

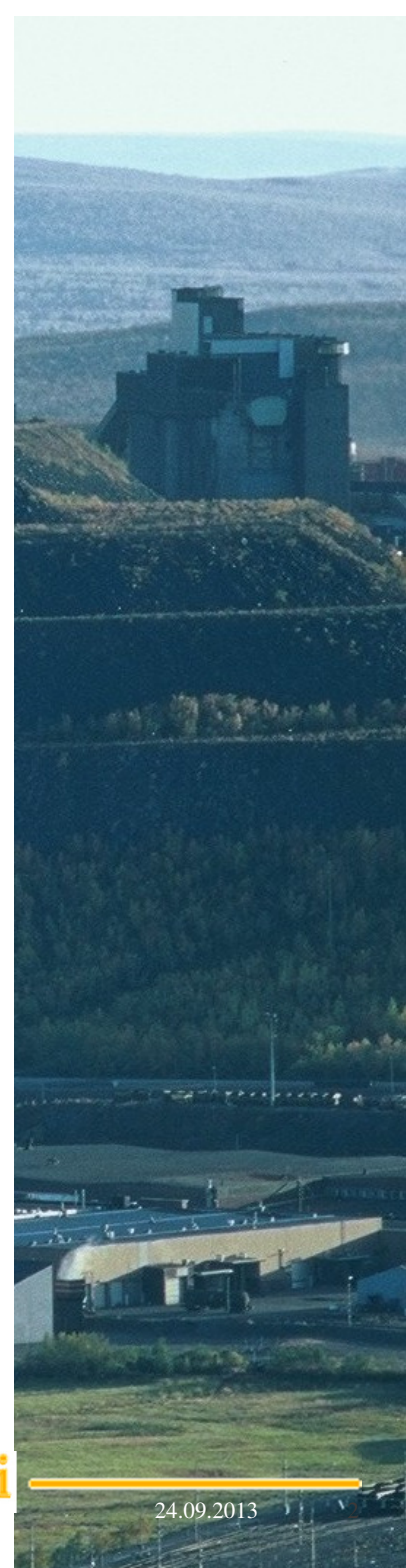
Future outlook of the Finnish mining industry

Mari Tuusjärvi, GTK

Mine Water Management and Treatment – From Planning of Mine Operations to Mine Closure 24.– 25.9.2013

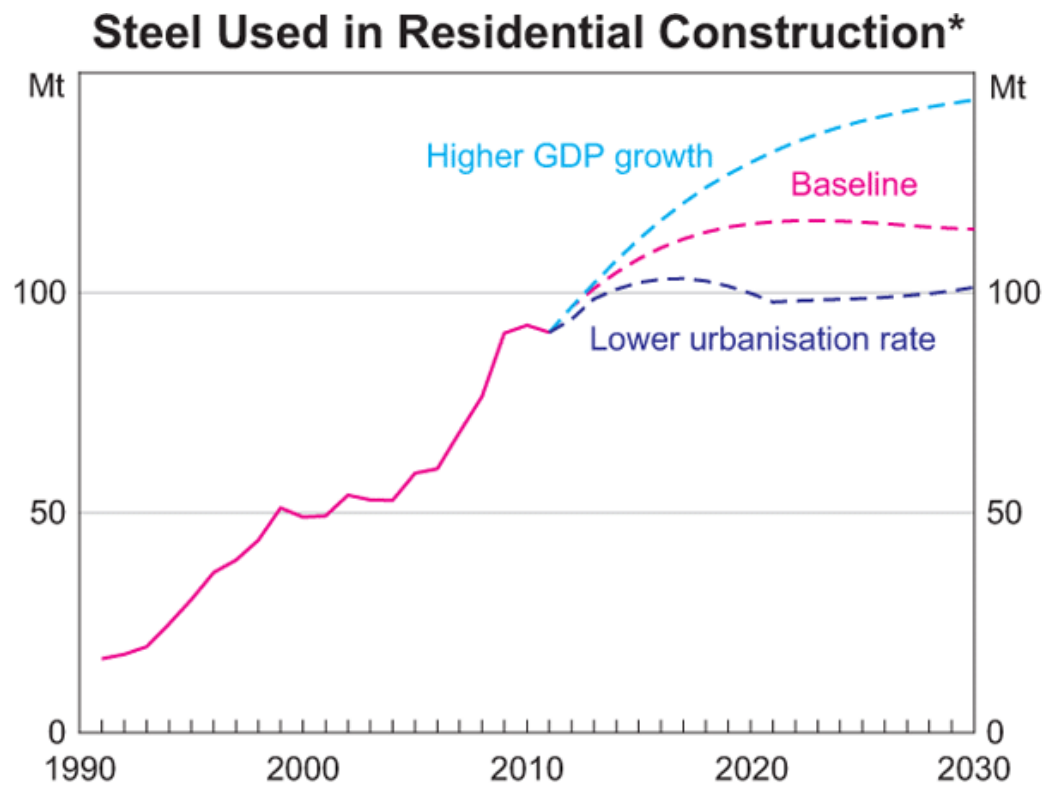
Themes

- Introduction: global context
- Introduction: foresight studies on minerals
- Past and future development in ore mining
- Opportunities and drawbacks



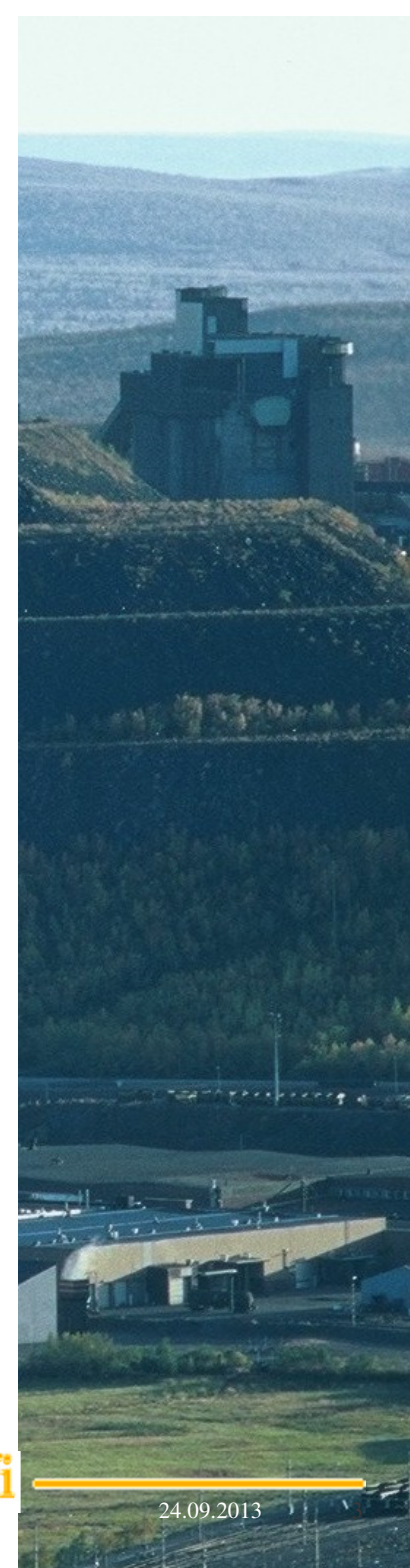
Increased interest on minerals (1)

