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Recent developments and new challenges in commodity markets, and policy options for commodity-based inclusive growth and sustainable development

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Geneva, Switzerland

Review and outlook for Copper, Nickel, Lead and Zinc

Don Smale
Secretary-General
International Lead and Zinc Study Group
International Copper Study Group
International Nickel Study Group

20 MARCH 2013

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UNCTAD Multi-year Expert Meeting on Commodities and Development
Geneva, 20-21 March 2013
International Copper Study Group

Introduction

- Formally established in 1992, following a series of UNCTAD expert meetings on copper.
- Headquarters in Lisbon, Portugal.
- The Group is an intergovernmental organization consisting of 23 member governments plus the European Union representing copper producing and using countries.
Membership is open to any country involved in copper production, consumption or international trade.

Last two countries joining in 2011/2012: Zambia and Iran.

Current members are: Australia, Belgium, Chile, China, Finland, France, Germany, Greece, India, Iran, Italy, Japan, Luxembourg, Mexico, Peru, Poland, Portugal, the Russian Federation, Serbia, Spain, Sweden, the United States, Zambia and the European Commission.

Possible new Member Countries: Mongolia, Brazil and DRC.
ICSG - MAIN OBJECTIVES & FUNCTIONS

➢ To conduct consultations and exchanges of information on the international copper economy.
➢ To improve statistics on copper.
➢ To increase market transparency.
➢ To undertake studies on issues of interest to the Group.
➢ To consider special problems or difficulties that exist or may arise in the international copper economy.

ICSG endeavours to provide its membership with the most accurate, comprehensive and timely information on capacities, production, usage, trade, stocks, prices, technologies, research and development, and other areas that may influence the supply and demand for copper.
A FORUM FOR DISCUSSION

- **Markets**: forecasts of supply and demand for metals a year ahead
- **Trade**: monitoring of international trade in metals
- **Environmental policy**: sharing information on approaches to regulation
- **Industry Advisory Panel**: metals industry executives provide input to member governments
- Invite **observer countries, industry and observer organizations** such as UNCTAD, World Bank, UNIDO, Common Fund for Commodities and metals associations
Directory of Copper Mines & Plants (semi-annual): The Directory of Copper Mines and Plants highlights current capacity and provides a five year outlook of forecasted capacity for over 1,000 existing and planned copper mines, plants and refineries on a country by country basis, including separate tables for SX-EW plants. Salient details for each operation are included and the Directory separates operations between Operating & Developing and Exploration & Feasibility stages.

Directory of Copper & Copper Alloy Fabricators - First Use (annual): This directory provides a systematic global overview of companies and plants involved in the first use of copper. First users are mainly semis fabricators that process refinery shapes into semi-finished copper and copper alloy products. The Directory covers wire rod plants, ingot makers (for castings), master alloy plants, brass mills, and electrodeposited copper foil mills.
ICSG MAIN PUBLICATIONS/OUTPUTS

**Copper Bulletin** (monthly): includes annual and monthly statistics, by country, on copper mine, smelter, refined and semis production, copper usage and trade, as well as stocks and exchange prices, providing a global view of supply and demand.

**Statistical Yearbook**: As above, covering the past 10 years.

**Monthly Press Release** on the state of the copper market (to be included in the email distribution list please contact mail@icsg.org)

**World Copper Market Forecast**: Prepared twice a year for the following two years.

**Copper Factbook**: The Factbook provides a broad overview of all facets of copper, from production to trade, usage, recycling and more. It is designed to promote copper and educate readers about the importance and contribution of copper to society. Available in ICSG Website, in PDF and in hard copies.

Publication prices refer to orders originating from institutions based in ICSG member countries
World Copper Reserves 2011

Resources: about 3000 million tonnes (Mt)

Sources: USGS

contained copper metal

Reserves 690 Mt

2011 Mine Production 16.03 Mt

Sources: USGS
Despite increased consumption of copper produced from ore in recent years, increases in reserves have grown more, and there is more copper available to the world than at any other time in the past.

Mexico accounts for around 6% of World Copper Reserves reported by USGS
Average annual grow rate in the last century: 4%
Average annual grow rate in the last decade: 2.1%
Average annual grow rate in the last 3 years: 1.2%
The 2008 crisis had a severe impact on copper projects development and the postponement of many projects: no new major project until 2012.

Mine production growth averaged a disappointing 0.9% growth in the period 2008-2011 (concentrate growth was flat).

