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Main challenges and drivers for industry in exploration and extraction in practice: the industry perspective

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Min-Guide, Leoben 2017

Content

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- Background
- Investment in Europe
- EU energy-supply
- The four factors to future success
- What we need
- Vision 2050

Four key challenges till 2050

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- **World population** is expected to grow by over a third, or 2.3 billion people, between 2009 and 2050.

- **Food:** The projections show that feeding a world population of 9.1 billion people in 2050 would require raising overall food production by some 70 per cent between 2005/07 and 2050 (High Level Expert Forum - How to Feed the World in 2050, Italy 2009).

- **Water:** Nearly 1 billion people still do not have access to improved sources of drinking water and there are more people without access to tap water in cities today than there were at the end of the 1990s. (UN World Water Development Report, 2014)

- **Energy:** Energy demand projections (IEA, 2015)

The global challenge

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- Access to primary mineral resources is necessary for both developed and developing countries (especially for countries building infrastructure), and thus is a concern for all nations.

- Substitution, recycling and more efficient use of raw materials will contribute to resource supplies, but cannot solve the problem entirely due to population growth, rising standards of living, and locking up of potentially recyclable materials in cars, buildings and other infrastructure.

- Balancing resource supply and demand in the 21st century: Projections for energy technology, urbanisation and economic growth will dramatically increase the demand for all mineral raw materials, and change the mix of needed minerals and metals.

World Economic Forum: Pressure on Resource use

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- The global population is forecast to reach 9 billion by 2030, including 3 billion new middle-class consumers. This places unprecedented pressure on natural resources to meet future consumer demand.

- a New Vision for Mining & Metals, through the 'Responsible Mineral Development Initiative' (RMDI) and 'Mining & Metals in a Sustainable World 2050' is needed.

- The circular economy is a redesign of this future, where industrial systems are restorative and regenerative by intention and design.

Long-Term Investing, Infrastructure and Development

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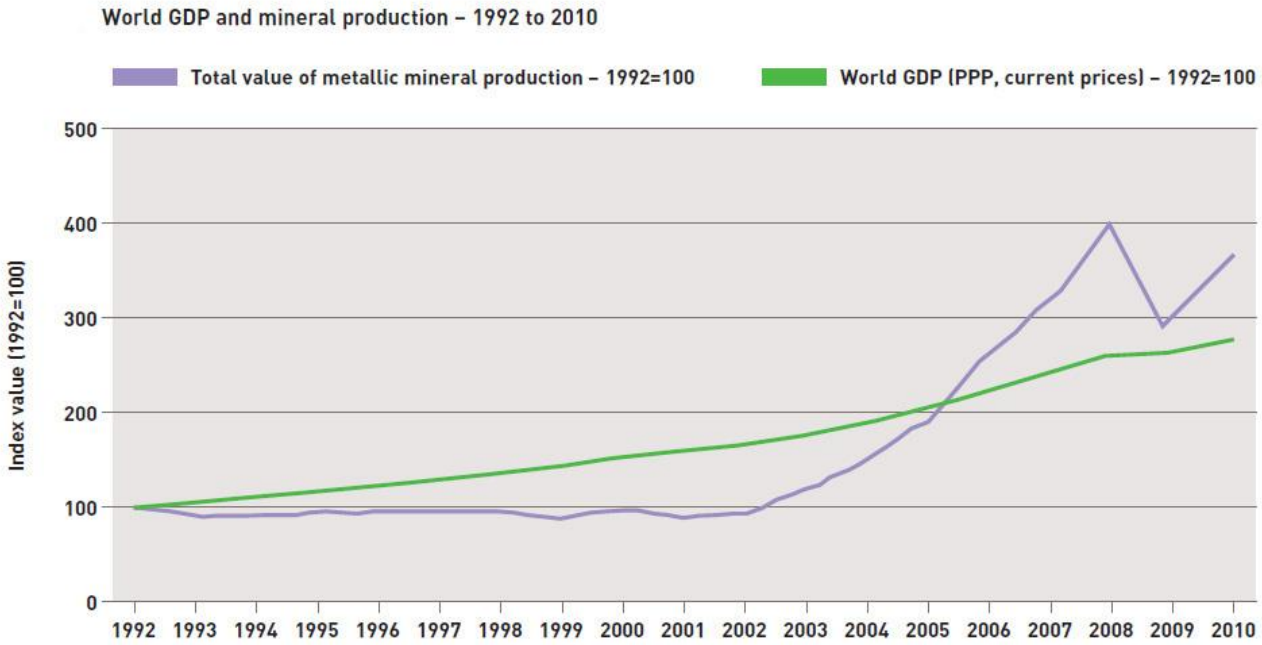
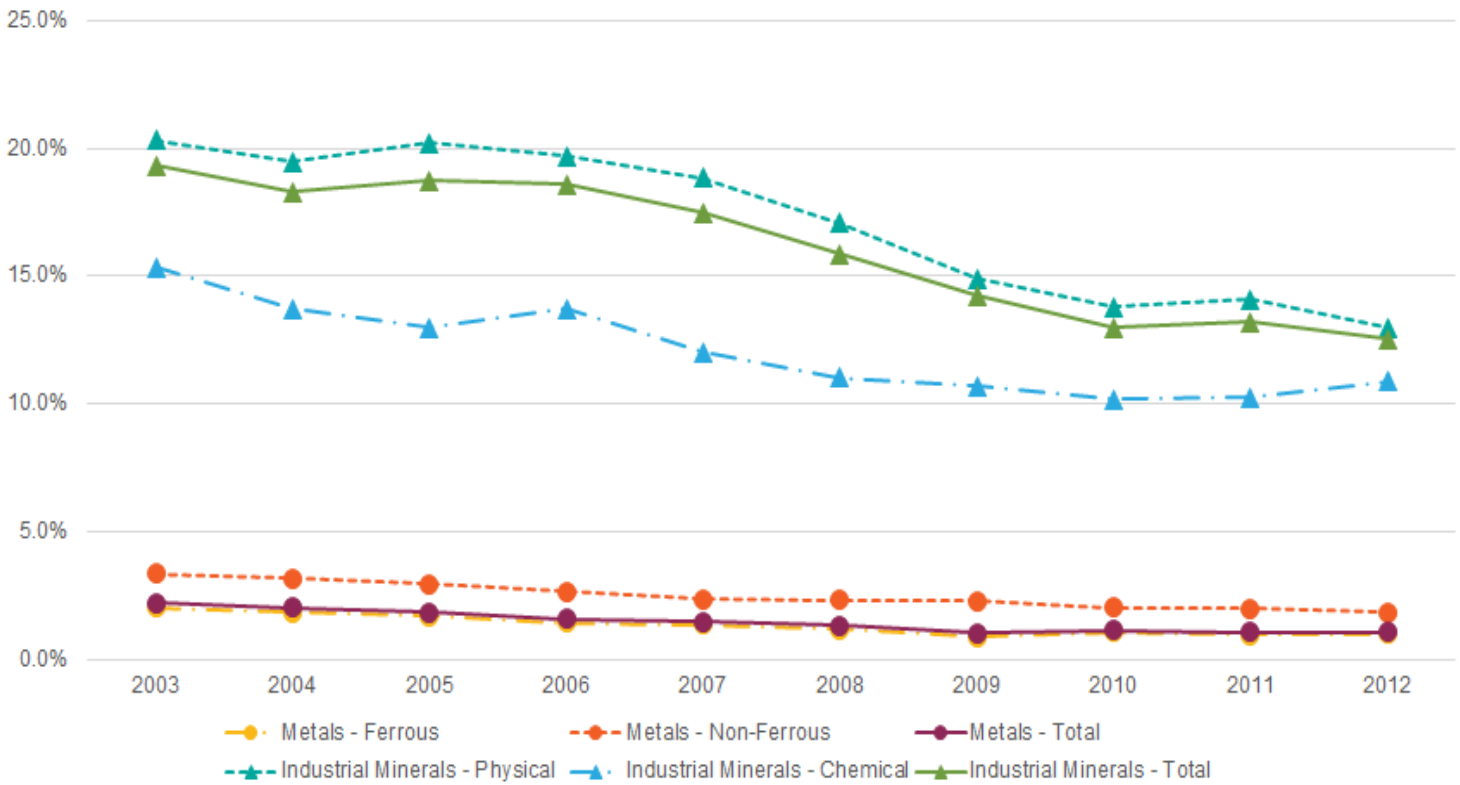
- The world needs to close its $1 trillion annual infrastructure investment gap. How?
- The importance of infrastructure as a key driver of growth, competitiveness and social well-being is well established. Yet, a significant number of economically viable infrastructure investments are not moving forward.
- Short political cycles, short-term investment horizons, a lack of viable financing structures, inappropriate risk assessment frameworks and a lack of long-term vision mean that much needed investment does not flow to infrastructure and development – causing a $1 trillion annual shortfall towards a $4 trillion demand in infrastructure alone.
- Closing these gaps is paramount if the world is to stay on a path to inclusive economic growth and recovery. Enhanced participation from the private sector could do much to close this gap.

