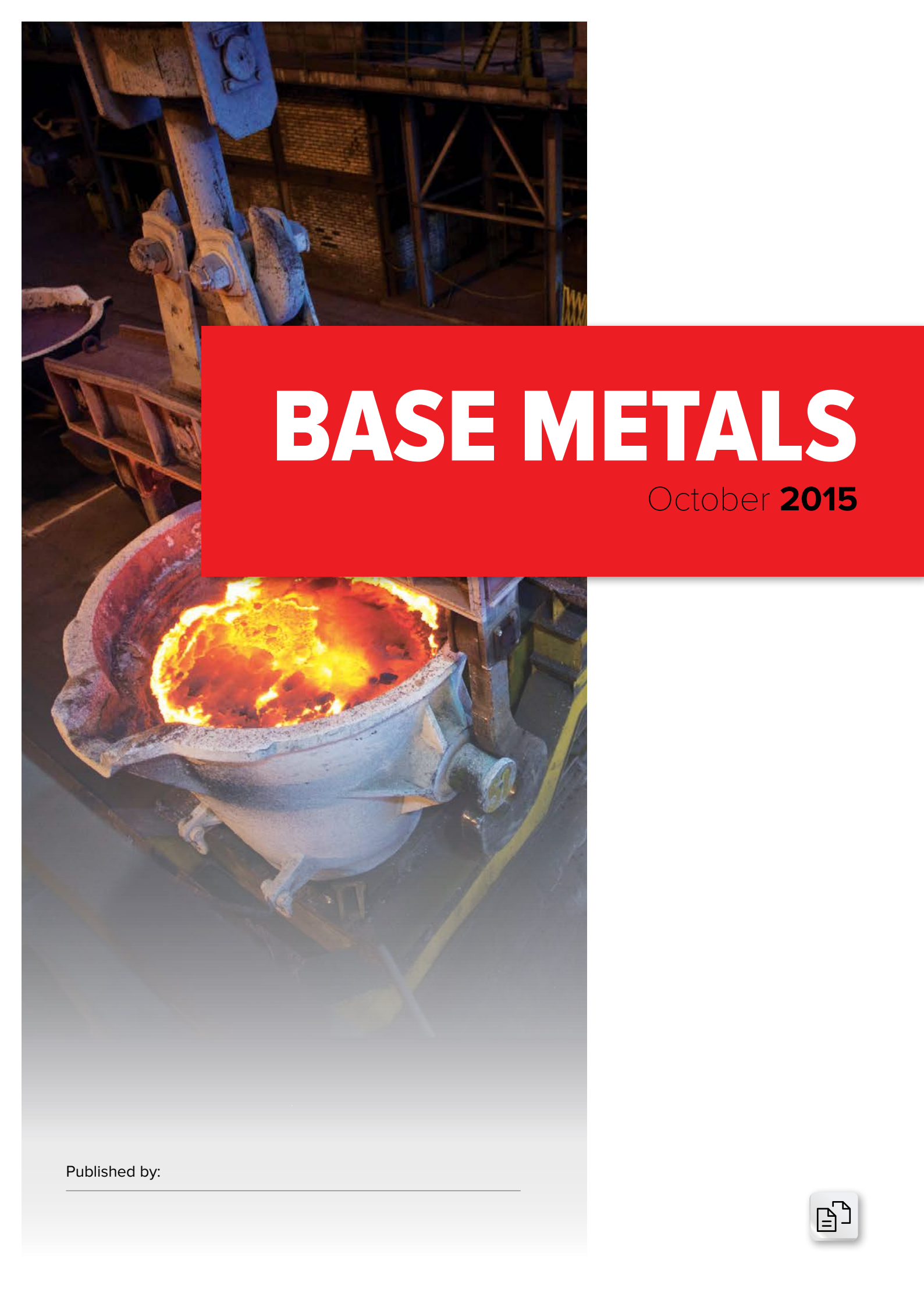


The background of the page is a photograph of an industrial setting. In the foreground, a large, heavy-duty metal ladle is filled with bright orange and yellow molten metal, likely steel or iron, which is glowing with intense heat. The ladle is positioned on a metal stand. In the background, there are various industrial structures, including a large metal frame and a brick wall, suggesting a foundry or a steel mill environment.

BASE METALS

October **2015**

Published by:



A review of Africa's base metals sectors

The material in this report was compiled by Martin Zhuwakinyu and the Research Unit of Creamer Media (Pty) Ltd, based in Johannesburg.

The information in this report is correct as of October 2015.

Report edited by Sheila Barradas, David Shepherd and Ria Theron.

Ordering information

To subscribe to *Research Channel Africa* or purchase this report contact:

Creamer Media (Pty) Ltd

tel +27 11 622 3744 or

email subscriptions@creamermedia.co.za

Cover picture by Bloomberg.



Picture by Reuters



Presented by:

Powertech 

Table of Contents

■	List of abbreviations	4
■	Key developments	5
■	Copper	6
	– Global supply	6
	– African supply	9
	– Global demand	13
	– Price	14
	– Outlook	15
■	Zinc	17
	– Global supply	17
	– African supply	19
	– Global demand	20
	– Price	21
	– Outlook	21
■	Nickel	22
	– Global supply	22
	– African supply	24
	– Global demand	24
	– Price	26
	– Outlook	26
■	Lead	27
	– Global supply	27
	– Global demand	28
	– Price	29
	– Outlook	29
■	Selected base metals operations in Africa	30
■	Selected base metals projects in Africa	34
■	Base metals outlook	40
■	Main sources	41



List of abbreviations

DRC	Democratic Republic of Congo
ENRC	Eurasian Natural Resources Corporation
FQM	First Quantum Minerals
GDP	gross domestic product
HMS	heavy-metal separation
ICSG	International Copper Study Group
ILZSG	International Lead and Zinc Study Group
INSG	International Nickel Study Group
JV	joint venture

KCM	Konkola Copper Mines
MCM	Mopani Copper Mines
NPI	nickel pig iron
PGM	platinum-group metal
PMI	purchasing managers index
RNC	Royal Nickel Corporation
SX-EW	solvent extraction and electrowinning
VAT	value-added tax
Zesco	Zambia Electricity Supply Corporation

Units of measurement

The distinction between tonne (1 000 kg) and ton (1 016.047 kg) is maintained in this report according to the information that is reported in the public domain by each company.



Zinc ingots

Picture by Bloomberg

Presented by:

Powertech 



Key developments

January 2015: Australian-listed Mawson West places the Dikulushi copper/silver mine, in the Democratic Republic of Congo, on care and maintenance, owing to deteriorating commodity prices and lower-than-expected copper and silver production.

January 2015: MMG announces that output at its Century mine, in Australia, during 2015 – its final year of operation – will be 21% to 31% lower than the 465 696 t produced in 2014.

February 2015: London-based Weatherly International's Tschudi mine, in Namibia, starts commercial production, with output for the quarter ended June 2015 amounting to 2 257 t of A-grade copper cathode.

February 2015: Production ceases at the Paroo Station mine, in Australia, reducing the country's lead production capacity by about 85 000 t/y.

February 2015: The board of Palabora Copper approves a R9.3-billion project to extend the operating life of the company's copper mine in South Africa's Limpopo province by 20 years.

April 2015: Russia's OJSC MMC Norilsk Nickel completes the sale of its 85% stake in Botswana's Tati Nickel Mining Company to Botswana State-owned company BCL Limited, in a \$337-million deal that also entailed the sale of its 50% interest in South Africa's Nkomati nickel mine to BCL.

April 2015: The Democratic Republic of Congo government exempts mining companies from customs duties and sales tax on electricity imports, as well as on foreign-sourced generators, to lessen the impact of electricity shortages on mining companies.

April 2015: Toronto-listed mining company Nevsun Resources reports that the zinc plant under construction at its Bisha mine, in Eritrea, has reached the 60% completion mark and that the \$92-million project is on course for completion by mid-2016.

April 2015: Zambia-based Chambishi Metals closes its cobalt plant for three months, owing to the unavailability of cobalt feed.

May 2015: African Copper suspends operations at its Thakadu copper mine, in Botswana, owing to low ore grades and high operating costs.

May 2015: Glencore and Barrick Gold announce they are selling their jointly owned greenfield Kabanga nickel project, in Tanzania. Glencore has stated it is not interested in greenfield projects, which require huge cash outlays, while Barrick Gold is aiming to reduce its \$3-billion debt by the end of 2015.

May 2015: Protesters force Southern Copper to halt the development of its planned \$1.4-billion Tia Maria copper mine, in Peru. The protesters claimed that the mine would drain rivers and pollute water sources.

May 2015: Zambia's Mopani Copper Mines completes a \$74-million upgrade of its plant in Mufulira, a project that will reduce energy consumption.

June 2015: The Zambian government starts releasing value-added tax (VAT) refunds to mining companies, which it had been withholding unless the companies produced import certificates from the destination countries to which their minerals were exported. The VAT standoff had resulted in some mining companies slowing down or suspending their capital investment projects.

July 2015: Construction starts on Vedanta's \$630-million Gamsberg zinc project, in South Africa's Northern Cape province, which will comprise a 250 000 t/y opencast mine, a concentrator plant and associated infrastructure.

August 2015: First Quantum Minerals announces that full power supplies have been restored to its Kansanshi mine and Sentinel project, in Zambia, after being cut from 153 MW to 127 MW and from 55 MW to 42 MW respectively during the first half of 2015.

September 2015: Glencore announces it will suspend copper production at the Mopani and Katanga copper mines, in Zambia and the Democratic Republic of Congo respectively, for 18 months as a result of a challenging commodities environment.

October 2015: Chile's second-biggest copper mine Collahuasi, owned by Anglo American and Glencore postpones expansion plans, on top of its previously announced cuts, as it faces a six-year low in the price of the base metal.

October 2015: US investment bank Goldman Sachs slashes its 2016 price forecasts for nickel, zinc, and lead by more than 20%, primarily citing challenges to Chinese metals and mining demand.