- **Globally:** Increased need, prices and competition



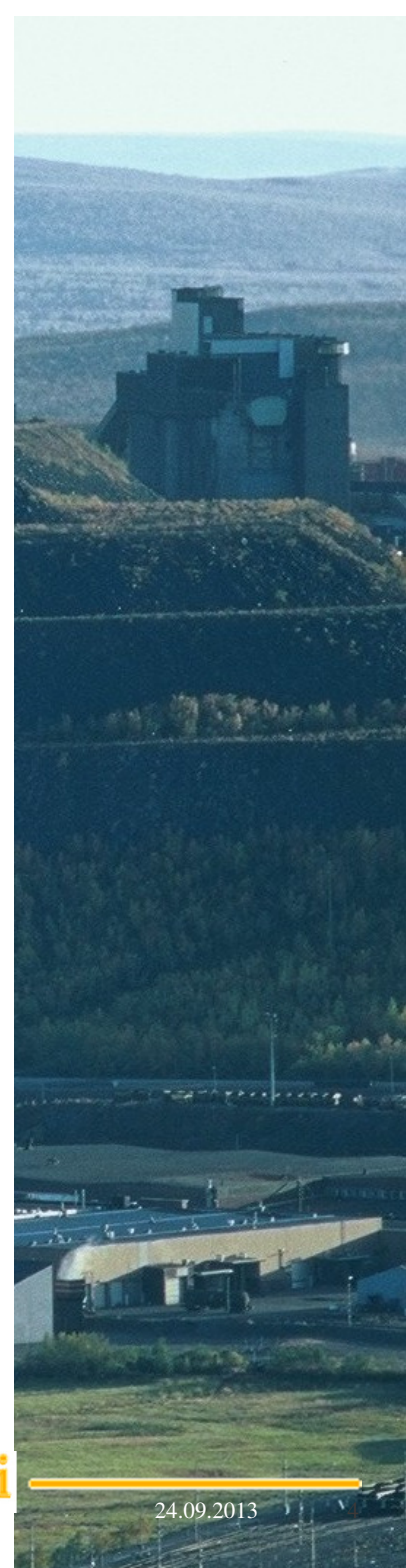
* Dashes indicate projections
Sources: CEIC; RBA

Source: Berkelmans and Wang 2012, Chinese Urban Residential Construction
Reserve Bank of Australia Bulletin - September 2012



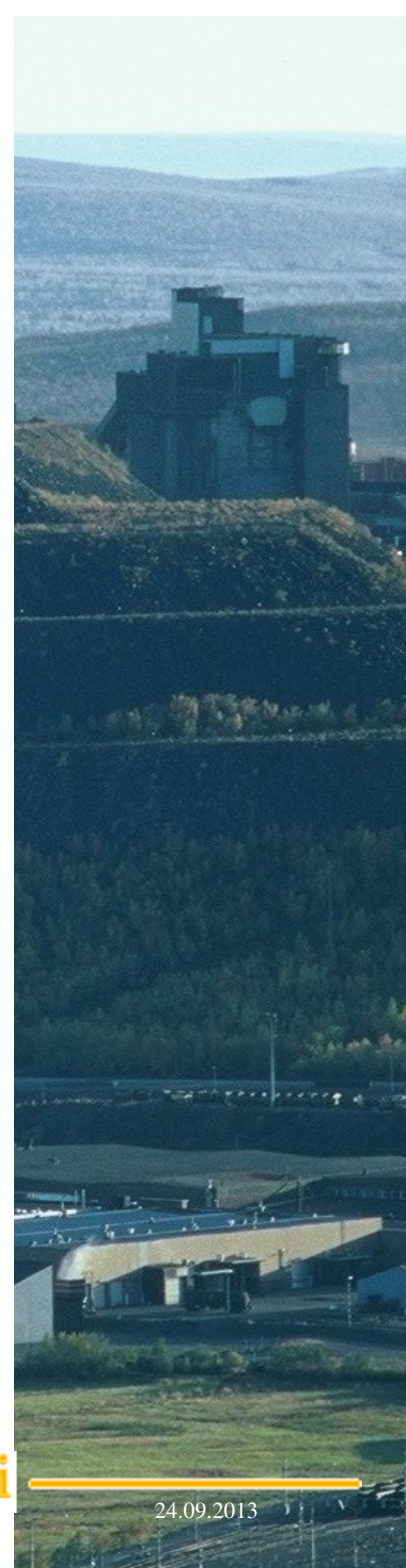
Foresight

- No crystal ball, but beneficial if you have some clue on possible development paths...



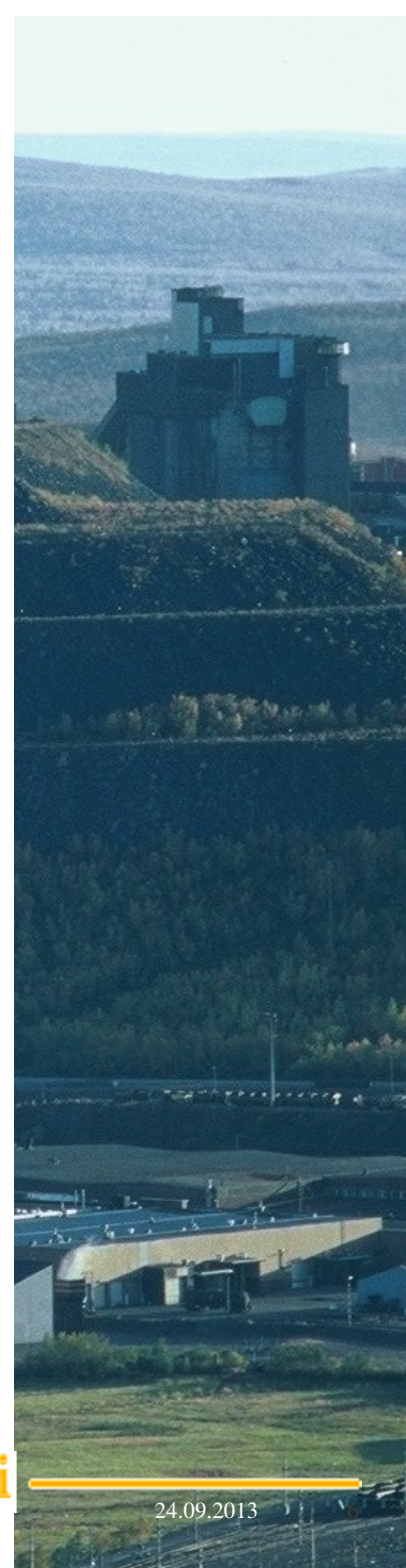
Foresight on minerals: EU perspective

- How to secure constant supply of raw materials on the use of downstream industries?
 - Domestic supply (primary & secondary)
 - Supply dependency & barriers on trade
 - Critical minerals
 - Policy directions
- Fraunhofer institute & BGR (Germany)
- Raw Materials Group (Sweden)
- Consultants (e.g. PWC, Ernst&Young)
- Projects, e.g. Minerals4EU