Trends in the nominal value of world mineral production

- In 2010, the nominal value of world mineral production was nearly four times higher than it had been in 2002. During this period, growth in value has been significantly greater than growth in world gross domestic product (GDP).

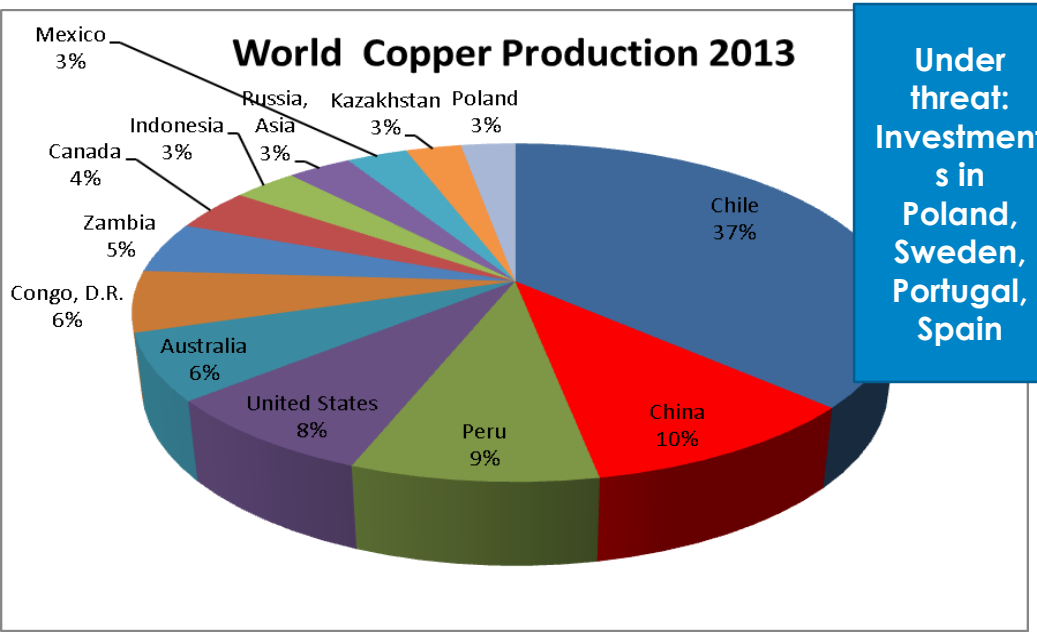


EU 28 share of Global Output

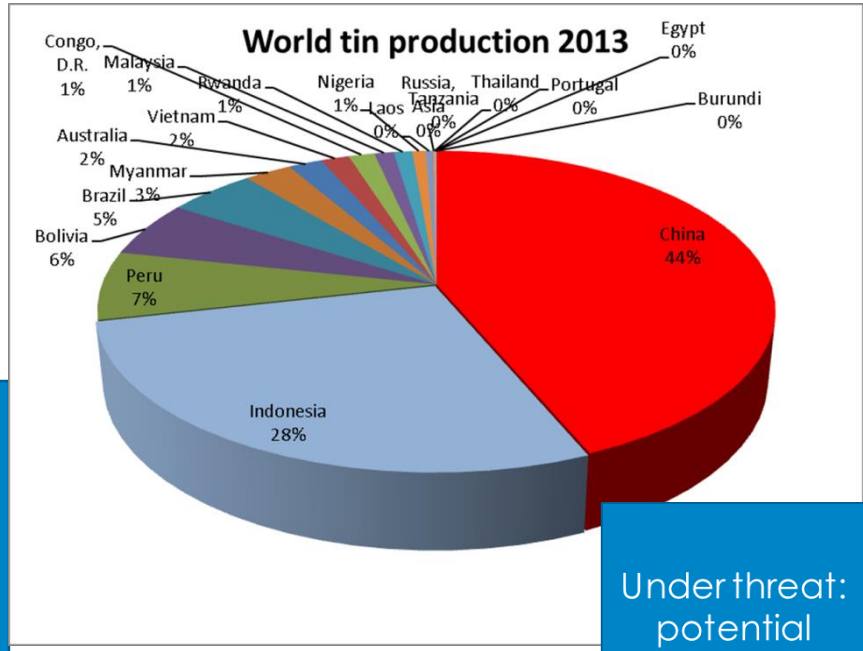


Source: BGS

Europe facing the challenge

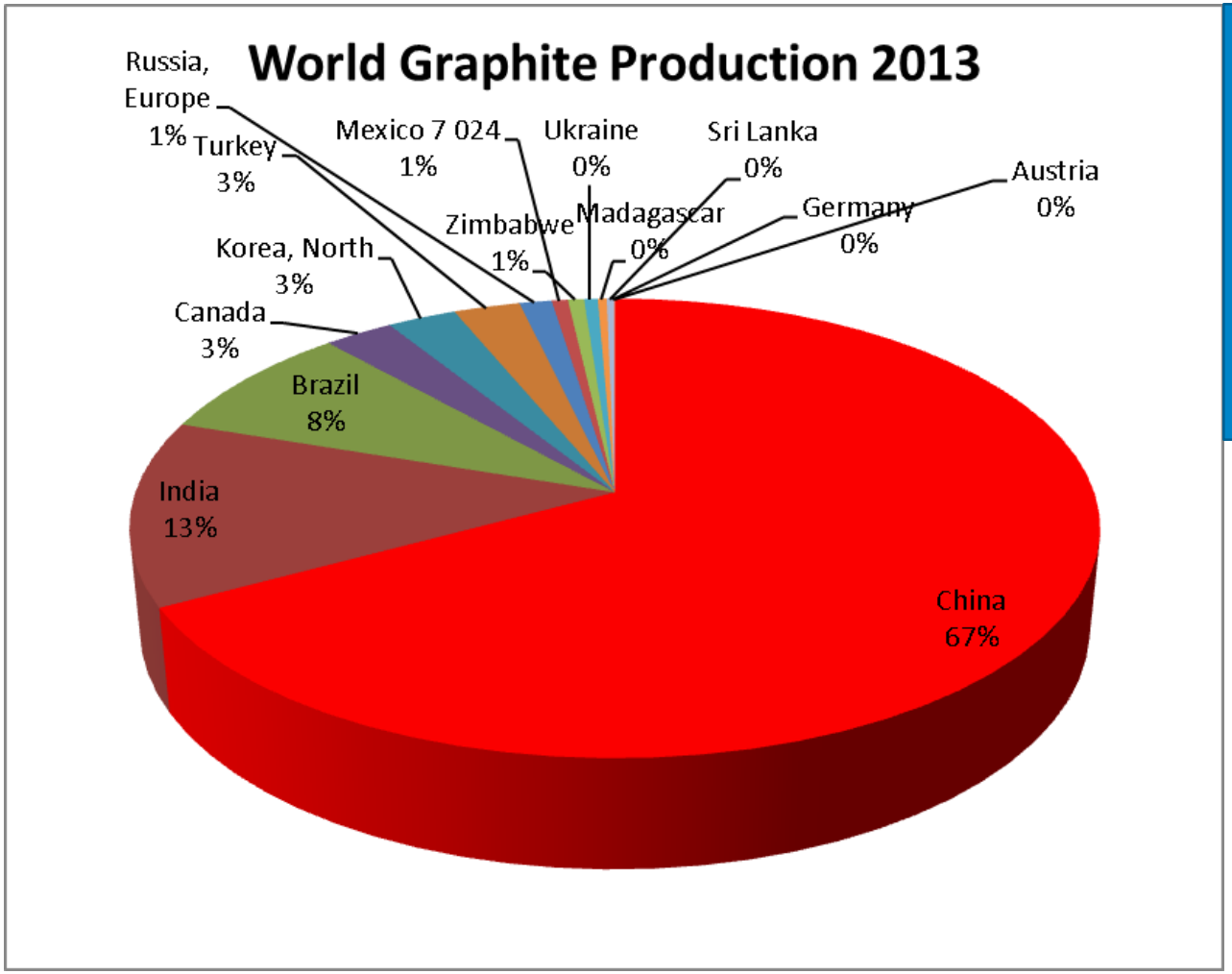


Under threat: Investments in Poland, Sweden, Portugal, Spain



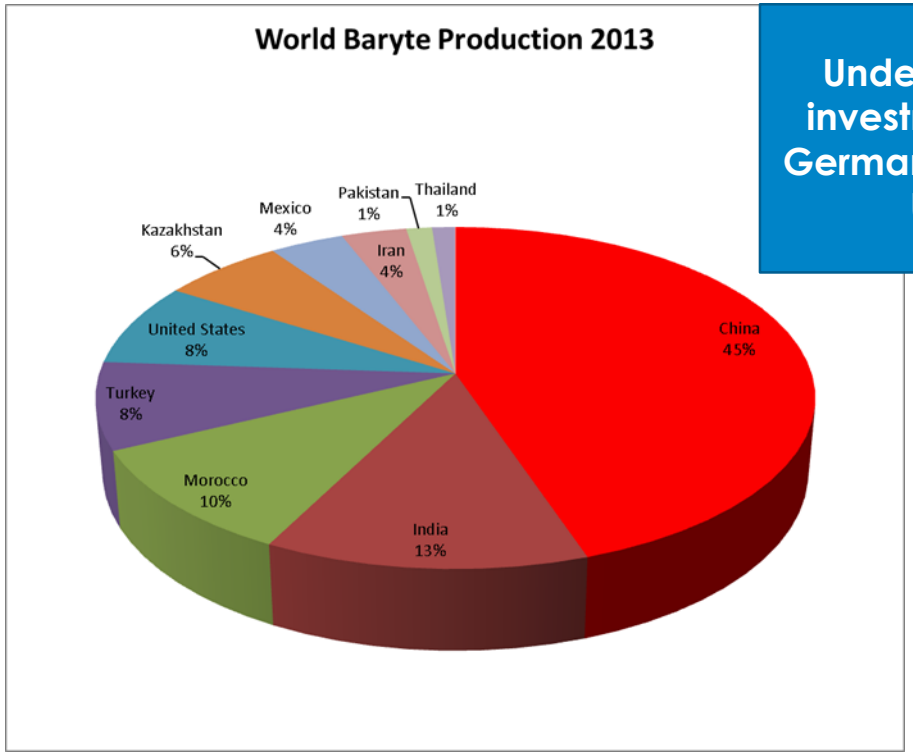
Under threat: potential Investments in Portugal and UK

Europe facing the challenge



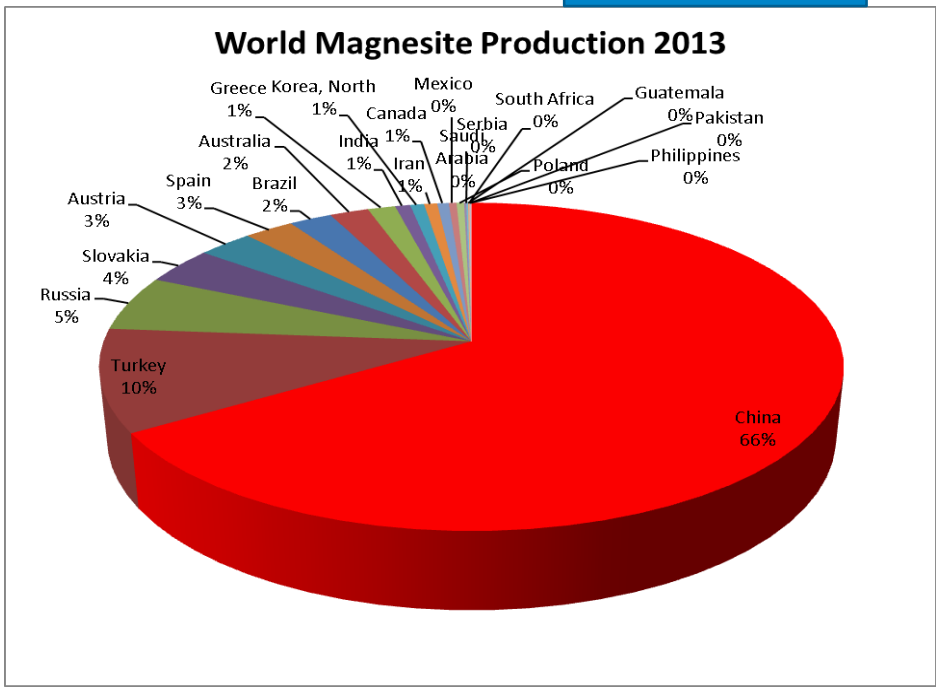
Under threat: investments in Austria, Germany, Sweden

Europe facing the challenge



Under threat investments in Germany, Spain, UK

Under threat investments in Austria, Spain, Greece, Slovakia, Poland



Under threat: Why?

- Legislation – not in particular the mining legislation but:
- ETS: Emission trading scheme? Ongoing discussions and significant reductions planned for the next periode: 2012 – 2030!
- Reduction of Levels for NOx in the air (workplace-condition): NO 2 ppm and NO_2 0,5 ppm (RICHTLINIE (EU) 2017/164 DER KOMMISSION vom 31. Januar 2017) → No diesel-equipment? No blasting? How should it be achieved?
- → That is absolute NOT helping the industry

The minerals-energy nexus

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- Raw materials provide 97% of our current energy through fossil fuels, uranium and biomass (IEA 2010) (10).

- Global energy demand also continues to rise (IEA, 2014)

- The infrastructure of the energy sector requires the massive use of metals and minerals, in particular
  - (1) steel for ships, pipelines, mining equipment, power plants, refineries and exploration activities,
  - (2) copper for the electricity grid, generators and electric motors, and
  - (3) aluminium, primarily for the electricity grid, and
  - (4) a host of other metals and minerals including phosphorous, potassium and nitrogen for bio mass production.