October 2015: Goldman Sachs projects that the copper market will experience a surplus of 530 000 t in 2016, increasing to 566 000 t in 2017, largely owing to faltering Chinese demand growth.

October 2015: The international nickel study group forecasts that the global nickel market will swing into a 23 000 t deficit in 2016.



Presented by:

Powertech

Copper

Global supply

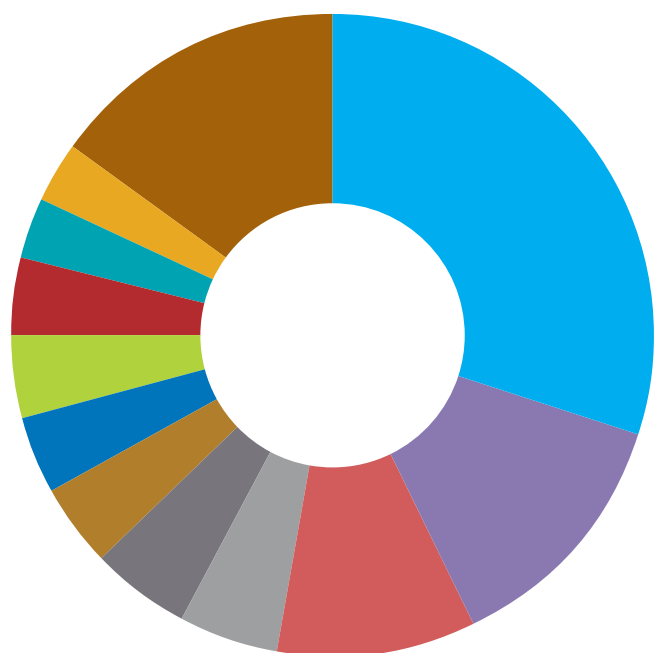
Statistics from the US Geological Survey indicate that the world boasted 2.1-billion tonnes of identified copper resources and 700-million tonnes of reserves in 2014, but the resource base could be as high as 5.6-billion tonnes if unidentified and undiscovered resources – including deep-sea nodules and land-based and submarine massive sulphides – were added.

The global resource base has increased nearly fourfold in the past 15 years, owing to a better understanding of the geology of copper deposits and the use of sophisticated geophysical and drilling techniques, as well as large, low-grade copper deposits becoming economically viable to mine with large-capacity equipment.

The currently available reserves are the highest the world has ever had, despite increases in copper consumption in recent years. Most of the reserves are in Chile, which hosts 30% of the total, with Australia and Peru hosting 13% and 10% respectively. Other countries with significant copper endowments are the US and Mexico, with 5% each; China, Russia, Indonesia and Poland, with 4% each; and Central African neighbours Zambia and the Democratic Republic of Congo (DRC), with 3% each. The rest of the world accounts for the remaining 15%.

Copper mine production in 2014 amounted to 18.54-million tonnes, an increase on the 18.26-million tonnes produced in the previous year. Production during the first six months of 2015 amounted to 9.4-million tonnes, up from 9.1-million tonnes during the corresponding period in 2014. This increase was mainly a result of a recovery in production at mines in Indonesia and Chile. The International Copper Study Group (ICSG) has forecast production increases of 5% in each of 2015 and 2016 to 19.5-million tonnes and 20.6-million tonnes respectively, as new capacity comes on stream.

World copper reserves



Chile	30%
Australia	13%
Peru	10%
US	5%
Mexico	5%
China	4%
Russia	4%
Indonesia	4%
Poland	4%
DRC	3%
Zambia	3%
Other	15%

Source: US Geological Survey

Chile continues to be the world's largest copper producer, accounting for 5.8-million tonnes of total tonnage produced in 2014. The country's copper commission has reduced its 2015 production estimate



Presented by:

Powertech

from 6-million tonnes to 5.94-million tonnes on the back of severe flooding and lower estimates from operations run by Anglo American and Barrick Gold, but the ICSG forecasts that Chile's share of world output will be 28.5% in 2016, up from 17.2% in 1990. The group expects China to retain its number two position in 2016, but to more than treble its share from 3.2% in 1990 to 10.2%.

Other major copper-producing countries are Peru, whose share of world production is forecast to increase from 3.3% in 1990 to 8.1% in 2016, as well as the US, Australia, Zambia and the DRC, with estimated 2016 production shares of 6.8%, 4.9%, 5.3% and 5.1% respectively.

The ICSG also estimates that the Russian Federation will account for 3.4% of total output in 2016, with Canada accounting for 3.3%, Indonesia 4.2%, Mexico 3.4%, Poland 2%, Kazakhstan 2.3%, Iran 1.3% and Brazil 1.7%. The remaining 9.5% will be mined in the rest of the world.

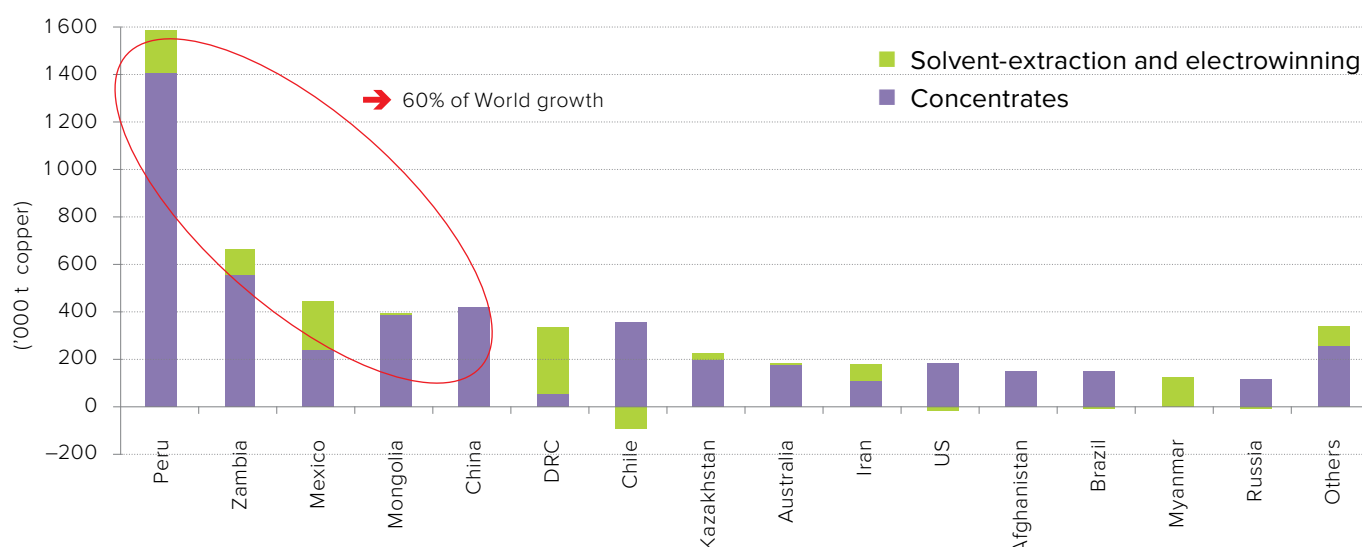
Recently commissioned projects that will boost production in the near term include Brazilian giant Vale's \$1.7-billion Salobo II expansion project, in Para state, which was completed in 2014; Caserones, a \$4.2-billion, 180 000 t/y mine in Chile that is majority-owned by Japan's JX Nippon Mining & Metals and started operations in 2014; and First Quantum Minerals' (FQM's) Sentinel mine, in Zambia, which forms part of

the larger Trident project, and includes the Enterprise nickel project, started production in December 2014 and is expected to produce 150 000 t to 200 000 t during 2015. Hudbay Minerals' \$2-billion Constancia project, in Peru, which has a nameplate capacity of 118 000 t/y, also started production in December 2014.

Further capacity will be added when the planned \$1.5-billion to \$2-billion expansion of the Sierra Gorda mine, in Chile, enters production in 2019. A joint venture (JV) between KGHM, Europe's number two copper miner, and Japan's Sumitomo Metal Mining, Sierra Gorda will produce 220 000 t/y over a 20-year operating life if its owners decide to start the second phase of the project. MMG's \$7-billion Las Bambas mine, in Peru, is scheduled to start production at one of its four deposits in early 2016. Las Bambas continues to progress to plan, with overall construction progress at 95% and concentrate-related construction 90% complete as of June 30, 2015.

Chilean State-owned miner Codelco plans to spend \$4-billion on projects to extend the life of its oldest mines and to bring them in line with stringent environmental standards. The projects include deepening the El Teniente mine, transforming the Chuquicamata openpit into an underground operation and maintaining existing mines. Funding for the projects will come from government, which plans to invest \$1-billion a year in the company over the next four years.

Projected copper mine production capacity increase by country 2014 to 2018



Source: International Copper Study Group Directory of Copper Mines and Plants, December 2014

Presented by:

Powertech



Further, the company, which intends getting more funds through debt, will decide in 2016 whether to construct a new mine named Rajo Inca.

Polymetallic miner Milpo, which is controlled by Brazilian group Votorantim, is optimistic that the Peruvian government will approve its plan to develop the Michiquillay deposit, in the country's northern Cajamarca region. Anglo American withdrew from the project in 2014. If other companies show interest in the project, Peruvian authorities will open formal bidding. Should it go ahead, Michiquillay will produce 187 000 t/y of copper. The project has, however, met with resistance from local communities in the past.

Meanwhile, Southern Copper, which was forced by protesting community members to halt the development of its planned \$1.4-billion Tia Maria copper mine, in Peru, in May 2015, hopes to reach an agreement with the protesters – who claim the mine will drain rivers and pollute water resources – and resume construction before the end of 2015. This would enable production to start in 2018. A permit for the 120 000 t/y mine was granted in March 2015.

While the oceans contain significant copper resources, the challenge is to exploit these deposits efficiently and turn them into economically viable operations.

Three offshore copper projects that could be developed earlier than the rest are the Clipperton Fracture Zone, in the international waters of the Pacific Ocean, between Hawaii and Mexico; the Atlantis II basin, in the Red Sea; and the Solwara 1 project, in the Bismark Sea, off Papua New Guinea.