However smaller and medium size mine projects stared in 2012 and 2012 production recovered from 2011 operational constrains.

Capacity expansions occurring in Chile, Mexico and Peru.

Major mine projects start by end 2013 and in 2014 boosting world production (eg. Oyu Tolgoi).

The supply constraint factors that have been affecting the copper industry in the last few years will expected continue to impact supply.

World copper mine production expected to grow by around 6% in 2013, after a growth of about 3% in 2012.
Distribution of Copper Mine Production by Country

1990

Chile, 17.2%
China, 3.2%
Peru, 3.3%
United States, 17.2%
Australia, 3.5%
Russian Fed., 8.7%
Zambia, 4.6%
Canada, 3.6%
Indonesia, 3.4%
Congo, 3.9%
Mexico, 3.6%
Brazil, 0.4%
Iran, 0.7%
Kazakhstan, 3.4%
Poland, 3.6%

2014

Chile, 29.3%
China, 8.9%
Peru, 7.4%
Mexico, 3.6%
Australia, 6.3%
United States, 7.2%
Brazil, 1.7%
Iran, 1.6%
Kazakhstan, 2.0%
Poland, 2.2%
Mexico, 3.6%
Congo, 4.4%
Indonesia, 3.4%
Canada, 3.6%
Zambia, 4.9%
Russian Fed., 4.0%

Chile to continue the biggest copper mine producer in the world
United States loosing share and Peru increasing its share
Mexico maintaining the same share at around 3.6%

Source: ICSG
2012/2014 Main Global Assumptions for Refined Production

- 2012 Japanese refined production recovered from low 2011 levels. (earthquake)
- 2013 world refined production recovering from extended maintenances occurring in 2012
- Chinese refined production continuing its strong expansion
- Expected improved capacity utilization rates at Indian refineries.
- Two new refineries that started in Turkey and in Kazakhstan in 2011 bringing new supply in 2012/2013
- Primary electrolytic refinery production to remain constrained by shortage of concentrates
- World secondary production expected to grow by 11% in 2013 and share in total output to be around 19%
- World copper refined production expected to grow by around 6% in 2013, after a growth of about 2% in 2012

Source: ICSG
Distribution of Copper Refined Production by Country

1990

- China, 5.2%
- Chile, 11.1%
- Japan, 9.3%
- United States, 18.7%
- Russian Fed., 7.4%
- Germany, 4.9%
- India, 0.4%
- Korea Rep., 1.7%
- Zambia, 4.1%
- Poland, 3.2%
- Australia, 2.5%
- Mexico, 1.4%
- Others, 23.7%

2014

- China, 30.0%
- Chile, 13.3%
- Japan, 6.8%
- United States, 5.3%
- Russian Fed., 4.0%
- Germany, 3.1%
- Mexico, 2.0%
- Spain, 2.0%
- Australia, 2.2%
- Zambia, 3.3%
- Poland, 2.5%
- Korean Rep., 2.9%
- India, 3.2%
- Others, 16.2%

Strong growth in Chinese refined production, up from 5% of world share in 1990 to 30% by 2014

United States and Japan loosing share

Mexico growing from 1.4% to 2%

Source: ICSG
2012/2014 Main Global Assumptions for Usage

- Copper consuming sectors growth linked to the performance of the world economy.
- World GDP should pick up gradually during 2013/2014 supporting global usage growth. However regional divergences occur with lower growth in some regions than others. Globally, the downside risk remains elevated.
- Stimulus packs by some governments supportive of usage growth.
- Improved outlook for the US economy, lower wire rod imports and new wire rod plant positive for usage in 2012-2014.
- Uncertainty on EU sovereign debt issues and economy contraction negatively impacting usage in 2012 with small recovery anticipated for 2013 and 2014.
- Japan’s usage is expected to remain practically unchanged in the period 2012-2014.
- Indian urbanization and industrialization should continue to boost copper usage and supporting growth in 2013 and 2014.
- Unstable political situation in the Middle East and North Africa affecting usage in the region in 2011-2012 and only small growths expected for 2013-2014.
- Global green applications such as wind farms are a growing sector boosting world copper usage.
- Substitution remains a threat when copper prices remain high.
- In 2012, China apparent usage growth (+11%) inflated by high net cathode imports. However, anecdotal evidence suggests that the high imports were accompanied by an increase in inventories held in bonded warehouses. Chinese usage growth in 2013/2014 expected to be lower than in previous years.
Distribution of Copper Refined Usage by Country

