

Nickel: The necessity of higher prices

Metal Bulletin
Events

International
Ferro-Alloys
Conference

8-10 November 2009
The Fairmont,
Monte Carlo, Monaco

25th
in the
series

A horizontal banner with a dark red background. On the left, it says 'Metal Bulletin Events' in white. In the center, 'International Ferro-Alloys Conference' is written in large, bold, yellow and white letters. On the right, the dates '8-10 November 2009' and location 'The Fairmont, Monte Carlo, Monaco' are in white. A circular badge on the far right contains the text '25th in the series' in white on a yellow background.

Robert Cartman – Hatch Beddows

Contents

- **Hatch and Hatch Beddows**

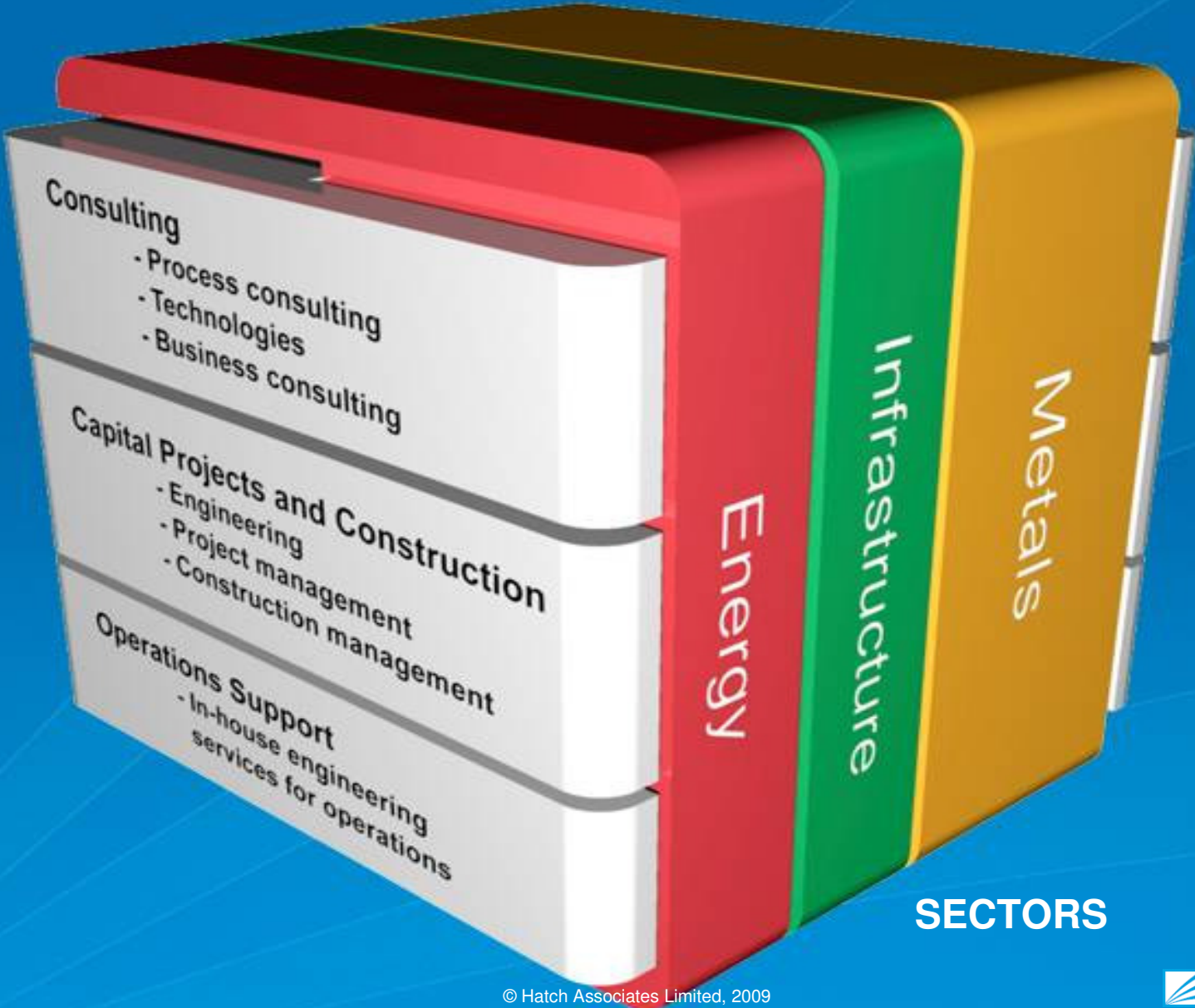
- Short-term Ni prices

- Long-term Ni prices

- Conclusions

HATCH
Hatch services and sectors

S
E
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S

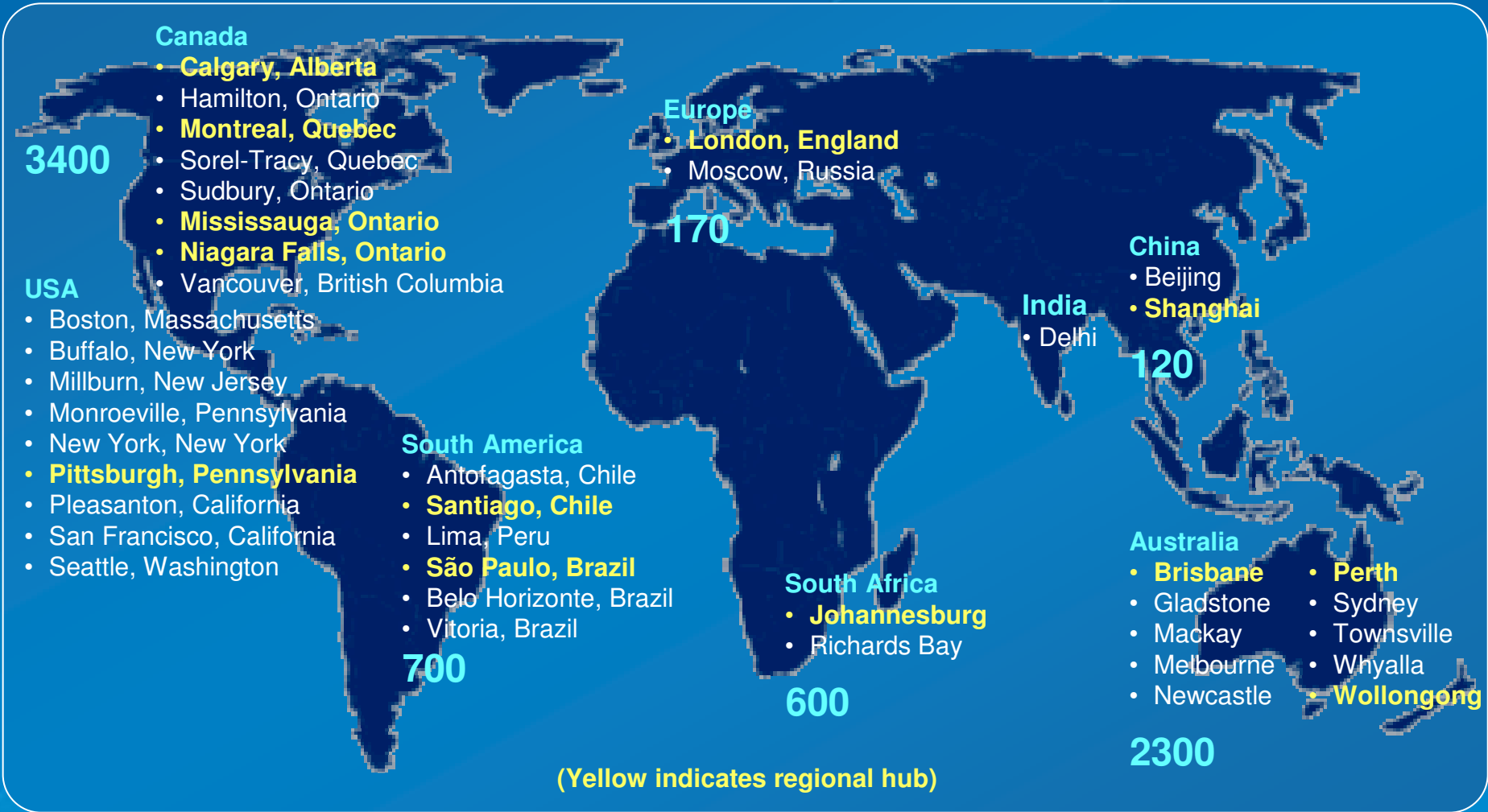


SECTORS

HATCH

Global reach and resources

8000 people



(Yellow indicates regional hub)

Hatch counts many of the world's major mining and steelmaking companies and financial institutions among its core client base

Mining

Alcan
Alcoa
Anglo American
Assmang
BHP Billiton
De Beers
ENRC
Falconbridge
Impala Platinum
Lonmin
Newmont Mining
Norilsk
Placer Dome
QIT
Rio Tinto
SUAL
Vale Inco
Xstrata

Steel

ArcelorMittal
BlueScope Steel
Celsa
CMC
Tata/Corus Group
Evraz Group
Gerdau Group
Mechel
Metalloinvest
Metinvest
Nucor
POSCO
Ruukki
Severstal
Shougang
TMK
U.S. Steel
voestalpine

Financial institutions

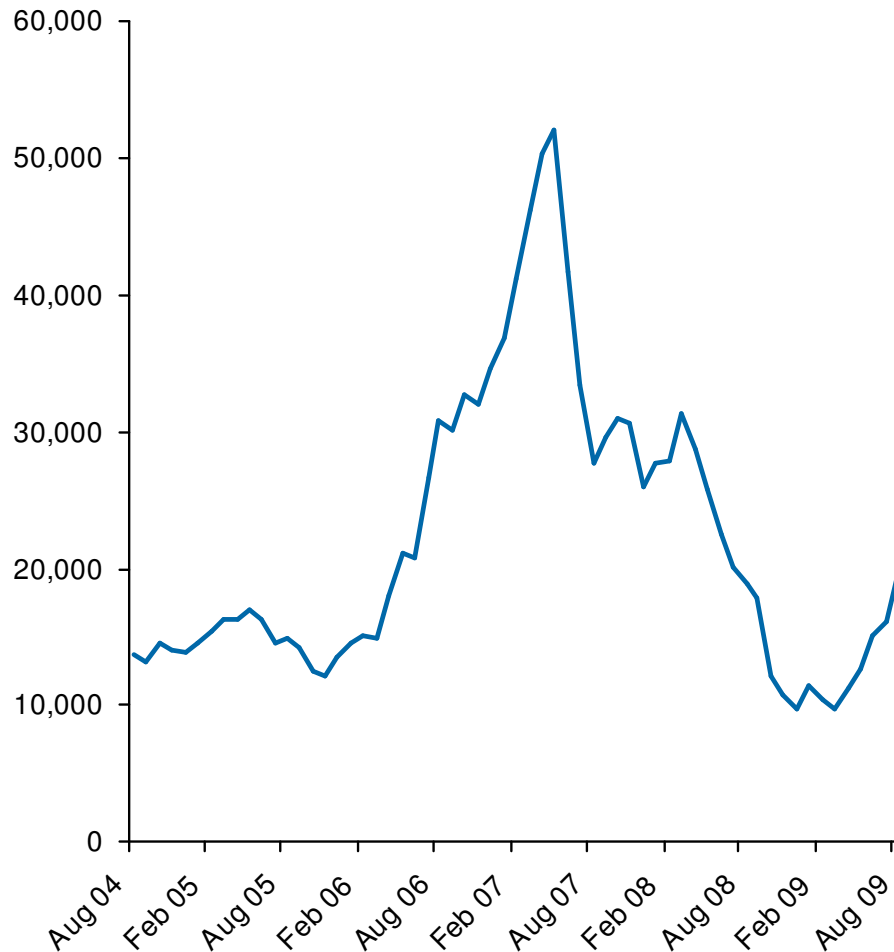
ADB
Bank of America
Bear Stearns
CIBC
Citibank
Commonwealth Bank
Credit Lyonnais
CSFB
Deutsche Bank
EBRD
HSBC
IFC
JP Morgan Chase
Mellon Bank
NM Rothschild & Sons
RBS
UBS Warburg
World Bank

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- Hatch and Hatch Beddows
- **Short-term Ni prices**
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The LME Ni price has shown great volatility in the last 5 years, driven by a number of key factors

LME Ni price (\$/tonne)



Drivers of short-term Ni price

- Supply / Demand balance
 - Stockpiles, strikes, natural disasters
 - Stainless production, financial crises / recession