Foresight on minerals: Finland's perspective

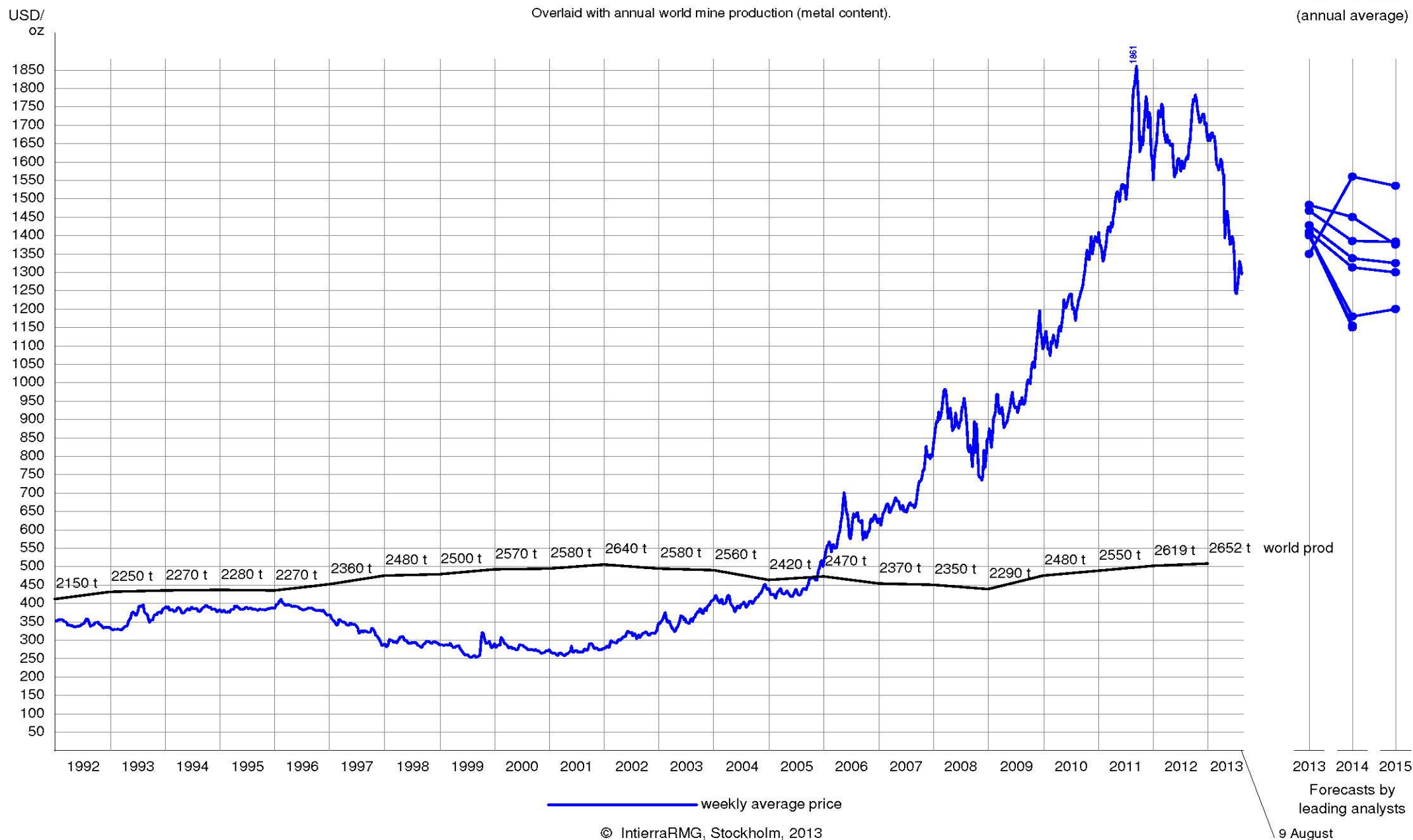
- How to manage increased exploration and mining activity in the country?
 - Economic benefits
 - Environmental protection
 - But also trade politics...
- } Acceptance & approval
- Several projects incorporating foresight research:
 - SURE (Thule, GTK & SYKE)
 - LowCarbonFinland2050Platform (VTT, VATT, GTK, Metla)
 - SAM (VTT, SYKE, GTK & HY)



Gold price (London pm fix, weekly averages) through week 32 2013

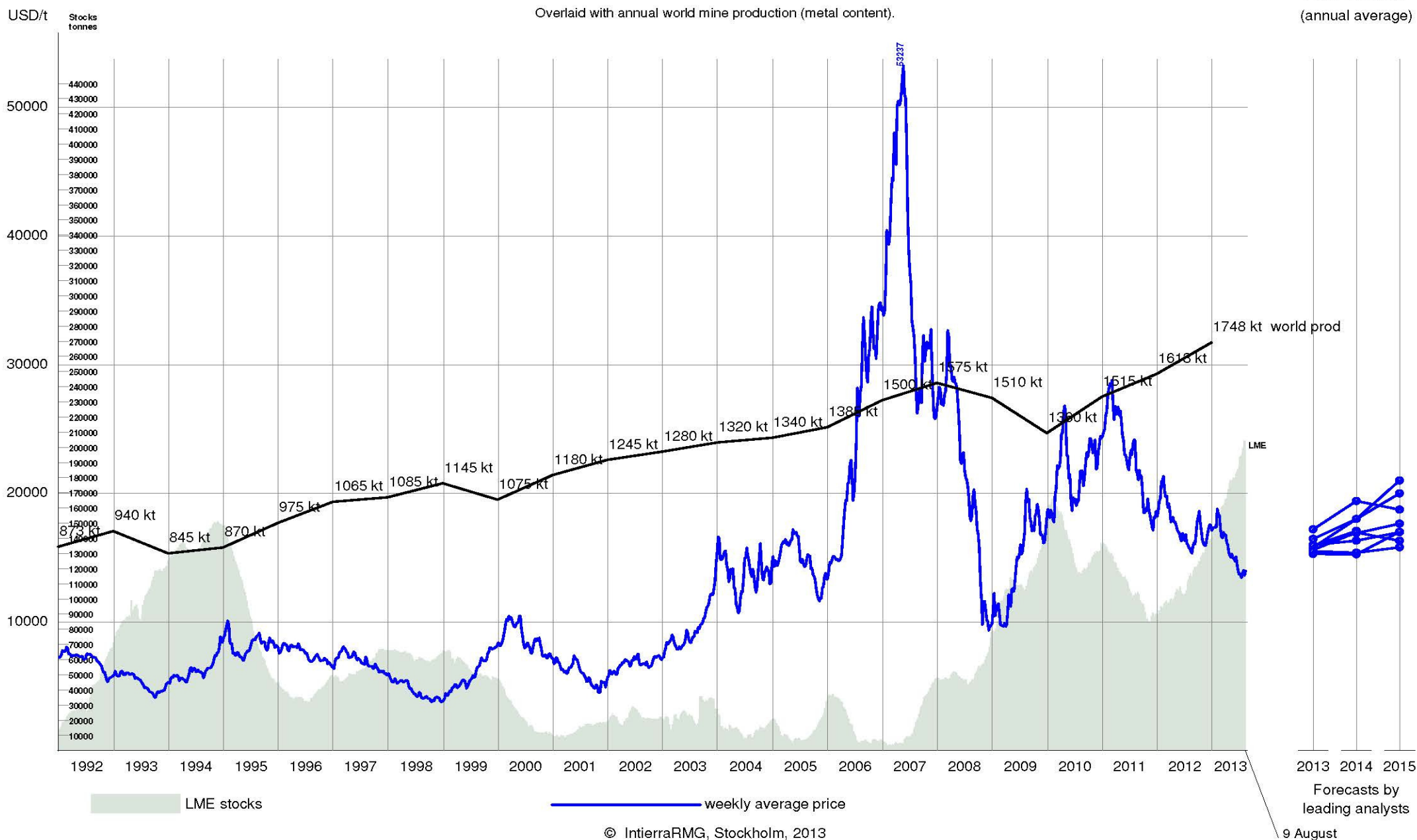
Overlaid with annual world mine production (metal content).