1990
- United States, 20%
- Japan, 14.5%
- Germany, 9%
- China, 5%
- Others, 26%
- Belgium, 3.6%
- Mexico, 1.2%
- Spain, 1.3%
- Turkey, 0.9%
- Brazil, 1.3%
- Taiwan, 2.5%
- Italy, 4.4%
- India, 1.2%
- Russian Fed., 2.9%

2014
- China, 42%
- United States, 9%
- Mexico, 1.5%
- Spain, 1.8%
- Turkey, 2.1%
- Brazil, 2.1%
- Taiwan, 2.0%
- Italy, 2.9%
- India, 3.3%
- Russian Fed., 3.1%
- Korea Rep., 3.1%
- Japan, 4.6%
- Germany, 6%
- Others, 15%

Strong growth in Chinese refined usage, up from 5% of world share in 1990 to more than 40% by 2014
United States share in world usage declining from 20% to 9%
Mexico growing slightly from 1.2% to 1.5%

Source: ICSG
Major Uses of Copper: Usage by Region and End Use Sector, 2010

Basis: copper content, thousand metric tonnes
Source: International Copper Association

- **Asia**: 62%
- **Europe**: 22%
- **Latin America**: 10%
- **North America**: 6%

**Equipment**: 54%
**Building Construction**: 32%
**Infrastructure**: 14%
With production growth expected to exceed demand growth in 2013 and 2014, the market is foreseen to return to surplus after three years of consecutive deficits.

The International Copper Study Group recognized that numerous factors including a world economic slow down, European Union sovereign debt issues, political disturbances in the Middle East and North Africa, and market price volatility create significant uncertainty, and that the global market balances could vary from those projected.

<table>
<thead>
<tr>
<th>REGIONS</th>
<th>MINE PRODUCTION (1000 t)</th>
<th>MINE PRODUCTION</th>
<th>MINE PRODUCTION</th>
<th>MINE PRODUCTION</th>
<th>MINE PRODUCTION</th>
<th>MINE PRODUCTION</th>
<th>MINE PRODUCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>1,306</td>
<td>1,396</td>
<td>1,712</td>
<td>961</td>
<td>1,064</td>
<td>1,326</td>
<td>281</td>
</tr>
<tr>
<td>N.America</td>
<td>2,150</td>
<td>2,244</td>
<td>2,536</td>
<td>1,706</td>
<td>1,701</td>
<td>1,886</td>
<td>2,202</td>
</tr>
<tr>
<td>Latin America</td>
<td>6,848</td>
<td>6,993</td>
<td>7,209</td>
<td>3,717</td>
<td>3,463</td>
<td>3,606</td>
<td>600</td>
</tr>
<tr>
<td>Asean-10</td>
<td>765</td>
<td>653</td>
<td>909</td>
<td>517</td>
<td>398</td>
<td>575</td>
<td>734</td>
</tr>
<tr>
<td>Asia ex Asean/CIS</td>
<td>1,768</td>
<td>1,977</td>
<td>2,298</td>
<td>8,048</td>
<td>8,772</td>
<td>9,367</td>
<td>11,331</td>
</tr>
<tr>
<td>Asia-CIS</td>
<td>470</td>
<td>487</td>
<td>500</td>
<td>428</td>
<td>447</td>
<td>472</td>
<td>99</td>
</tr>
<tr>
<td>EU-27</td>
<td>788</td>
<td>804</td>
<td>814</td>
<td>2,716</td>
<td>2,768</td>
<td>2,790</td>
<td>3,295</td>
</tr>
<tr>
<td>Europe Others</td>
<td>832</td>
<td>853</td>
<td>870</td>
<td>1,080</td>
<td>1,049</td>
<td>1,095</td>
<td>1,202</td>
</tr>
<tr>
<td>Oceania</td>
<td>1,092</td>
<td>1,118</td>
<td>1,300</td>
<td>477</td>
<td>503</td>
<td>504</td>
<td>120</td>
</tr>
<tr>
<td>TOTAL</td>
<td>16,019</td>
<td>16,524</td>
<td>18,147</td>
<td>19,651</td>
<td>20,166</td>
<td>21,620</td>
<td>19,865</td>
</tr>
<tr>
<td>World adjusted 1/ 2/</td>
<td>16,019</td>
<td>16,479</td>
<td>17,533</td>
<td>19,651</td>
<td>19,950</td>
<td>21,140</td>
<td>19,865</td>
</tr>
</tbody>
</table>

