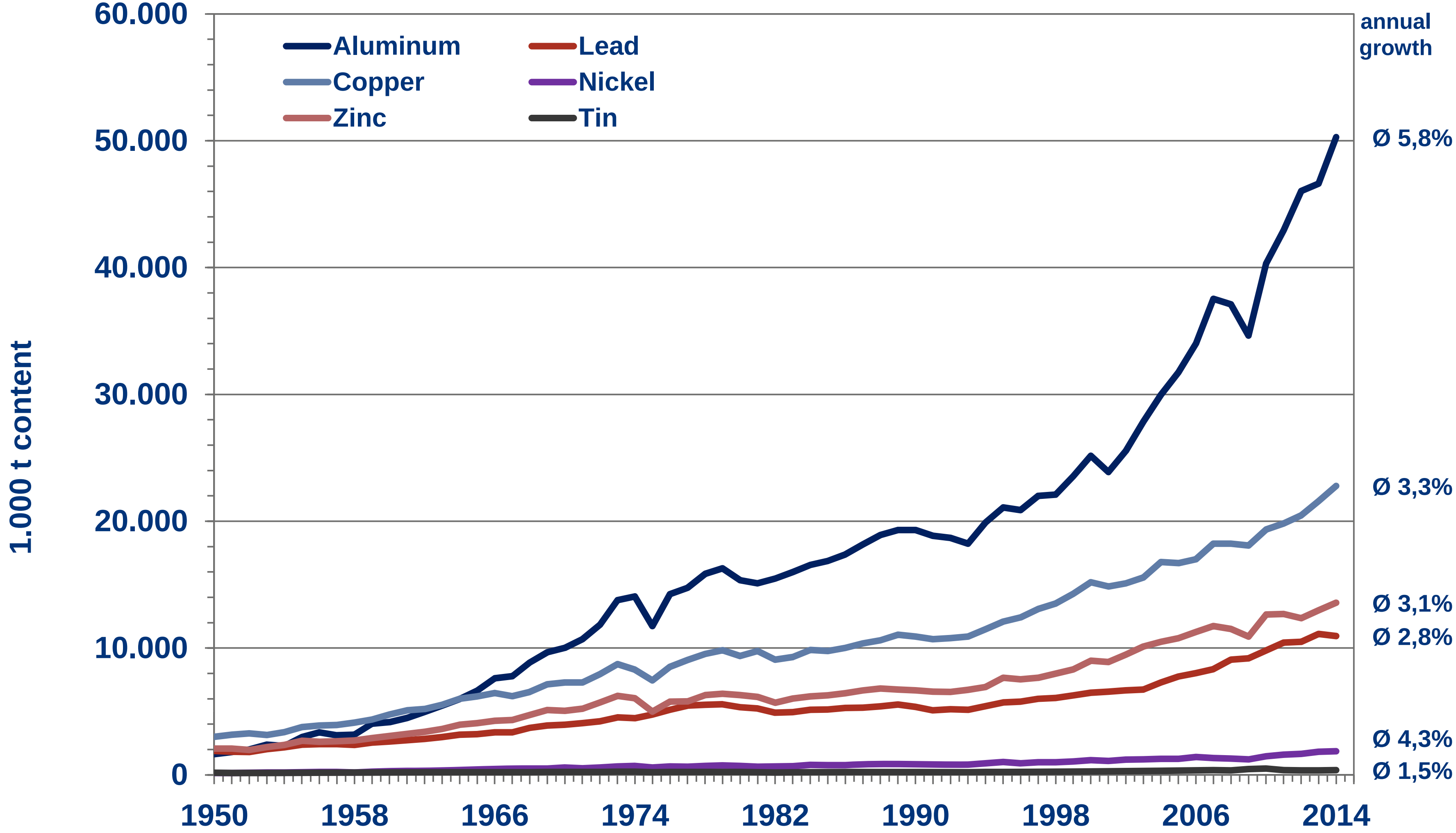
Decline of ore exports by 34 % in 1 year

Iron ore exports +15 % in 2015

- Massive decline at more or less all prices for industrial metals and mining shares, surplus
- Still high demand, global GDP in 2016 estimated to 3.8 % (IMF)
- New demand boom: Observe India; if necessary new impulses from new technologies

source: DERA, 2015

Global demand of raw materials: Selected metals



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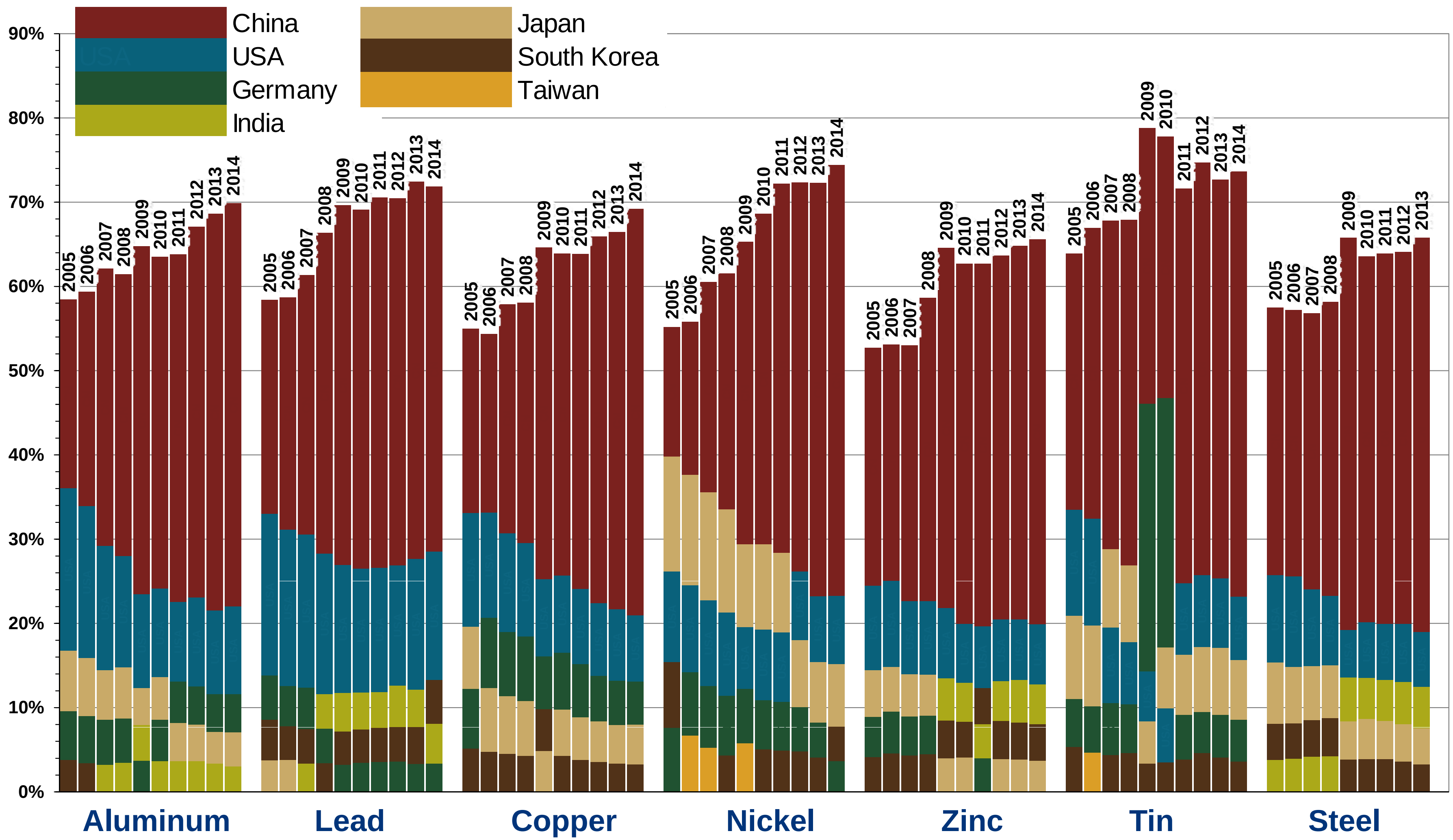
source: DERA, 2015