Other zones attracting exploration interest are the Mid-Atlantic Ridge and the Southwestern Indian Ridge.

Metal companies globally have been decreasing production and freezing production plans as a cooling Chinese economy, torrential rains and floods in Chile, and a pay dispute between management and workers at the world's second-largest copper mine, Grasberg, in Indonesia, have dampened the outlook for a quick recovery in the copper price.

Chile's second-biggest copper mine Collahuasi, owned by Anglo American and Glencore has postponed expansion plans as it faces a six-year low in the price of the base metal.

On September 29, Collahuasi had said it was planning to cut output by 30 000 t, alongside dozens of jobs, because of difficult market conditions.

Its growth project will also be delayed.

Collahuasi had been mulling expansion plans to double the mine's production to about one-million tonnes for some time, a plan originally slated to cost an estimated \$6.5-billion.

Metals companies globally have been cutting back on production and freezing expansion plans as a cooling Chinese economy has darkened the outlook for a quick recovery in the copper price.

Further, Antofagasta had to reduce the copper output forecast for its Los Pelambres mine, its largest mine in Chile, by about 5 000 t, following a court order forcing the company to destroy a gigantic dam it had constructed for the mine.

Meanwhile, taking account of the present copper market, BHP Billiton, one of the world's largest copper mining companies, with an output of 1.7-million tonnes in 2014, has reduced its forecast output from the Escondida mine, in Chile, by 150 000 t.

Rio Tinto has also trimmed forecast 2015 output from its Kennecott operation, in the US, by 100 000 t, while Glencore expects output from its Alumbra mine, in Argentina, to be 50 000 t lower than initially estimated.

Top six copper mining companies

Company	Production in 2014 ('000 t)	Change from 2013	Mine locations
Freeport-McMoRan	1740	-5%	Indonesia, DRC, US, Peru, Chile
BHP Billiton	1727	+2%	Australia, Peru, Chile
Codelco	1672	+3.1%	Chile
Glencore	1546	+4%	Argentina, Australia, Canada, Chile, DRC, Peru, the Philippines, Zambia
Grupo Mexico	827	+3.4%	Mexico, Peru
Rio Tinto	603	+4%	Australia, Indonesia, Mongolia, Peru, the US

Source: Austex Mining

Presented by:

Powertech 



Chile copper mine water use forecast to rise 66% in ten years

Water consumption in Chile's copper mining industry is forecast to increase by about 66% by 2025, with new mines accounting for about 75% of the expected water use.

Most copper mines in Chile, which account for about one-third of the world's production of the metal, are located in the Atacama, the world's driest desert. The country has been hit by a series of droughts in recent times, raising concerns about water use.

Water shortages have resulted in copper mining companies increasingly turning to seawater, which is expected to meet one-third of their water demand in ten years, up from 9% currently.

Several mines have unveiled plans to develop desalination plants, including Freeport-McMoRan's El Abra and its former Candelaria mine, as well as Radomiro Tomic and Chuquibambilla, both divisions of State-owned miner Codelco. Anglo-Australian majors BHP Billiton and Rio Tinto, joint owners of the Escondida copper mine, plan to build a \$3-billion plant that will pump treated seawater to the operation.

Anglo American opened a desalination plant in November 2014 to supply its Mantoverde mine. In June 2013, Lundin Mining's Candelaria opencast mine, then in the Freeport-McMoRan fold, started its desalination plant to supply 500 ℓ/s to the mine through an 80 km pipeline.

Water shortages in Chile have prompted the country's lawmakers to introduce a Bill that will force miners to run all their operations on desalinated water from the Pacific Ocean. The Bill, which was submitted in 2014 and is being studied by the country's Mining Committee, will target mining companies consuming more than 150 ℓ/s .

Source: Reuters and Mining.com

Meanwhile, refined copper production increased from 21.1-million tonnes in 2013 to 22.5-million tonnes in 2014. Production for the first half of 2015 was 11.2-million tonnes, up from 10.86-million tonnes for the corresponding period in 2014.

On a regional basis, refined metal output during the first half of 2015 increased by 9% in Africa and by 7% in Asia, while Oceania reported a 22% decline and production in the Americas and Europe was largely unchanged.

The ICSG expects increases of 4% in 2015 and 3% in 2016.

While a copper surplus was initially forecast for 2015, the downward revision of several companies' estimated output has raised doubts that this will be the case. Some analysts expected the surplus to be 350 000 t in 2015 from an estimated 94 300 t in 2014.

However, the envisaged production cuts and a possible upturn in the property sector in China, a consumer of about 40% of the world's copper, have led some commentators to forecast a balanced market in 2015, while others foresee a deficit.

African supply

Africa's contribution to global copper mine production is forecast to increase from 5% in 2014 to 13% in 2018 as new projects come on stream. The continent's output will continue to be dominated by the DRC, its foremost producer since 2013, and neighbouring Zambia, which was forced into second position after decades of continental pre-eminence.

The DRC's copper production has increased more than thirtyfold since 2002, topping one-million tons a year for the first time in 2014, with an increase to 1.5-million tonnes expected in 2015. However, energy and infrastructure constraints might jeopardise the chances of this target being met.

The exponential increase in the DRC's copper production is the result of projects implemented by international companies. The envisaged increase in production during 2015 will emanate from private-sector projects currently under way.

Further, copper production from the Sicomin project, a JV between Chinese investors and State-owned

Presented by:

Powertech 



miner Gecamines, will start by the end of 2015. The Chinese companies involved are Sinohydro and China Railway Group, which, with support from China's Export-Import Bank, are building railways, roads, hospitals and schools valued at about \$3-billion, in return for a 68% shareholding in two copper/cobalt mines in the eastern Katanga province. Gecamines will retain a 32% equity stake.

The deal will initially produce about 50 000 t/y, but this will increase to 400 000 t/y – equivalent to 40% of the DRC's copper production in 2014 – over two decades.

The agreement was initially signed in 2007 for \$9-billion, but this was later reduced to \$6.2-billion – comprising \$3.2-billion to develop the mines and \$3-billion for infrastructure projects – after the International Monetary Fund had objected to the amount of debt the DRC government was incurring.

Meanwhile, DRC miners face a shortage of electricity that has been estimated at 60 MW by Kazakh group Eurasian Natural Resources Corporation director Ben Munanga, who also deals with energy matters on the country's chamber of business.

The electricity shortage has been attributed to ageing infrastructure and poor maintenance of power stations, and Munanga says the DRC's copper production could be increased by 250 000 t/y to 300 000 t/y with greater electricity availability.

Some mining companies have resorted to installing their own generators and importing electricity from Zambia, both of which are expensive options. To lessen the impact, the DRC government issued a decree in April 2015 that exempted mining companies from customs duties and sales tax on electricity imports, as well as on foreign-sourced generators. The decree will be in place for the next four years.

The mood in the Congolese mining sector has also been dampened somewhat by a revised mining code that critics say will result in copper and cobalt miners earning only about 20% of the total cash flow over the operating life of a mine, compared with government's 80%. This is despite the most recent version of the code, submitted to Parliament in March 2015, containing reduced proposals for the State's share of projects from 30% to 10%, the company tax rate by five percentage points to 30% and the gold mining royalty from 6% to

3.5%. A plan for a 50% tax on 'excessive profits' was also removed.

Meanwhile, Glencore announced in September 2015 that it was to suspend production at the Katanga mine, in the DRC, as well as at the Mopani mine, in neighbouring Zambia, because of a depressed commodities environment.

The two operations produced 127 000 t of copper in the first half of 2015, about 17% of Glencore's output. During the production suspension, which will last 18 months, Glencore will build new processing facilities that will lower production costs from more than \$2.30/lb. Glencore employs 8 000 people at Mopani and 5 000 at Katanga, excluding thousands of contractors. Eighty per cent of Katanga's workforce have been retained despite the suspension of operations, but it is not clear how many jobs will be affected at Mopani.

Glencore will, however, go ahead with its planned investment of \$880-million in process plant upgrades and waste stripping at the KOV and Mashamba openpits at Katanga. The process upgrades include the commissioning of a new leach plant that will replace the existing oxide concentration process.

Zambia orders Vedanta unit to get rid of Chilean copper

In September 2015, the Zambian government ordered Vedanta Resources' Konkola Copper Mines (KCM) subsidiary to get rid of copper concentrate it had imported from Chile, claiming that it contained high levels of arsenic.

Zambian authorities asked KCM in June 2015 to delay processing the concentrates, saying they had found arsenic to be around 4%, higher than the 1% found in local product.

KCM imported about 5 000 t of concentrate from Chilean State-owned group Codelco because its Nchanga smelter was operating at about half its capacity. The company had been blending its concentrate with material from other local mines and the Democratic Republic of Congo, but these were not enough to reach the smelter's capacity.

KCM produces more than 30% of Zambia's copper.

Source: Mining.com

Presented by:

Powertech 



Zambia's 2015 copper output seen down 15% on low demand

Zambia is expected to produce 600 000 t of copper in 2015, down 15% from 708 000 t in 2014, a government official said in October.

Copper output in Africa's second-largest producer should recover to 700 000 t in 2016, permanent secretary for economic and budget affairs Pamela Kabamba has noted.

The Zambia Chamber of Mines said the current state of the mining sector Zambia was grave and called for urgent attention to sustain existing operations and avert a continuation of the current spate of suspensions and loss of jobs.

"The Chamber views the focus on mining in the recently announced 2016 national budget as generally inadequate and at odds with the need to apply urgent and decisive restorative measures to the industry," the chamber said in a statement.

"The mining industry is faced with a global downturn that draws ominous parallels with the trend last seen in 2008, when prices of commodities on the international markets experienced a severe downturn."

Zambia's kwacha currency went into freefall in September as prices for its copper exports hit a one-month low.

The southern African country faces external challenges including weak commodity prices, Finance Minister Alexander Chikwanda said in his 2016 Budget speech.