| % change | 2.9%     | 6.4%     | 1.5%     | 6.0%     | 2.6%     | 1.5%     |
| Refined Production - Usage Balance | -214 | -426 | 458 |
South America will remain the region with the largest copper mine installed capacity and is expected to bring to the market until 2016 an additional 2.3 Mt capacity. Asian and African copper mining capacity also increasing substantially. All together, these three regions represent 78% of the world additional copper mine production capacity to come on stream by 2016.

Source: ICSG Directory of Copper Mines and Plants – February 2013
COPPER MINE PROJECTS (cap > 100Ktpy Cu)

Total annual Capacity of Listed Projects : 9 Mt Cu

Source: ICSG Directory of Copper Mines and Plants – February 2013
China will continue to increase its smelting capacity through expansions and new projects. Some expansions, new projects occurring in other few countries. Indonesian new mining law on banning ore exports leading to the development of new smelter projects in the country. In August 2010 Grupo Mexico announced plans for a smelter/refinery project (Empalme) to start in Mexico in 2016 with a capacity of 350ktpy (development not yet confirmed).

Source: ICSG Directory of Copper Mines and Plants – February 2013
International Nickel Study Group

- An Autonomous International Governmental Organization
- Co-located in Lisbon, Portugal with International Lead & Zinc and Copper Study Groups, resulting in significant cost savings
- Enhancement of market transparency in the world nickel market
- Forum for discussions on nickel issues.
INSG Member Countries

Australia
Finland
Italy
Russian Federation
Brazil
France
Japan
Sweden
Cuba
Germany
Norway
United Kingdom
European Union
Greece
Portugal
World Nickel Ore Production (2/2)

2003 (1257.3)

Europe 21%
Asia 16%
Oceania 25%
Americas 32%
Africa 6%

2013 (f)
(2154.7)

Europe 18%
Oceania 19%
Asia 36%
Africa 5%
Americas 23%

(f) forecast October 2012;
Asia adjusted in March 2013.
World Primary Nickel Production (1/2)

(f) forecast October 2012;
Americas, Asia and Europe adjusted in March 2013.
World Primary Nickel Production (2/2)

<table>
<thead>
<tr>
<th>Region</th>
<th>2003</th>
<th>2013 (f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>5%</td>
<td>3%</td>
</tr>
<tr>
<td>Americas</td>
<td>24%</td>
<td>18%</td>
</tr>
<tr>
<td>Asia</td>
<td>19%</td>
<td>41%</td>
</tr>
<tr>
<td>Europe</td>
<td>37%</td>
<td>28%</td>
</tr>
<tr>
<td>Oceania</td>
<td>15%</td>
<td>15%</td>
</tr>
</tbody>
</table>

(f) forecast October 2012; Americas, Asia and Europe adjusted in March 2013.
World Primary Nickel Usage (consumption) (1/2)

(f) forecast October 2012;
Asia adjusted in March 2013.
Africa | 2%  
Americas | 10%  
Asia | 67%  
Europe | 21%  
Oceania | 0.2%  

2003 (1218.6)

Asia 43%
Americas 14%
Europe 41%
Oceania 0.2%
Africa 3%

2013 (f) (1755.2)

Europe 21%
Oceania 0.2%
Africa 2%
Americas 10%
Asia 67%

(f) forecast October 2012; Asia adjusted in March 2013.
World Primary Nickel Balance - annual

(forecast October 2012; Americas, Asia and Europe adjusted in March 2013.)
Primary Nickel Capacity by Country