Global demand of raw materials:
Share of the Top 5 consumers of important metals



source: DERA, 2015

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Global demand of raw materials:
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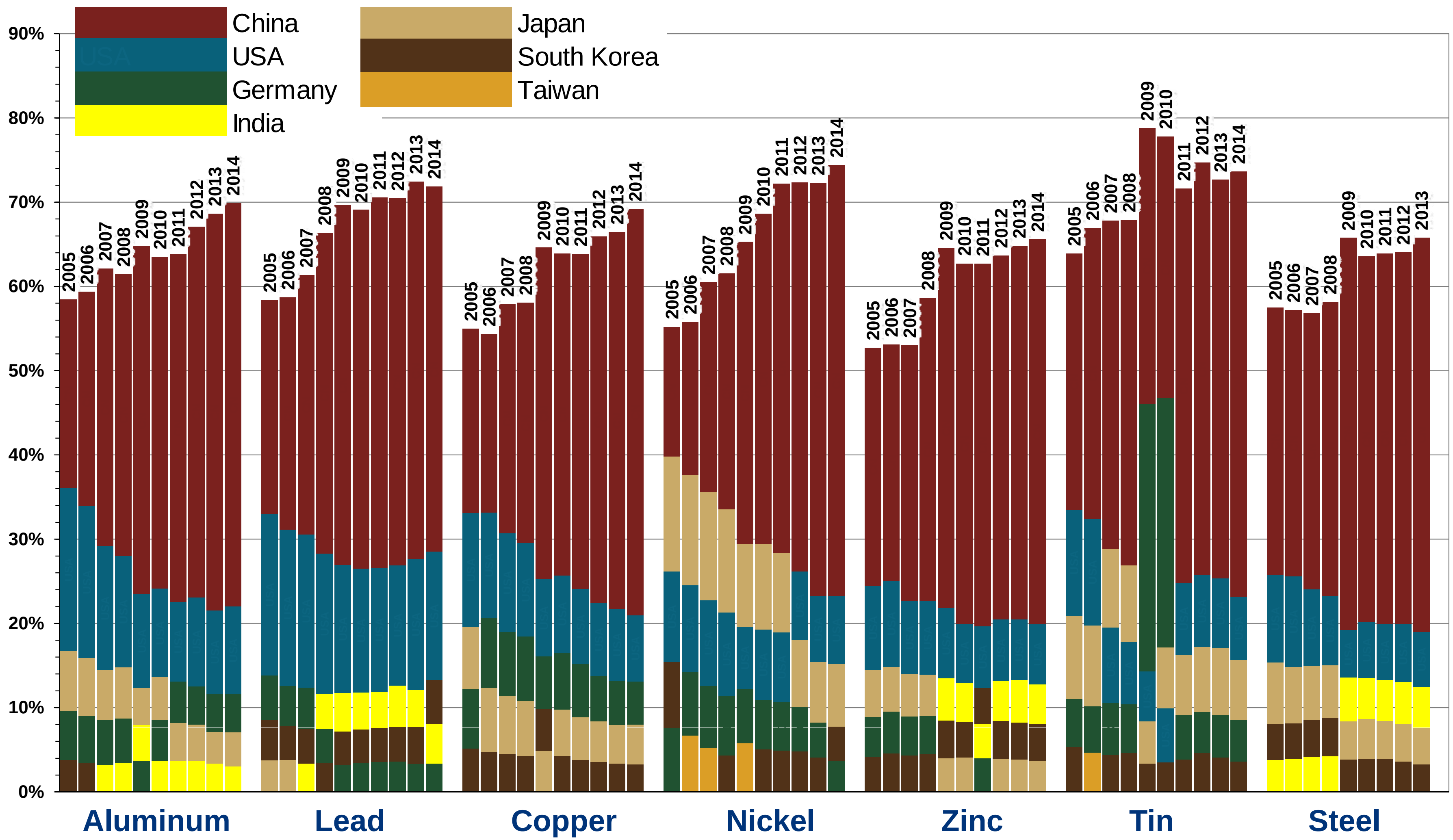
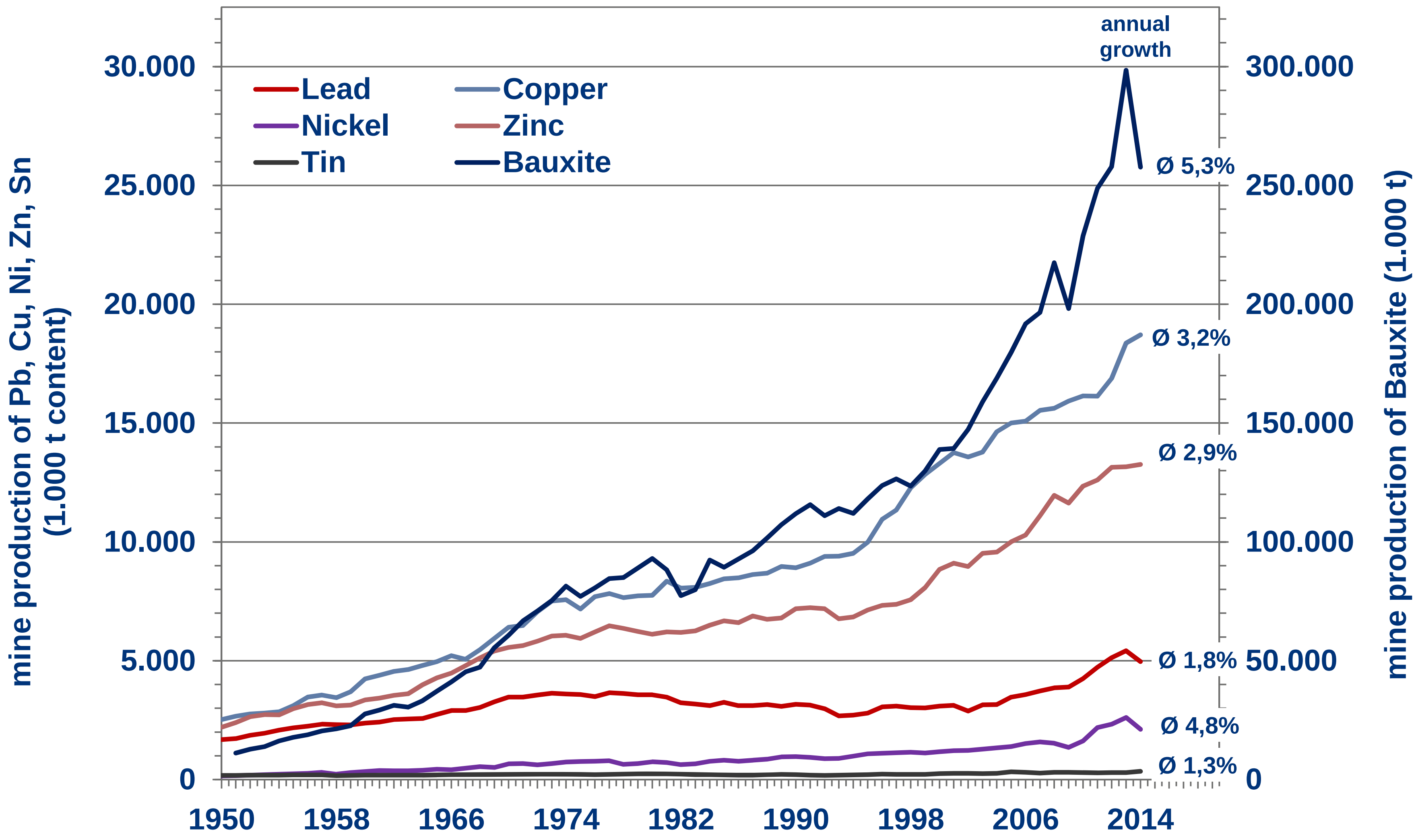