Source: Reuters

Zambia, which boasts vast swathes of untapped copper reserves averaging 2% to 3% copper – compared with a global average of 0.8% – produced 708 259 t in 2014.

This was the lowest level in three years, compared with the target of 900 000 t set by former Mines Minister Christopher Yaluma.

The decline was attributed largely to lower output from six of the country's nine large-scale copper miners: Mopani Copper Mines (MCM), Konkola Copper Mines (KCM), Sino Metals, Kansanshi Mining, Chibuluma Mines and Lumwana Mining Company.

Production at MCM, owned by Switzerland-headquartered Glencore, declined from 116 851 t in 2013 to 109 870 t as a result of a planned smelter shutdown at the Mufulira mine, while Vedanta-owned KCM's production also declined from 139 891 t in 2013 to 120 409 t, as the company was forced to suspend operations at the Nchanga underground mine because of flooding, caused by electricity restrictions imposed by Copperbelt Energy Corporation. These restrictions, in turn, were prompted by a financial dispute between KCM and the corporation.

Sino Metals' production declined from 4 001 t in 2013 to 3 643 t in 2014, while production at Kansanshi, an FQM subsidiary, declined from 270 723 t to 262 705 t.

Production at Lumwana, a unit of Barrick Gold, declined from 117 967 t to 97 057 t, owing to a breakdown in the ore conveyance system at the company's mine, in Solwezi. Chibuluma's output dropped from 18 771 t to 15 825 t.

The 2015 calendar year started on a difficult note for the Zambian copper mining industry, with government threatening to go ahead with plans to raise royalties to 20% for opencast mines and to 8% for underground mines. This prompted Barrick Gold to initiate steps to place the Lumwana mine – a contributor of 14% of Zambia's 2014 copper production – on care and maintenance.

Owing to the royalties row with Barrick Gold and other miners, then Mines Minister Christopher Yaluma forecast that 2015 production was likely to be lower than the 708 000 t produced in 2014. Barrick Gold reversed its decision to mothball Lumwana when the Zambian government pegged royalties for underground and opencast mines at 9%. A further reduction is reportedly being contemplated.



Presented by:

Powertech

Besides lower metal prices, the Zambian mining industry is reeling under power rationing as the country has had to reduce power generation by 300 MW, owing to falling water levels in Kariba dam and prolonged drought affecting other hydropower sources. The power shortages, coupled with falling copper prices, forced the Chinese-owned CNMC Luanshya Copper Mines to close its Baluba mine in September 2015, sending 1 600 workers on forced leave. Owing to falling copper prices, the Zambia Revenue Authority stated in September 2015 that its collections for the year were likely to be lower than the \$202-million projected by the country's Ministry of Finance earlier in the year.

In the longer term, however, production is expected to increase as brownfield and greenfield projects come on stream. These include MCM's \$323-million Nkana Synclinorium project, which is scheduled to be commissioned in February 2016 and to increase the life-of-mine by more than 25 years. Also under way are the development of the South-East orebody at NFC Africa Mining's Chambishi operation, a \$500-million investment that will extend the operating life by about 20 years; the development by KCM of the Nchanga upper orebody; and the \$380-million Phase 2 production ramp-up to 45 000 t at the Lubambe copper mine through the development of the operation's south-east limb.

Further, Chibuluma Mine plc is implementing a project that will enable it to access the Chifupu orebody from the first quarter of 2016 and Kansanshi is building a new smelter and sulphide circuit at its mine in Solwezi.

Also being implemented are FQM's \$2-billion Kalumbila copper project, now in the final stages of construction; Zhonghui Mining Group's Ichimpe copper project; Blackburn Resources' Kitumba copper project, which will contribute 58 000 t/y to total production over an 11-year operating life; Sino Metals' Mwambashi copper project, with a nameplate capacity of 35 000 t/y; Macro Link Resources' Mwekera copper project; Changfa Resources' Mwakambo copper/cobalt project; and the Cheowa/Kangaluwi copper project, being developed by Zambezi Resources.

Meanwhile, in a development that improved optimism in the copper mining sector, the Zambian government started paying value-added tax (VAT) refunds to mining companies in June 2015. Zambia started withholding

VAT refunds in 2014 unless exporters produced import certificates from destination countries.

Mining companies argued that it was difficult to comply with this because they often sold copper to trading companies and did not know where it ended up.

Mining companies had claimed for months that government owed them more than \$600-million in VAT refunds and government decided in February 2015 to relax the rule so that import documentation from transit countries would suffice.

The VAT standoff had resulted in mining companies slowing down or suspending projects. FQM, from which VAT repayments of about \$150-million were being withheld, reported that it would delay more than \$1-billion in capital expenditure, while Glencore, which is claiming a \$200-million refund, had decided to suspend projects with a combined price tag of \$800-million.

Owing to softening copper prices, Zambia, which depends heavily on the red metal, reported in August 2015 that it expected its 2015 gross domestic product (GDP) growth to be 5%, down from a projected target of 7%. The Southern African country, which is aiming for GDP growth of 6%, forecasts that growth will return to its target in 2016 and increase to 6.5% in 2017 and 6.8% in 2018.

Although not on the same scale as the DRC or Zambia, South Africa, Botswana, Mauritania, Morocco, Namibia, Tanzania and Zimbabwe are all copper mining countries.

Copper production in South Africa is undertaken mainly at Palabora Copper's mine, in Limpopo, which produces 43 000 t/y of refined copper.

In February 2015, the company's board approved a R9.3-billion project to extend the mine's operating life by 20 years. Construction of the mine started in July.

In neighbouring Botswana, the underexplored Kalahari Copperbelt, which runs through the Southern African country, is believed to hold substantial sediment-hosted copper and silver deposits.

One of the companies with an interest in Botswana's copper sector is Australia-based African Copper, which had to close its Thakadu mine in May 2015 – owing



to low ore grades and high operating costs – while curtailing operations at its flagship Mowana mine.

Thakadu became the second copper mine in Botswana to cease operations in 2015 after Discovery Metals' Boseto mine, which, before its closure in March 2015, had battled operational difficulties and debt since coming on stream in the first half of 2012.

Meanwhile, Cupric Canyon Capital, a private-equity firm supported by Barclays plc, plans to spend \$200-million to bring its Khoemacau copper/silver project to production.

Construction is scheduled to start in 2016, with commissioning by 2018. The new mine will produce an estimated 50 000 t/y of copper and 1.8-million ounces of silver.

Cupric's Botswana subsidiary has also concluded a deal to acquire the mothballed Boseto mine, which is 30 km from its new mine site.

In Eritrea, Canadian company Nevsun's Bisha mine,

\$500-million secured for Zambian copper rail line

Zambia's Northwest Rail has secured \$500-million for the first phase of a railway line linking the country's Copperbelt to the border with Angola.

South Africa's Grindrod and other investors are providing equity, which will comprise 30% of the total cost, while several banks will provide debt, comprising 70%.

Grindrod was contracted to build, operate and maintain the 590 km railway line in February 2014 by Northwest Rail, which won the right to develop the line to export copper from Zambia. Construction will begin once agreement on the construction has been reached, possibly by the end of 2015.

The first phase will connect Zambia's old Chingola copperfields to the newer mines at Kansanshi, Lumwana and Kalumbila. The second phase, also estimated to cost \$500-million, will open a direct corridor to the Angolan port of Lobito, which will enable Zambia to export copper and import oil.

Source: Reuters

which was built between 2008 and 2010 and processed oxide ore to produce gold/silver doré, switched to copper concentrate production in 2013, following a \$110-million expansion project.

The second phase, also estimated to cost \$500-million, will open a direct corridor to the Angolan port of Lobito, which will enable Zambia to export copper and import oil.

Global demand

A total of 31% of the world's copper is used in the manufacture of electrical equipment, with the building construction sector consuming 30%. The infrastructure sector accounts for 15%, with the transport and industrial sectors accounting for 12% each. China is the world's largest copper consumer, accounting for about 44% of total demand, compared with the European Union's 14%, the US's 8%, Japan's 5% and the rest of the world's 28%.

According to the ICSG, copper demand amounted to 22.9-million tonnes in 2014, a 7.1% increase on the previous year's figure. The ICSG has projected an overall increase of only 0.6% in 2015. This is mainly because apparent demand in China is expected to grow by 1%, despite a 4.5% to 5% demand growth from the Asian giant's industrial sector, while demand in the rest of the world is expected to remain flat.

Analysts at Thomson Reuters GFMS are more upbeat about Chinese demand, stating in July 2015 that they expected growth of 3.6% for the year.

Thomson Reuters GFMS's Bruce Alway states that demand from China will fundamentally continue to grow, even though the growth rate is decelerating. His optimism is based on the continued growth of China's Tier 1 cities, while copper will be required for electricity transmission infrastructure from solar and wind farms in the central and western parts of the country to cities in the east.

Antofagasta CEO Diego Hernandez stated when he presented the company's 2014 financial results that the Chinese authorities had set aside \$70-billion for investment in electrical network infrastructure, which accounted for 27% of the Asian country's copper demand in 2014. Further, the building of high-speed train infrastructure will be a driver of copper demand in the future.

Presented by:

Powertech 



Always states that, worldwide, one of the factors weighing on copper is the strong dollar. As copper is often priced in the greenback, a strong currency makes copper more expensive, thus dampening demand.

However, a strong US dollar is indicative of a strong US economy, which is good for copper consumption.

Codelco, the world's largest copper producer, expects US demand to be buoyed by the automotive and construction sectors to pre-subprime crisis levels and by consumer confidence, which has been growing to high-level ranges.

The ICSG anticipates an improvement in the global economy during 2016, which will result in 3% overall demand growth, underpinned by a 5% increase in Chinese industrial demand.

The ICSG expects demand in the rest of the world to grow by 2%.

Price

Many analysts are not bullish about the short-term prospects of the copper price.

A price rally that almost took the red metal to \$6 500/t in May 2015 quickly reversed as signs emerged of

demand weakening during the second quarter of the year.