2011: ≈ 1.7Mt

New committed developments: ≈ 0.5Mt

Note: excluding NPI.
## New Nickel Capacity on Stream / Ramp Up

<table>
<thead>
<tr>
<th>Project Name / Country</th>
<th>Product</th>
<th>Mode</th>
<th>Estimated Production</th>
<th>Projected Total Production</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambatovy / Madagascar</td>
<td>Class I</td>
<td>Ramp Up</td>
<td>≈ 35 000</td>
<td>60 000</td>
<td>Open market</td>
</tr>
<tr>
<td>Tagaung Taung / Myanmar</td>
<td>FeNi</td>
<td>Ramp Up</td>
<td>≈ 10 000</td>
<td>22 000</td>
<td>China</td>
</tr>
<tr>
<td>Koniambo / New Caledonia</td>
<td>FeNi</td>
<td>Start Up</td>
<td>≈ 16 000</td>
<td>60 000</td>
<td>Open market</td>
</tr>
<tr>
<td>Onça Puma / Brazil</td>
<td>FeNi</td>
<td>Ramp Up</td>
<td>≈ 30 000</td>
<td>58 000</td>
<td>Open market</td>
</tr>
<tr>
<td>Barro Alto / Brazil</td>
<td>FeNi</td>
<td>Ramp Up</td>
<td>≈ 27 000</td>
<td>36 000</td>
<td>Open market</td>
</tr>
<tr>
<td>Goro / New Caledonia</td>
<td>Semi / Class I</td>
<td>Ramp Up</td>
<td>≈ 26 000</td>
<td>60 000</td>
<td>Australia &amp; China</td>
</tr>
<tr>
<td>Ramu / PNG</td>
<td>Semi</td>
<td>Ramp Up</td>
<td>≈ 13 000</td>
<td>30 000</td>
<td>China &amp; Other</td>
</tr>
<tr>
<td>Talvivaara / Finland</td>
<td>Semi</td>
<td>Ramp Up</td>
<td>≈ 18 000</td>
<td>35 000</td>
<td>Finland</td>
</tr>
<tr>
<td>Raventhorpe / Australia</td>
<td>Semi</td>
<td>Ramp Up</td>
<td>≈ 33 000</td>
<td>39 000</td>
<td>Australia &amp; Other</td>
</tr>
<tr>
<td>Santa Rita / Brazil</td>
<td>Conc.</td>
<td>Ramp Up</td>
<td>≈ 23 000</td>
<td>25 000</td>
<td>Brazil &amp; Finland</td>
</tr>
<tr>
<td>Kevitsa / Finland</td>
<td>Conc.</td>
<td>Start Up</td>
<td>≈ 9 000</td>
<td>10 000</td>
<td>Open market</td>
</tr>
<tr>
<td>Long Harbour / Canada</td>
<td>Class I</td>
<td>Start Up</td>
<td>≈ 10 000</td>
<td>50 000</td>
<td>Mainly replacement</td>
</tr>
<tr>
<td>Taganito / The Philippines</td>
<td>Semi</td>
<td>Start Up</td>
<td>≈ 6 000</td>
<td>30 000</td>
<td>Japan</td>
</tr>
</tbody>
</table>

**Note:** no Chinese NPI projects included.
## World Nickel Ore Production 2010 to 2013 (f)

<table>
<thead>
<tr>
<th>Area</th>
<th>2010</th>
<th>2011</th>
<th>% change</th>
<th>2012</th>
<th>% change</th>
<th>2013 (f)</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>80.1</td>
<td>79.5</td>
<td>-0.8</td>
<td>89.5</td>
<td>12.5</td>
<td>101.0</td>
<td>12.9</td>
</tr>
<tr>
<td>America</td>
<td>367.2</td>
<td>482.7</td>
<td>31.5</td>
<td>488.1</td>
<td>1.1</td>
<td>490.0</td>
<td>0.4</td>
</tr>
<tr>
<td>Asia</td>
<td>504.8</td>
<td>662.4</td>
<td>31.2</td>
<td>732.5</td>
<td>10.6</td>
<td>780.0</td>
<td>6.5</td>
</tr>
<tr>
<td>Europe</td>
<td>325.4</td>
<td>361.5</td>
<td>11.1</td>
<td>343.5</td>
<td>-5.0</td>
<td>377.7</td>
<td>9.9</td>
</tr>
<tr>
<td>Oceania</td>
<td>298.4</td>
<td>346.1</td>
<td>16.0</td>
<td>375.8</td>
<td>8.6</td>
<td>406.0</td>
<td>8.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1575.8</strong></td>
<td><strong>1932.3</strong></td>
<td><strong>22.6</strong></td>
<td><strong>2029.4</strong></td>
<td><strong>5.0</strong></td>
<td><strong>2154.7</strong></td>
<td><strong>6.2</strong></td>
</tr>
</tbody>
</table>

(f) forecast October 2012; Asia adjusted in March 2013.
## World Primary Nickel Production
### 2010 to 2013 (f)