source: DERA, 2015

Global supply of raw materials:
Mine production of selected metals



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source: DERA, 2015

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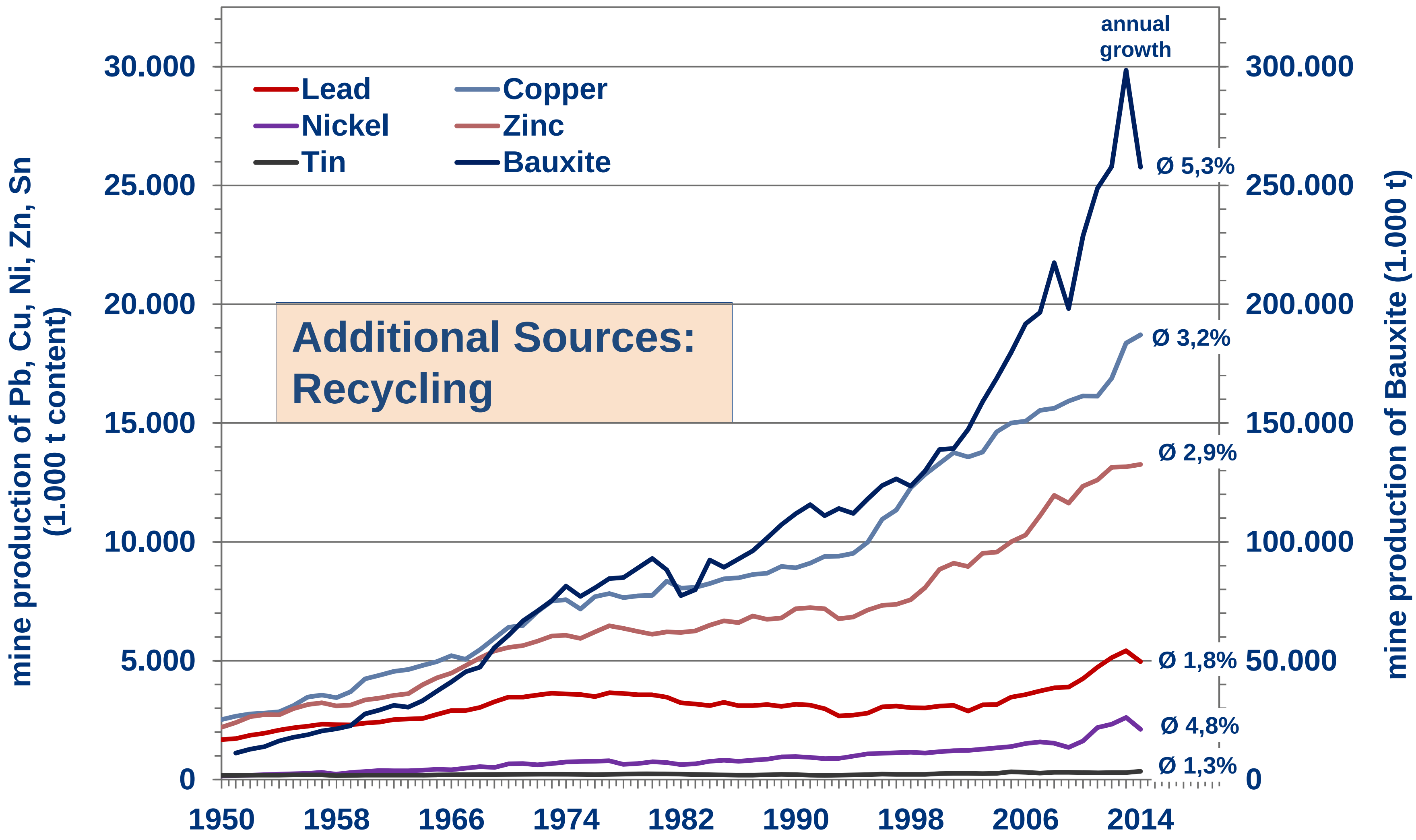

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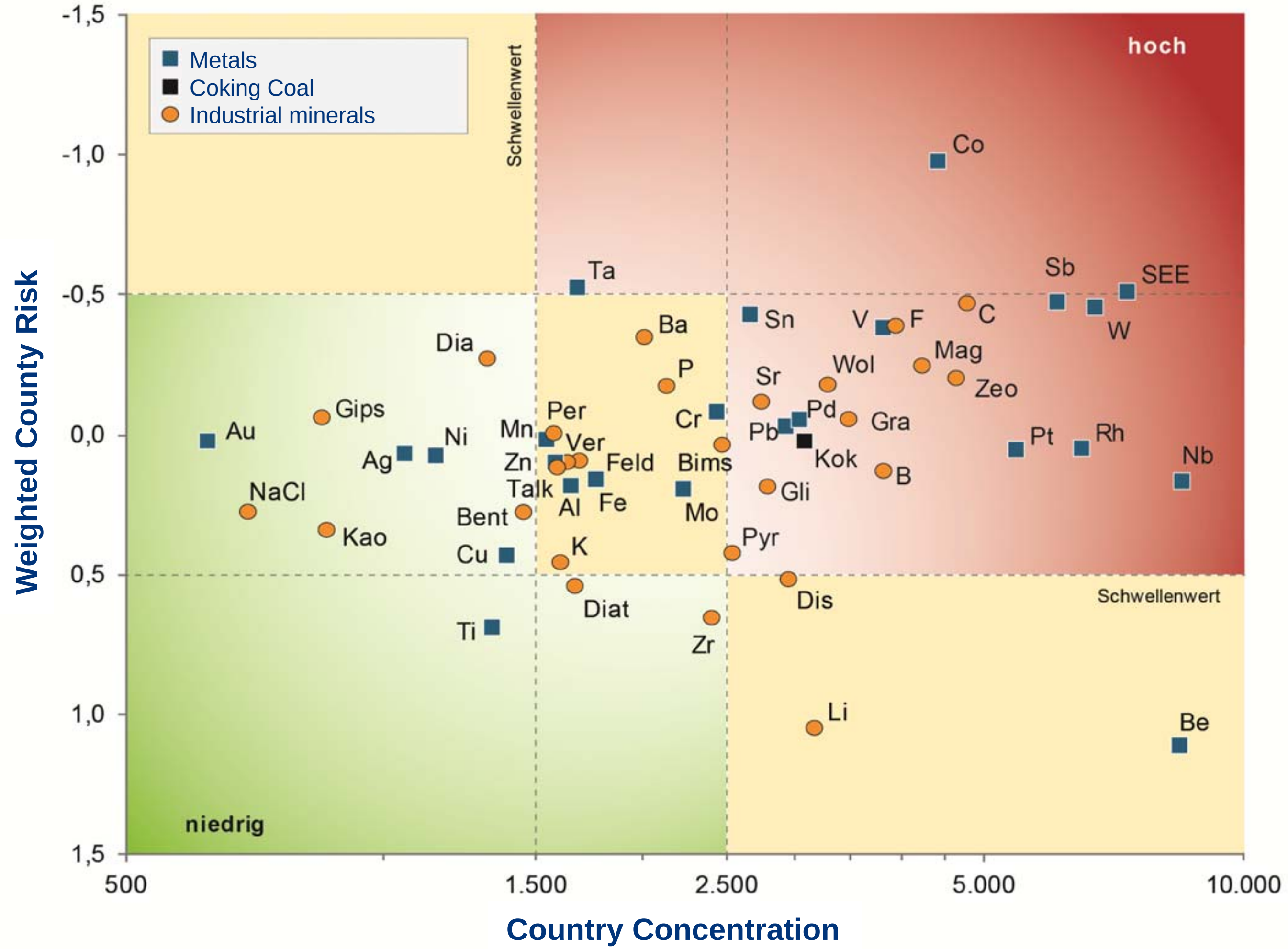
source: DERA, 2015