The copper price's decline from about \$6 500/t in May 2015 to a six-year low of \$4 855/t in August 2015 has been attributed largely to lower-than-expected demand from Chinese State-owned power utility Grid Corporation, which had planned to spend more than Rmb40-billion on the construction of electrical network infrastructure during 2015.

The company appears to be struggling to recover from a 2013 corruption scandal in which about \$1-billion was misappropriated by executives in 2013.

In light of lower Chinese demand growth forecasts, as well as surging stockpiles and the US Federal Reserve's raising interest rates, Goldman Sachs states that the copper price could decline to \$4 800/t at the end of 2015 and to \$4 500/t at the end of 2016.

However, the financial services company has warned that the price could decline to levels below \$4 000/t should weaker demand persist and inventories continue to increase in an environment characterised by cost deflation.

Goldman Sachs has lowered its copper price outlook to 2018 by as much as 44%, noting that it expects

The copper bear cycle has years to run

On the slide

Goldman says copper bear cycle has years to run



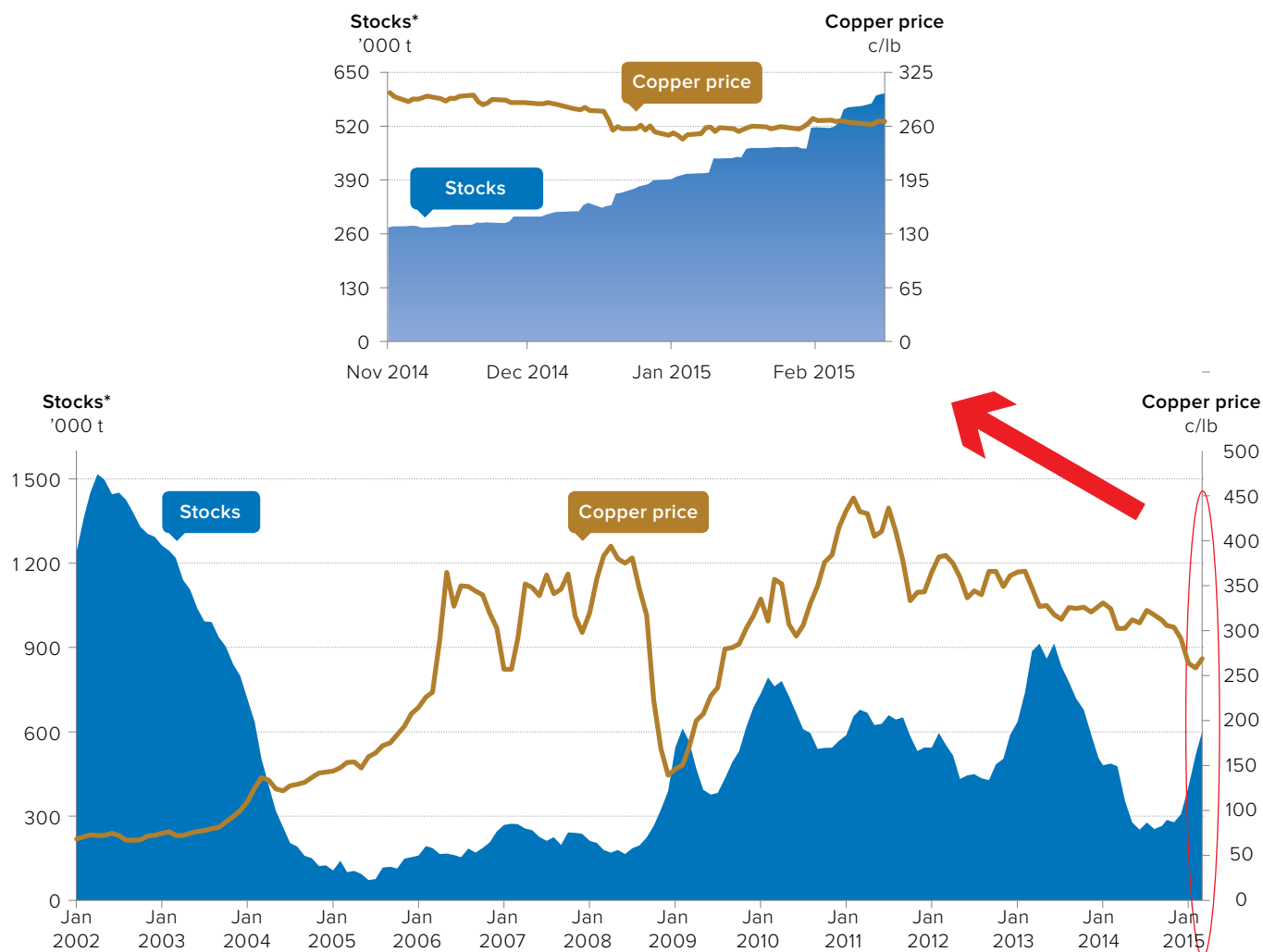
Source: Bloomberg

Presented by:

Powertech



Copper price and stocks evolution



*Figures up to April 9, 2015: London, COMEX and Shanghai metal exchanges
Source: Codelco

Chinese demand to grow at its slowest pace in two decades.

The decision in early September 2015 by Glencore to suspend operations at its copper mines in Zambia and the DRC, which the company said would take 400 000 t out of the market, boosted prices by more than 1% to \$5 192/t.

However, some analysts were quick to opine that the rally would be short-lived after lifting copper from a six-year low of \$4 855/t in August 2015. This is because there has been no evidence that the bear cycle in copper is over.

Outlook

Copper supply is set to decline substantially, owing to mine closures, falling ore grades and delays in developing projects. This, according to Wood Mackenzie, will result in 400 000 t to 900 000 t of copper production being lost between 2017 and 2021.

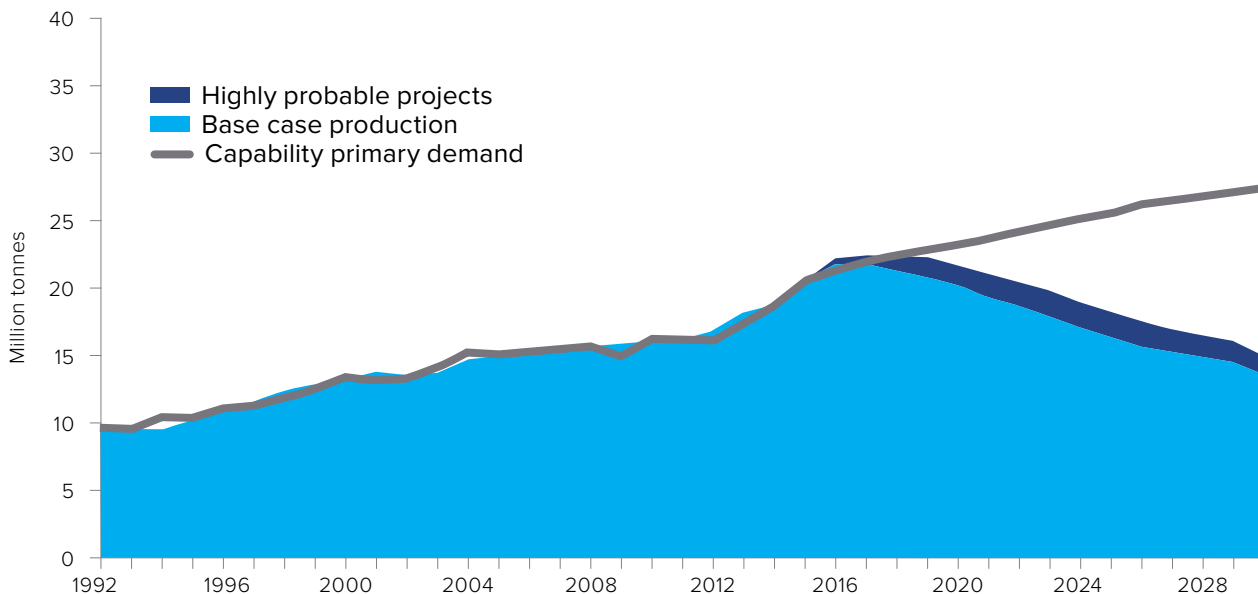
However, financial services group Goldman Sachs projects that the copper market will experience a surplus of 530 000 t in 2016, increasing to 566 000 t in 2017, 626 000 t in 2018 and 657 000 t in 2019 largely as a result of faltering Chinese demand growth.

Presented by:

Powertech



Global copper supply and demand



Source: Wood Mackenzie

On the other hand, Jean-Sebastian Jacques, head of Rio Tinto's copper business unit, believes that the copper market will experience a shortage of about eight-million tonnes over the next ten years – equivalent to about eight mines the scale of Escondida, in Chile, the world's largest copper mine. This is because high capital costs will likely see few mining companies invest in new mines or expand existing ones, leading to a supply gap towards the end of this decade.

Prices need to increase to \$6 600/t – the level required to guarantee a 1% return – to incentivise new investments.

As Jacques points out, it took nearly 25 years to build the Escondida mine, so it would take a long time to build new mines that would replace the capacity that is being lost, which means the supply gap will persist into the long term.