<table>
<thead>
<tr>
<th>Area</th>
<th>2010</th>
<th>2011</th>
<th>% change</th>
<th>2012</th>
<th>% change</th>
<th>2013 (f)</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>36.0</td>
<td>36.4</td>
<td>1.0</td>
<td>41.7</td>
<td>14.6</td>
<td>56.5</td>
<td>35.6</td>
</tr>
<tr>
<td>America</td>
<td>229.0</td>
<td>272.4</td>
<td>18.9</td>
<td>295.2</td>
<td>8.4</td>
<td>332.0</td>
<td>12.5</td>
</tr>
<tr>
<td>Asia</td>
<td>538.0</td>
<td>628.7</td>
<td>16.9</td>
<td>724.4</td>
<td>15.2</td>
<td>750.0</td>
<td>3.5</td>
</tr>
<tr>
<td>Europe</td>
<td>501.6</td>
<td>525.1</td>
<td>4.7</td>
<td>511.6</td>
<td>-2.6</td>
<td>509.0</td>
<td>-0.5</td>
</tr>
<tr>
<td>Oceania</td>
<td>141.4</td>
<td>150.2</td>
<td>6.2</td>
<td>176.5</td>
<td>17.5</td>
<td>201.5</td>
<td>14.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1446.0</strong></td>
<td><strong>1612.7</strong></td>
<td><strong>11.5</strong></td>
<td><strong>1749.4</strong></td>
<td><strong>8.5</strong></td>
<td><strong>1849.0</strong></td>
<td><strong>5.7</strong></td>
</tr>
</tbody>
</table>

(f) forecast October 2012; Americas, Asia and Europe adjusted in March 2013.
## World Primary Nickel Usage 2010 to 2013 (f)

<table>
<thead>
<tr>
<th>Area</th>
<th>2010</th>
<th>2011</th>
<th>% change</th>
<th>2012</th>
<th>% change</th>
<th>2013 (f)</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>24.0</td>
<td>23.9</td>
<td>-0.4</td>
<td>25.3</td>
<td>5.9</td>
<td>27.2</td>
<td>7.5</td>
</tr>
<tr>
<td>America</td>
<td>153.2</td>
<td>165.0</td>
<td>7.7</td>
<td>168.7</td>
<td>2.2</td>
<td>180.3</td>
<td>6.9</td>
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<td>Asia</td>
<td>929.4</td>
<td>1050.6</td>
<td>13.0</td>
<td>1105.7</td>
<td>5.2</td>
<td>1170.0</td>
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<tr>
<td>Europe</td>
<td>355.9</td>
<td>364.5</td>
<td>2.4</td>
<td>359.3</td>
<td>-1.4</td>
<td>374.9</td>
<td>4.3</td>
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<tr>
<td>Oceania</td>
<td>2.7</td>
<td>2.7</td>
<td>0.0</td>
<td>2.7</td>
<td>0.0</td>
<td>2.8</td>
<td>3.7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1465.2</strong></td>
<td><strong>1606.7</strong></td>
<td><strong>9.7</strong></td>
<td><strong>1661.7</strong></td>
<td><strong>3.4</strong></td>
<td><strong>1755.2</strong></td>
<td><strong>5.6</strong></td>
</tr>
</tbody>
</table>

(f) forecast October 2012; Asia adjusted in March 2013.
The impact of Asia and China

Nickel Usage (Consumption)

Asia: 47%
China: 15%

Asia: 66%
China: 46%
Nickel Product Substitution

- **Europe & North America:**
  - Nickel scrap units are replacing primary nickel in not only stainless steel, but also in alloyed steel and high nickel alloys where possible.

- **China PR:**
  - Nickel Pig Iron (NPI) is replacing primary nickel and to some extent stainless steel scrap due to cost and easy availability.

- **India:**
  - Nickel scrap units are increasing faster than primary nickel in stainless steel.