Potential price and supply risks: DERA Raw Materials List

Country Concentration and Weighted Country Risk of Mine Production



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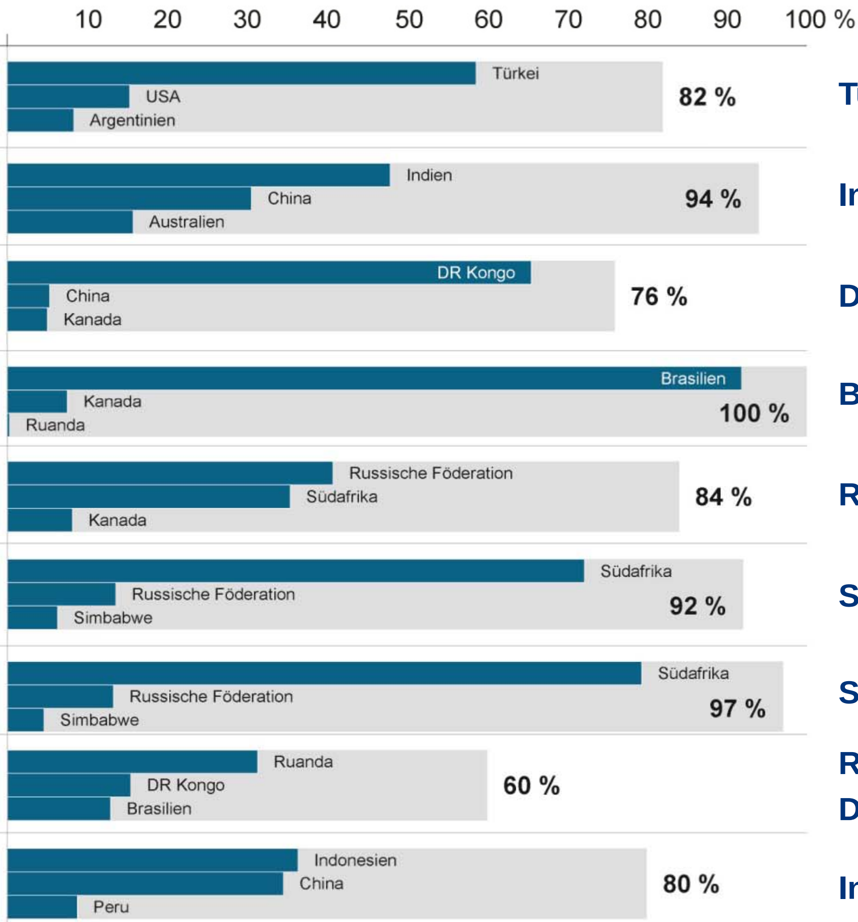
source: DERA, 2014

Potential price and supply risks: DERA Raw Materials List 2014

Country concentration of mine production beside China

Risk Type 3:

	HHI	GLR	
Borates	3.825	0,13	Turkey: 59%
Granate	3.484	–0,06	India: 48%
Cobalt	4.414	–0,98	DR Congo: 65%
Niobium	8.497	0,16	Brasil: 92%
Palladium	3.044	–0,06	Russia: 41%
Platinum	5.447	0,05	South Africa: 72%
Rhodium	6.492	0,04	South Africa: 79%
Tantalum	1.678	–0,53	Ruanda: 31% DR Congo: 15%
Tin	2.667	–0,44	Indonesia: 36%



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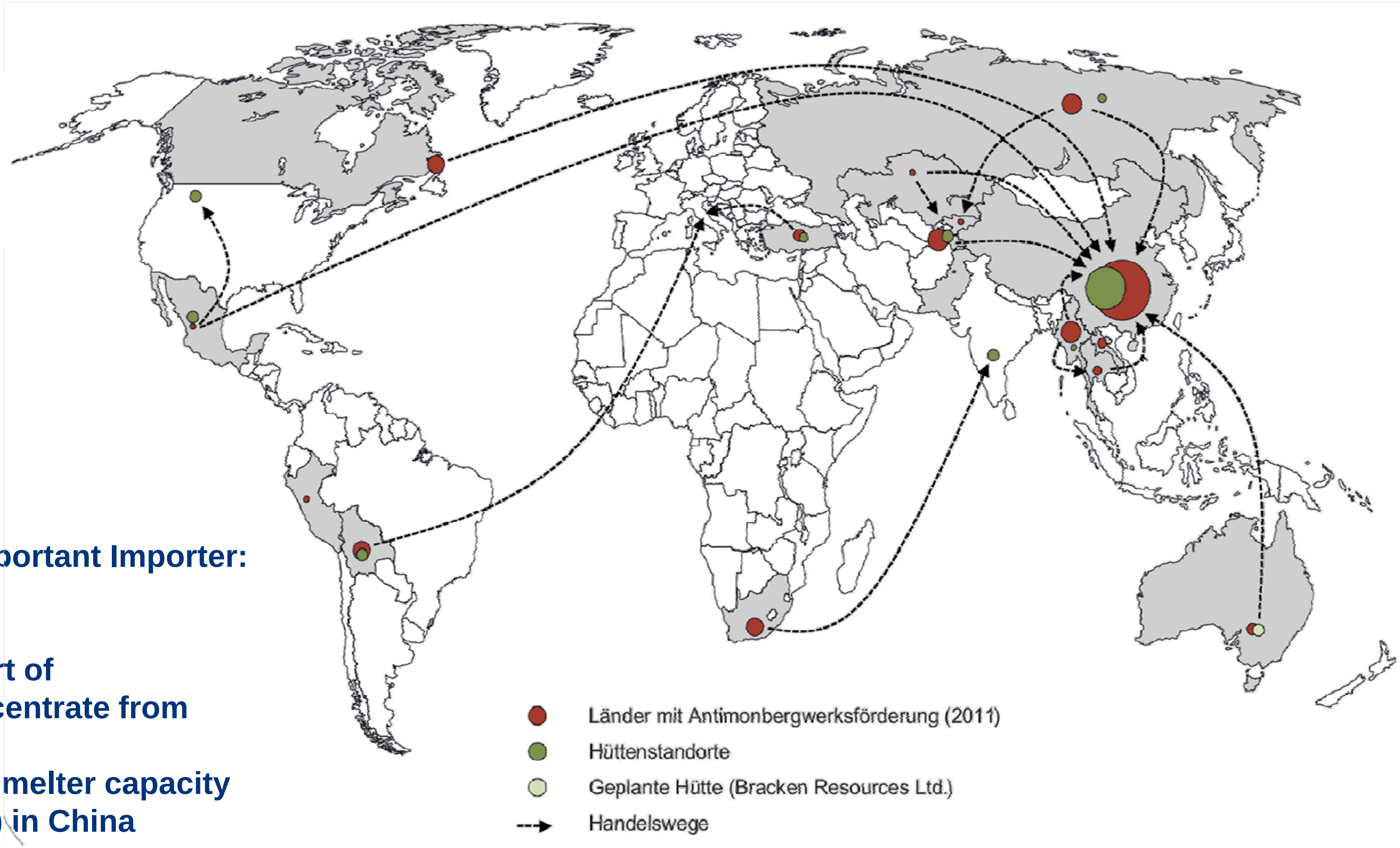
source: DERA, 2014

Raw materials trade routes:
Example Antimony Ore & Concentrate



- **most important Importer: China**
- **no export of Ore/Concentrate from China**
- **largest smelter capacity (globally) in China**