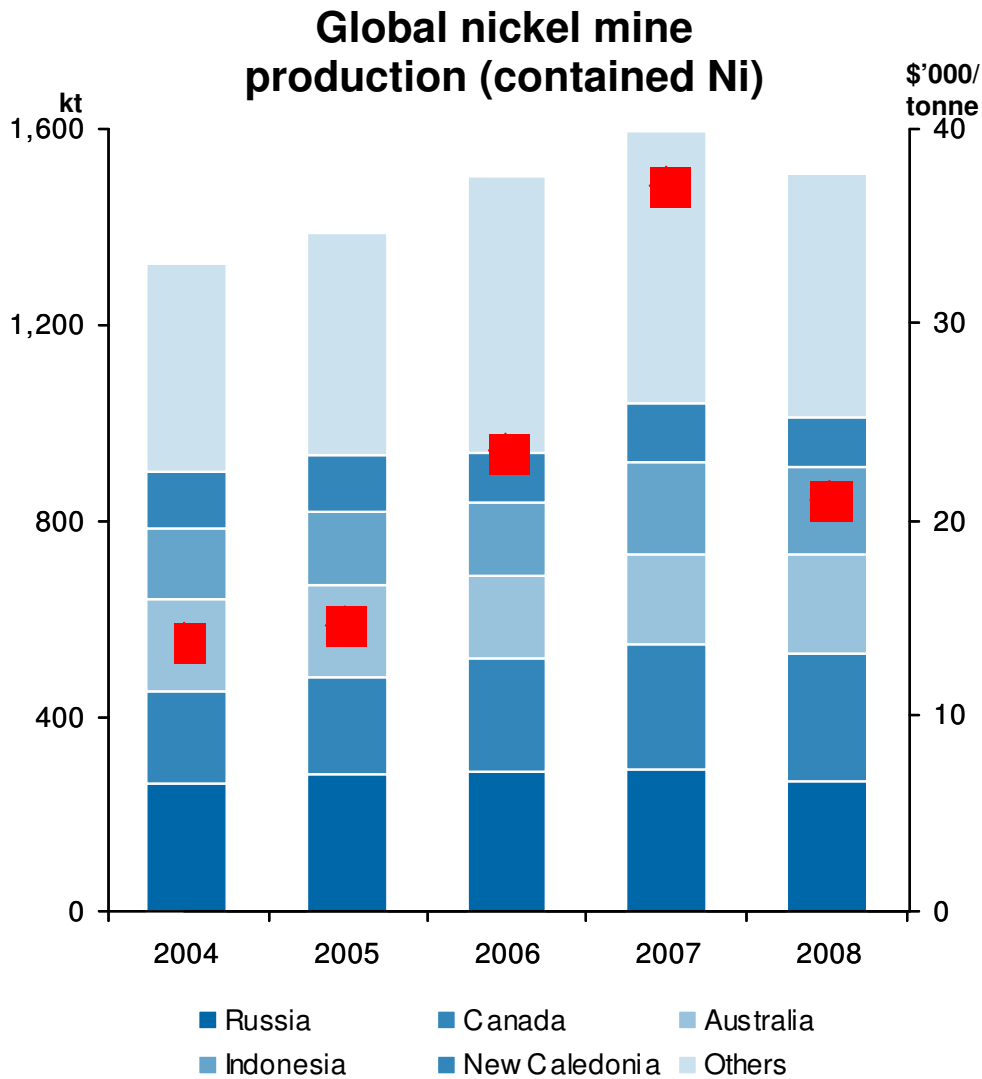
- Expectations
 - Alloy surcharge mechanism
 - Speculation

- Dollar weakness
 - Against Ni-producing countries

- Input costs
 - Oil price, sulphuric acid

Source: MB, Hatch Beddows

Ni supply has moved in line with prices. Cutbacks in 2008 reflect the fact that prices moved below marginal cost for some producers

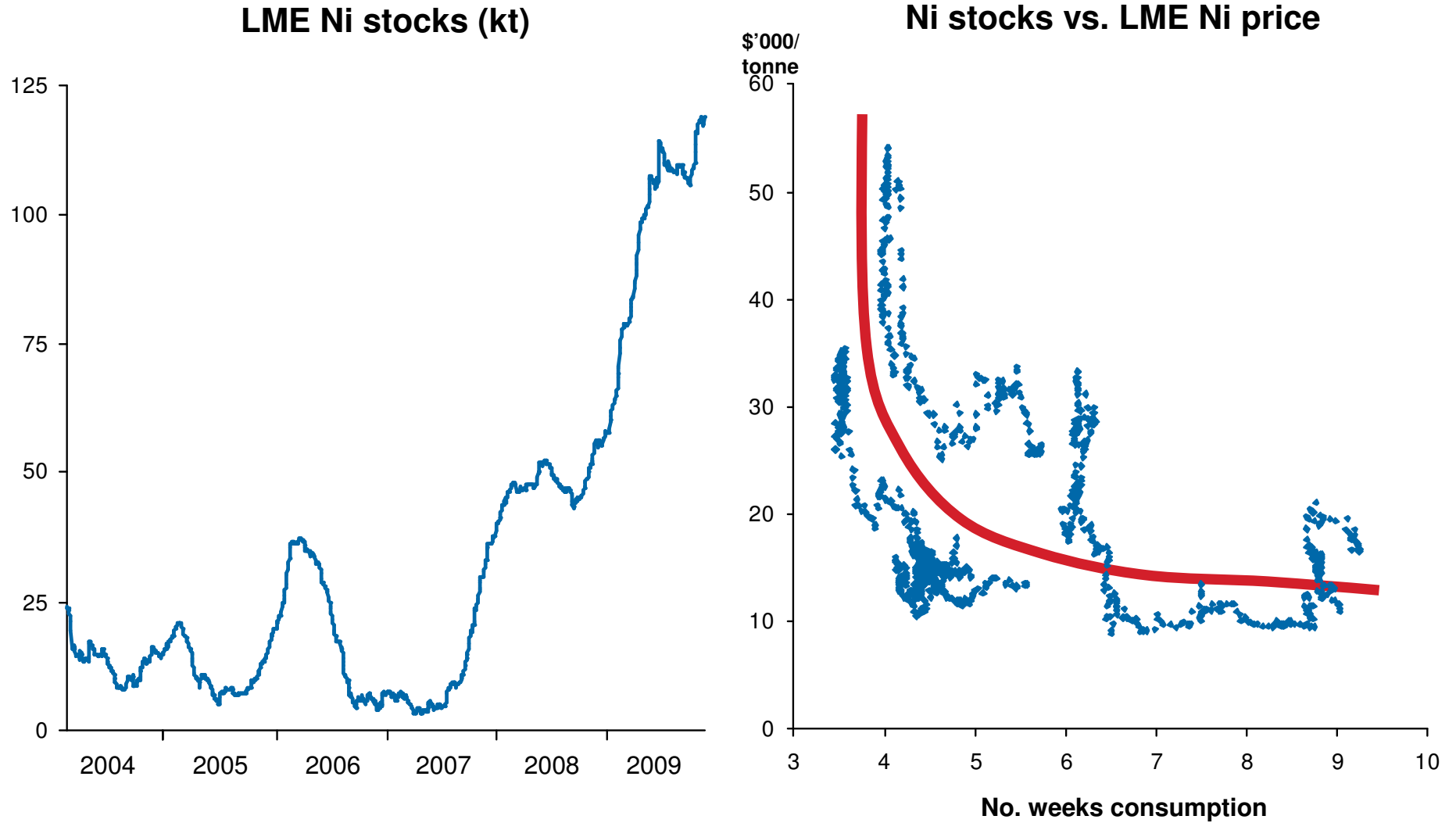


Key nickel cutbacks 2008 / 2009

| Company | Details |
|--------------|--|
| Xstrata | Falconado operations in Dominican Republic suspended indefinitely (29kt) |
| | Mine closures in Canada (17kt) |
| BHP Billiton | Closure of Ravensthorpe, now up for sale (14kt) |
| Vale | Onca Puma project repeatedly suspended (58kt) |
| | Global mine cutbacks (90kt) |
| Norilsk | Suspension of Australian operations (47kt) |
| Antam | Cutback of Indonesian operations (7kt) |

Source: INSG, MB, Hatch Beddows

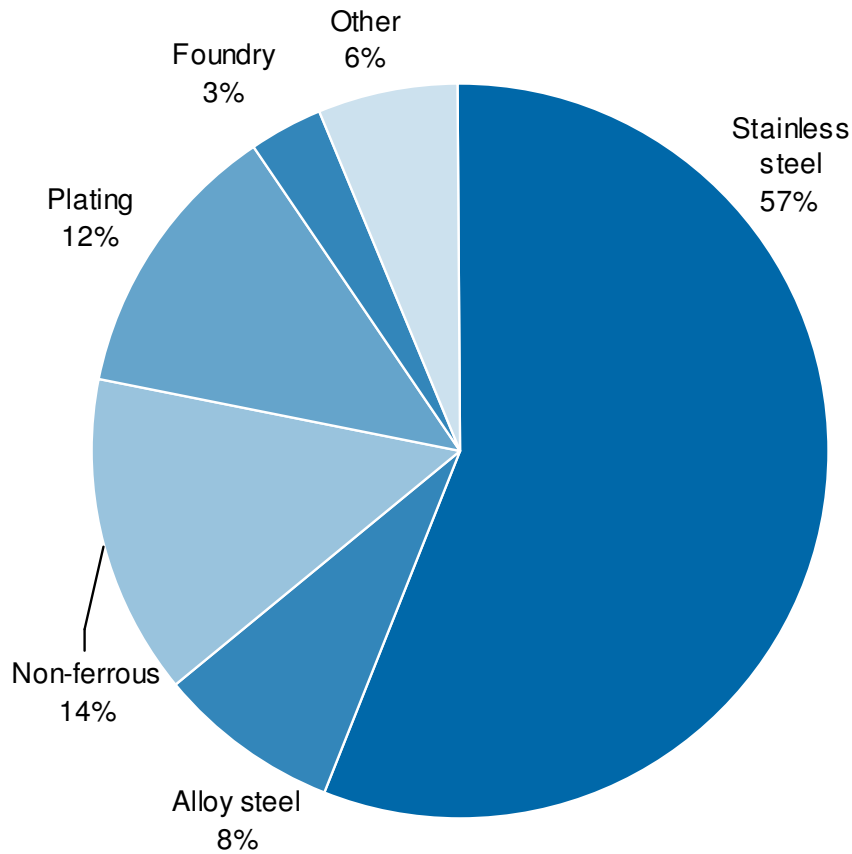
Despite some cutbacks, Ni oversupply will act as a drag on upward movements in the Ni price in the short term



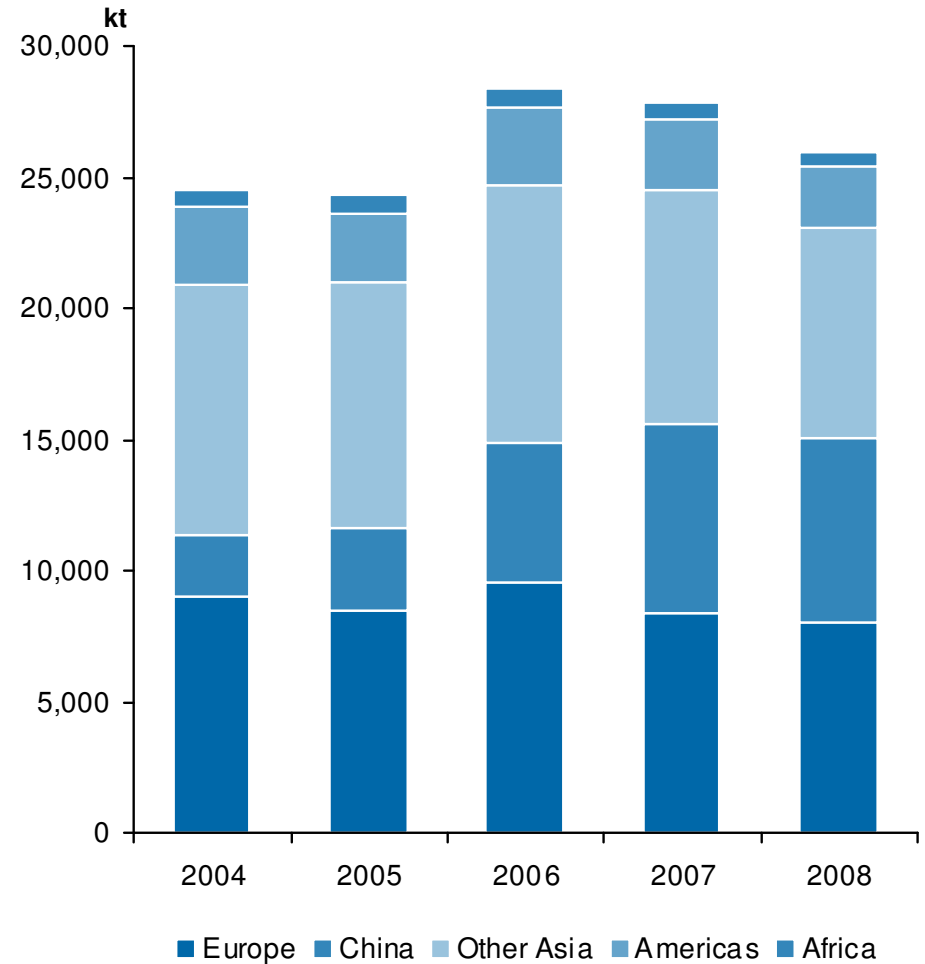
Source: MB, LME, INSG, Hatch Beddows

Ni demand is dominated by stainless steel production. This has fallen since a 2006 peak of 28.4Mt