  The remainder of the energy is produced through hydropower, wind and sunlight – which need huge amounts of concrete, steel and specialty metals (Hertwich et al. 2015).

- It is this low carbon energy supply that global leaders will seek to expand in order to transition to a low carbon society within the coming decades to counterbalance climate change.

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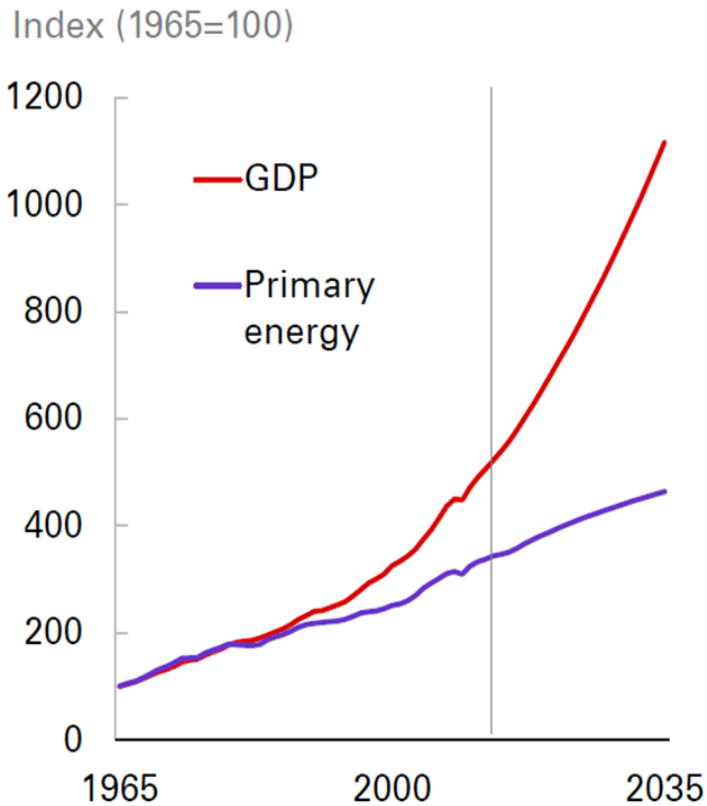
World GDP and energy demand

BP Energy Outlook
2016 edition

bp



- Growth in world economy = more energy required
- Energy consumption to rise 34% to 2035.
- Most additional energy is consumed in fast-growing emerging economies (China, India)
- Energy demand in OECD barely grows.
- Fossil fuels remain dominant source of energy; 60% of energy growth; almost 80% of total energy supply in 2035.

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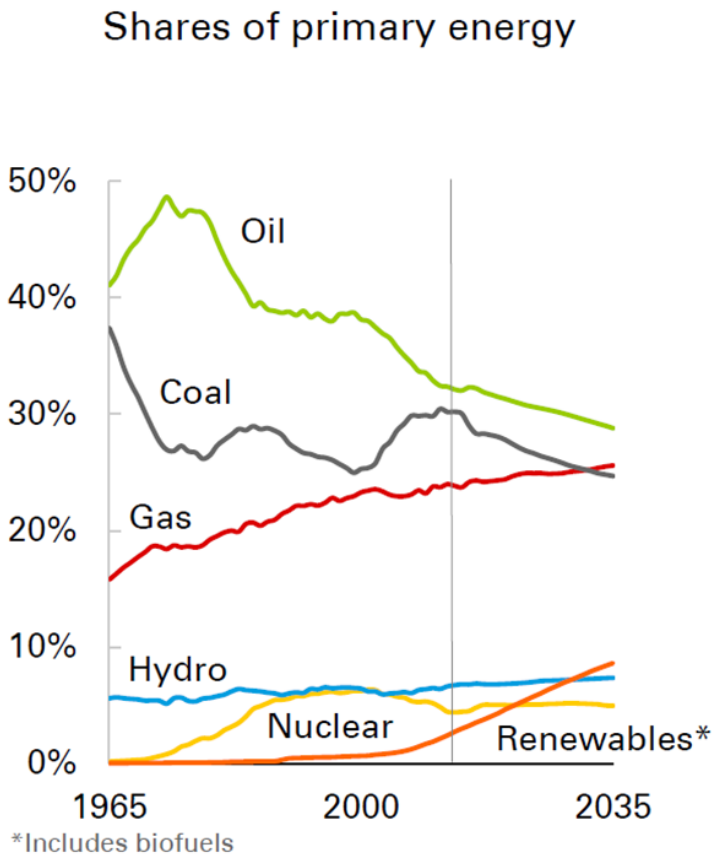

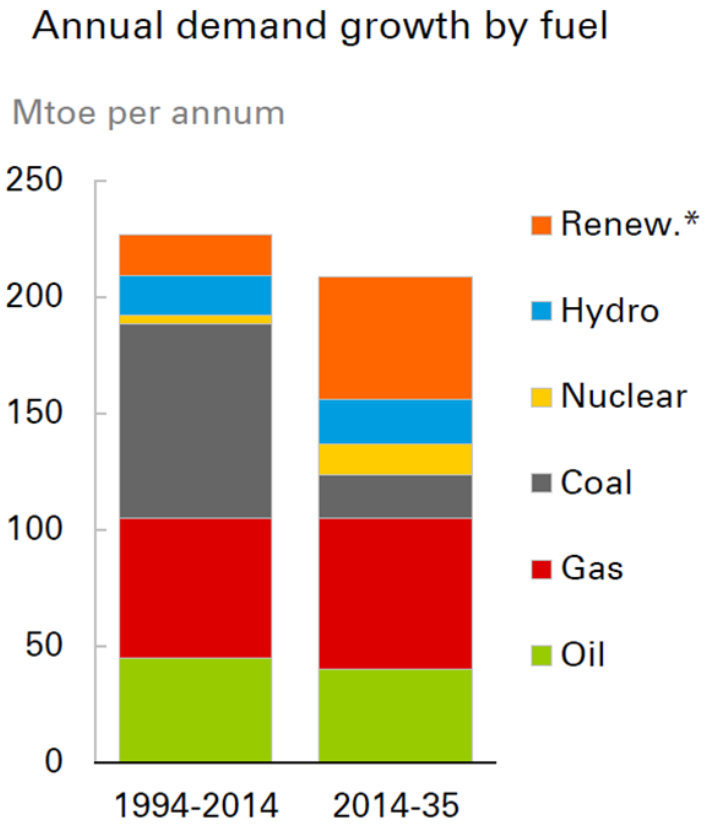

Source: BP Energy Outlook 2016

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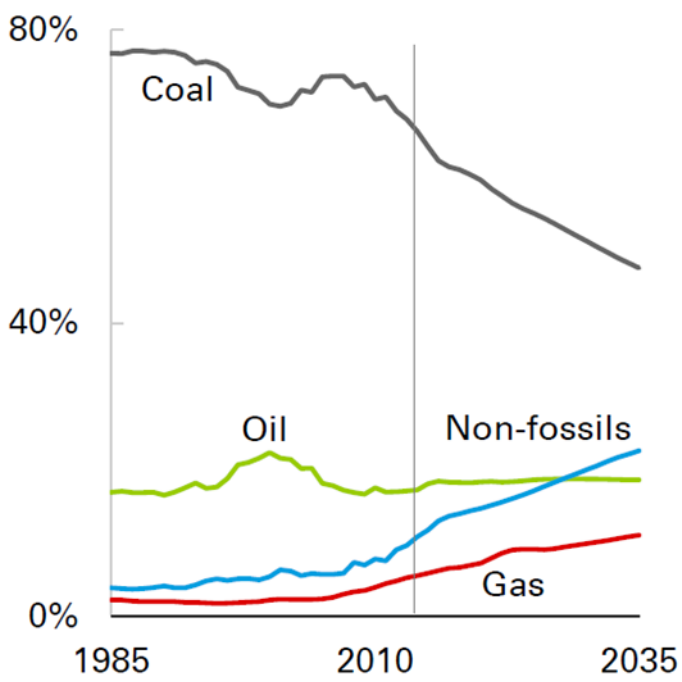
Shares of primary energy in China



Source: BP Energy Outlook 2016

- China's rise in gas demand to 2035
- Slowing GDP = China's energy demand to grow by <2% p.a. (was 8% since 2000)
- Fuel mix likely to change significantly, driven by changing economic structure, environmental and climate policies
- Non-fossil fuels and gas expected to increase rapidly, with combined share in China's energy mix more than doubling to around a third by 2035.