Price forecasts
(annual average)



Nickel price (LME cash settlement, weekly averages) and metal stocks through week 32 2013

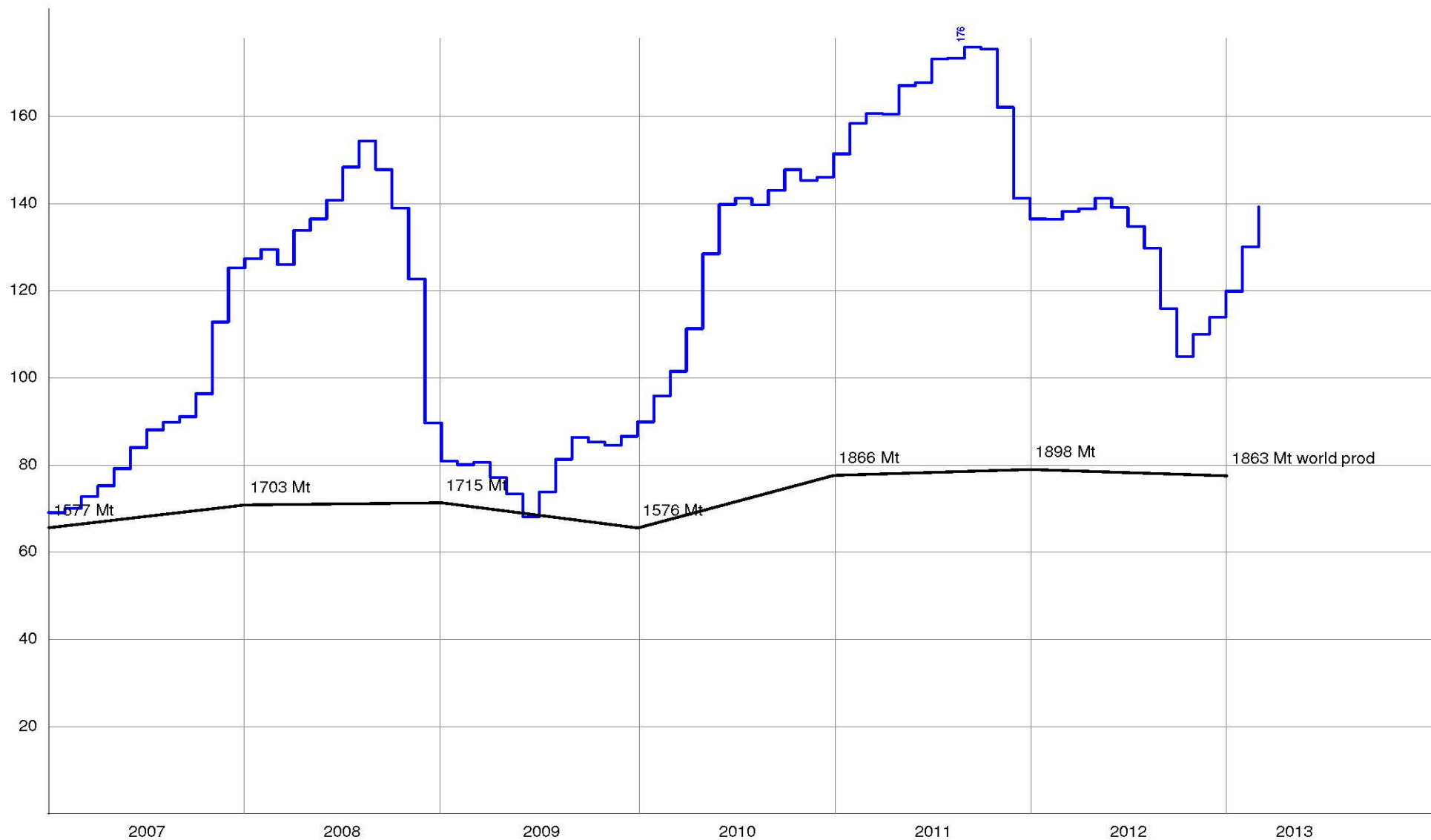
Price forecasts
(annual average)



Iron ore price - Average composite price imported Fe ore (USD/t) to China

Overlaid with annual world mine production .

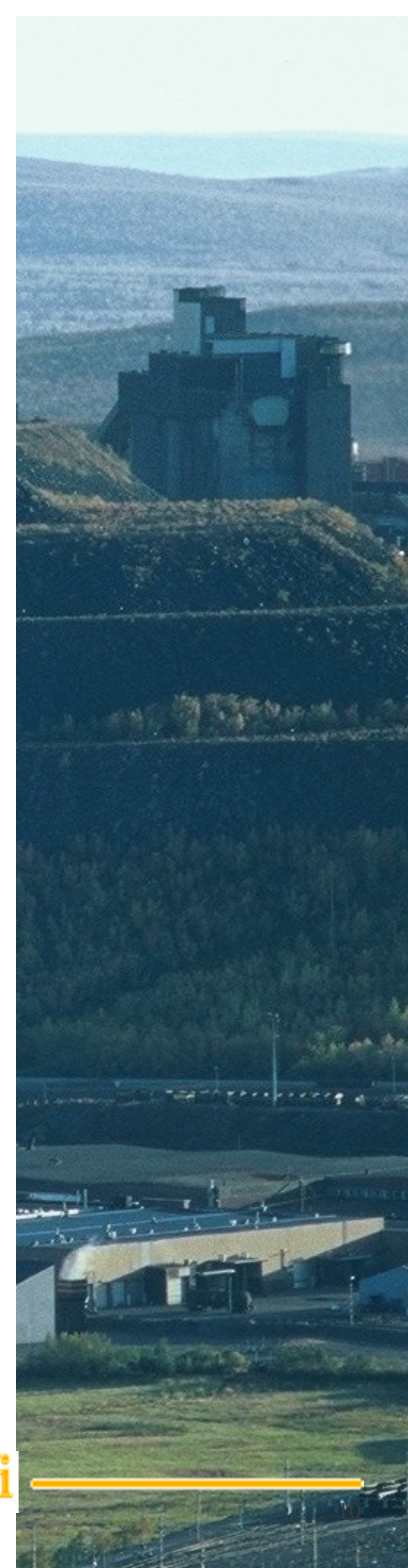
USD/t



— monthly average price

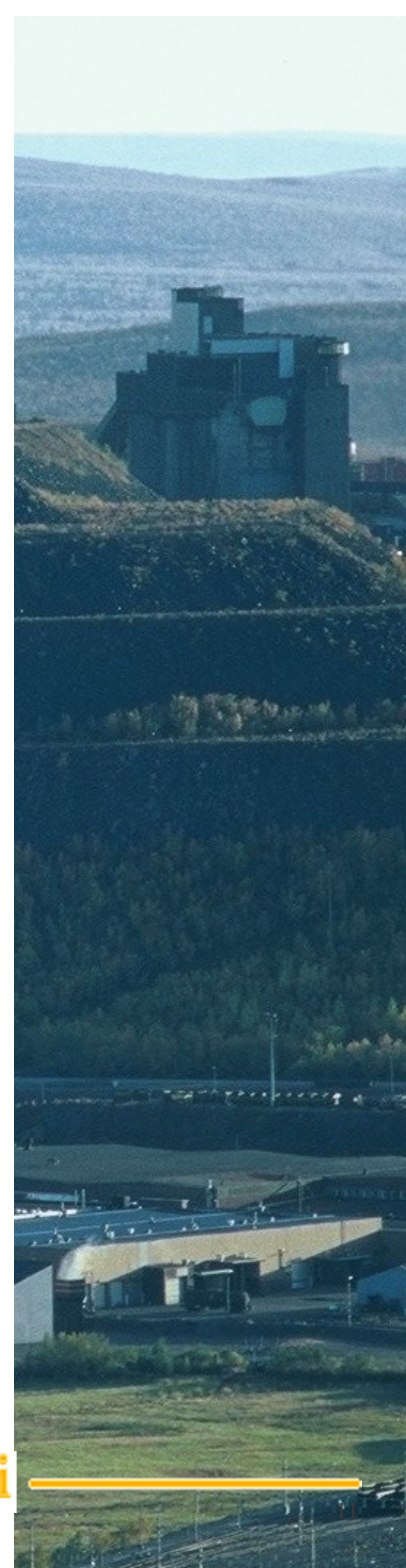
Key risks on the mining industry (Earnst & Young 2013)

1. Capital management/access
2. Margin protection/productivity
3. Resources nationalism
4. Social license to operate
5. Skills shortage
6. Price and currency volatility
7. Capital project execution
8. Sharing the benefits
9. Infrastructure access
10. Threat of substitutes