Ni demand by end-use



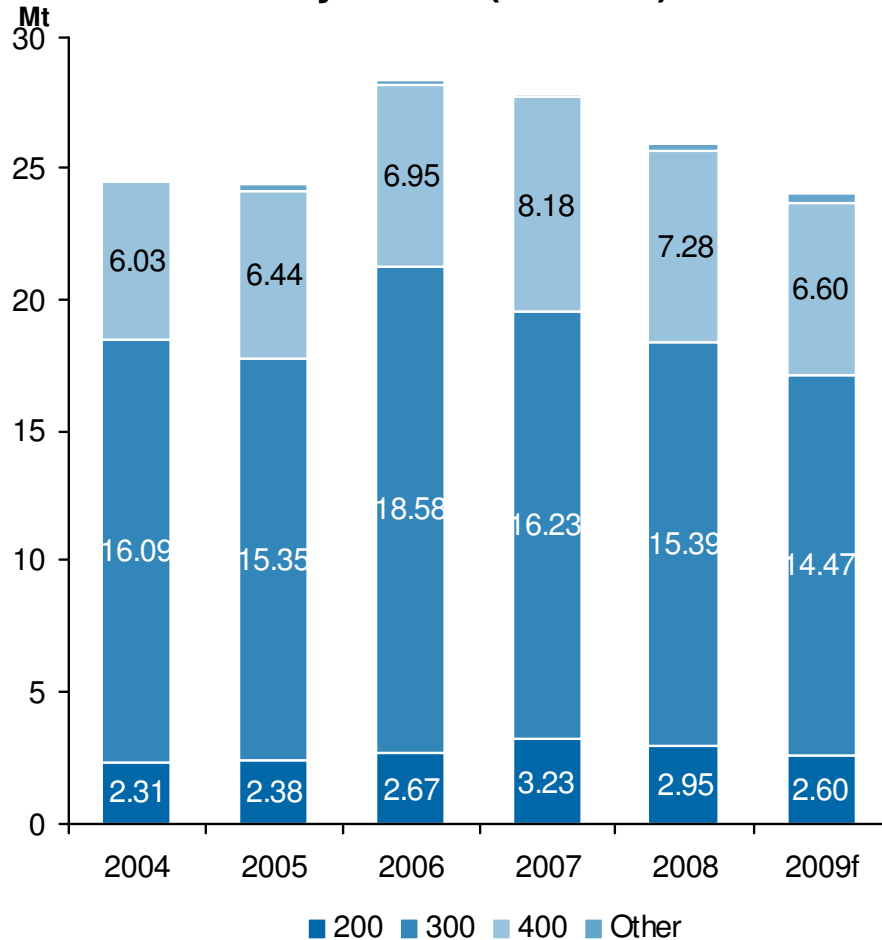
Global stainless steel production



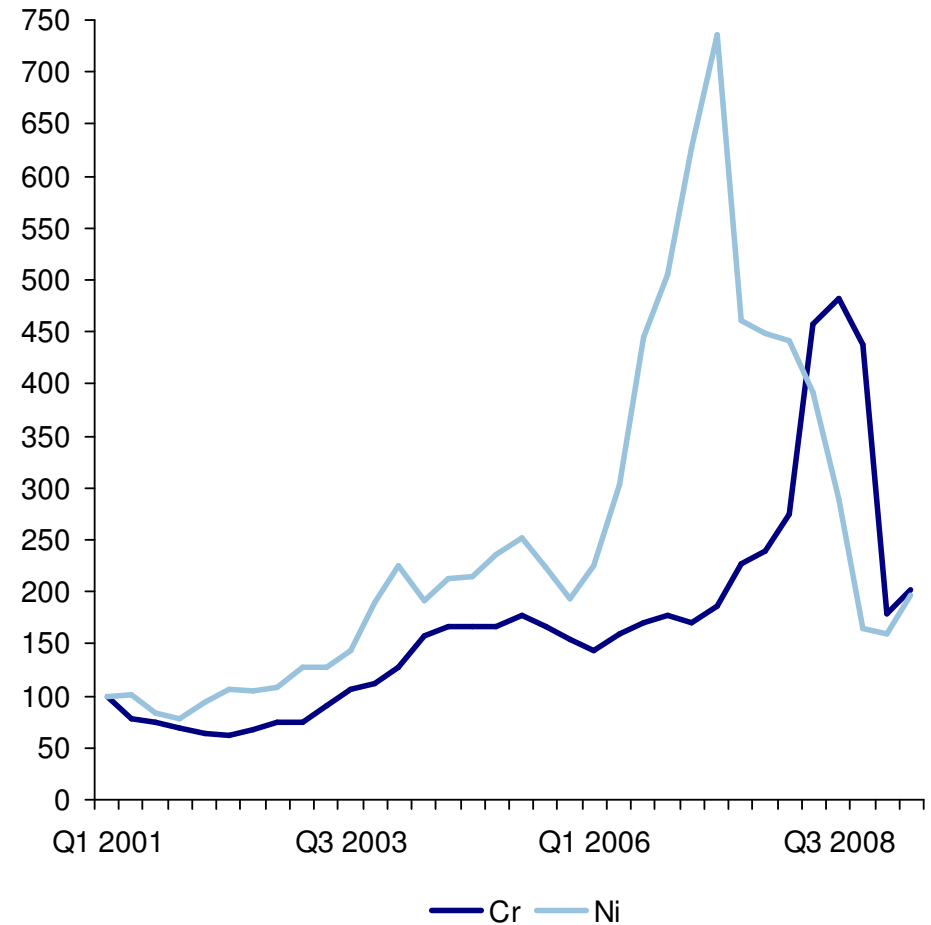
Source: ISSF, Hatch Beddows

The production of Ni-containing grades of stainless steel has fallen even faster than overall stainless steel production

Global stainless steel production by series (2004-09)



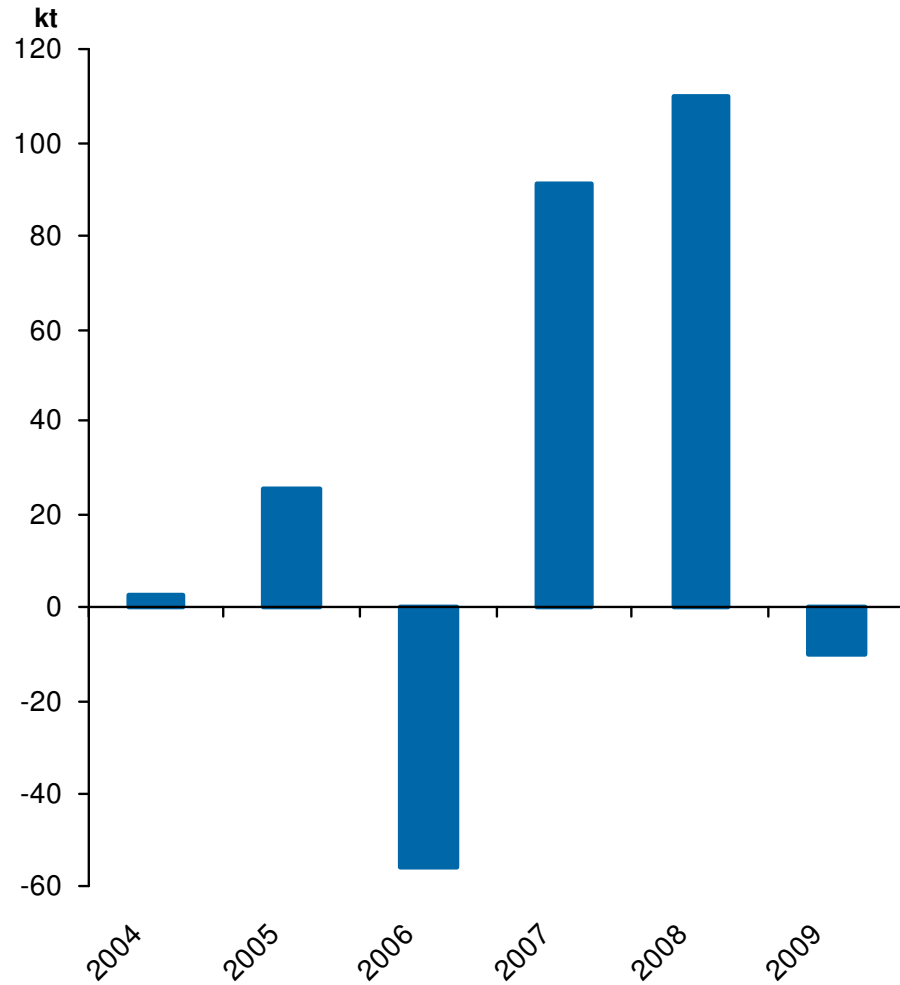
Index of Cr and Ni prices (Q1 2001 = 100)



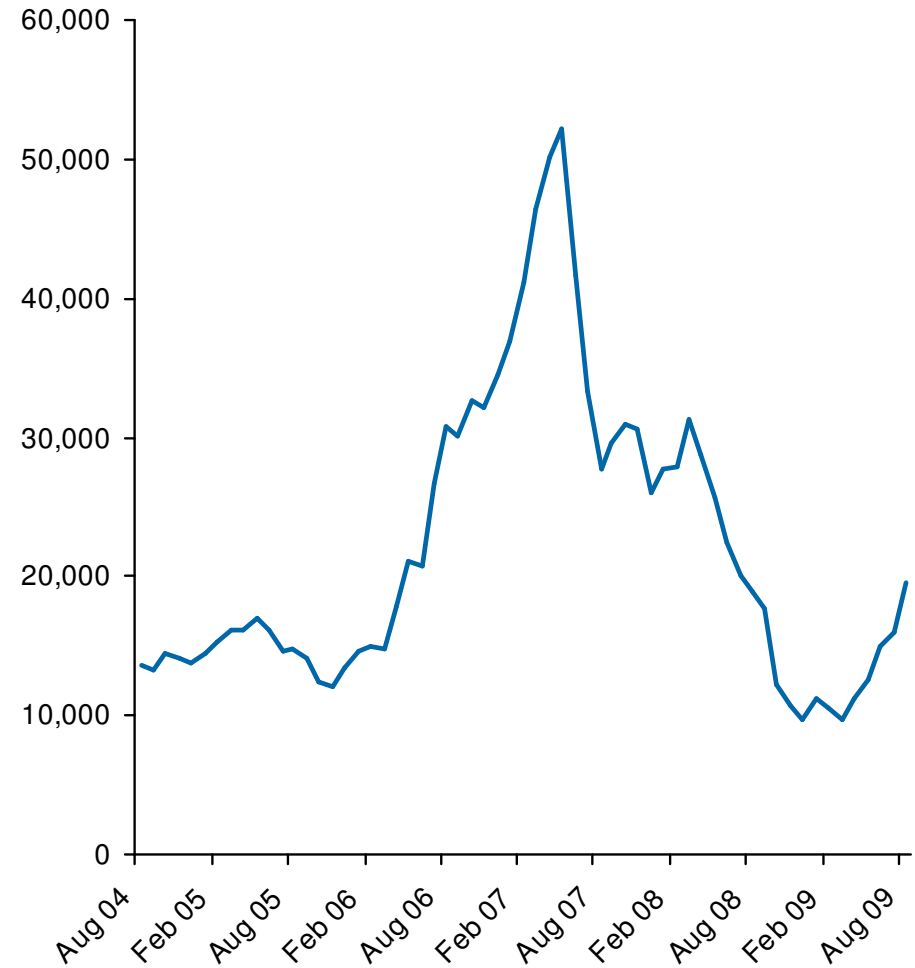
Source: ISSF, MB, Hatch Beddows

The supply / demand balance for nickel has an effect on nickel prices, although 2007 shows that other factors matter

Supply / Demand balance for finished Ni



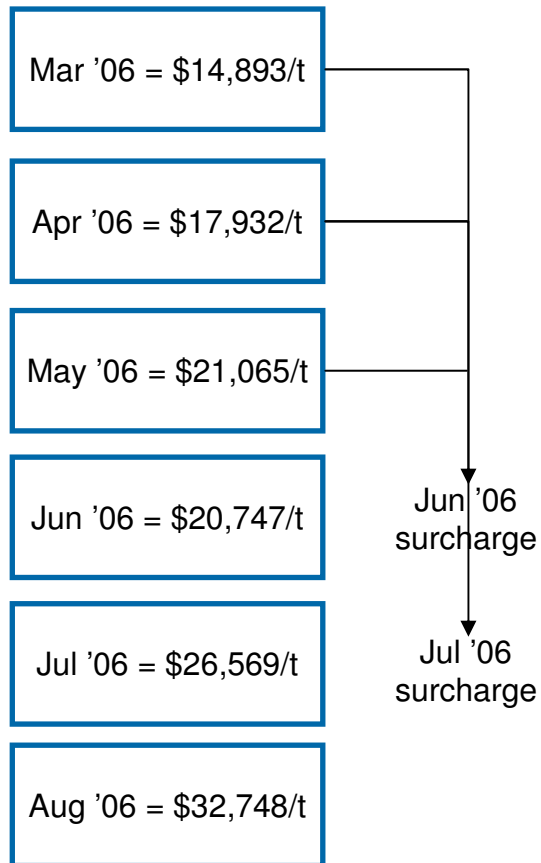
LME Ni price (\$/tonne)