Rise in gas output to 2035
5.6% growth in shale gas
(to almost 25% share)

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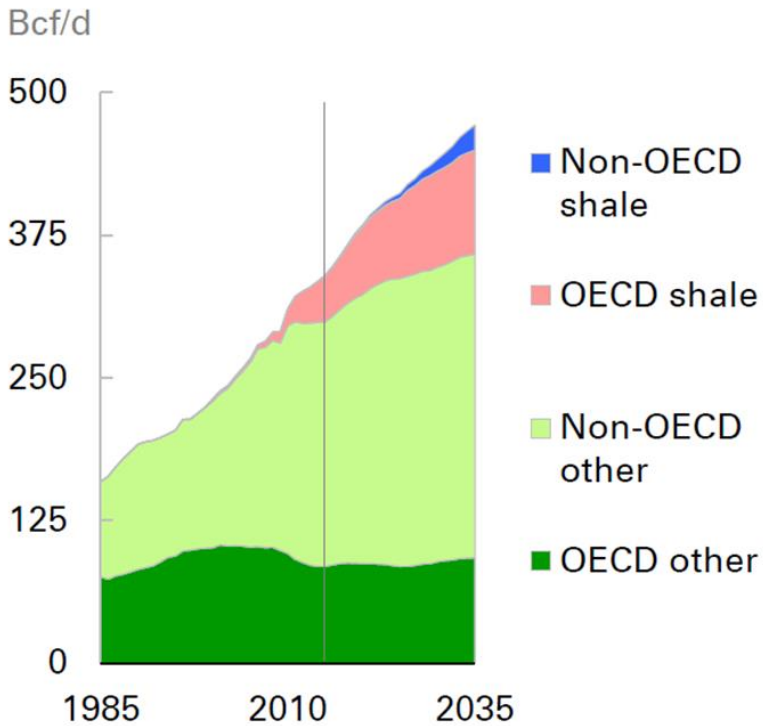
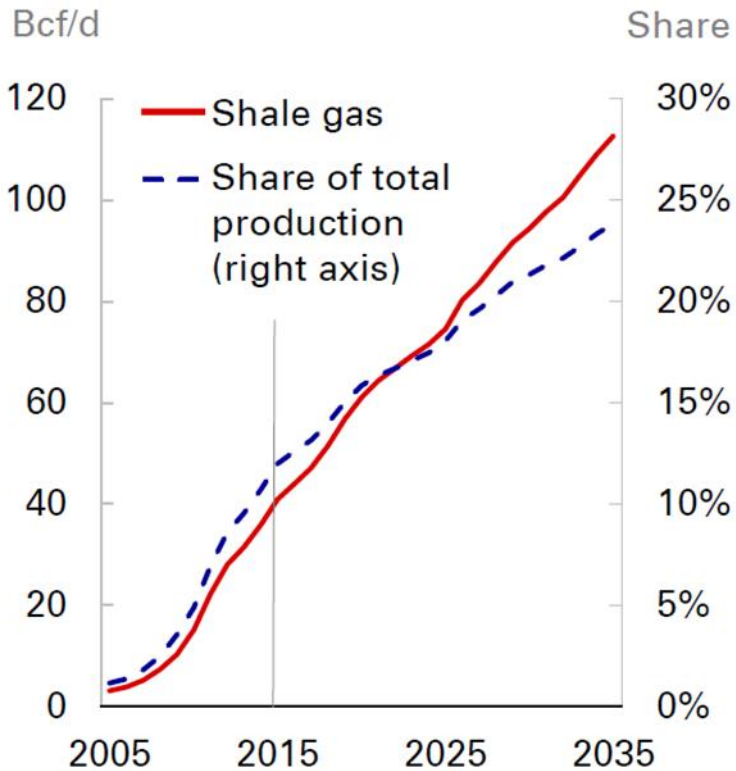
Gas production by type and region



Source: BP Energy Outlook 2016

Global shale gas production



European Mining Context 2015 - 2020

- Economic and Social disruption
  - Need for jobs & growth through export
  - Need for regional stability & well-being
- Climate agreement / Coal divestment
  - Energy market & infrastructure re-build
- Demand for sustainable supply/prices
- Demand for greater re-use and recycling
- Demand for greater governance
- EU funding for research & innovation