- **Conclusion:**
  - The nickel market is changing all the time and currently nickel supply and demand is working differently around the world with China developing the usage of NPI and Europe, India & North America is going the scrap route more and more.
Comments

• What effect will the new nickel projects currently coming on stream and ramping up have on the market?
• Nickel pig iron production and usage in China:
  – what effect would that have on the world nickel market, including ore availability, price and scrap?
• Will nickel remain an attractive investment object and store of value in the future?
ILZSG Overview

- Intergovernmental organization set up within the UN system
- Significant level of industry representation
- Established by UN in 1959 in New York
- Moved to London in 1977
- From start of 2006 ILZSG, ICSG & INSG co-located in Lisbon, Portugal

www.icsg.org

www.insg.org
ILZSG Membership

- Membership open to any country involved in lead and/or zinc production, usage, or trade.
- 30 members (>85% of global lead/zinc industry):

<table>
<thead>
<tr>
<th>Australia</th>
<th>Germany</th>
<th>Morocco</th>
<th>Serbia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>India</td>
<td>Namibia</td>
<td>South Africa</td>
</tr>
<tr>
<td>Brazil</td>
<td>Iran</td>
<td>Netherlands</td>
<td>Sweden</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>Ireland</td>
<td>Norway</td>
<td>Thailand</td>
</tr>
<tr>
<td>Canada</td>
<td>Italy</td>
<td>Peru</td>
<td>United States</td>
</tr>
<tr>
<td>China</td>
<td>Japan</td>
<td>Poland</td>
<td>European Community</td>
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<td>Finland</td>
<td>Korea Rep.</td>
<td>Portugal</td>
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<tr>
<td>France</td>
<td>Mexico</td>
<td>Russian Fed.</td>
<td></td>
</tr>
</tbody>
</table>
ILZSG Main Publications

- Lead and Zinc New Mine and Smelter Projects 2013
- Study on Chinese Zn First Use Market 2012
- The By-Products of Copper, Zinc, Lead and Nickel
- Indian Lead Market 2012
- World Directory: Primary and Secondary Lead Plants 2011
- Environment and Health Controls on Lead 2011
- Environment and Health Controls on Zinc 2011
- China Lead Acid Battery Market (prepared for ILZSG by BGRIMM)
- China Zinc Recycling Industry (prepared for ILZSG by BGRIMM)

50% Discount
For companies based in member countries
World Zinc Reserves 2011

Resources: about 1900 million tonnes (Mt)

Reserve Base 480 Mt
Reserves 250 Mt
Mine Production 13.0 Mt

Sources: USGS, ILZSG

contained zinc metal
World Zinc Reserves
2011 Breakdown

- Despite increased consumption of zinc produced from ore in recent years, increases in reserves have grown more, and there is more zinc available to the world than at any other time in the past.

- Mexico accounts for 7% of World Zinc Reserves
Falling Lead and Zinc Mine Grades

Source: Wood Mackenzie, Macquarie Research
Distribution of Lead Metal Supply

### 2001
- **China**: 15%
- **USA**: 23%
- **Canada**: 4%
- **Europe**: 30%
- **Japan**: 5%
- **Australia**: 4%
- **Korea**: 3%
- **Other**: 13%

### 2011
- **China**: 44%
- **USA**: 13%
- **Canada**: 3%
- **Europe**: 17%
- **Mexico**: 3%
- **Australia**: 2%
- **Korea**: 4%
- **Japan**: 2%
- **Other**: 12%

Source: ILZSG
# Selected Lead Mine Openings/Expansions 2012 to 2014 (Committed* and Under Consideration)

Source: New Mines and Smelters 2013 Report, ILZSG

<table>
<thead>
<tr>
<th>Mine</th>
<th>Annual Capacity (Pb metal contained)</th>
<th>Open</th>
</tr>
</thead>
<tbody>
<tr>
<td>George Fisher, Australia*</td>
<td>120,000t</td>
<td>2012 <em>(36kt expansion)</em></td>
</tr>
<tr>
<td>Magellan, Australia*</td>
<td>85,000t</td>
<td>2013 <em>(reopening)</em></td>
</tr>
<tr>
<td>Potosi, Australia*</td>
<td>14,000t</td>
<td>2012 <em>(new)</em></td>
</tr>
<tr>
<td>Keke Tale, China*</td>
<td>15,000t</td>
<td>2012 <em>(new)</em></td>
</tr>
<tr>
<td>Kayar, India*</td>
<td>15,000t</td>
<td>2013 <em>(new)</em></td>
</tr>
<tr>
<td>Garpenburg, Sweden*</td>
<td>50,000t</td>
<td>2012 <em>(20kt expansion)</em></td>
</tr>
<tr>
<td>Tala Hamza, Algeria</td>
<td>36,000t</td>
<td></td>
</tr>
<tr>
<td>Admiral Bay, Australia</td>
<td>350,000t</td>
<td></td>
</tr>
<tr>
<td>Browns Oxide Project, Australia</td>
<td>70,000t</td>
<td></td>
</tr>
<tr>
<td>Browns Sulphide Project, Australia</td>
<td>150,000t</td>
<td></td>
</tr>
<tr>
<td>McArthur River (expansion), Australia</td>
<td>93,000t</td>
<td></td>
</tr>
<tr>
<td>Mount Isa Super Pit, Australia</td>
<td>200,000t</td>
<td></td>
</tr>
</tbody>
</table>
Zinc Mine Supply
1963-2013f