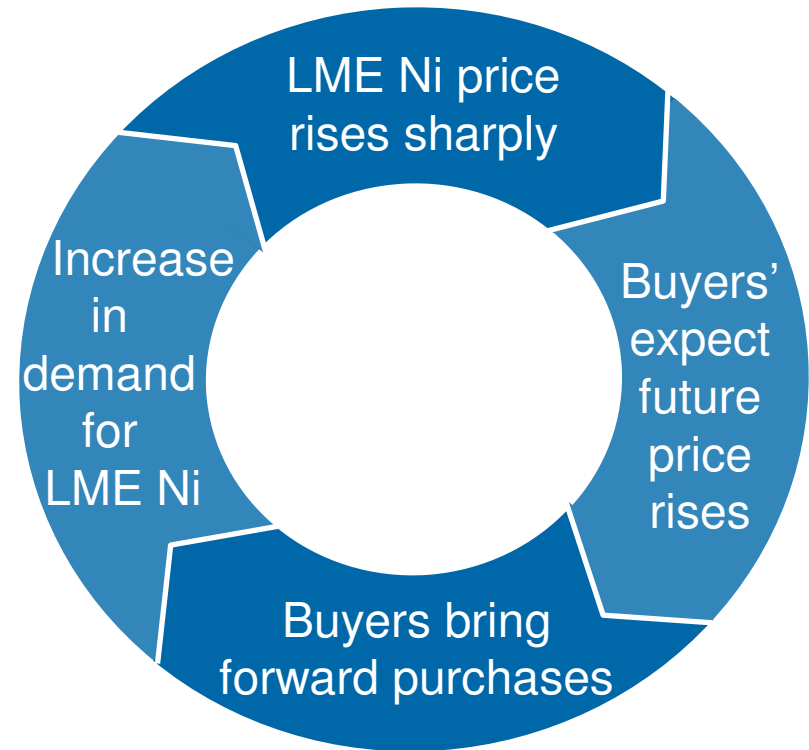
Source: Hatch Beddows

The previous alloy surcharge mechanism of stainless steel producers helped to create a speculative cycle

Previous alloy surcharge mechanism

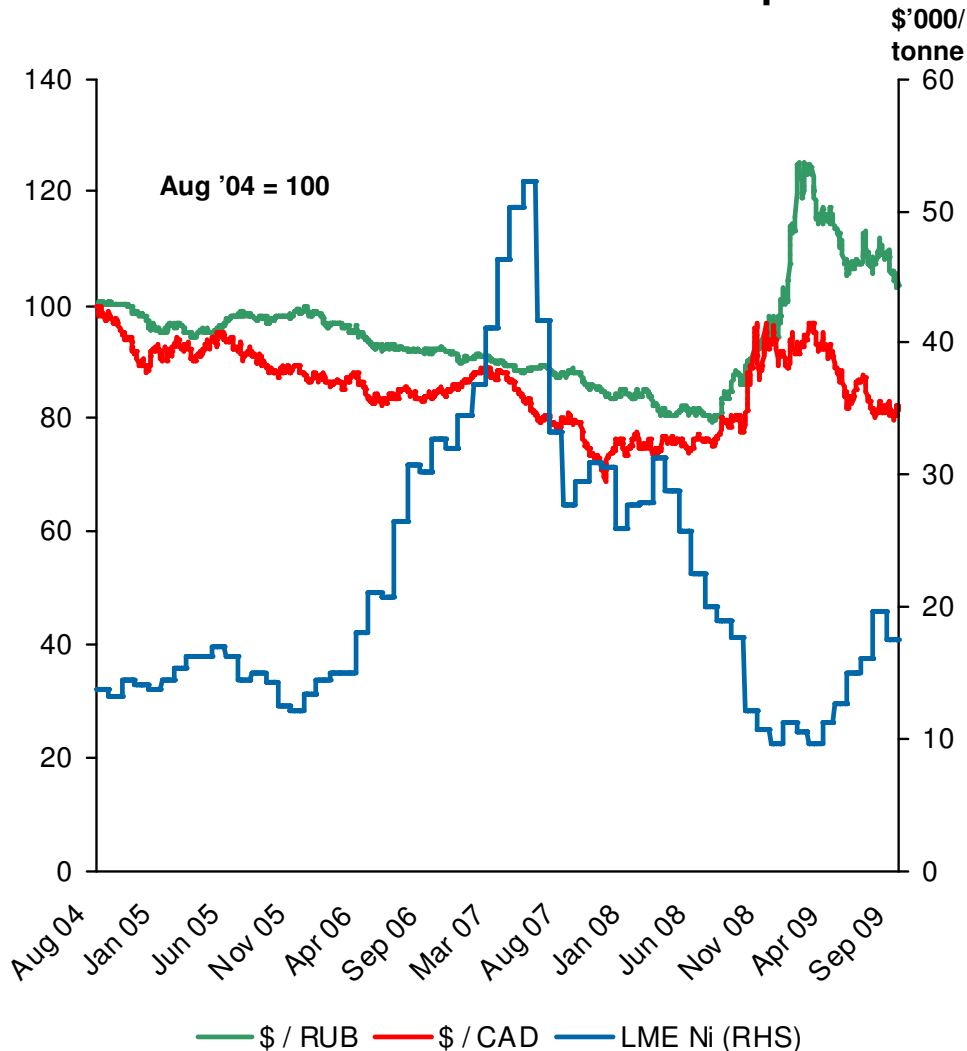


Effect of previous alloy surcharge mechanism



The weakening of the US dollar has helped to drive the Ni price higher

Indexed dollar value vs. LME Ni price



Source: Oanda, Hatch Beddows

Effect of \$ weakness on Ni prices

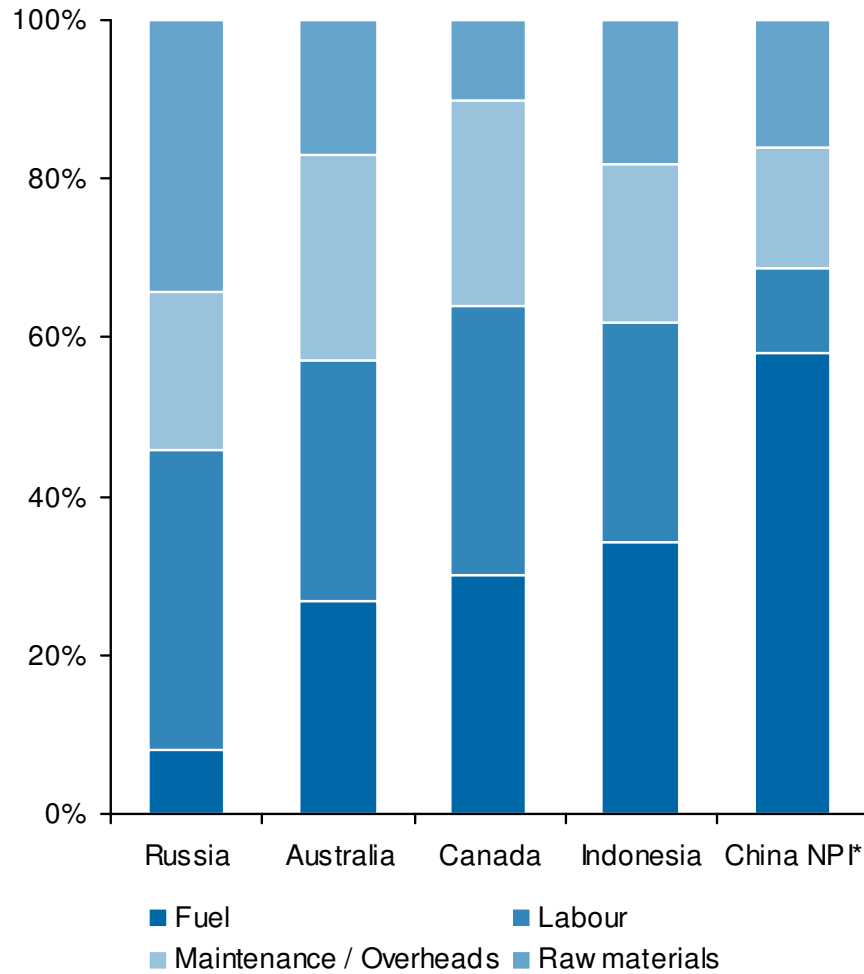
- Priced in dollars
 - No US production of Ni
 - Ni Production in non-\$ countries
 - Ni Production in countries with 'floating' FX rate

- Dollar weakness
 - Falling revenues for Ni producers
 - Need to increase \$ price of Ni to compensate

- Conclusion
 - Visible correlation, $r = -0.6$
 - Large movements driven more by short-term market conditions

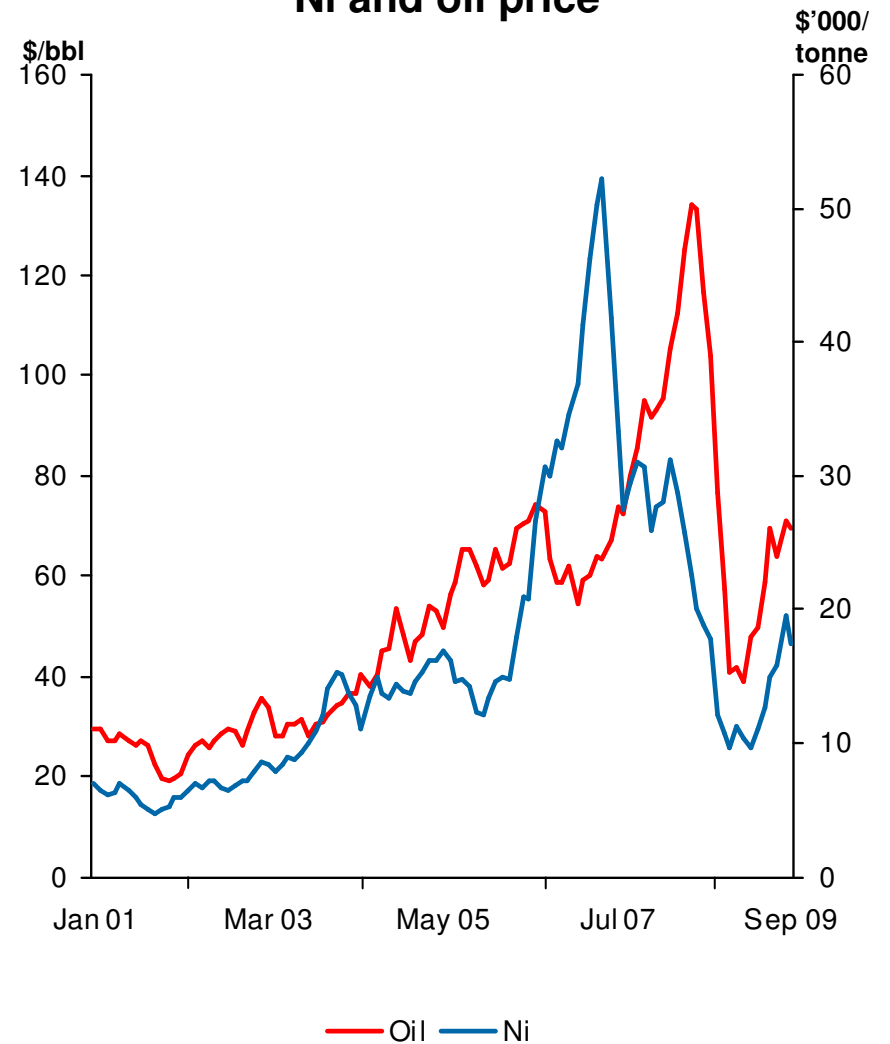
As a major component of production costs, the rise in oil prices over recent years has also fed through to Ni prices