The four factors to future success

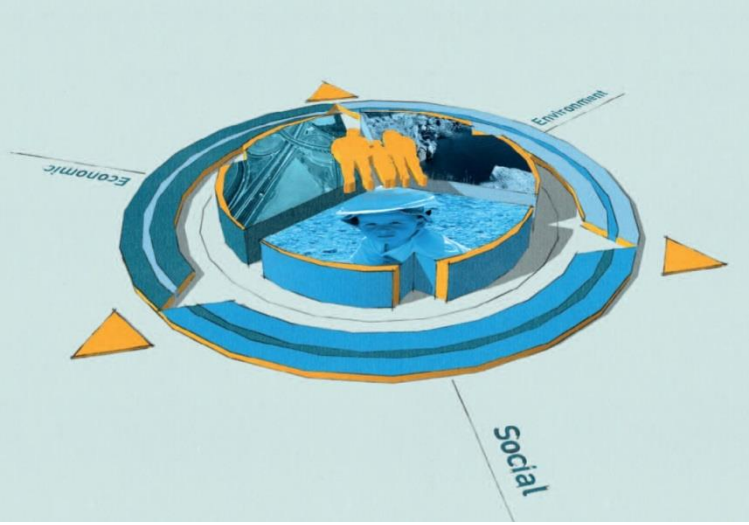
Know-how: knowledge and technology

Performance

Good governance and social acceptance

International dialogue

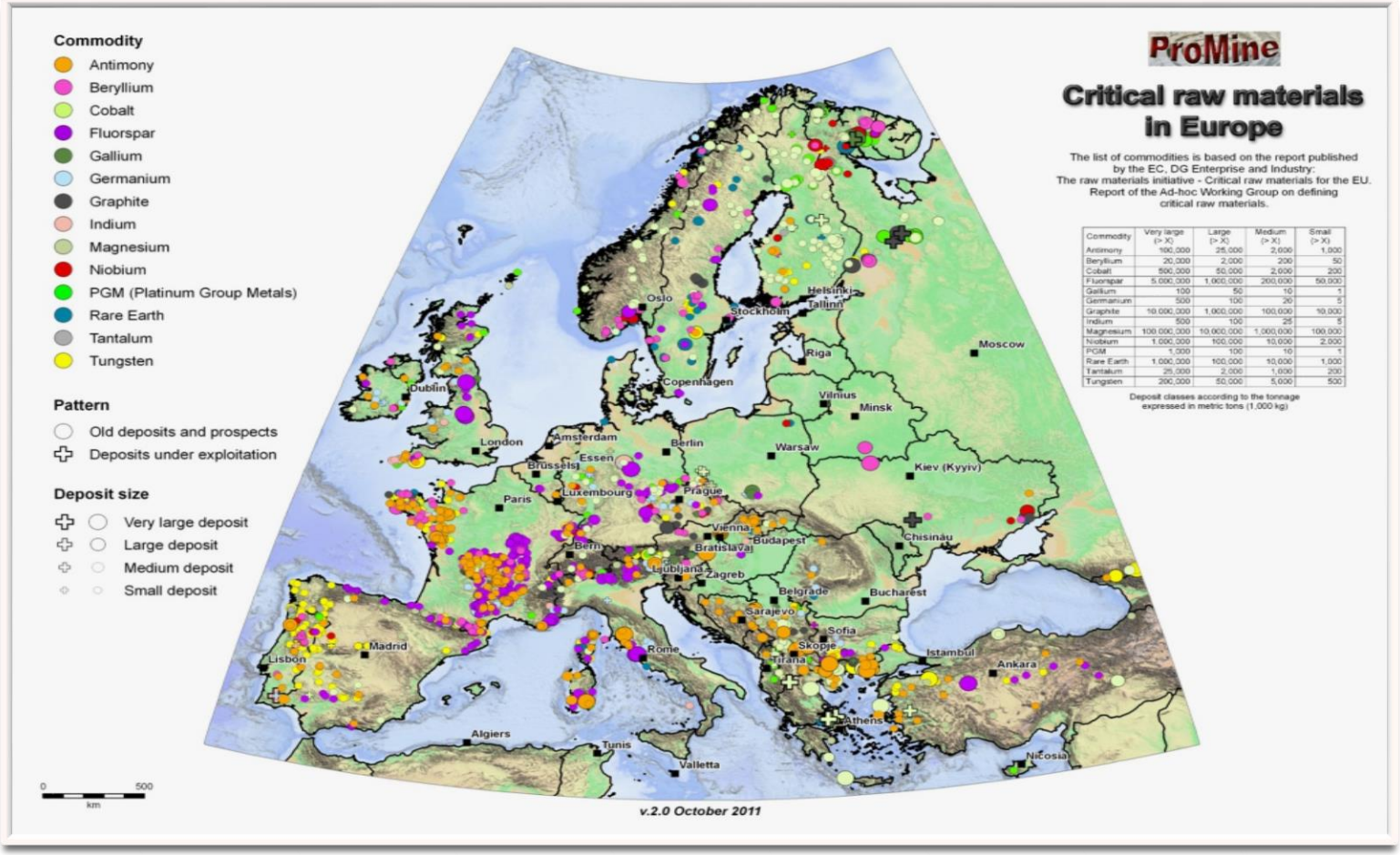
2030-2050:
Meeting "base-load" demand



- Upgrading & maintaining infrastructure (health, transport, energy,…)
- Accommodating increased urbanisation
- Deploying new sustainable technologies
- Sharing equitably the benefits of new technologies
- Re-balancing lifestyles and employment across EU regions

The EU mining industry consistently adds more to proven reserves than it takes away

Increasing knowledge is key



Technological challenges arising

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- New deposits:
  - stability at greater depths
  - new processes required
  - marine environment
- Rising environmental requirements:
  - energy consumption
  - waste management
  - remediation
- Automated mine:
  - new design layouts and operations to suit automation
  - adapting conventional designs and operations to automation
  - Safety

Technoloigcal challenges arising -2-

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- New materials for new industrial applications: Part of Industry 4.0

- Social understanding and acceptance
  - Training and education for future engineers : → KIC
  - Capacity building :
    - skills and transfer knowledge and understanding within and beyond current practice for industry and authorities
  - Awareness raising for general public

Technology routes to increased supply do indeed exist , but all have inherent limitations:

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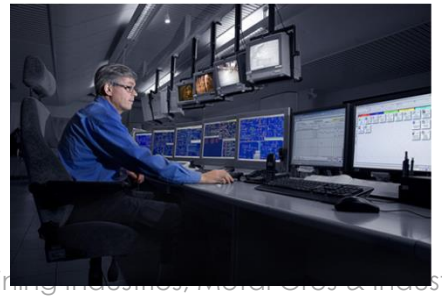
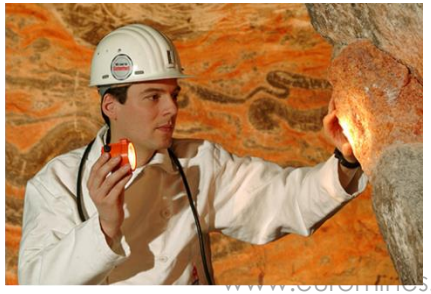
- Improving the output from mining and processing: Technology and innovation to improve the efficiency of extracting raw materials from the ground is a major goal of the resources industry.
  - **Today a car manufacturer is 95% automated, this is where the mining industry has to be in 2030.**

- Given socio-economic and environmental requirements for resource development, known accessible resources are limited and even the most efficient operations will not enable an increasing demand for metals, such as copper, to be met solely through technological gains over the next two to three decades (Northey et al. 2014)





Using better what we already have

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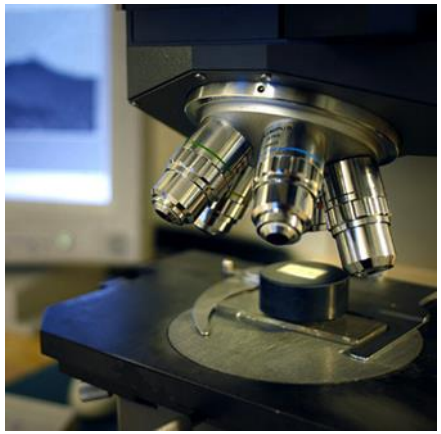
- Recycling will contribute to resource supplies but for most metals, less than 25% of metals production currently comes from recycled sources (Graedel et al. 2011)

- There are considerable economic and energy based challenges in recycling, and considerable quantities of materials are "locked up" for many years or even decades in vehicles, buildings, and other infrastructure. Poor design also limits recycling (Ciacci et al. 2015)

- The time for the technological and cultural change required to realise a more circular economy with increased recycling is also significant (UNEP, 2013)



The future role of industry and governments

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- The private sector may by 2030 have proven itself a highly efficient and effective champion of societal challenges, applying significant human and financial resources and pioneering new
  - However, if framework conditions are wrong, by that point the business community could be disengaged, distracted by other issues around corporate survival, or excluded in other ways.

- In 2030, national governments may be highly successful at tackling societal challenges, taking indications of success in environment and social development and institutionalising them in the public sector.
  - However, governments may also, under economic stress, disengage from providing public goods, leaving civil society to fill the gaps. Finally, in the context of conflict, governments may restrict civil society activity all together.

