Base metals outlook
Drivers on the supply and demand side

February 2012

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The supply story so far

➡️ The bull market of the past 10 years has been driven by the massive increase in Chinese demand

➡️ What has largely differentiated price performance has been supply response

➡️ Relative price performance has reflected extent to which China has been able to source its own supply to meet demand…and the cost of that supply

➡️ Non-Chinese suppliers have generally struggled to meet incremental Chinese demand
Not all commodities have performed well and some have re-balanced.

Index of selected prices since 2000

Source: LME, Nymex, Platts, Tex, Metal Bulletin, CRU, Macquarie Research, February 2012
Base metals price to cost curves...copper stands out

Source: LME, Macquarie Research, February 2012
Iron ore hits all-time highs – copper has been there before

Source: LME, USGS, Tex, Macquarie Research, February 2012
It’s all been China for demand over the past decade…

Average growth in consumption, 2000-2010

<table>
<thead>
<tr>
<th>Material</th>
<th>2000-2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td>-1.3%</td>
</tr>
<tr>
<td>Aluminium</td>
<td>18.0%</td>
</tr>
<tr>
<td>Zinc</td>
<td>13.9%</td>
</tr>
<tr>
<td>Nickel</td>
<td>24.4%</td>
</tr>
<tr>
<td>Lead</td>
<td>18.9%</td>
</tr>
</tbody>
</table>

Source: Antaike, ICSG, ILZSG, INSG, IAI, Brook Hunt, Macquarie Research, February 2012
Surge in demand over the past decade

Copper demand growth by decade

-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
mt Cu

China
World Ex-China
Total

Lead demand growth by decade

-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
mt Pb

China
World Ex-China
Total

Copper demand growth by decade

-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
mt Cu

China
World Ex-China
Total

nickel demand growth by decade

-200
-100
0
100
200
300
400
500
600
'000 Ni

China
World Ex-China
Total

Zinc demand growth by decade

-1.0
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
mt Zn

China
World Ex-China
Total

Source: Antalke, ICSG, ILZSG, INSG, IAI, Brook Hunt, Macquarie Research, February 2012
All about China in copper

Source: ICSG, IMF, Macquarie Research, February 2012
How copper consumption has evolved – no growth from 1973-1993 then take-off!

Source: ICSG, IMF, Macquarie Research, February 2012
Where supply came: China dominates except in mining

Source: Antaike, ICSG, ILZSG, INSG, IAI, Brook Hunt, Macquarie Research, February 2012
China has met a lot of its own requirements, especially in smelting/refining.

China has excelled in smelting/refining due to:

- Extremely low capital costs of building new smelters (1/4th to 1/3rd of rest of world)
- Short lead times to build – 12-18months vs. 3-4 years elsewhere
- Lower environmental standards (arguably now changing)
- Access to cheap finance and other incentives

Source: Antaike, ICSG, ILZSG, INSG, IAI, Brook Hunt, Macquarie Research, February 2012
We think that there is yet more growth to come, albeit slower in China than in the past decade.

Source: Antaike, ICSG, ILZSG, INSG, IAI, Brook Hunt, Macquarie Research, February 2012
Summary of demand forecasts to 2020 – still lots of growth

Source: Antaike, ICSG, ILZSG, INSG, Macquarie Research, February 2012

### China's share of global consumption

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2010</th>
<th>2020F</th>
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</thead>
<tbody>
<tr>
<td>Copper</td>
<td>38%</td>
<td>49%</td>
<td>42%</td>
</tr>
<tr>
<td>Aluminum</td>
<td>12%</td>
<td>13%</td>
<td>15%</td>
</tr>
<tr>
<td>Zinc</td>
<td>60%</td>
<td>53%</td>
<td>41%</td>
</tr>
<tr>
<td>Nickel</td>
<td>53%</td>
<td>58%</td>
<td>40%</td>
</tr>
<tr>
<td>Lead</td>
<td>57%</td>
<td>58%</td>
<td>43%</td>
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### Actual and "needed" supply growth for copper

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<tr>
<td>mt refined copper</td>
<td></td>
<td>1.5</td>
<td>4.0</td>
<td>4.0</td>
<td>6.2</td>
</tr>
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### Actual and "needed" supply growth for lead

<table>
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<tbody>
<tr>
<td>mt refined lead</td>
<td></td>
<td>0.1</td>
<td>1.2</td>
<td>2.3</td>
<td>4.5</td>
</tr>
</tbody>
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### Actual and "needed" supply growth for zinc

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<tbody>
<tr>
<td>mt refined zinc</td>
<td></td>
<td>0.6</td>
<td>2.2</td>
<td>3.7</td>
</tr>
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### Actual and "needed" supply growth for nickel

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<tbody>
<tr>
<td>'000t refined nickel</td>
<td></td>
<td>183</td>
<td>166</td>
<td>328</td>
</tr>
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</table>

Source: Antaike, ICSG, ILZSG, INSG, Macquarie Research, February 2012
Per capita consumption still has some way to go