Ni mining and processing costs, 2009

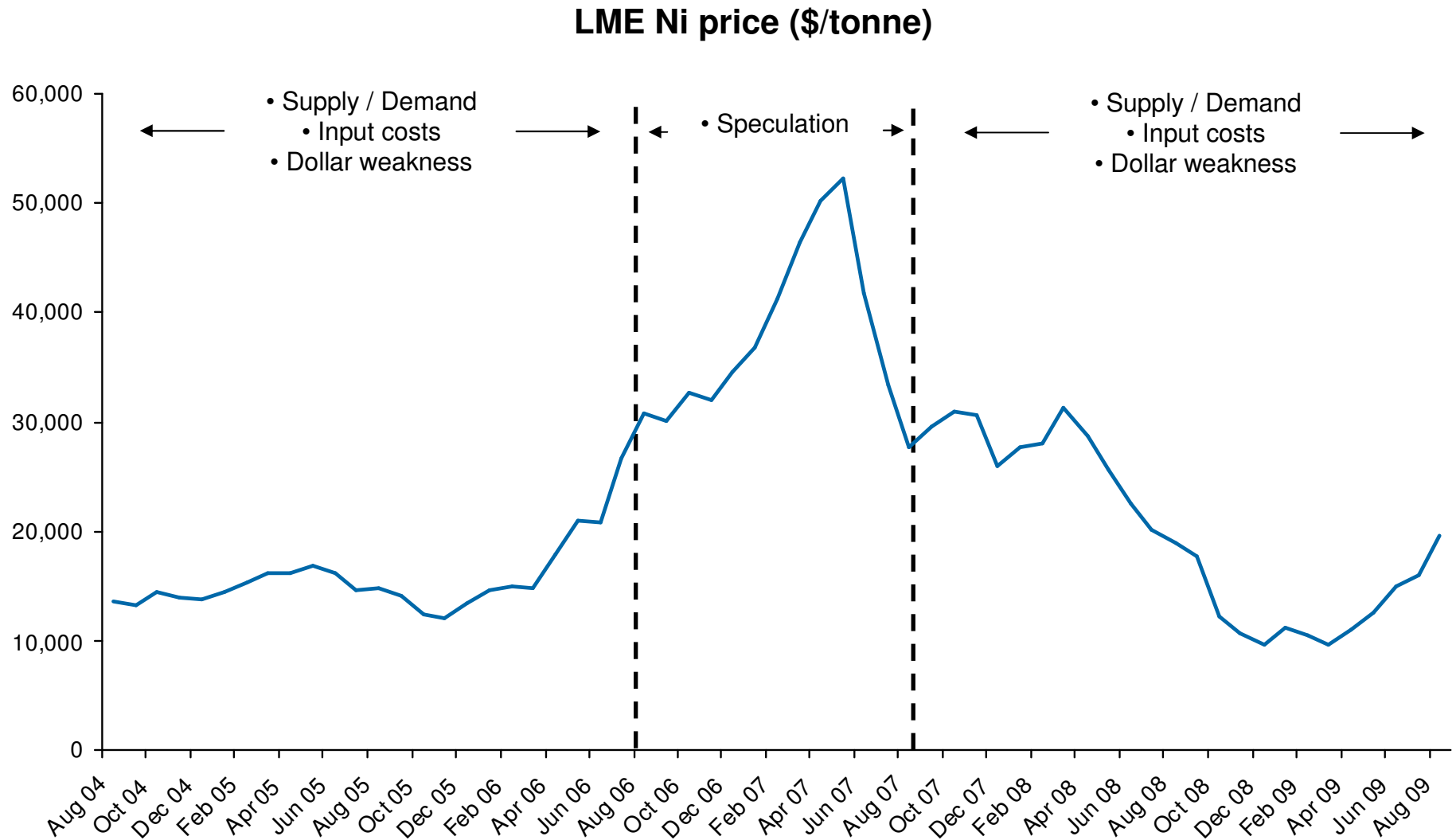


Source: Company reports, EIA, Hatch Beddows
* via EAF

Ni and oil price



Nickel prices have been influenced by a range of factors over the last 5 years



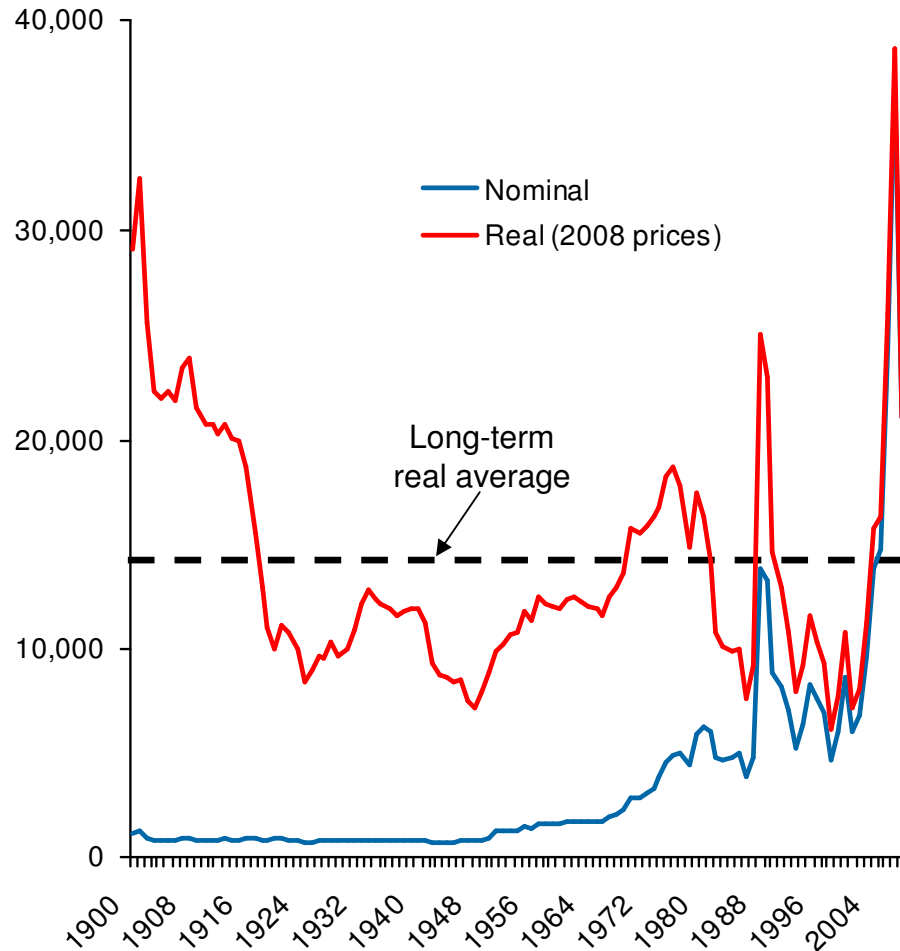
Source: Hatch Beddows

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Long-term Ni prices have averaged just under \$14,000/tonne in real terms (2008 \$)

Long-term Ni prices (\$/tonne)



Source: USGS, LME, Hatch Beddows

Drivers of long-term Ni price

- Supply / Demand
 - Long-term stainless production
 - Long-term Ni availability, investment vs. exploitation

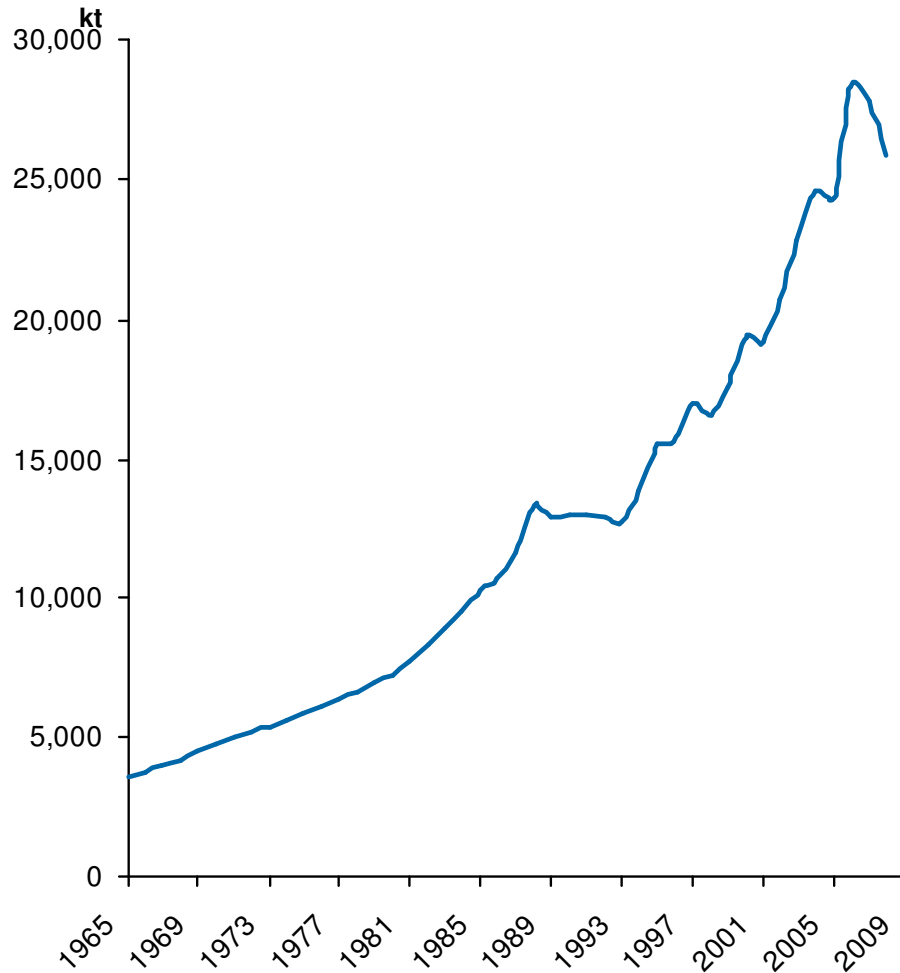
- Supplier / Consumer power balance
 - Consolidation in Ni, stainless industries
 - Backward / Forward integration

- Technology
 - Reduction in marginal costs of mining, processing
 - Greater accessibility of ores
 - Processing of by-products

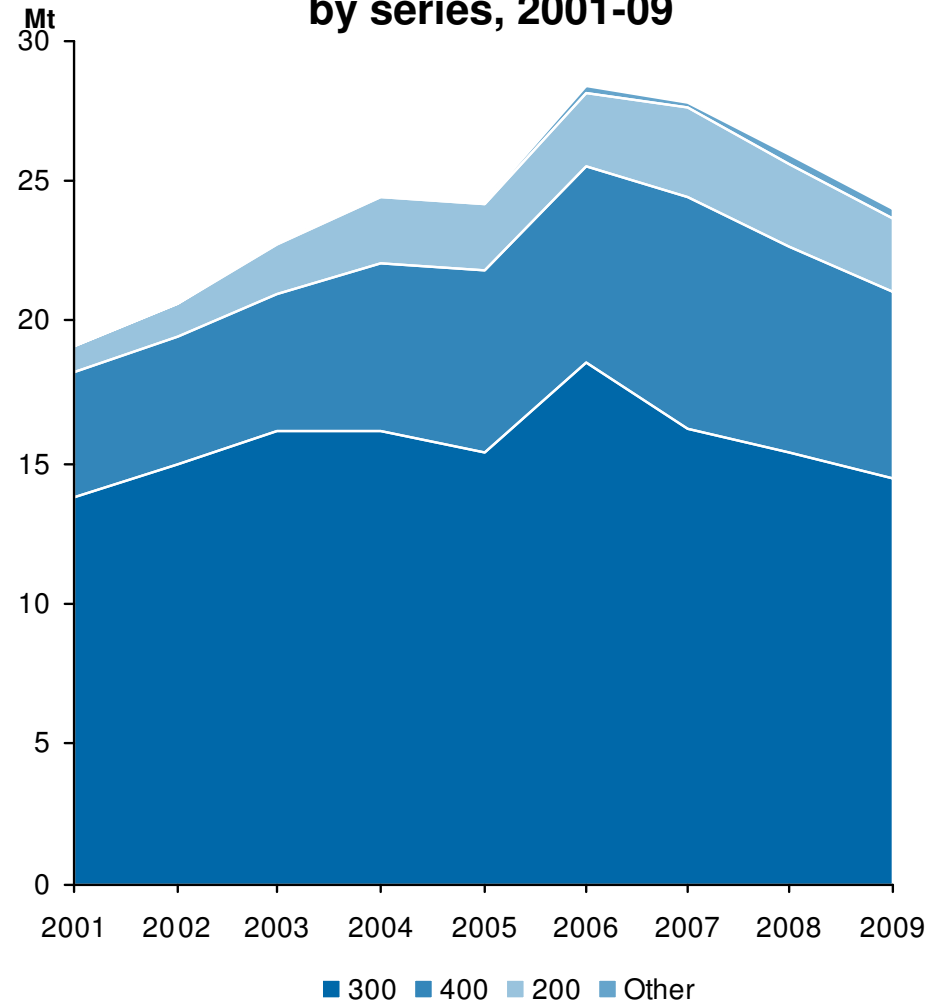
- Substitution
 - Non-nickel stainless, Li-ion batteries