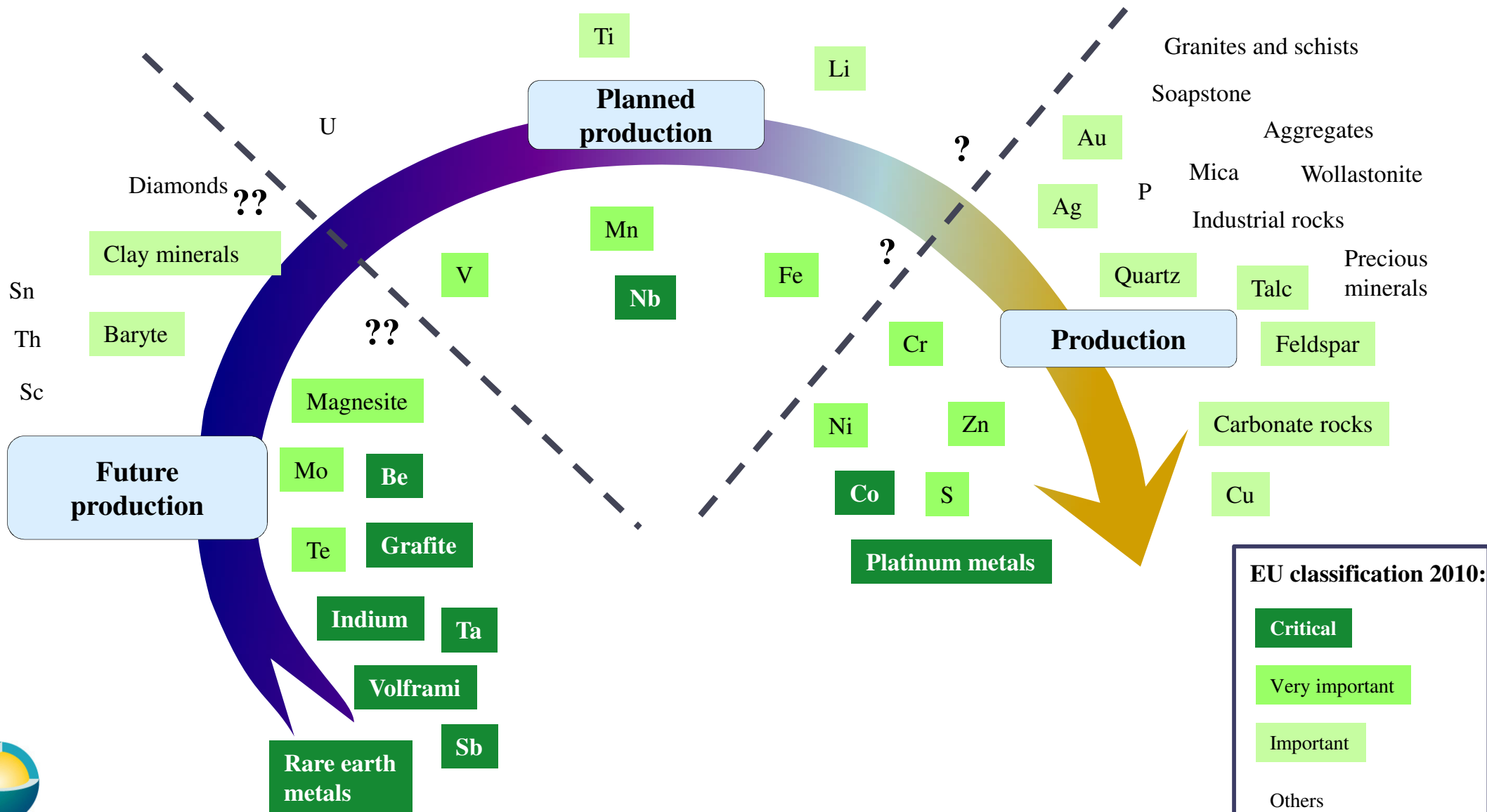


Long and short term outlooks

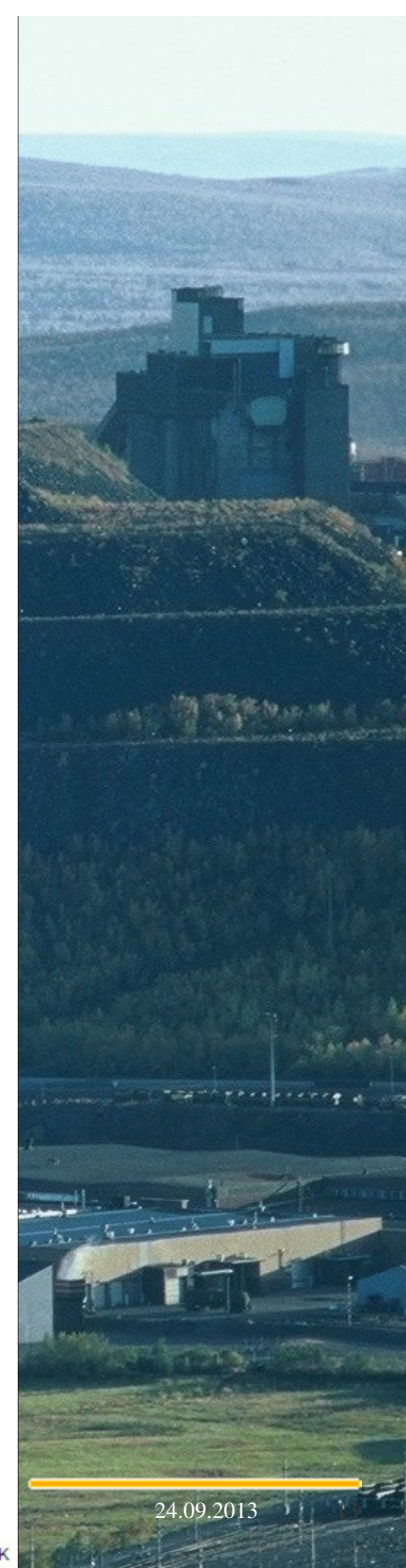
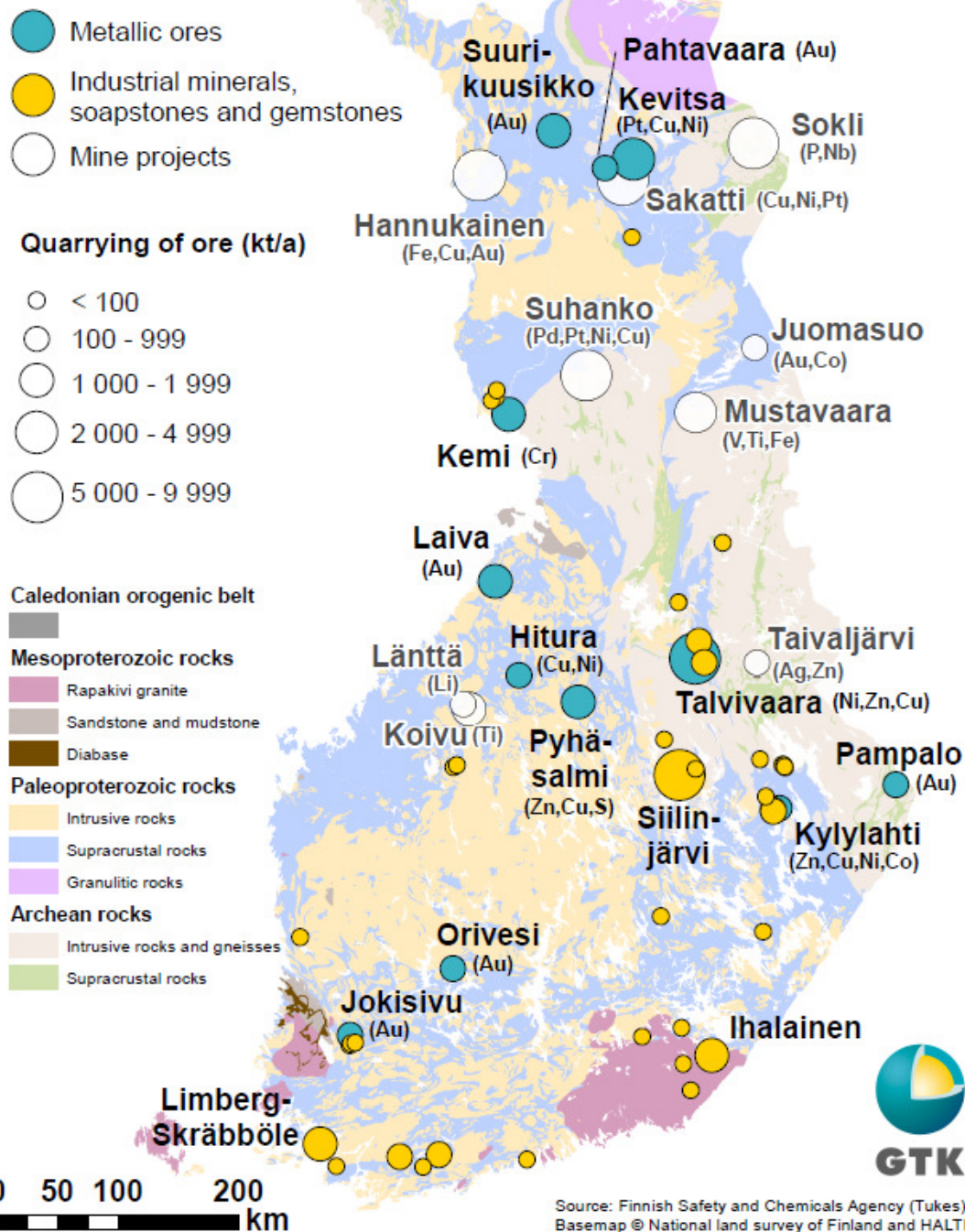
- Super cycle continuing driven by China and India?
- Need for raw materials still intensive
- Lowering ore grade, complex mineralogy, going underground?
- Short term development seems challenging
- Profitability problems at some mines
- Especially junior companies are lacking capital
- However, good projects survive in these conditions also