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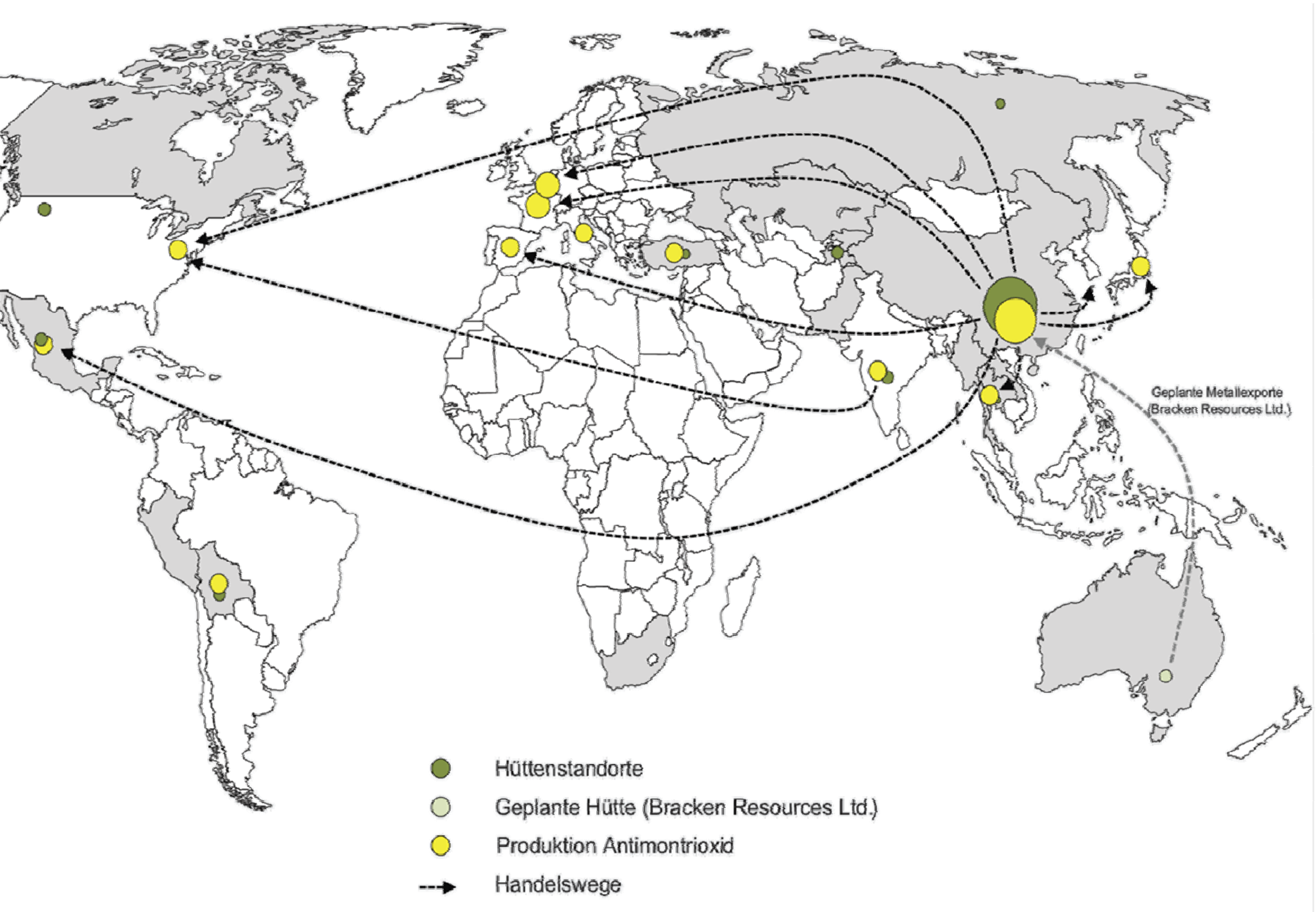
source: DERA, 2013

Raw materials trade routes:
Example Antimony Metal

- **Most important producer of Antimon Metal: China**

- **Official exports from China significantly lower than global Chinese exports**

- **Most important producer of Antimony-Troxide: China**



source: DERA, 2013

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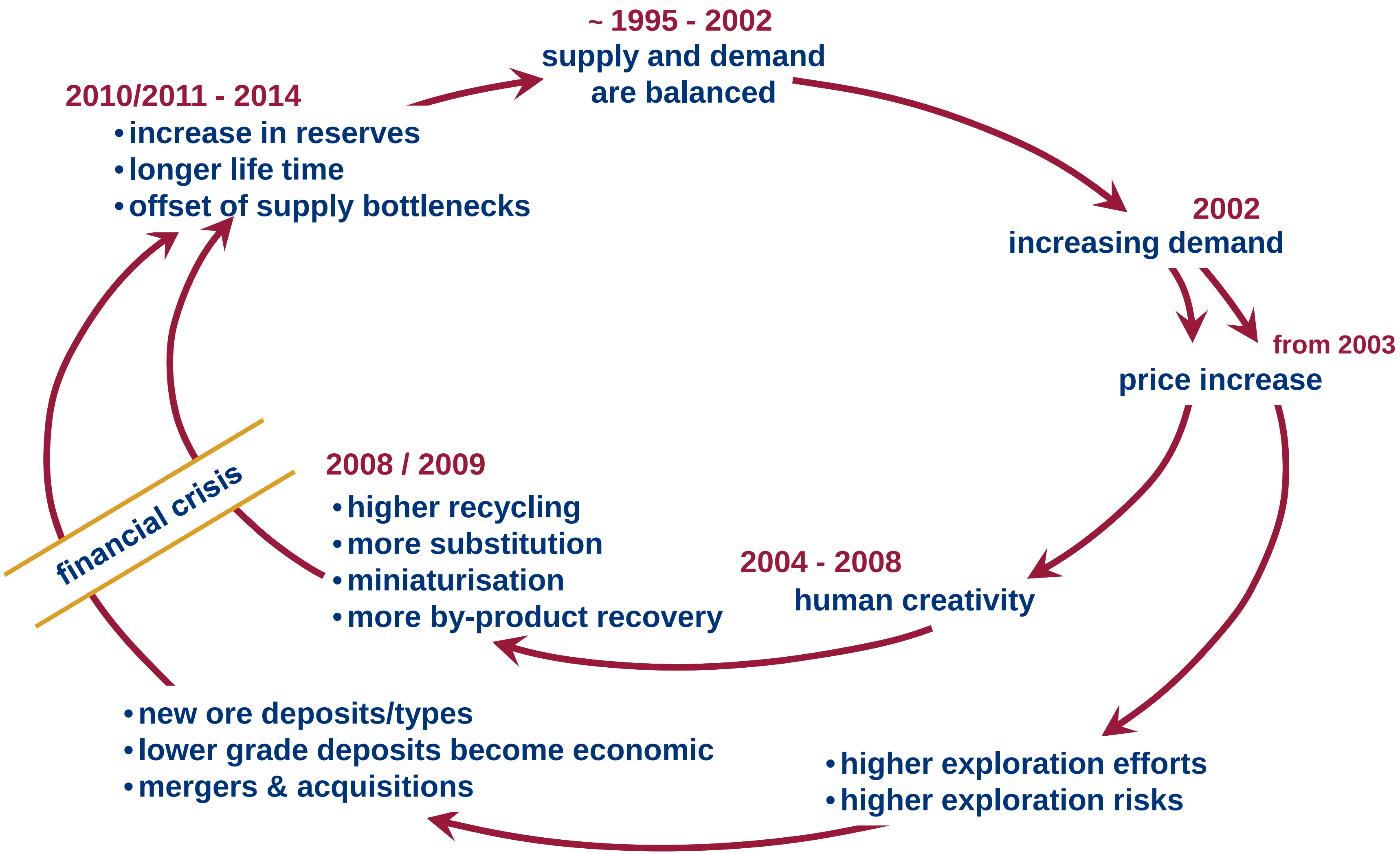
Potential sources of raw materials:
Cycle of minerals supply