Long-term stainless steel production has risen at a CAGR of 4.5% since 1965

Stainless steel production



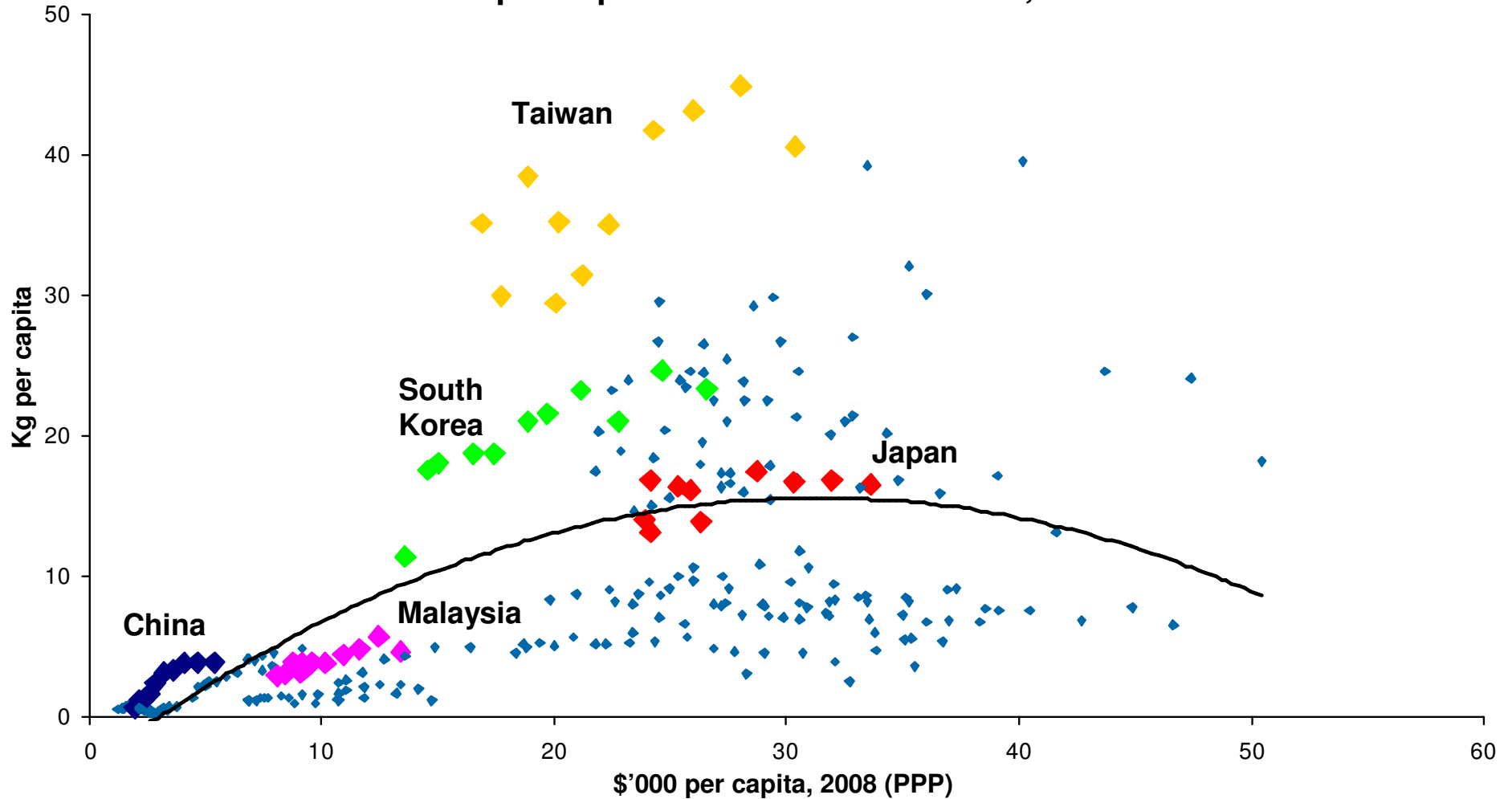
Stainless steel production by series, 2001-09



Source: Vale, ISSF, Hatch Beddows

Stainless steel production is forecast to continue rising in order to meet the expected growth in consumption by the developing world

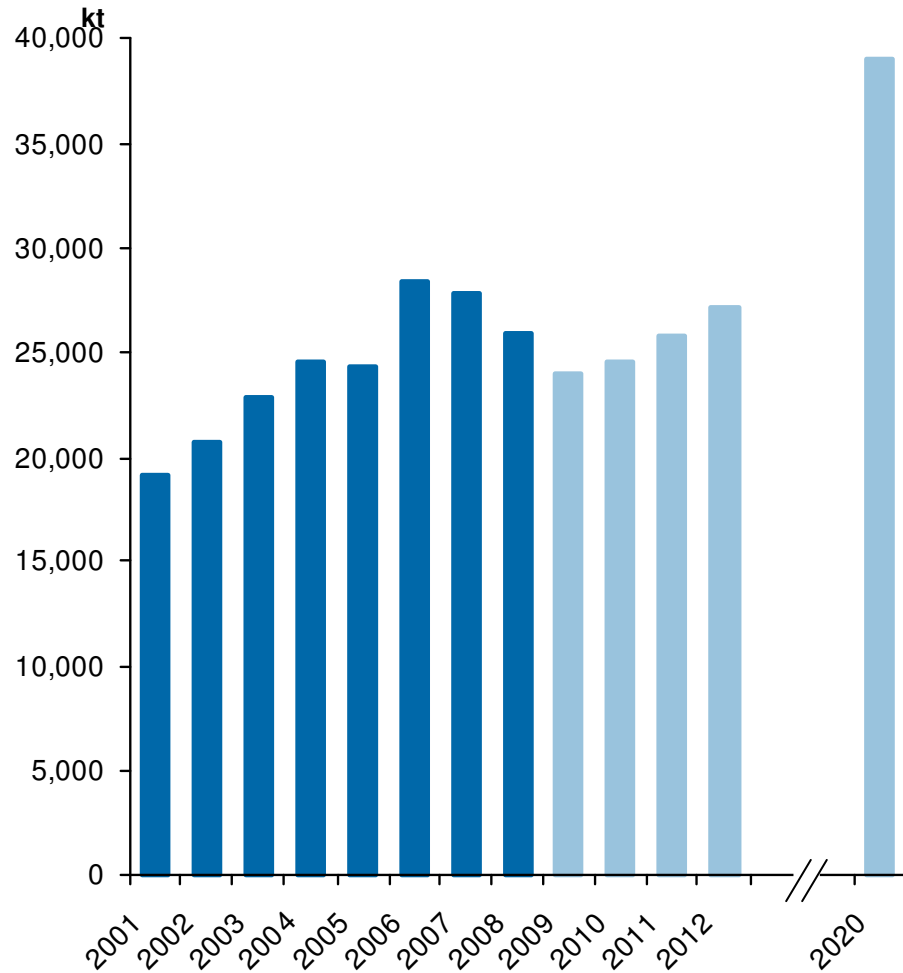
Per capita consumption of stainless steel vs income per capita for selected countries, 1997-2008



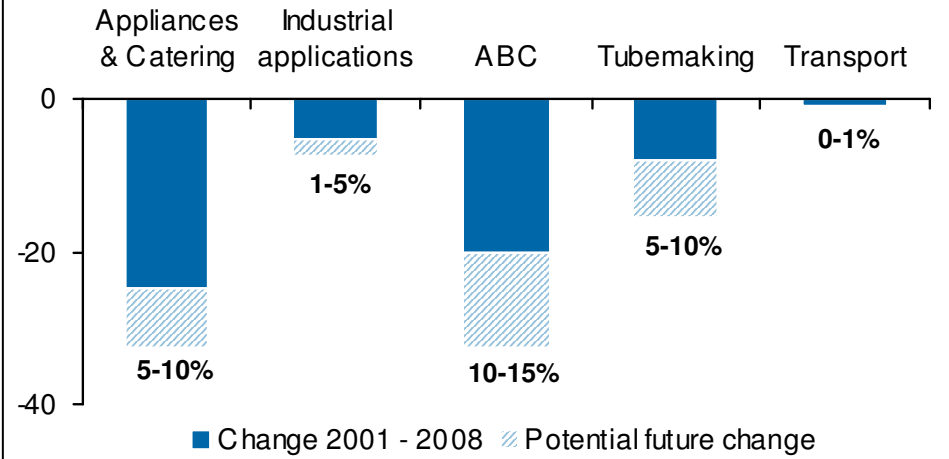
Source: Vale, IMF, Hatch Beddows

Long-term stainless steel production will move toward 40Mt by 2020. Further substitution is possible but most of this has already taken place