Source: Antaike, ICSG, ILZSG, INSG, IAI, world steel, World Bank, Macquarie Research, February 2012
All growth in lead is from China – in zinc, China is all the smelting growth

Chinese zinc mine production have average 13% a year since 2000, while rest of world production has averaged 10% a year; lead mine and zinc and lead refined production has not grown outside China

Source: Brook Hunt, Macquarie Research, February 2012
Virtually ALL nickel supply growth has come from China in recent years, mainly from nickel pig iron

Source: Antaike, INSG, Brook Hunt, Macquarie Research, February 2012

- Chinese nickel pig iron at the top of global cash cost curves – extremely low capex means 1-3 year capital payback possible on investments
- Raw materials: low-grade nickel ores (from Indonesia/Philippines) which are plentiful and easy to mine
All nickel supply growth is from laterite exports from Indonesia and Philippines.

Source: Antaike, INSG, Brook Hunt, Macquarie Research, February 2012
Copper supply tightness driven by lack of China supply response

- China can meet only one-third of its copper demand (from concentrate and scrap)
- Non-Chinese production has not responded to price incentive over past six years

Source: Antaike, ICSG, Brook Hunt, LME, Macquarie Research, February 2012
Global copper mine output continues to fall short of expectations...

Shortfall in global mine output compared with forecasts made one year previously

Source: CRU, Wood Mackenzie, Macquarie Research, February 2012
All sorts of reason for supply under-performing…

- Too much optimism from mine promoters!
- Declining run-of-mine ore grades
- Longer and longer lead times on key items such as mine truck tyres, SAG mills
- Technical operating challenges, e.g., pit wall failures from over-mining, equipment failures from over use and maintenance postponements
- Shortage of water – high and rising costs of desalination plants in Chile
- Shortage of skilled labour, strikes and high labour turnover
- Environmental challenges (extended time in getting approvals, etc)
- Weather and earthquakes (seemingly more prevalent)
- Deferral/delay of projects due to difficulty in obtaining finance amid massive capital and operating cost escalations and concerns over new legislation and fiscal regimes in mining countries

Source: Brook Hunt – A Wood Mackenzie company, Macquarie Research, February 2012
Some reasons for copper supply disruptions

Source: Brook Hunt – A Wood Mackenzie company, February 2012
Head grades are falling in most metals

Falling grades reflect end of temporary high-grading, lower-quality ore deposits and reserve depletions at better ore bodies
Analysis of Chilean copper mine production - running harder to stand still…

Existing Chilean mines will lose another 1mtpa of production between now and 2020 due to reserve and grade depletion.
Copper supply needs to grow faster than demand increases due to depletions at existing operations – this is the case for copper, which is similar for zinc and nickel.

Source: Brook Hunt – A Woodmac Company, Macquarie Research, February 2012
Nickel projects abound but many are late and some may not work...

Main changes in nickel capacity (before disruption allowance)

Source: Company reports, INSG, Macquarie Research, February 2012

Actual and forecast growth in nickel supply

Source: Company reports, INSG, Macquarie Research, February 2012
Main new projects and losses in 2011

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<tbody>
<tr>
<td><strong>Company</strong></td>
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<tr>
<td>Vale</td>
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<td>Vale</td>
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<tr>
<td>First Quantum</td>
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<td>Xstrata</td>
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<td>Anglo American</td>
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<tr>
<td>Sherritt/Kores/Sumitomo</td>
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<tr>
<td>MMC/Highland Pacific</td>
</tr>
<tr>
<td>Taguang Taung Nickel</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

**Losses from existing operations**

| **Company** | **Previous** | **Now** | **"Loss"** |
| Vale Canada | 18 | 8 | 12 |
| BHP Billiton Colombia | 10 | 7 | 9 |
| BHP Billiton Australia | 5 | 16 | 9 |
| PT Inco Indonesia | 3 | 5 | 1 |
| Pacific Metals | 11 | 26 | 20 |
| Xstrata Norway | 2 | 6 | 20 |
| SNNC Korea | 5 | 16 | 16 |
| Talvivarra | 14 | 5 | 5 |
| **Total** | 68 | 24 | 64 |

**Deviations from "plan" (our forecasts of a year ago)**

**Source:** Company reports, Macquarie Research, February 2012
New projects abound (naturally) but delivery has been extremely disappointing

- On paper, most markets look set to re-balance over next 2-5 years
- …but we said this in every year from 2005!
- Dual issues of (China and OECD) demand growth and project delivery remain the big uncertainties
- Where prices go depends on costs, in particular in China, which we think is at the top of the cash cost curve for most commodities
Chinese import demand is price sensitive!