Wide range of commodities for long-term needs

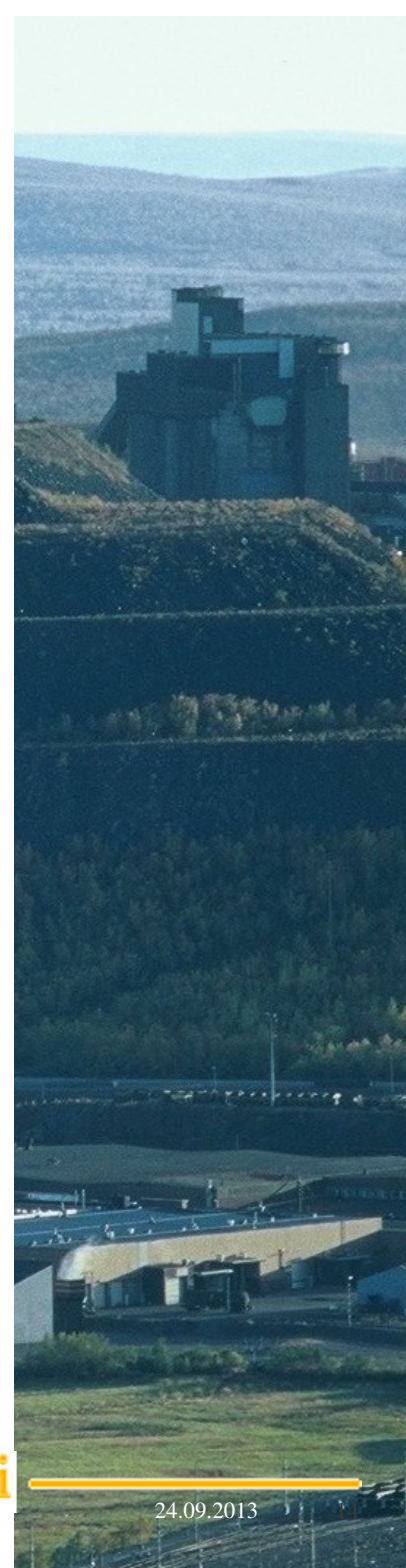


Mines and projects 2012

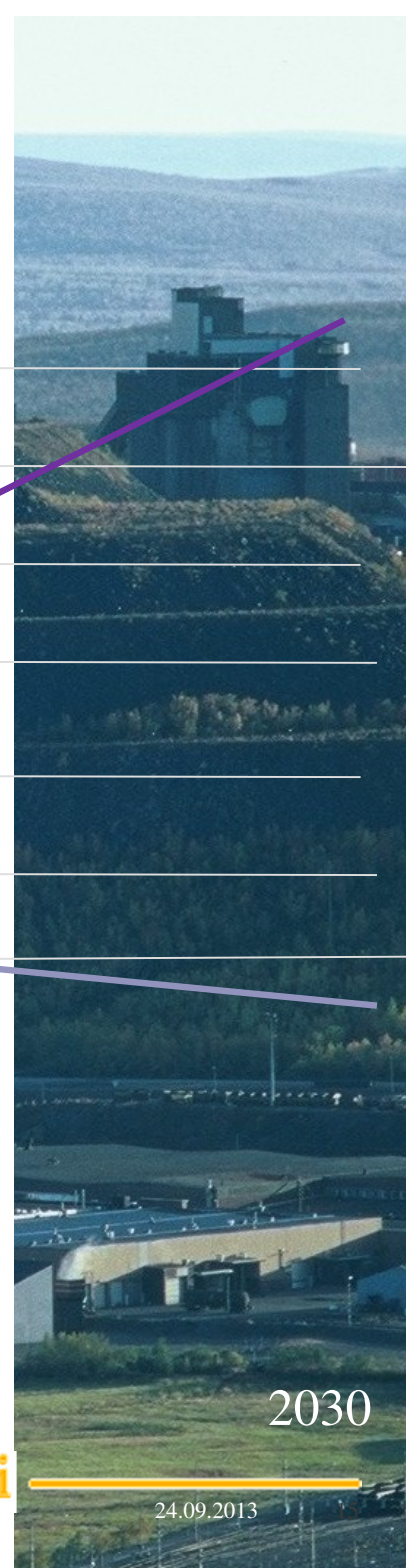
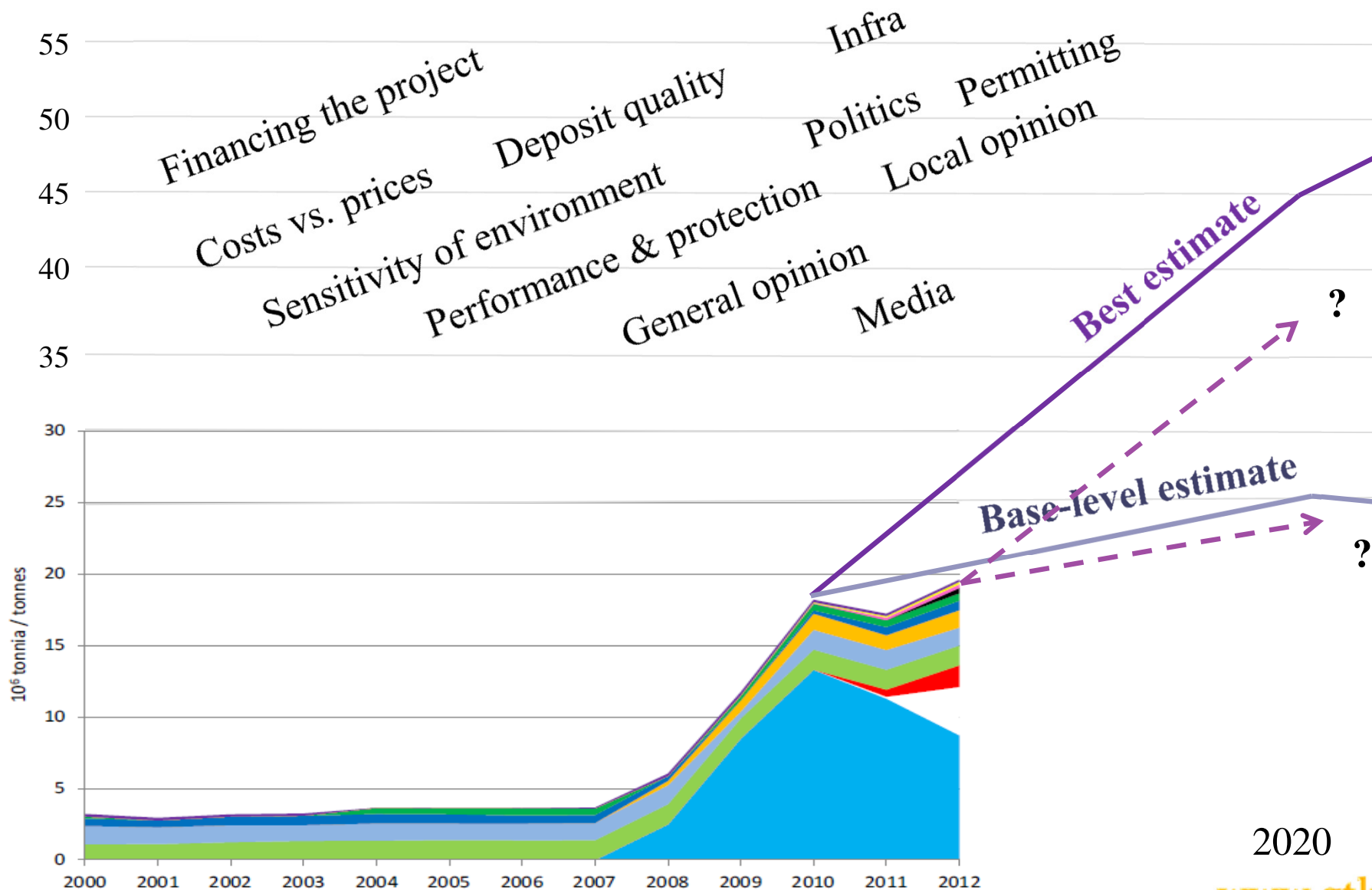