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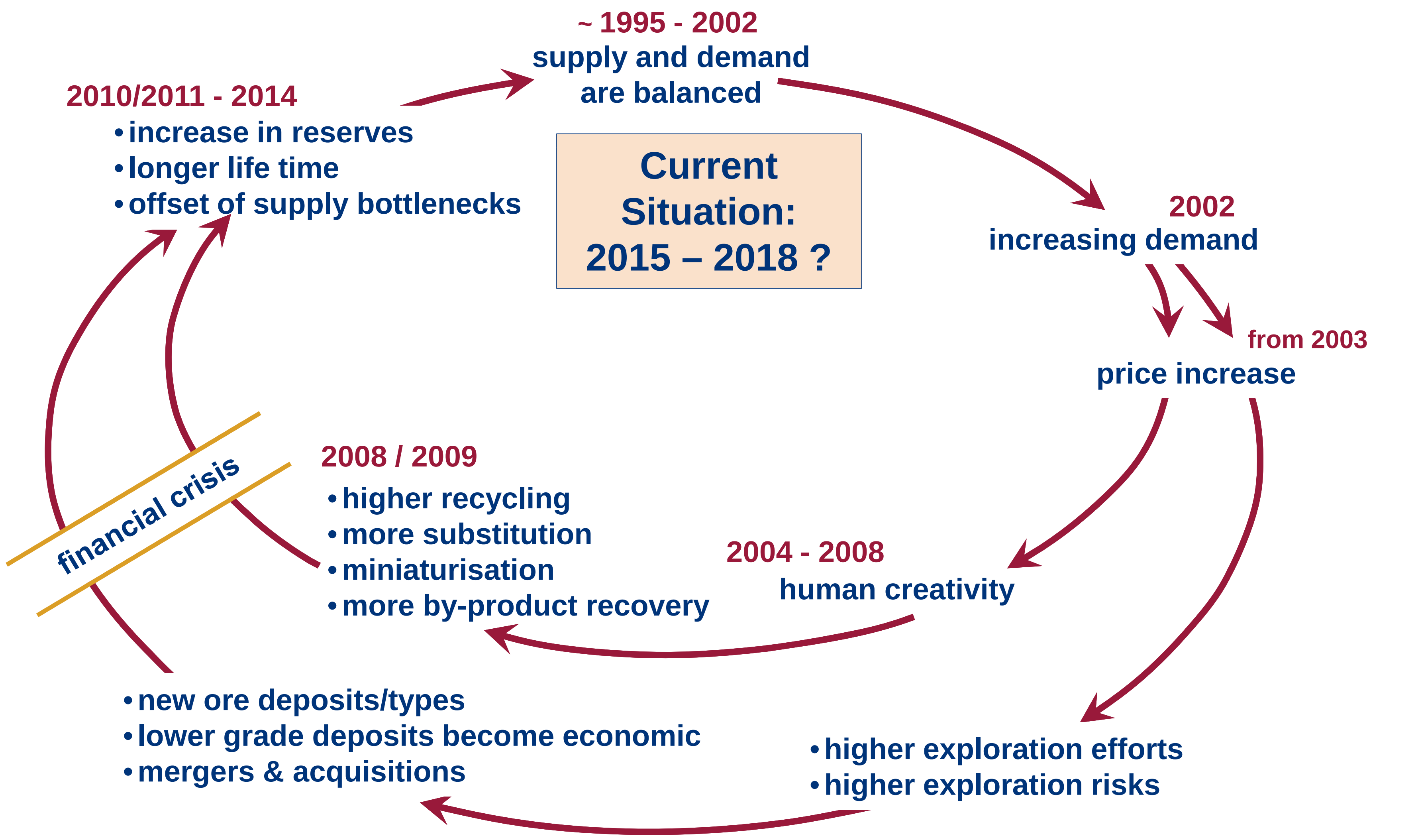
Cycle of minerals supply



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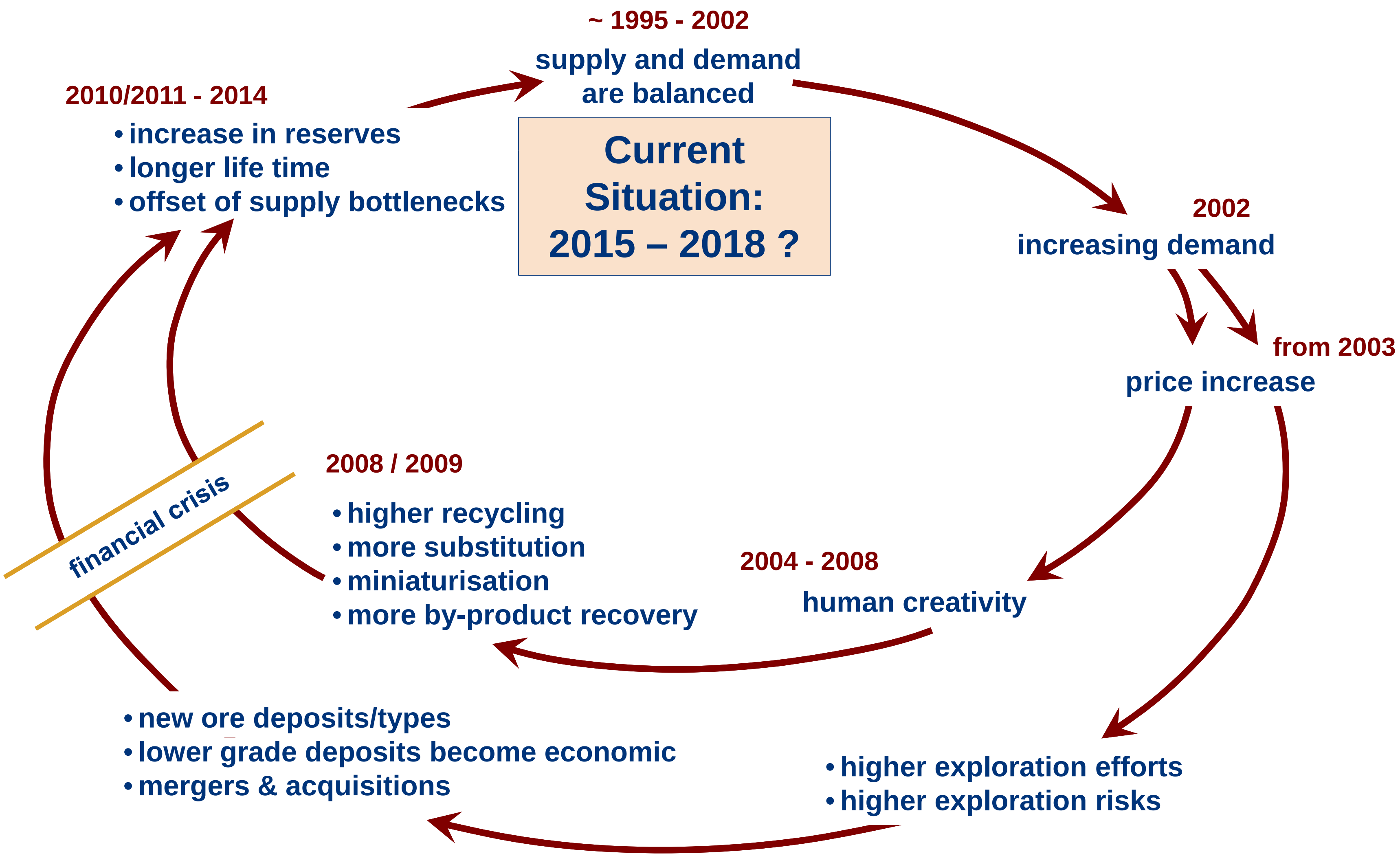
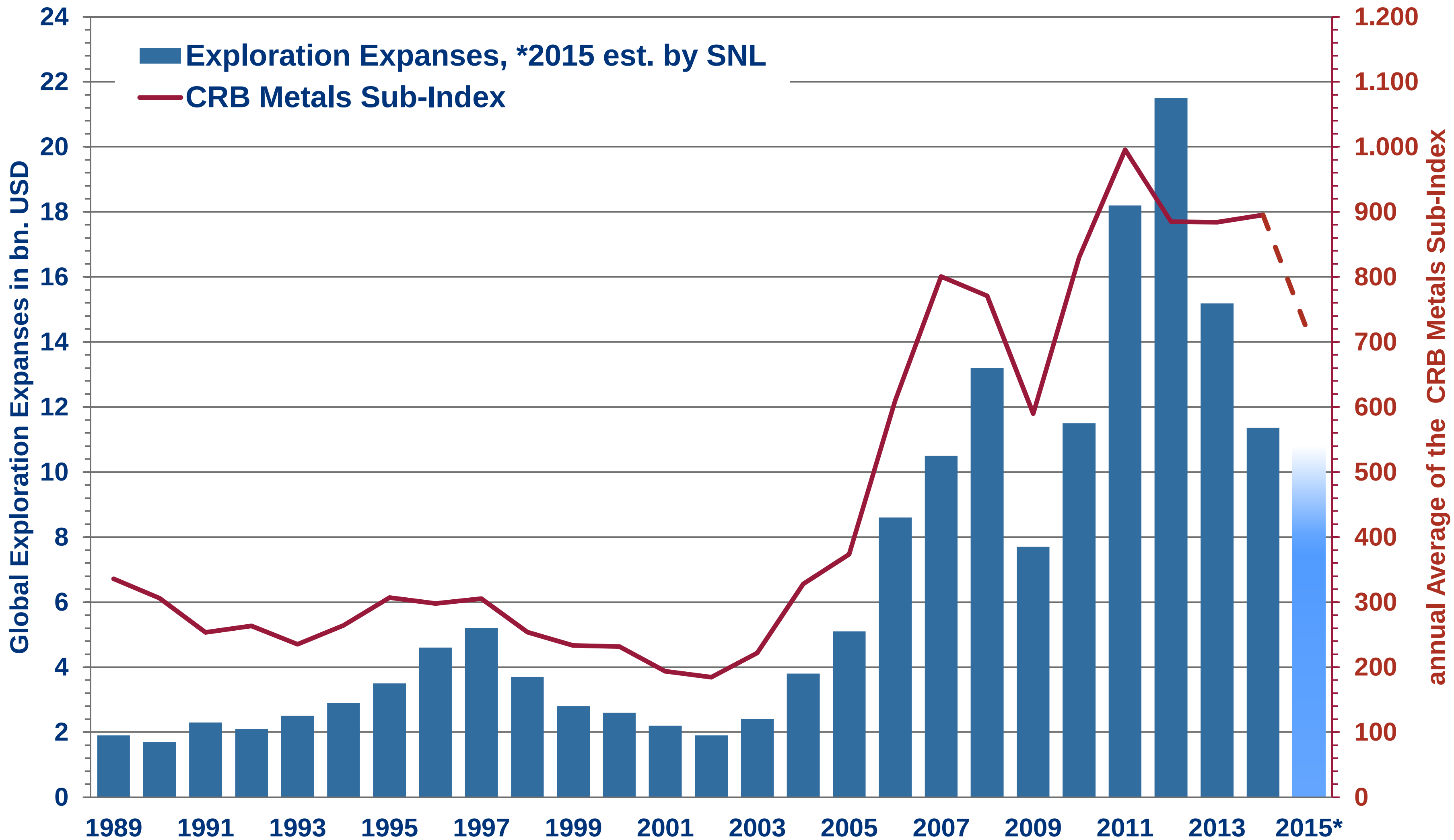