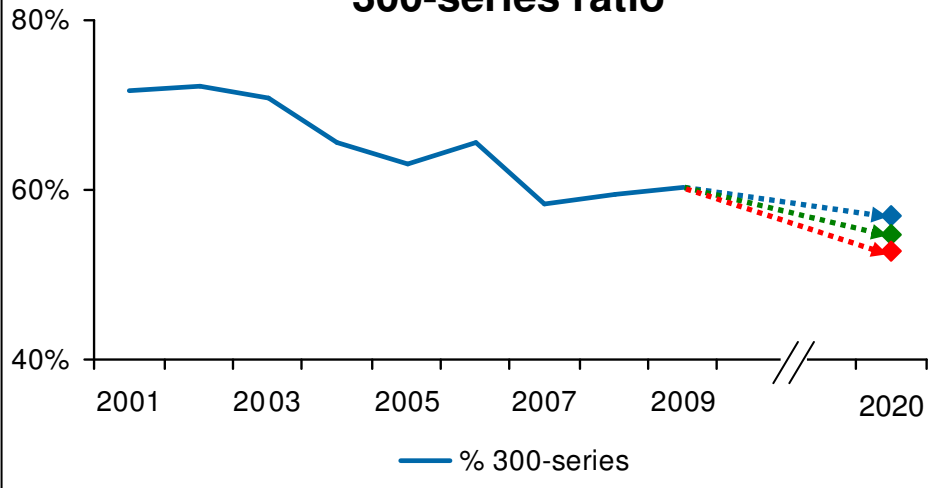
Stainless steel production



Percentage point shift from 300-series

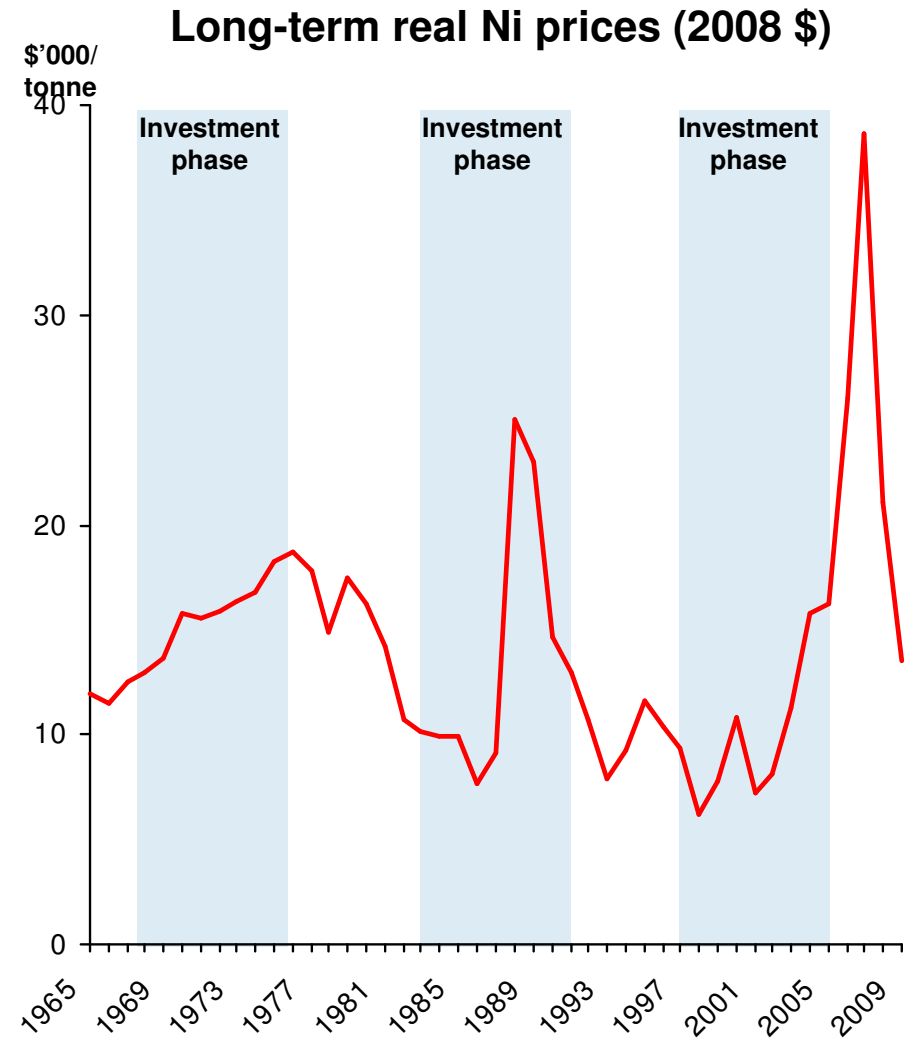
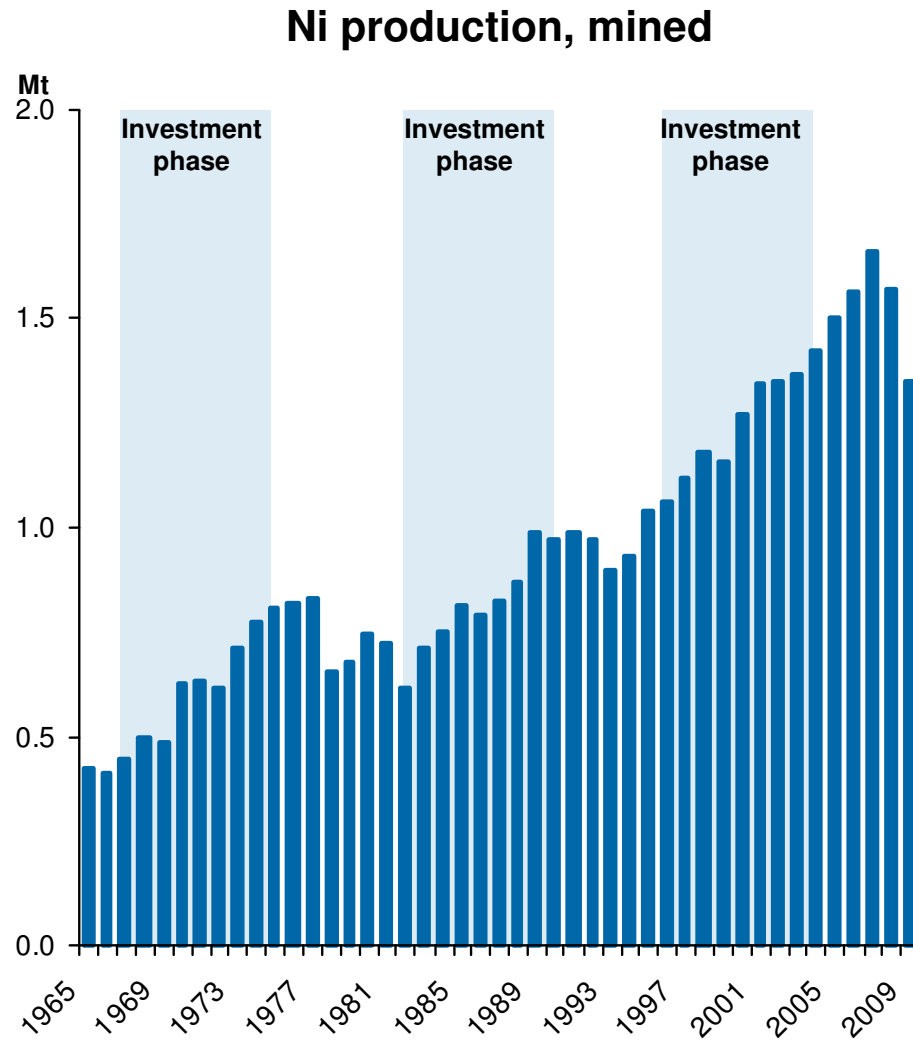


300-series ratio



Source: ISSF, Hatch Beddows

Long-term Ni supply fluctuates between waves of investment, followed by exploitation



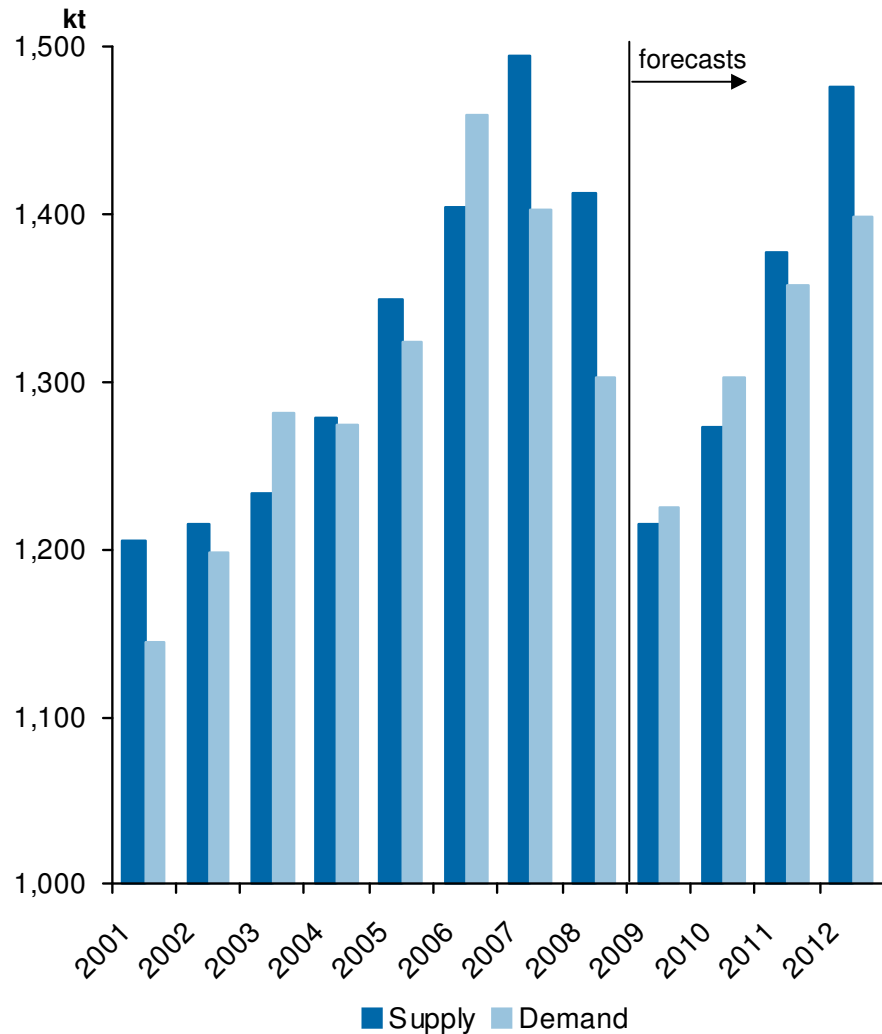
Source: INSG, USGS, LME, Hatch Beddows

The next wave of investment could add another ~500kt of capacity

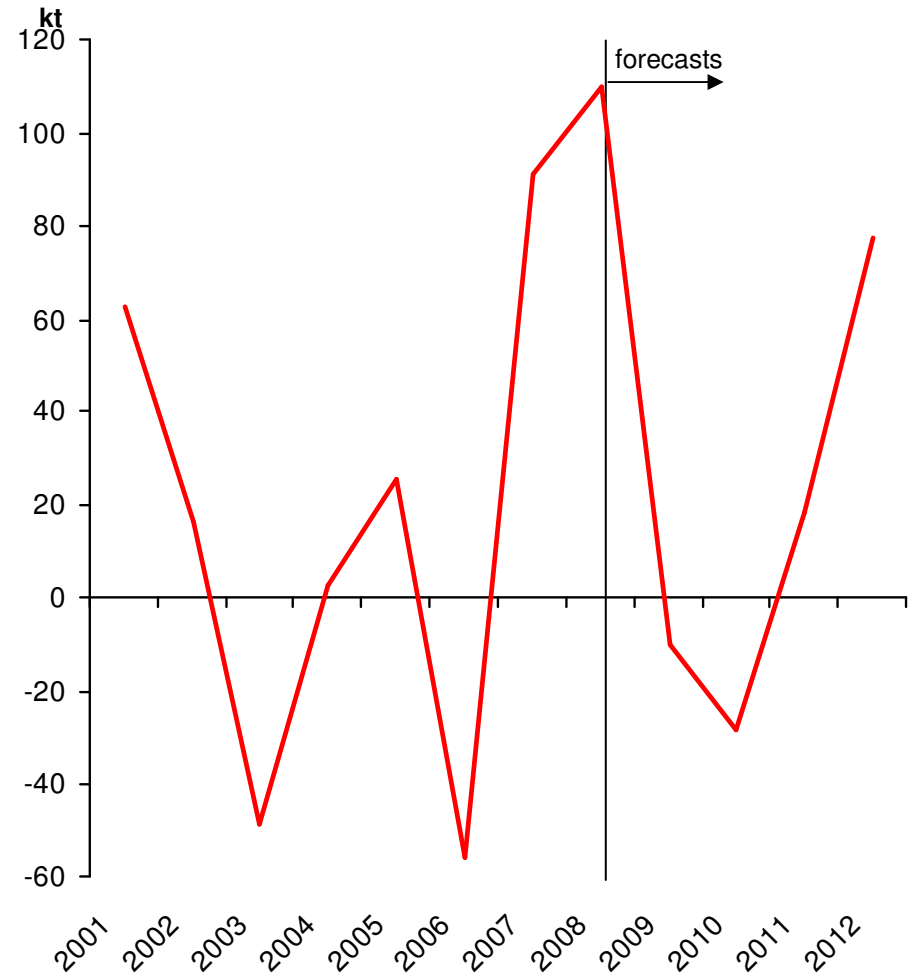
| | Ore type | Capacity | 2010 | 2011 | 2012 | 2013+ |
|----------------------|----------|----------|------|------|------|-------|
| Ambatovy | Laterite | 60kt | | → | | |
| Barro Alto | Laterite | 36kt | | → | | |
| Eagle (?) | Sulphide | 10kt (?) | | | → | |
| Fenix (?) | Laterite | 23kt | | | | → |
| Gladstone (?) | Laterite | 63kt | | | | → |
| Goro | Laterite | 60kt | → | | | |
| Koniambo | Laterite | 60kt | | | → | |
| Nonoc (?) | Laterite | 40kt (?) | | | → | |
| Nunavik | Sulphide | 12kt | | → | | |
| Onca Puma | Laterite | 52kt | | → | | |
| Ramu | Laterite | 31kt | → | | | |
| Shevchenko | Laterite | 22kt | | | → | |
| Tagaung Taung | Laterite | 23kt | | → | | |
| Vermelho (?) | Laterite | 46kt | | | | → |
| Weda Bay (?) | Laterite | 60kt | | | | → |

A small nickel supply deficit is expected for 2009 and 2010 before a return to surplus