Sustainable Use of Natural Resources and the Finnish Economy (SURE)

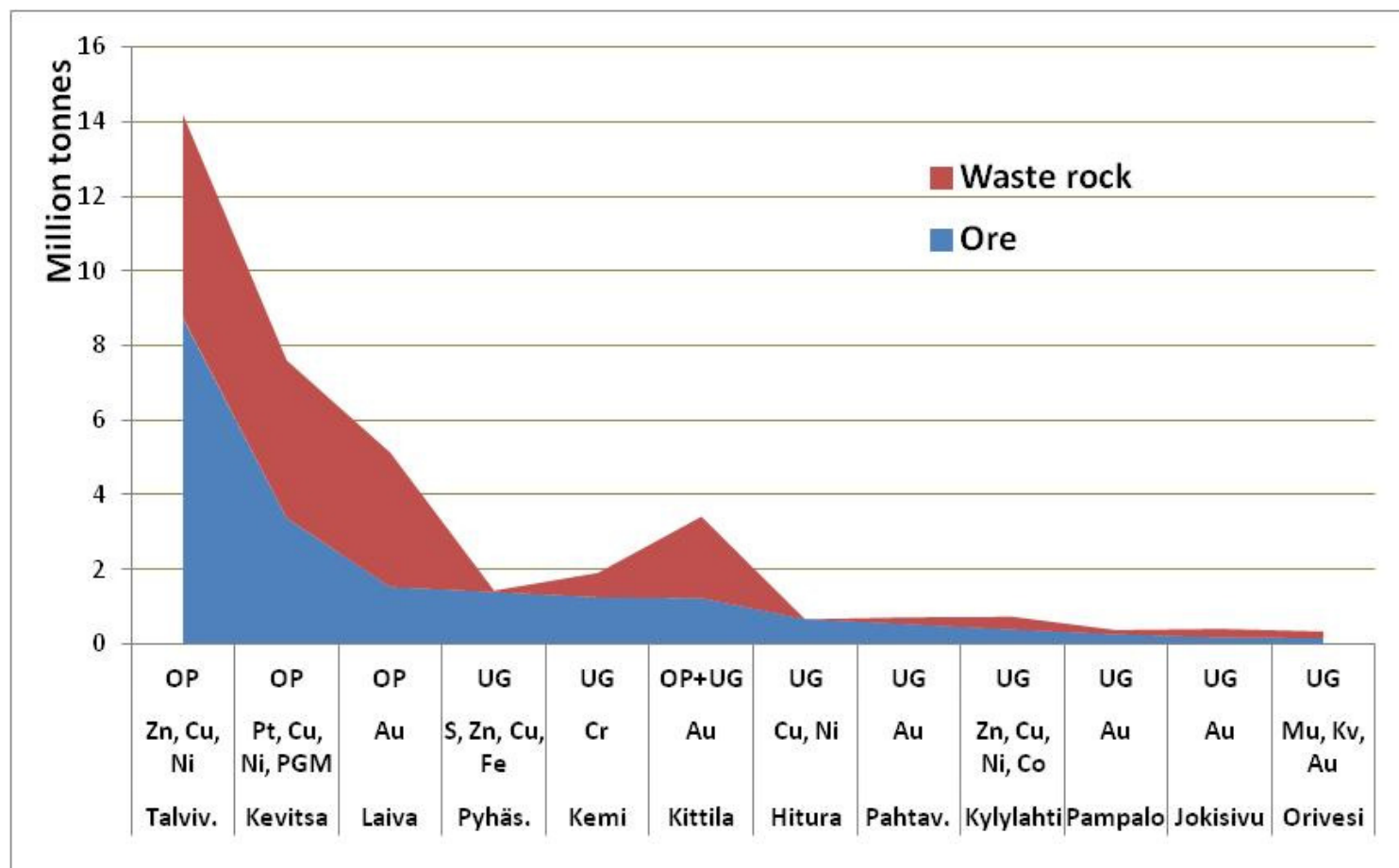
- Development models for the Finnish economy to 2030 (and 2050)
- Mining included
- Three development scenarios from 2010 to 2030: Base-Level, Best-Estimate and Maximum
- Based on company plans and rough estimation of the profitability
- Monetary, physical and environmental indicators



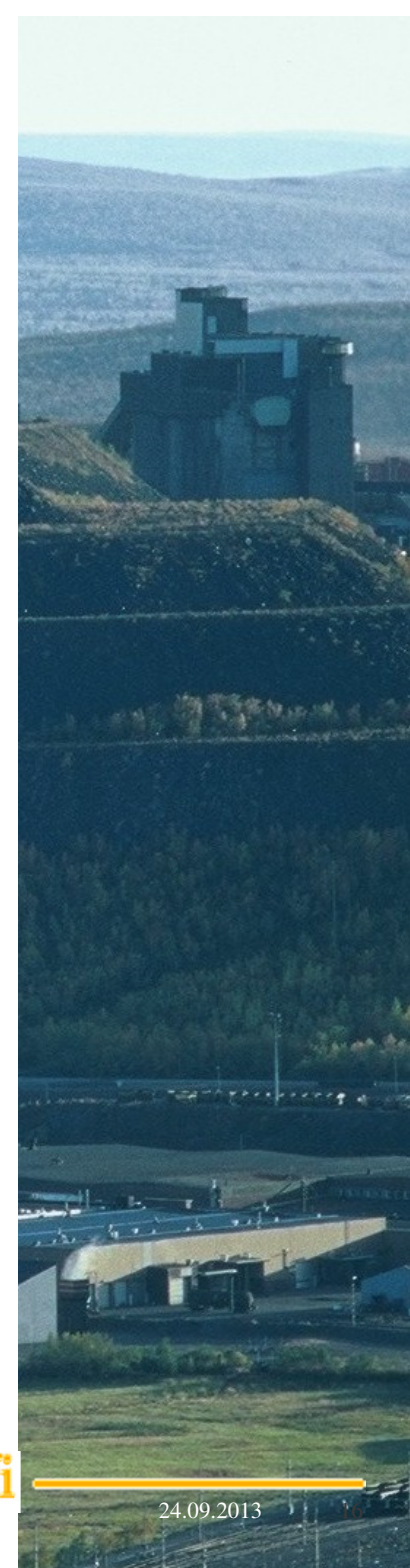
Future development in ore mining?