Source: LME, Chinese Customs, Macquarie Research, February 2012
High cost Chinese commodity supply has come out of the market

Source: NBS, Macquarie Research, February 2012
Prices will not return to previous levels since cost pressures will remain upwards

- Major rise in operating and capital costs (in $US) unlikely to be unwound due to:
  - Energy and steel prices to remain high (coal, oil and iron ore costs to remain high), keeping capex and operating costs near current levels
  - The next generation of Greenfield projects are mostly lower grade and in remote locations requiring large expenditure on infrastructure
  - Governments are targeting the industry as a source of revenue and taxes and these will rise (which in tight markets will be passed on to consumers)
  - China’s dominance in supply (except for copper) means that Chinese costs matter and we think that due to rising labour, energy, transport costs in RMB terms and a 3-5% a year revaluation of the RMB against the US dollar, Chinese costs can rise by 7-10% a year in US dollar terms (before offsetting efficiencies)
  - Ongoing weakness of US$ against producer currencies generally?
Capital and operating cost escalation has been huge and steady since 2004 – the case of copper

Source: Brook Hunt – A Wood Mackenzie Company, Macquarie Research, February 2012
Why the nickel price withstood the global financial crisis... sharply rising cash costs at the margin

Source: Brook Hunt – A Wood Mackenzie Company, Macquarie Research, February 2012
Cash costs in China set to rise – our assessment for Chinese nickel pig iron – a $2.50/lb rise by 2015?

![Chart showing cost components for nickel production in China, comparing 2011 and 2015.](image)

Source: Macquarie Research, September 2011
In summary

- Supply growth has been strong (but disappointing relative to expectations) over the past 10 years
- China has played a dominant role in both demand and supply growth
- Rising costs have raised equilibrium prices for all commodities
- Chinese cost pressures will continue to be upwards, placing further upwards pressure on longer term equilibrium prices
- Supply is difficult to forecast, but “don’t count the chickens before they are hatched”!
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### Recommendation definitions

**Macquarie - Australia/New Zealand**
- **Outperform** – return > 3% in excess of benchmark return
- **Neutral** – return within 3% of benchmark return
- **Underperform** – return > 3% below benchmark return

Benchmark return is determined by long term nominal GDP growth plus 12 month forward market dividend yield

**Macquarie - Asia/Europe**
- **Outperform** – expected return > +10%
- **Neutral** – expected return from -10% to +10%
- **Underperform** – expected < -10%

**Macquarie First South - South Africa**
- **Outperform** – return > 10% in excess of benchmark return
- **Neutral** – return within 10% of benchmark return
- **Underperform** – return > 10% below benchmark return

**Macquarie - Canada**
- **Outperform** – return > 5% in excess of benchmark return
- **Neutral** – return within 5% of benchmark return
- **Underperform** – return > 5% below benchmark return

**Macquarie - USA**
- **Outperform** – return > 5% in excess of benchmark return
- **Neutral** – return within 5% of benchmark return
- **Underperform** – return > 5% below benchmark return

### Volatility index definition*

- **Very high** – highest risk
  - Stock should be expected to move up or down 60-100% in a year – investors should be aware this stock is highly speculative.

- **High** – stock should be expected to move up or down at least 40-60% in a year – investors should be aware this stock could be speculative.

- **Medium** – stock should be expected to move up or down at least 30-40% in a year.

- **Low - medium** – stock should be expected to move up or down at least 25-30% in a year.

- **Low** – stock should be expected to move up or down at least 15-25% in a year.

*Applicable to Australian/NZ stocks only

### Financial definitions

All "Adjusted" data items have had the following adjustments made:

- **Added back**: goodwill amortisation, provision for catastrophe reserves, IFRS derivatives & hedging, IFRS impairments & IFRS interest expense
- **Excluded**: non recurring items, asset revals, property revals, appraisal value uplift, preference dividends & minority interests

**EPS = adjusted net profit / equivalent fully paid ordinary weighted average number of shares**

**ROA = adjusted ebit / average total assets**

**ROA Banks/Insurance = adjusted net profit /average total assets**

**ROE = adjusted net profit / average shareholders funds**

**Gross cashflow = adjusted net profit + depreciation**

All Reported numbers for Australian/NZ listed stocks are modelled under IFRS (International Financial Reporting Standards).

### Recommendation proportions – For quarter ending 30 June 2011

<table>
<thead>
<tr>
<th></th>
<th>AU/NZ</th>
<th>Asia</th>
<th>RSA</th>
<th>USA</th>
<th>CA</th>
<th>EUR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outperform</strong></td>
<td>50.37%</td>
<td>64.60%</td>
<td>64.62%</td>
<td>45.63%</td>
<td>67.74%</td>
<td>48.02%</td>
</tr>
<tr>
<td><strong>Neutral</strong></td>
<td>36.86%</td>
<td>21.22%</td>
<td>29.23%</td>
<td>51.30%</td>
<td>28.50%</td>
<td>38.42%</td>
</tr>
<tr>
<td><strong>Underperform</strong></td>
<td>12.77%</td>
<td>14.18%</td>
<td>6.15%</td>
<td>3.07%</td>
<td>3.76%</td>
<td>13.56%</td>
</tr>
</tbody>
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(For US coverage by MCUSA, 12.44% of stocks covered are investment banking clients)

(For US coverage by MCUSA, 12.95% of stocks covered are investment banking clients)

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