Cauldron filled with molten copper

Picture by Bloomberg

Presented by:

Powertech



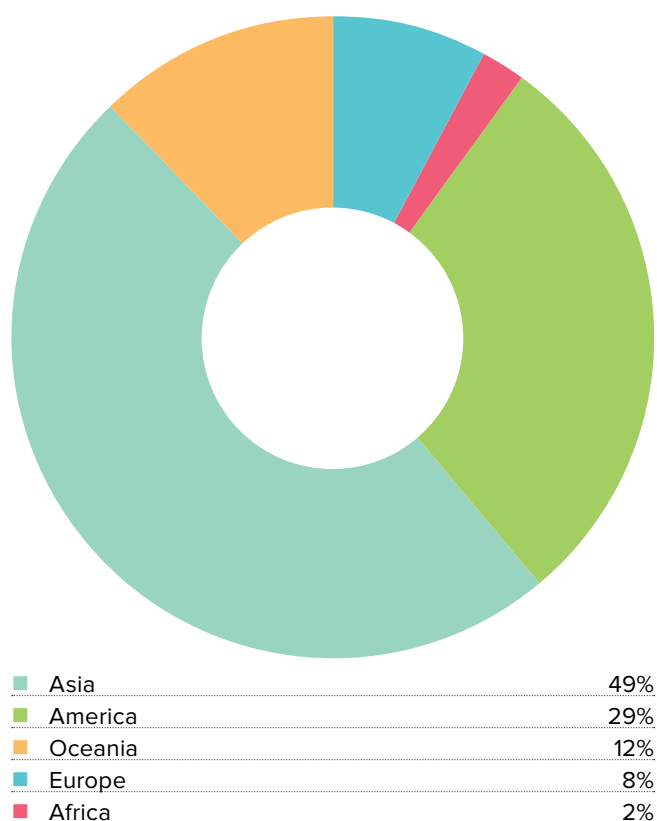
Zinc

Global supply

The US Geological Survey estimates the world's zinc resources at 1.9-billion tonnes and reserves at 230-million tonnes. Australia has the largest zinc reserves endowment, at 27% of the total, followed by China, with 19%, Peru (13%), Mexico (7%), Kazakhstan and the US (4% each) and Canada (3%). The rest of the world accounts for the balance of 23%.

Figures from the International Lead and Zinc Study Group (ILZSG) indicate that zinc mine production

Breakdown of zinc mine production by continent, 2014



Source: International Lead and Zinc Study Group

amounted to 13.28-million tonnes in 2014, up from 13.18-million tonnes in 2013, driven primarily by a 6.3% increase in Chinese output to 5.03-million tonnes. This was enough to more than offset declines in countries including Canada, where output decreased by 15.8% to 353 000 t; India, which reported an 11% decrease to 706 000 t; Kazakhstan, whose 386 000 t output was 7.4% lower than the previous year's figure; and Australia, which produced 2.5% less zinc than the 1.52-million tonnes produced in 2013. Peru reported a 2.4% decline to 1.32-million tonnes.

Global production for the first five months of 2015 amounted to 5.63-million tonnes, up from 5.23-million tonnes for the corresponding period of the previous year, mainly as a result of higher production in Australia, China, India, Peru and Sweden.

The significant year-on-year decline in Canadian output in 2014 was attributable to the closure in 2013 of Glencore's 240 000 t/y Brunswick mine and 115 000 t/y Perseverance mine. Canadian production will be further affected in 2015 by the suspension of operations at Yukon Zinc's Wolverine zinc/silver/copper/lead/gold mine at the beginning of the year. The privately owned company stated in January 2015 that the decision was driven primarily by low silver prices and that the suspension would be for three months, possibly more.

More zinc mines are scheduled to close in 2015, including Indian-owned group Vedanta's Lisheen mine, in Ireland, and the Century mine, in Australia, one of the largest sources of the base metal. The Century mine's owner, MMG, the Hong Kong-listed arm of China's State-owned Minmetals, announced in January 2015 that output during the mine's final year would be 21% to 31% lower than the 465 696 t it produced in 2014.

Further cessations of operations are expected in 2016, including at the 70 000 t/y Bukowno Olkusz mine, in Poland. Vedanta's Skorpion mine, in Namibia, with a nameplate capacity of 154 000 t/y, was also due to stop

Presented by:

Powertech 



operating in 2016, but the Indian group has announced plans to extend the life-of-mine.

The loss of production from mine closures is expected to be more than offset during 2015 by production from recently commissioned expansion and greenfield projects. According to ILZSG estimates, 2015 zinc mine supply will be 13.84-million tonnes, 3.7% up on the previous year's output. The recently completed expansion projects include those implemented by Glencore at its Lady Loretta, McArthur River and Mt Isa operations, all in Australia.

Commissioning of the Phase 3 expansion project at McArthur River – which is expected to increase ore production to five-million tonnes a year – started in the first half of 2014, but ramp-up challenges were encountered during the second half of that year, particularly with regard to the flotation and dewatering circuits.

The \$350-million Lady Loretta expansion project was expected to ramp up ore production to 1.6-million tonnes a year during the second half of 2015. At Mt Isa, Glencore built a new hoisting shaft and associated infrastructure at a cost of \$245-million. Hoist commissioning was scheduled for the first quarter of 2015, with a sustainable run rate of 4.5-million tonnes of ore a year expected from the second quarter.

Other expansions that came on stream during 2014 include the \$588-million project undertaken by Boliden at Garpenberg – Sweden's oldest operating mine – to increase ore production from 1.4-million tonnes a year to 2.5-million tonnes a year. The greenfield projects that began operating in 2014 include Teck Resources' Pend Oreille mine, in the US, which has a nameplate capacity of 44 000 t/y, as well as the 90 000 t/y capacity Kyzyl Tashtygskoe mine, in Russia.

Additional production will be realised when Trevali Mining Corporation's 42 000 t/y Caribou mine, in



Location map of Trevali Mining's Caribou and Halfmile Lake projects and Stratmat exploration project

Picture by Trevali Mining

Canada, resumes operation before the end of 2015, after having been on care and maintenance since 2008, owing to depressed commodity prices and adverse global financial conditions. Trevali also intends opening its 55 000 t/y Halfmile Lake mine, also in Canada, during 2016.

Australian production will be boosted by 210 000 t/y when the Dugald River zinc mine, being developed by MMG, comes on stream in 2017. Elsewhere, the Shalkiya mine, in the Kyzylorda region of Kazakhstan, which is being developed by Shalkiya Zinc, will boost world production by 110 000 t/y from its scheduled start-up date of 2018.

MBC Resources' 350 000 t/y Ozeroye project, in Russia, is expected to start supplying world markets from 2018 or 2019. More zinc mines are under consideration and would boost global production capacity by more than one-million tonnes a year, should they be implemented.

These include Buenaventura's San Gregorio project, in Peru, which, if it goes ahead, will produce 105 000 t/y from 2017. Mulled projects with a possible opening date of 2018 include MMG's Izok Lake, in Canada, with

World refined zinc supply and use 2010 to 2015 ('000 t)

						2014	2015	2015			
	2010	2011	2012	2013	2014	January–June		March	April	May	June
Mine production	12 360	12 584	12 900	12 982	13 353	6 356	6 845	1137.3	1 145.4	1 176.7	1 197.0
Metal production	12 896	13 037	12 630	12 845	13 292	6 395	6 994	1159.5	1 175.7	1 187.2	1 209.5
Metal use	12 628	12 679	12 368	12 956	13 521	6 644	6 837	1148.2	1 139.4	1 204.9	1 227.8

Source: International Lead and Zinc Study Group

Presented by:

Powertech



a nameplate capacity of 80 000 t/y; the 80 000 t/y Khnaiguiah project, in Saudi Arabia, which will be a 50:50 venture between United Arabian Mining Company and Khnaiguiah Mining Company; Ironbark Zinc's Citronen 170 000 t/y project, in Greenland; and the potential projects with later envisaged start-up dates include Mobin's 400 000 t/y Mehdiabad project, in Iran, which could come on stream in 2019, and Terramin Australia's Oued-Amizour project, in Algeria, which could start production in 2019 or 2020, adding 164 000 t/y to global output.

African supply

Although Africa's contribution to global zinc production is small, amounting to a mere 2% of total output in 2014, there is much activity in the zinc milieu on the continent, with the most significant being Indian group Vedanta's Skorpion mine, in Namibia, and the Black Mountain mine, in South Africa's Northern Cape province, as well as Glencore's Rosh Pinah mine, in Namibia.

Construction began in July 2015 on Vedanta's \$630-million Gamsberg project, in South Africa's Northern Cape province, which will comprise a 250 000 t/y opencast mine, a concentrator plant and

associated infrastructure at the Black Mountain Mines subsidiary. It is being developed as part of Vedanta's overall three-year \$782-million Southern Africa Gamsberg integrated zinc project, which includes the development of an integrated roaster at the Skorpion zinc refinery, in Namibia, to enable it to treat zinc sulphide ore from Gamsberg to produce high-grade zinc and also extend the operating life of the Skorpion zinc operation.

Production at Gamsberg – the site of one of the world's largest zinc deposits – is expected to eventually increase to 450 000 t/y and beyond in three phases, with first ore production scheduled for 2018. The Gamsberg mine is being developed about 20 km from the Black Mountain mine, which has been operating for about 30 years, providing an opportunity for zinc mining to continue in the area for at least another 20 years.

The Gamsberg-Skorpion integrated zinc project is central to Vedanta's long-term aspirations for Southern Africa, with the start of production at Gamsberg and the extension of the life of the refinery at Skorpion Zinc expected to make the region one of the most important suppliers of refined zinc globally and a cornerstone of Vedanta's operations in Africa.



Early works at Vedanta's Gamsberg zinc project, in South Africa

Picture by Vedanta

Presented by:

Powertech 



The zinc refinery at Skorpion will take two years to complete and will also process material from the planned Gergarub mine, in Namibia, which is being developed as a joint venture between Vedanta and Glencore's Rosh Pinah mine. Should it go ahead, the Gergarub mine will start producing zinc from 2018 at the rate of 100 000 t/y.

Elsewhere in Southern Africa, Glencore has a presence in the zinc mining sector in Zambia, where it owns Sable Zinc Kabwe. However, the operation was placed on care and maintenance in October 2014 because of a disagreement with the authorities concerning the withdrawal of value-added tax refunds. The Zambian government has since started repaying mining companies the funds, which amounted to more than \$600-million.

In Burkina Faso, Glencore acquired Blackburn Resources' 27.3% shareholding in the Perkoa mine in 2014 to become the asset's sole owner. Production ramp-up at Perkoa, as well as at Mt Isa and McArthur River, helped Glencore boost its own-sourced zinc output to 1.39-million tonnes in 2014. The Perkoa mine is part of the Other Zinc division of Glencore's zinc business, which includes AR Zinc, in Argentina; Los Quenuales, in Peru; Sinchi Wayra, in Bolivia; and Rosh Pinah, in Namibia.