Large and small mining operations

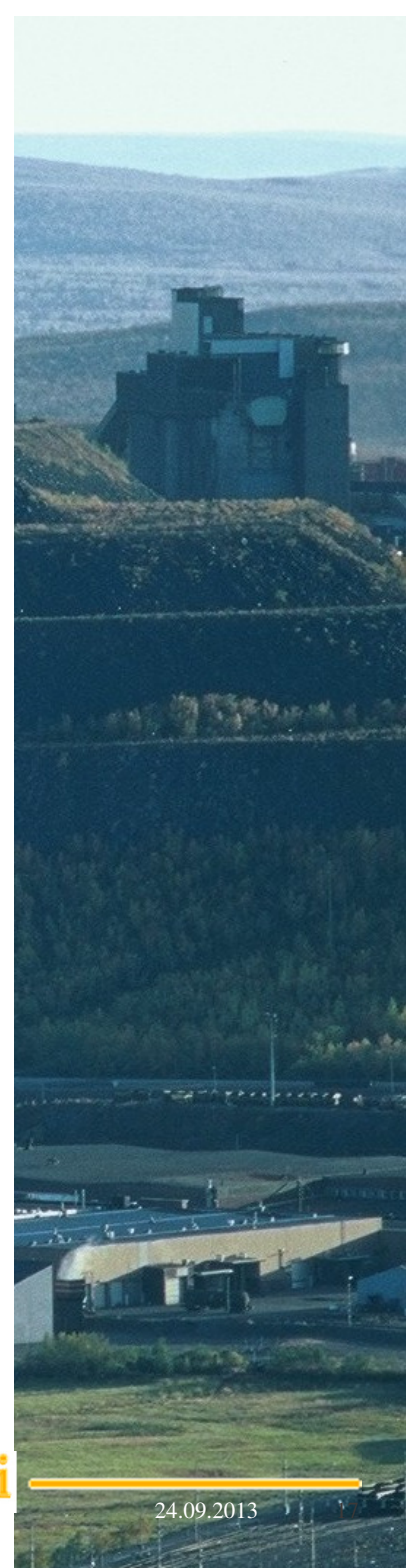


Not only volume, but also ore mineralogy, hydrological conditions and processing techniques matter



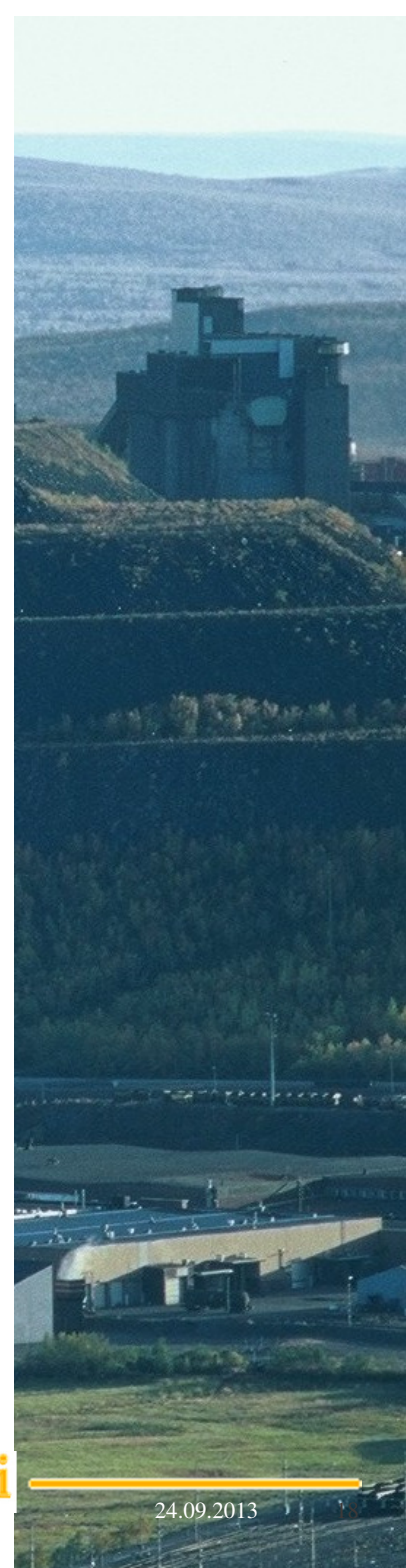
Opportunities and drawbacks (1)

- **Economic:** employment, investments, tax receivings, but also struggle with costs and surviving in low price times
- **Environmental:** intensive land use (exp. open pit mining), mineral waste, mine water, biodiversity loss, energy use, environmental accidents
- **Social:** employment and economic wealth, fears, insecurity, competition with other businesses, decreasing quality in living environment



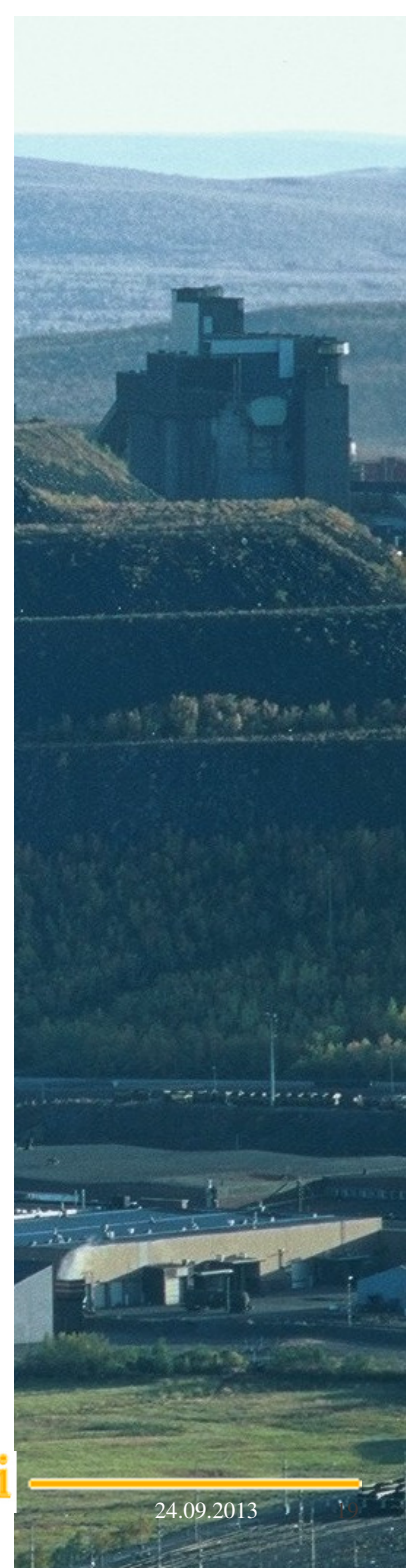
Opportunities and drawbacks (2)

- Opportunities for research society to widen the research subjects, find new partners, get funding and try to make a difference
- Co-operation between industry, academy and governance needed to guarantee a successful development in the future



Key message

- Mining activity have increased significantly in recent years
- A long-term continuation of the increase will probably take place driven by a global need
- Both benefits and drawbacks
- Water issues are in focus of environmental management
- With climate change the Finnish climate will possibly change more rainy
- **This calls for even better techniques and applications, co-operation and motivation for mine water management!**



Environmental protection - a key for future success

(not forgetting profitability however...)