Potential sources of raw materials
Development of exploration expanses vs. metal prices



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sources: CRB, 2014; SNL, 2014 (est. 2015)

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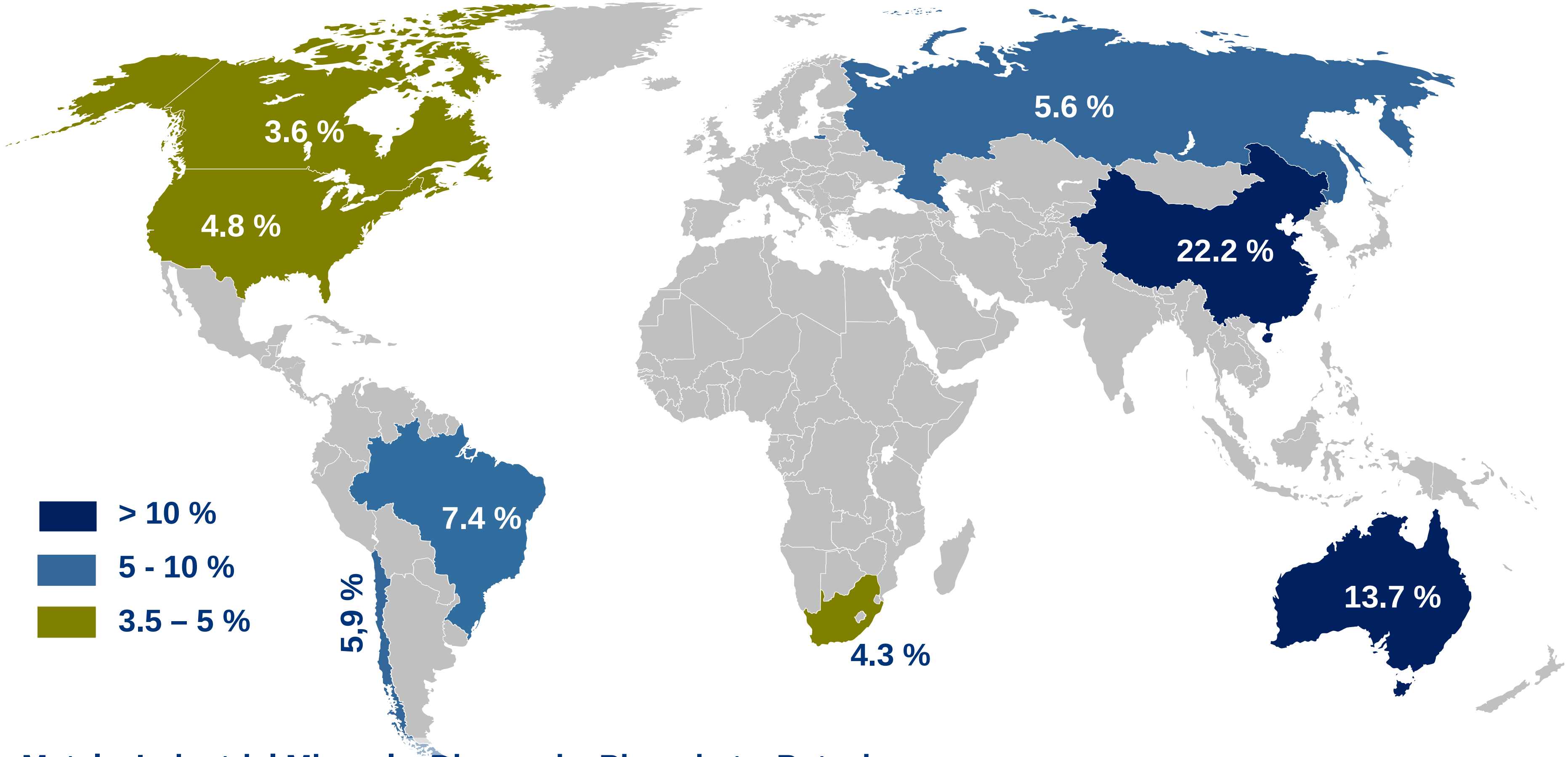
Raw material producers (2013)

Top 8 mining countries (total value of world production 2013: 882 billion US$*)



*** Metals, Industrial Minerals, Diamonds, Phosphate, Potash**
Mining countries with a share > than 3.5 % of total value
These countries cover 68 % of world production