Social acceptance for the need to secure supply

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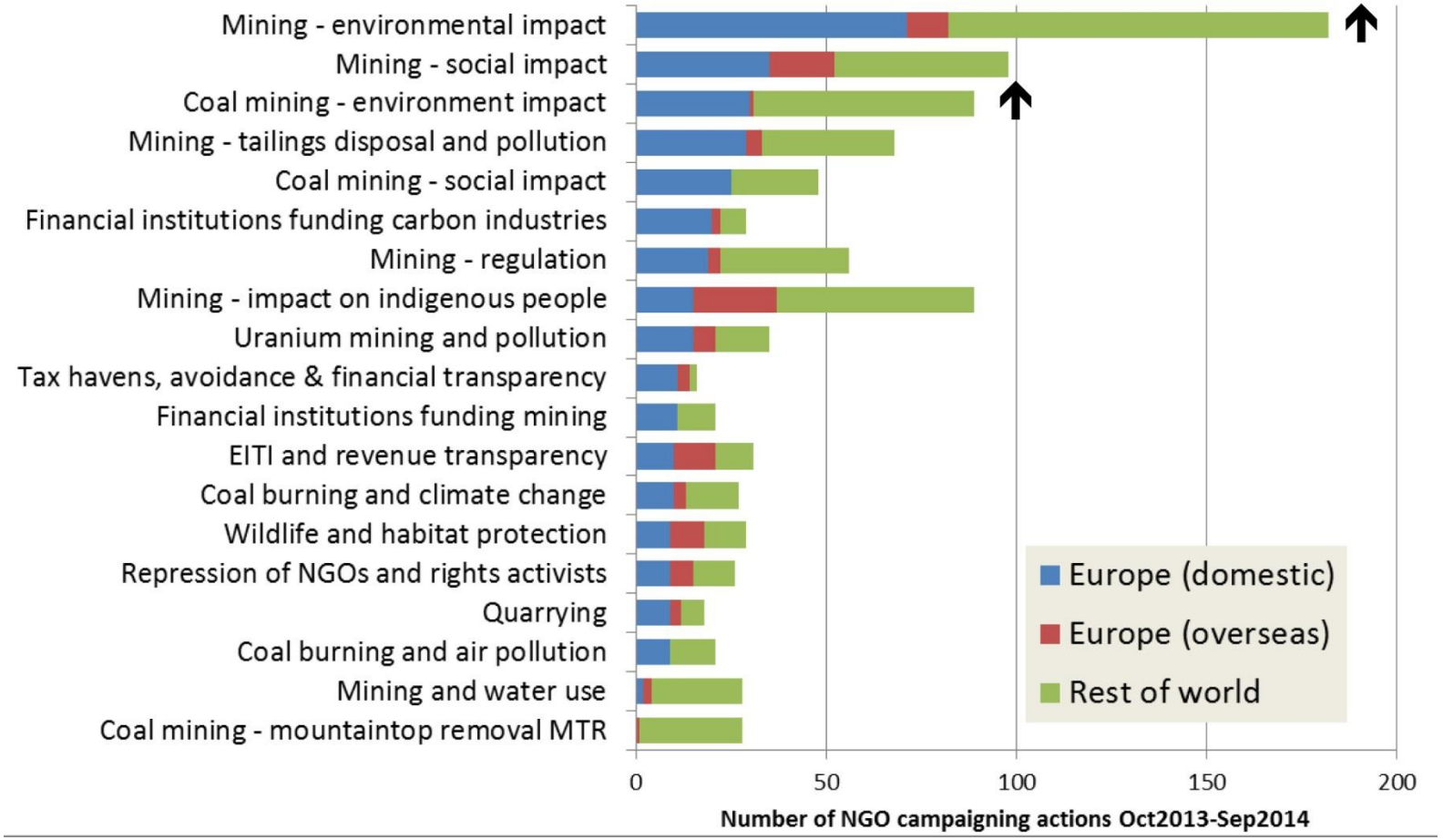
- Mineral deposits are irregularly distributed and their location controlled by geology. Thus, the value of these mineral resources must be recognised and assessed in the contexts of other land uses, such as agriculture, forestry, water resources, habitats for flora and fauna, cultural and natural heritage, as well as land for settlement and infrastructure. Furthermore, the use of materials, energy and water are all interconnected.

- Environmental protection and social licence are part of sound public policy, including sustainable resource use.

- Both individual consumers and nations need to be accountable for their resource use, whether produced at home or abroad.

- Societal accountability and stewardship need to include responsible resource development as a viable land use.

Current NGO agenda on mining



Source: SIGWATCH data ©2014

Improving performance: Best practice + modern mining explained

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The legal framework conditions

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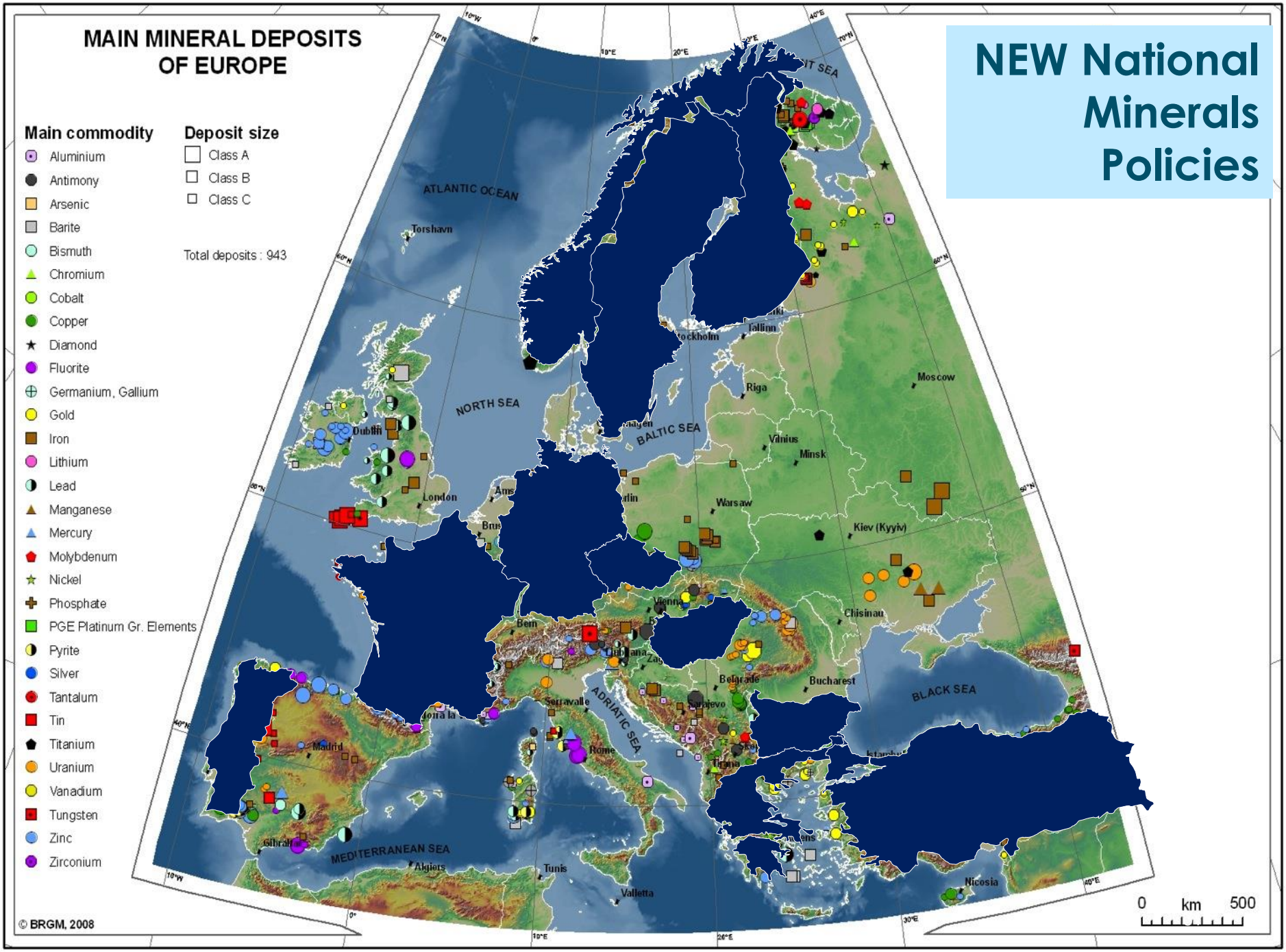
- Better laws and better implementation
- Identification of skill requirements and harmonisation of education and further education across Europe
- Diversification of energy sources and development of infrastructure, reduction of greenhouse gases
- Ensuring competitive technologies and deployment across the world
- Protecting and enhancing our environment.