Source: Wood Mackenzie, Macquarie Research
Distribution of Zinc Mine Supply

2001

Europe 12.0%
Mexico 4.8%
Peru 10.3%
India 2.4%
Australia 13.7%
Other 34.8%

2011

Europe 8.0%
Mexico 4.9%
Peru 9.7%
India 6.4%
Australia 11.4%
Other 26.3%

Source: ILZSG
# Selected Zinc Mine Openings/Expansions
## 2012 to 2014 (Committed* and Under Consideration)

<table>
<thead>
<tr>
<th>Mine</th>
<th>Annual Capacity</th>
<th>Source: New Mines and Smelters 2013 Report, ILZSG</th>
</tr>
</thead>
<tbody>
<tr>
<td>George Fisher, Australia*</td>
<td>215,000t</td>
<td></td>
</tr>
<tr>
<td>Perkoa, Burkina Faso*</td>
<td>95,000t</td>
<td></td>
</tr>
<tr>
<td>Bracemac-McLeod, Canada*</td>
<td>90,000t</td>
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</tr>
<tr>
<td>Keke Tale, China*</td>
<td>40,000t</td>
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</tr>
<tr>
<td>Valardena, Mexico*</td>
<td>90,000t</td>
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<tr>
<td>Garpenburg, Sweden*</td>
<td>50,000t</td>
<td></td>
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<tr>
<td>Tala Hamza, Algeria</td>
<td>164,000t</td>
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<tr>
<td>Admiral Bay, Australia</td>
<td>450,000t</td>
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<tr>
<td>Dugald River, Australia</td>
<td>200,000t</td>
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<tr>
<td>McArthur River (expansion), Australia</td>
<td>380,000t</td>
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<tr>
<td>Mount Isa Super Pit, Australia</td>
<td>300,000t</td>
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<tr>
<td>Panorama, Australia</td>
<td>185,000t</td>
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<tr>
<td>Gamsburg, South Africa</td>
<td>350,000t</td>
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<tr>
<td>Ozernoye, Russia</td>
<td>350,000t</td>
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</table>

<table>
<thead>
<tr>
<th>Open</th>
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</thead>
<tbody>
<tr>
<td>2012 (64kt expansion)</td>
<td>2013 (new)</td>
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<tr>
<td>2013 (new)</td>
<td>2012 (reactivation)</td>
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<tr>
<td>2012 (20kt expansion)</td>
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</tr>
</tbody>
</table>

*Annual Capacity (Zn Metal contained)
World Lead Demand Forecast

ILZSG Forecast

- 2012  3.4%
- 2013  3.3%

Source: ILZSG
World Lead Mine Supply Forecast

ILZSG Forecast

- 2012  10.9%
- 2013  2.8%

Source: ILZSG
World Lead Metal Supply Forecast

ILZSG Forecast

• 2012  2.9 %
• 2013  3.8%

Source: ILZSG
Lead Metal World Balance

Source: ILZSG


Source: ILZSG
World Zinc Metal Demand Forecast

ILZSG Forecast

• 2012  \(-0.3\%\)
• 2013  3.8\%

Source: ILZSG
World Zinc Mine Supply Forecast

ILZSG Forecast

• 2012  5.0 %
• 2013  2.7%

Source: ILZSG
World Zinc Metal Supply Forecast

ILZSG Forecast

• 2012  -2.0 %
• 2013  4.8%

Source: ILZSG
Zinc Metal World Balance

Source: ILZSG
Next Study Group Meetings in Lisbon, Portugal

- **22-23 April 2013**  International Nickel Study Group
- **Morning 24 April 2013**  International Lead and Zinc Study Group
- **2.00pm 24 April 2013**  Joint Study Groups Seminar “Financial Aspects of the Metals Industry: Price Volatility, Investor Activity and Project Financing”
- **25-26 April 2013**  International Copper Study Group