Supply and demand of finished Ni

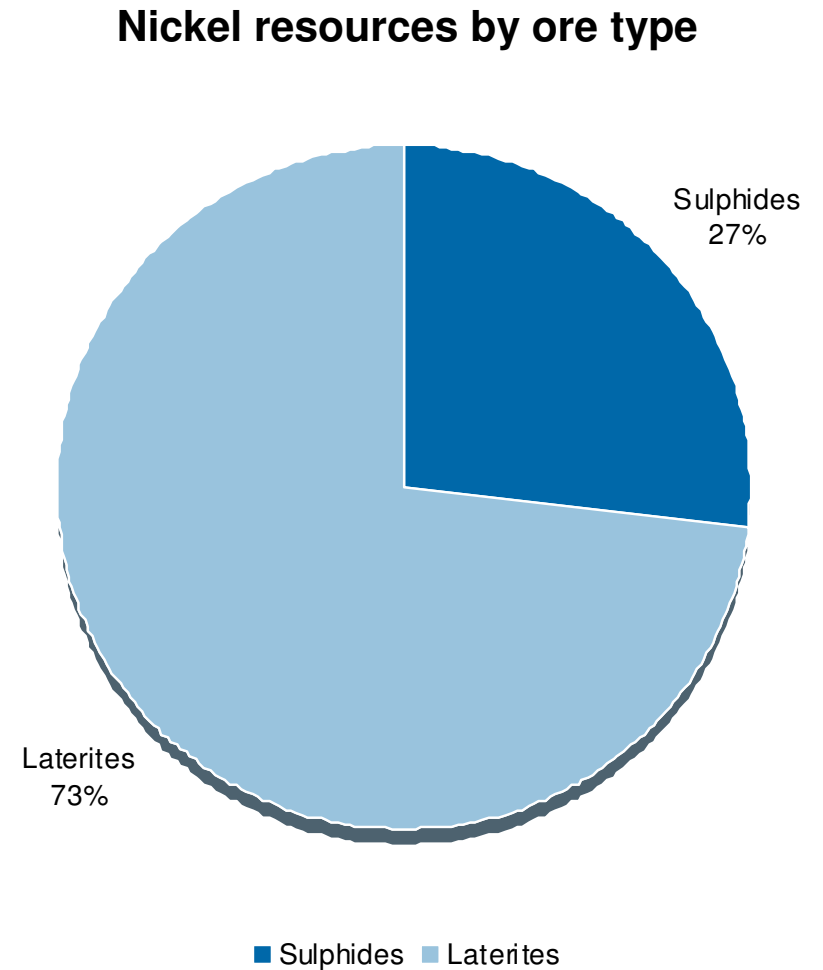
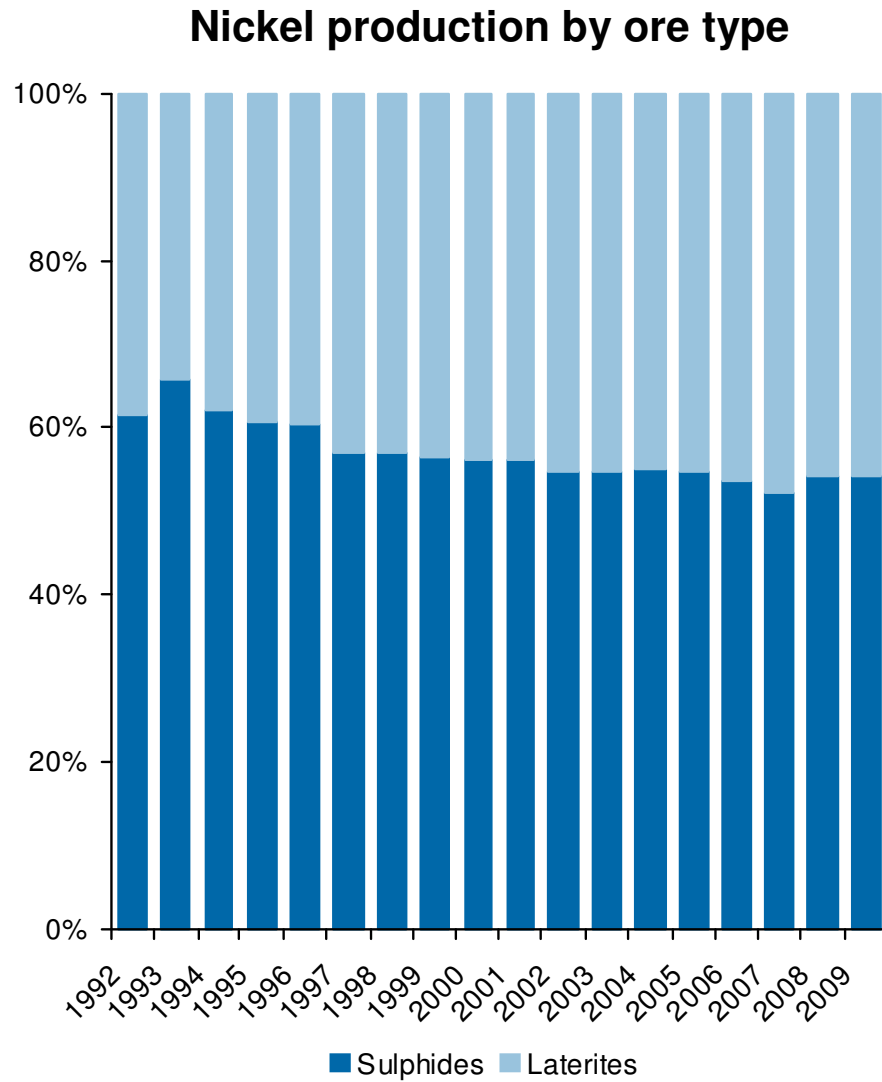


Supply / Demand balance for finished Ni



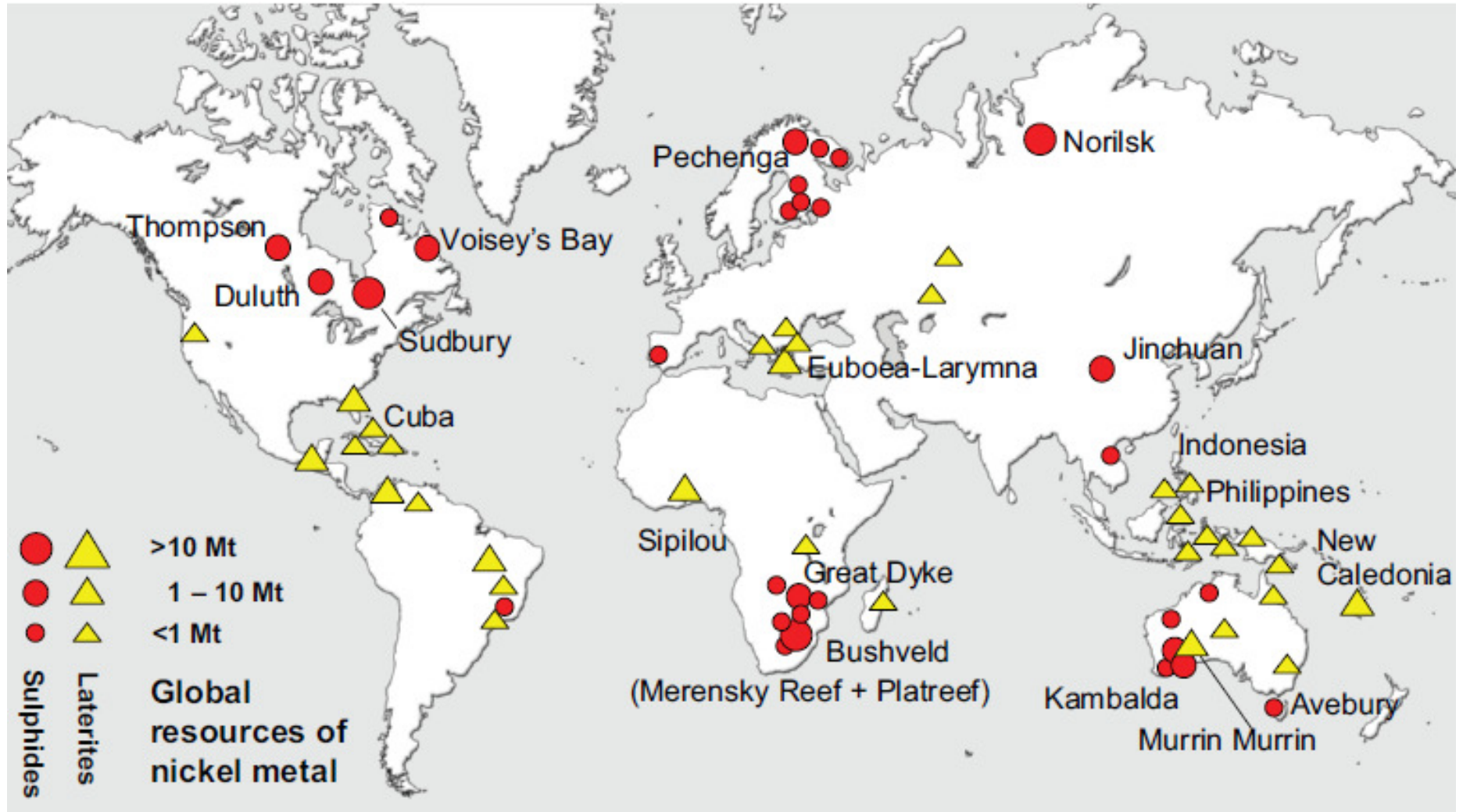
Source: Hatch Beddows

Nickel is increasingly being extracted from lateritic ores



Source: Hatch Beddows

Laterite resources are mainly found in countries that require large spending on infrastructure



Lateritic ores need to be subdivided into limonites or saprolites in order to understand the respective mining and processing costs

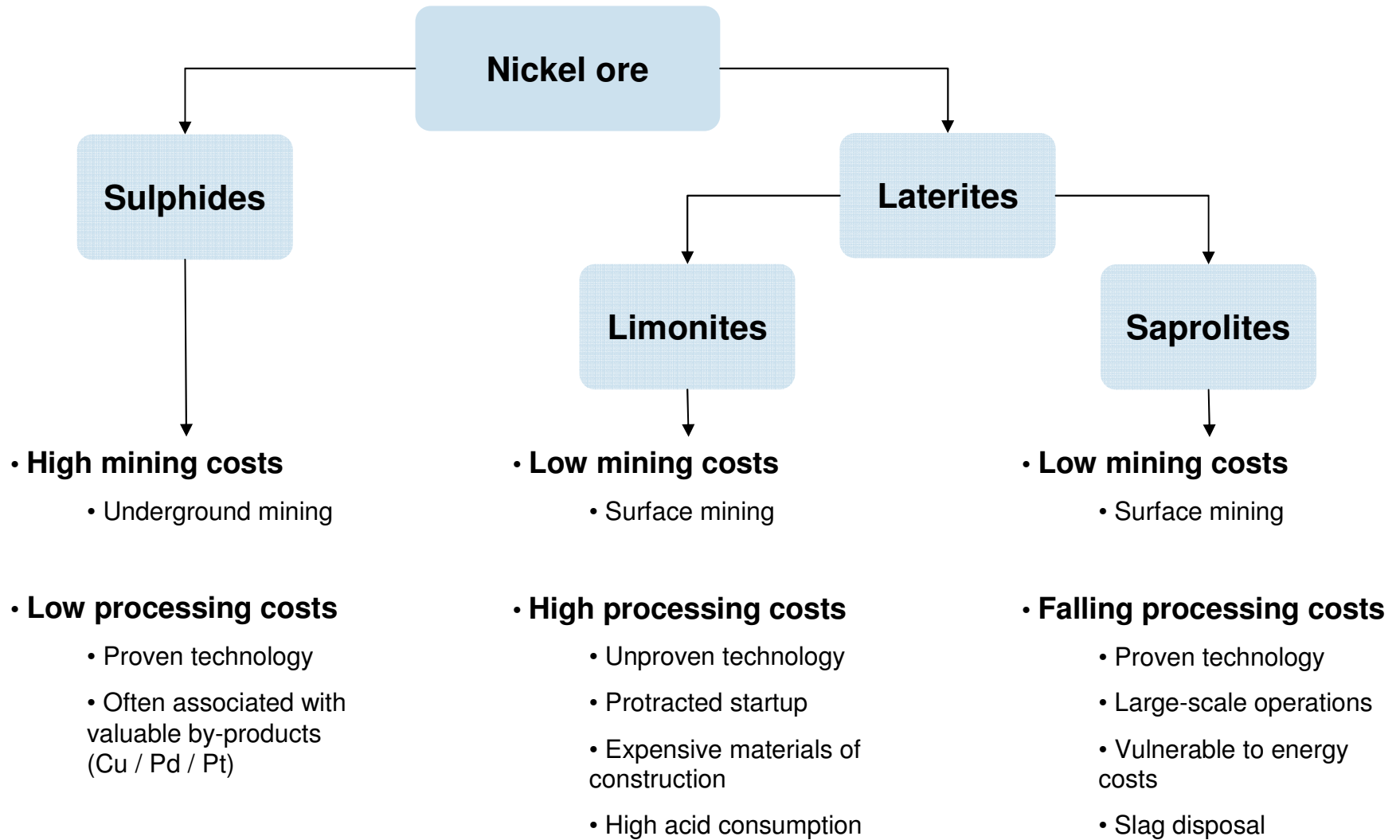
| Depth | | % content | | | |
|-------|-----------------|-----------|------------|---------|---------|
| | | Ni | Co | Fe | MgO |
| 5.5m | Limonite | 0.8 – 1.5 | 0.1 – 0.2 | 40 – 50 | 0.5 – 5 |
| | Transition zone | 1.5 – 4 | 0.02 – 0.1 | 25 – 40 | 5 – 15 |
| 10m | Saprolite | 1.8 – 3 | 0.02 – 0.1 | 10 – 25 | 15 – 35 |
| | Bedrock | 0.3 | 0.01 | 5 | 35 – 45 |

Oxides
 High Fe, low MgO, low SiO₂
 Processing – Dependent on presence of clay minerals. Typically hydrometallurgy (HPAL, Heap, Caron)

Silicates
 Low Fe, high MgO, high SiO₂
 Processing – Pyrometallurgy. End product (FeNi, matte) dependent on mineralogy

Source: Mick Elias, Hatch Beddows

Summary of nickel ores and their pros and cons



Mining and processing costs will depend on a variety of factors. It is too simplistic to categorise as laterites vs. sulphites

Resource

Higher grade = better

>1.5% \approx saprolite

Saprolite = proven processing technology

Larger size = better
Lower capex per tonne

Inputs

Merchant vs. captive

Hydroelectricity vs. fossil fuels

Hydrocarbons

Labour availability / skills

Project management

Project phasing

Project team continuity

New technologies

Ore mineralogy

Content of clay minerals
Lower = better

Magnesium content
Lower = less acid consumption
in hydrometallurgy

SiO₂ / MgO ratio
Impacts on choice of end-product

Infrastructure

Power / Acid / Lime plants

Transportation
Road / Sea / Air

Conveyors / Pipelines

Difficulty of terrain / climate

Accommodation

Permits / Compensation

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Conclusions

- **Short-term – Higher Ni prices through 2010, falling thereafter**
 - Supply deficits for 2009 / 2010
 - Stainless production to begin rebound in 2010
 - New supplies to arrive, mainly from 2011

- **Long-term – Rise in real prices but will it be temporary?**
 - Greater importance of laterites
 - Rise in production costs
 - Need for technological developments in processing limonites

Your contacts for further information

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