Meanwhile, Toronto-listed miner Nevsun Resources said in April 2015 that the zinc plant under construction at its Bisha base metals mine, in Eritrea, had been 60% completed and that the \$92-million project was on course for completion by mid-2016.

The Bisha mine, built from 2008 to 2010, produced low-cost gold/silver doré until mid-2013, with a \$110-million expansion project resulting in throughput increasing to 2.4-million tonnes of supergene ore a year and the product switching to copper concentrate.

The zinc expansion project, which will add to the zinc flotation capacity of the Bisha mine's processing plant, will float zinc concentrate after existing copper flotation, enabling the production of zinc and copper concentrate. When the zinc expansion project is completed in mid-2016, Bisha will produce 100 000 t/y of zinc and 24 000 t/y of copper over a ten-year period. Another significant zinc project in Africa is Ivanhoe Mines' 68%-owned high-grade Kipushi zinc/copper/silver project, in the Democratic Republic of Congo, which is

estimated to host a 16.9-million-tonne resource at 16.8% zinc and 2.3% copper in the indicated category, as well as 23.3% zinc and 1.9% copper in the inferred category.

Global demand

About half the world's refined zinc output is used to galvanise steel that is used extensively in construction and engineering, with other major sources of demand being die-casting and the manufacture of brass and bronze. Lesser quantities are used to make zinc sheets for roofing, guttering and general weatherproofing, as well as in chemical compounds such as zinc oxide and zinc sulphate.

Global refined zinc demand growth has accelerated over recent decades, with compound yearly growth rising from about 1% in the 1980s to 3.4% in the 1990s and 3.9% more recently. Total consumption in 2014 amounted to 13.52-million tonnes, up from 12.96-million tonnes in 2013 and 12.37-million tonnes in 2012.

Consumption during the first six months of 2015 amounted to 6.8-million tonnes, 2.9% up on the corresponding period of 2014, as Chinese and European consumption increased by 3.4% and 0.9% respectively, more than offsetting a decrease of 3.3% in the US.

Chinese consumption, which accounted for 6.42-million tonnes of the 2014 demand of 13.52-million tonnes,

World zinc metal consumption – 2012 to 2019



Source: Glencore estimates, Wood Mackenzie and CRU Group
F – forecast

Presented by:

Powertech



has soared in recent years following an upsurge in infrastructure projects in the country spread across the automotive, housing construction, railways and power sectors, besides others.

Other significant zinc consumers are the US, with demand of 2.36-million tonnes in 2014, India (658 000 t), South Korea (608 000 t) and Japan (506 000 t). European countries consumed 2.36-million tonnes and the rest of the world 2.29-million tonnes.

Despite the deceleration in Chinese economic growth, the country's refined zinc demand is forecast to increase by 4.8% in 2015. The country consumed 5.64-million tonnes during the first five months of 2015, up from 5.5-million tonnes during the corresponding period in 2014. Consumption in Europe and the US is forecast to increase by 2.4% and 6% respectively, while demand growth is also forecast in Canada, India, Indonesia, Mexico and Turkey, taking the total for 2015 to 14.14-million tonnes.

Price

Zinc prices have fallen to five-year lows owing to slowing demand from China, the largest consumer, and rising inventories, which are expected to increase substantially as Glencore liquidates about \$1.5-billion in inventories as one of a raft of measures to reduce its \$30-billion debt.

Canada's Scotiabank forecasts that the zinc price will increase from 98c/lb in 2014 to \$1/lb in 2015 and to as high as \$1.50/lb to \$1.70/lb between 2016 and 2017. The 98c/lb attained in 2014 was an improvement from 87c/lb in 2013.

The bank's zinc price prediction is based on its belief that envisaged mine production gains between 2013 and 2017 of 3.6% a year will likely fall short of demand growth of 4.3% a year, given depletion at major mines in the face of limited capital availability for new mines, besides other factors.

Further, the bank states that significant demand growth is expected in the automotive industry, a major consumer of primary zinc in galvanised steel.

Vehicle sales, which reached new highs in 2013 and 2014, are poised to be even higher in 2015, boosted by improving household purchasing power in the Asia-

Pacific region as a result of falling oil prices. Vehicle sales have also strengthened in Western Europe, especially in Spain, helped by the European Central Bank's quantitative easing.

However, Scotiabank stated in April 2015 that the zinc price expected in 2015 had been pared down moderately, owing to a soft global economy in the early months of the year.

Meanwhile, RBC Capital forecasts a \$1.03/lb zinc price for 2015 and \$1.25/lb for 2016 – 6% and 7% respectively lower than earlier forecasts – based on the projected demand growth for the galvanising metal dropping to 4.3%.

Outlook

Zinc production lagged consumption by 296 000 t in 2014 and the deficit is expected to intensify in 2015 as large mines cease production.

While China, the world's largest zinc producer, remains a wildcard in the zinc market, it is doubtful that it can increase production enough to replace the mines that are closing. During the past ten years, Chinese zinc mine production increased by an average of 225 000 t/y. To meet global zinc metal demand, it is believed that Chinese mine production would need to increase by up to 2.5-million tonnes over the next five years – an average of 450 000 t/y to 500 000 t/y.

Glencore forecasts that, if Chinese zinc mine production increased by 210 000 t/y to 220 000 t/y, there would be a global deficit of up to 1.5-million tonnes of zinc in concentrate over the next five years.

A deficit of concentrates would result in a drawdown on zinc metal stocks and, as Glencore points out, zinc prices have historically responded to the upside as the stocks-to-consumption ratio approaches three weeks of zinc metal consumption.

Credit Suisse states that some of the probable zinc mine projects awaiting definitive feasibility studies and financing may advance under an improved price regime that the financial services company expects from 2016.

Therefore, the refined zinc deficit forecast from 2017 might not materialise, should higher prices encourage production and discourage consumption.



Presented by:

Powertech

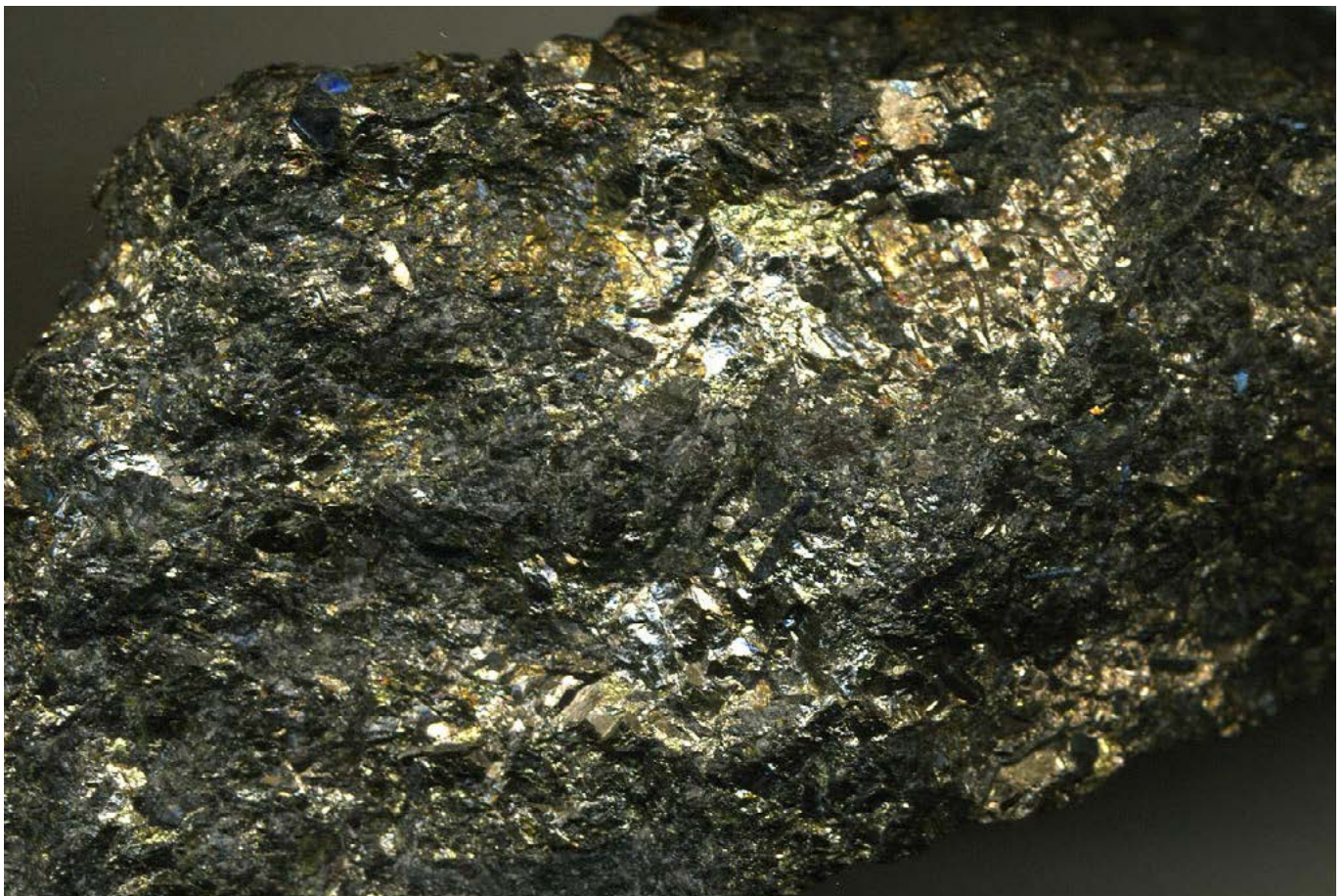
Nickel

Global supply

Statistics from the US Geological Survey indicate that, in 2014, the world's nickel resources averaging 1% nickel or greater totalled 130-million tonnes, with 60% being laterites and the balance sulphide deposits. Extensive nickel resources are also found in manganese crusts and nodules covering large areas of the ocean floor. Nickel reserves totalled 81-million tonnes in 2014, with Australia boasting the largest endowment, comprising 23% of the total.