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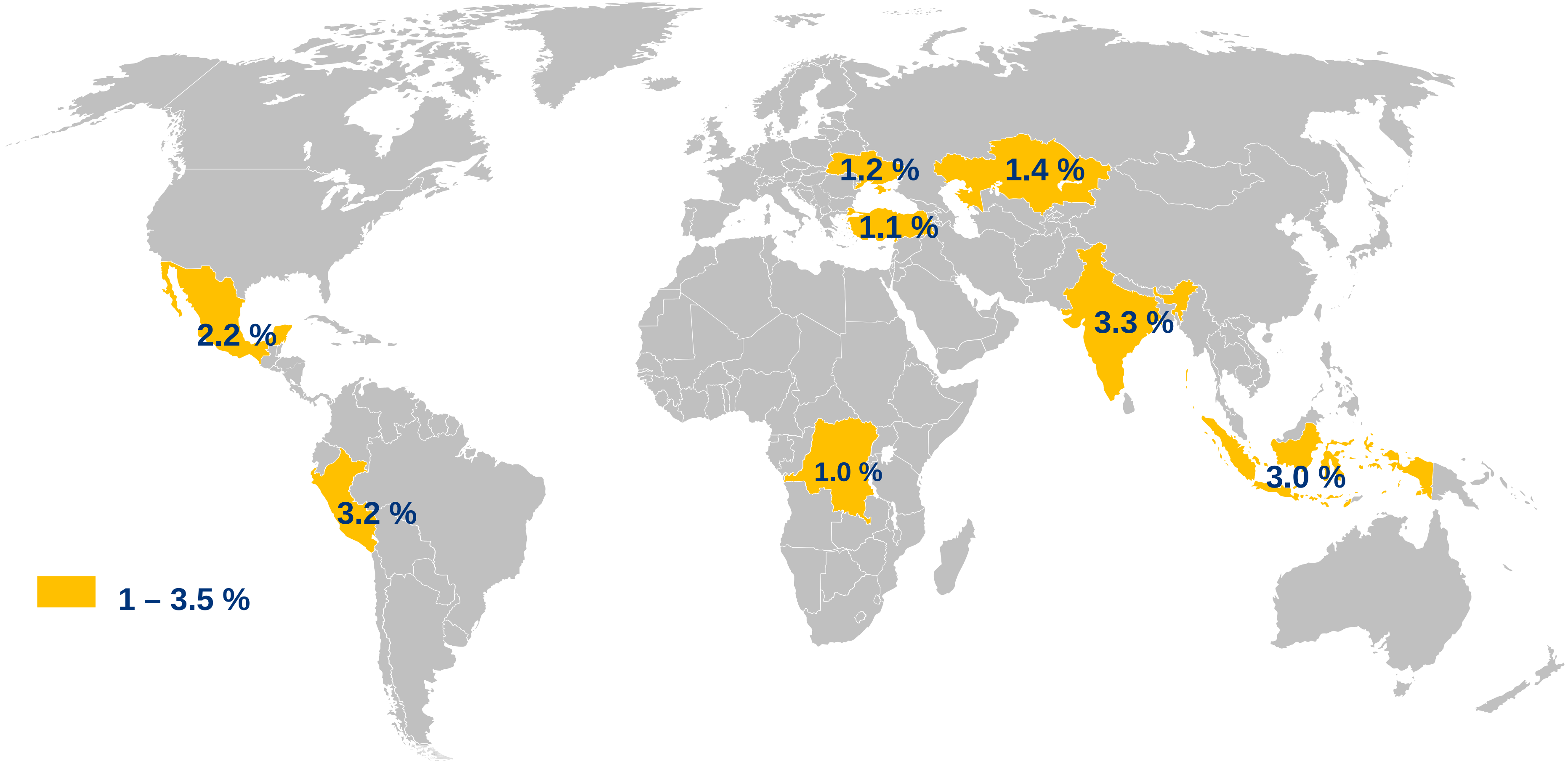
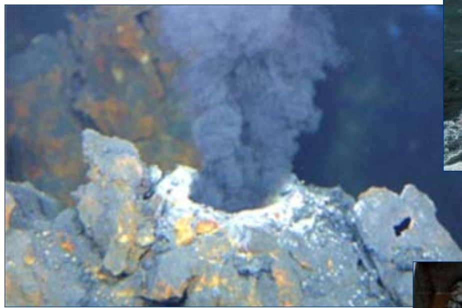
Raw material producers (2013)

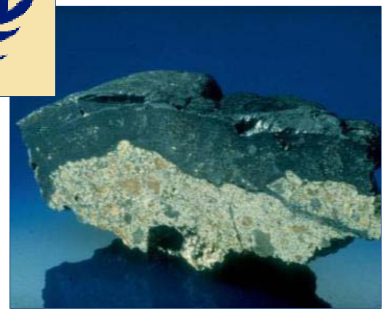
Important mining countries (share of total value* of world production 1 – 3.5 %)



*** Metals, Industrial Minerals, Diamonds, Phosphate, Potash**
Mining countries with a share between 1 and 3.5 % of total value
These countries cover 16% of world production (Total value 2013: 882 billion US$)

Marine Mineral Resources





Mineral Resources

- **New additional sources**

  Extension of the Raw Material Base

- **Deep Sea Area: long-term contract with ISA**

  Contribution to security of supply

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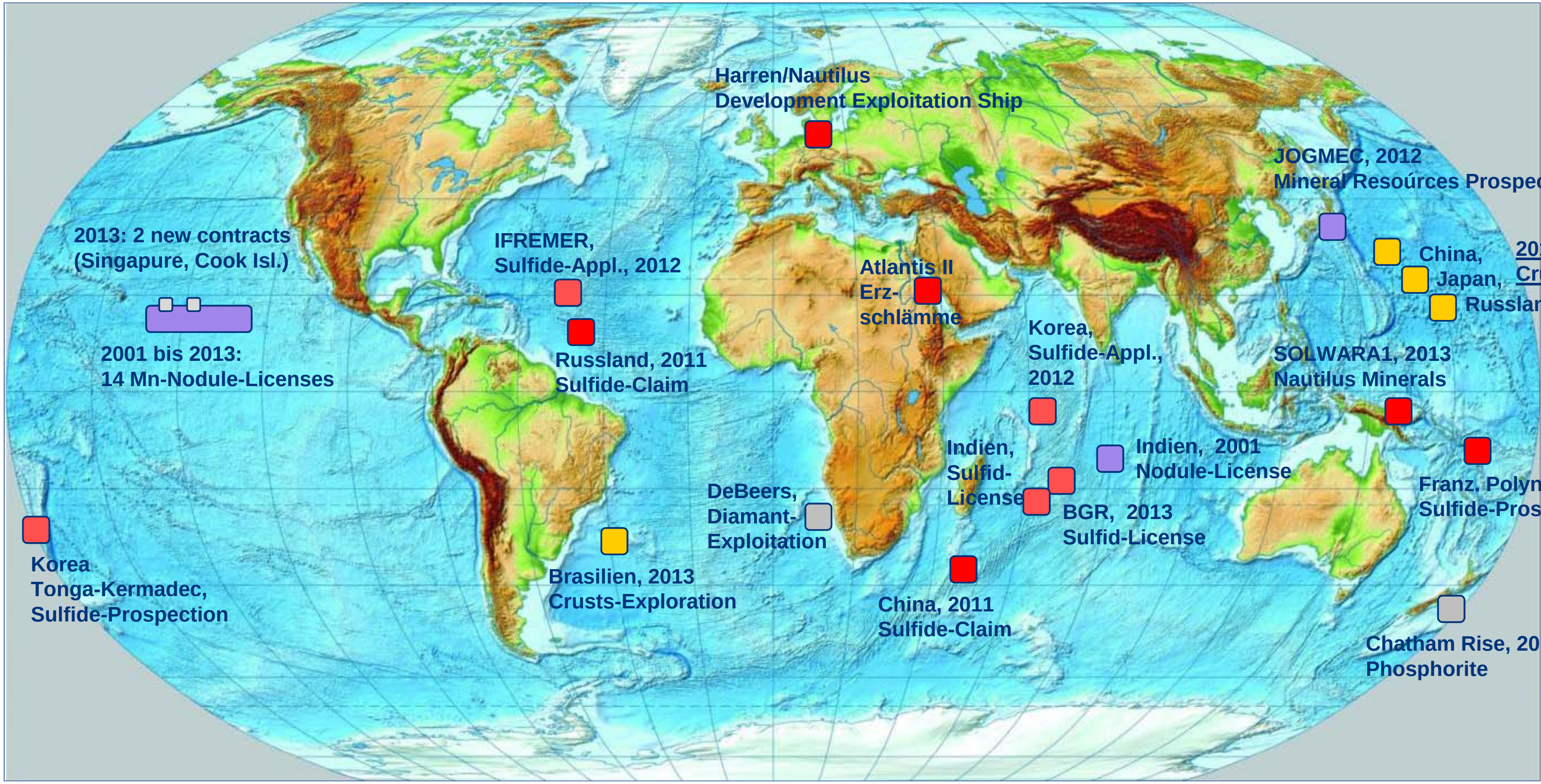
International Status of Marine Mineral Resources Activities



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