NEW National Minerals Policies



International dialogue

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Ongoing international debates

- UN Sustainable Development Goals;
- G7 Resource Efficiency;
- EU Raw Materials Directive,
- OECD Sustainable Materials Management,
- International Union for Conservation of Nature and Natural Resources,
- United Nations Environment
- International Resources Panel
- and on further groups such as
  - Asia-Pacific Economic Cooperation and the
  - African Union

What we need to contribute to employment rates

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- Explicit ***political support*** for mining as a particular growth strategy.
- Continued increase of minerals ***exploration*** in the EU Member States.
- Free movement of ***labour*** (e.g., EU job descriptions, standards, accreditations).
- Financial support for investments that target performance exceeding established standards.

What we need to invest in Europe

- **Predictable and stable policy** from the EU and Member States.
- An EU energy policy focused on creating a viable undistorted internal market that offers long-term supply contracts to industry.
- Deployment of all conventional and unconventional energy sources.
- **Reduced permitting times** in line with recommendations of the EU Semester.
- Recognition of **mine site rehabilitation**.

Vision for 2020 and beyond

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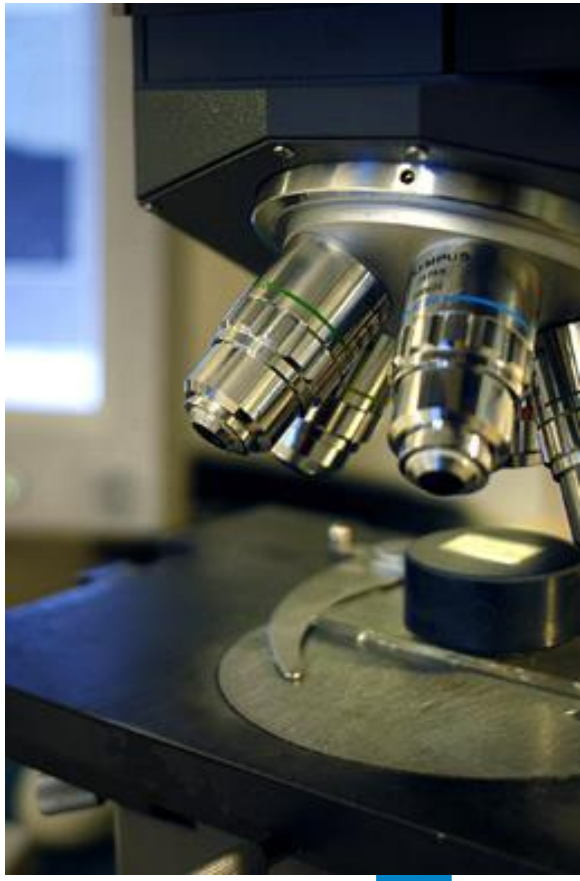
By 2020

- Complete modern database and economic assessment of EU primary and secondary resources
- Revised regulatory framework facilitating sustainable management of resources and uptake of innovation
- EU Leadership in technology for all aspects of resource management (exploration, extraction, processing, re-processing, reuse, recycling, recovery, design, …)
- EU ressource diversification



Vision for 2030 and beyond

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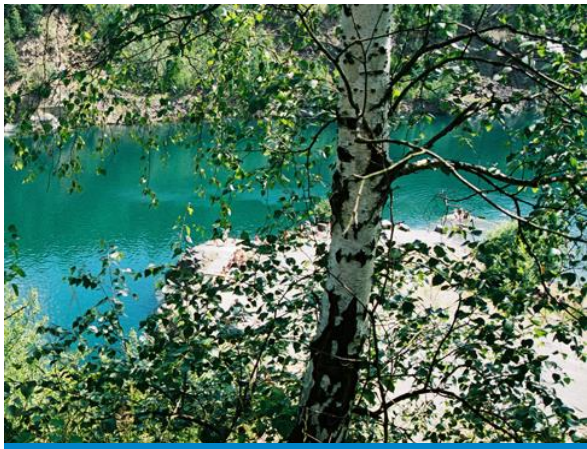
- **By 2030**
  - Only High tech mines in place in Europe
  - Technology proven and being exported
  - Optimised valorisation of available resources, i.e.
    - new technologies in place,
    - removal of legacy sites,
    - increased reuse, recovery and recycling rates,
    - material efficiency use in higher performance products

BEFORE RESTORATION



AFTER RESTORATION

EUROPEAN TECHNOLOGY PLATFORM ON SUSTAINABLE MINERAL RESOURCES

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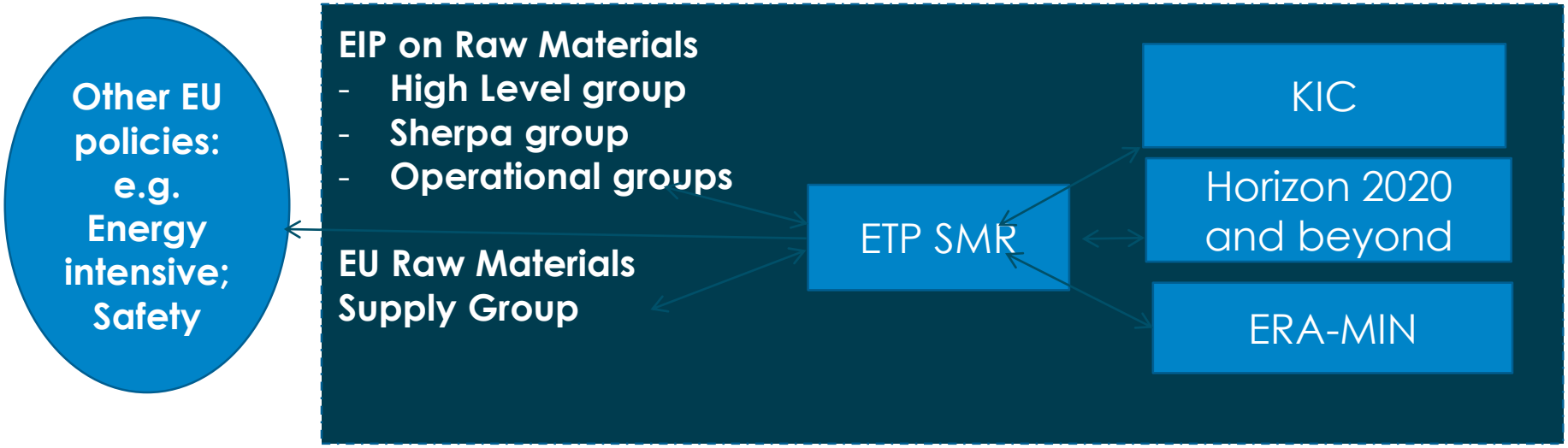
ETP SMR – Vision 2050: the VERAM project
Overall Strategic Ambition: towards Industry 4.0

- By 2050, the EU will have secured a sustainable minerals and metals supply base to ensure competitiveness and growth of the EU industry as a whole.
- Scientific breakthroughs and sustained innovation efforts will have significantly improved access to, production, use and recycling of resources.
- By 2050, the EU will have achieved a sustainable basis for the entire life-cycle of minerals and metals in the EU.



We must shape the future of our industry in Europe

Thank you for your kind attention

In case of any questions please contact:

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