New Caledonia, Brazil and Russia also host significant reserves, accounting for 15%, 11% and 10% respectively. Cuba hosts 7%, Indonesia and South Africa 5% each, Canada, China and the Philippines 4% each, Madagascar 2% and Colombia and the Dominican Republic 1% each.

The largest nickel ore mining country in 2014 was the Philippines, producing 440 000 t of the global total of 2.4-million tonnes, which was a decline from the previous year's 2.6-million tonnes.



Nickel ore

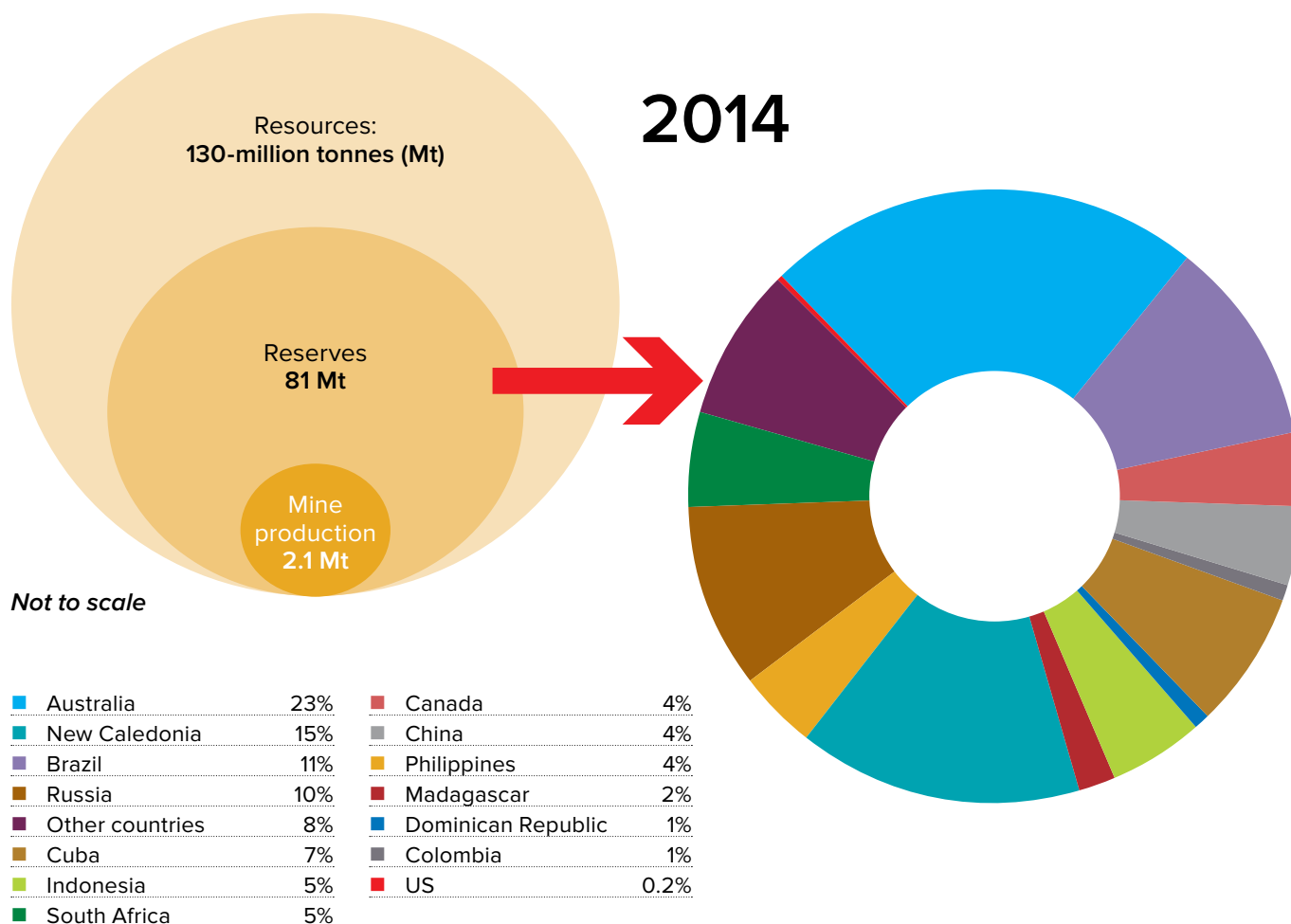
Picture by Flickr

Presented by:

Powertech 



Nickel reserves across the world



Source: US Geological Survey and International Nickel Study Group

While the Philippines' output was slightly lower than the 2013 figure, the country took advantage of an Indonesian ban on unbeneficiated ore exports to China, with its exports to the Asian giant increasing by 24% during the first ten months of 2013. While the bulk of the exports came from stockpiles, the Philippines plans to open more zinc mines and hopes to permanently fill the gap left by Indonesia.

Despite a production decrease from 275 000 t to 260 000 t, Russia was the second-largest nickel ore miner in 2014, ahead of third-placed Indonesia, whose output dropped to 240 000 t from 440 000 t in 2013, mainly because of the January 2014 ban on the export of unprocessed ores, imposed to reap additional benefits from the country's natural resources by forcing companies to undertake local beneficiation.

Canada, the fourth-largest nickel ore miner in 2014, experienced mild output gains, producing 223 000 t. Like other countries, it hopes the Indonesian ban will be a catalyst to increase production.

Rounding out the top ten nickel ore producers in 2014 were Australia, whose production declined from 234 000 t in 2013 to 220 000 t; New Caledonia, which produced 165 000 t, marginally more than 2013's 164 000 t; Brazil, which produced 126 000 t, down from 138 000 t in 2013; China, whose output of 100 000 t was 5 000 t higher than the 2013 figure; Colombia, whose output remained relatively constant, at 75 000 t; and Cuba, where production, at 66 000 t, was similar to 2013 levels but could have been higher had it not been for maintenance and capital improvements at one of the country's two nickel plants.

Presented by:

Powertech



Canada's Royal Nickel Corporation (RNC) stated in June 2015 that the Indonesian ban, which it believes is unlikely to be overturned, had removed 25% to 30% from global nickel supply and that there were few alternatives for high-grade laterite ore outside Indonesia.

It estimated that, at current production rates, the Philippines could only supply a maximum of five-million to ten-million tonnes of high-grade ore, equivalent to 10% to 20% of current Indonesian exports, while New Caledonia exported only to partners in Japan and Korea.

RNC notes that, even without the strict implementation of the Indonesian ban, the nickel industry is confronted by a dearth of projects in 2015 to 2016, as most projects that had been known for decades were developed in the early 2000s, with very few projects still to be developed. The projects that are yet to be developed include the company's \$500-million to \$600-million Dumont project, in Canada, which is shovel ready, and is being held back only by the finalisation of financing and permitting issues. Should it go ahead, the project would be built between 2015 and 2017 and commissioned in 2017, producing 33 000 t/y initially, with the output increasing to 54 000 t/y following a Phase 2 expansion.

African supply

The African continent accounts for about 6% of the world's nickel ore output, producing 122 800 t in 2014, up from the previous year's 120 100 t. The International Nickel Study Group (INSG) projects 2015 African production to increase to 137 000 t. The largest producers on the continent are Botswana, Zimbabwe, the Democratic Republic of Congo (DRC), South Africa and the Indian Ocean island nation of Madagascar, where the Ambatovy nickel/cobalt mine, which started commercial production in January 2014, is located. A joint venture (JV) involving Canada's Sherritt International (40%), Japan's Sumitomo (27.5%), Korea Resources (27.5%) and SNC-Lavalin (5%), Ambatovy produced 37 053 t in 2014, but is planned to eventually ramp up to 60 000 t/y.

Africa's nickel production could be further increased if several planned projects come to fruition. These include the restarting of the mothballed Munali nickel mine, in Zambia. Previous owners suspended operations twice – in 2008 and 2012 – owing to the mine's difficult geology and falling nickel prices. Plinian,

a company founded by former platinum mining major Lonmin CEO Brad Mills, has entered into a partnership with London-based Generation Asset Management subsidiary CE Mining to raise the \$40-million needed to restart operations at Munali. Production will initially be 4 750 t/y, with plans to ramp up to 8 000 t/y.

Canadian company First Quantum Minerals is also developing a nickel project in Zambia – the Enterprise project – which will produce 38 000 t/y initially, with scope to increase to 60 000 t/y when conditions allow. The project has been granted environmental approval and site construction work is in progress.

In neighbouring Tanzania, Australian-listed IMX Resources and JV partner Mauritius-based Fig Tree Resources Fund II are progressing the Ntaka Hill nickel project, which has the potential to be developed as a high-grade openpit and underground operation. The JV partners are targeting a mine producing between 9 000 t/y and 10 500 t/y of nickel in concentrate for ten years.

In Zimbabwe, a smelter belonging to London-listed Mwana Africa's 74.73%-owned subsidiary, Bindura Nickel Corporation, which has been on care and maintenance for several years, owing to low nickel prices, will be restarted during the first quarter of 2016. The start of the project was delayed by funding constraints. The smelter will have a capacity of 160 000 t/y. There are also potential platinum group metals projects in South Africa and Zimbabwe that would produce nickel as a coproduct.

Meanwhile, Glencore and Barrick Gold announced in May 2015 that they were selling their jointly owned Kabanga nickel project, also in Tanzania. Glencore CEO Ivan Glasenberg is on record as saying he is not interested in greenfield projects, which require huge cash outlays, while Barrick Gold is selling assets to whittle down its debt of \$3-billion by the end of 2015. Kabanga is projected to produce 40 000 t/y of nickel in concentrate if it goes ahead.

Global demand

Sixty-six per cent of the world's nickel is used to produce austenitic stainless steel. Other major uses of nickel are the production of nickel-based alloys (10%), plating (9%) and alloy steel (8%). The foundry industry consumes 3% of total nickel production, while other



uses, such as the production of rechargeable batteries, catalysts and nickel coins, account for the balance of 4%.

The US, Japan and Europe consumed more than 85% of the world's nickel until the 1990s, but Asia has since become the nickel demand hub, consuming about 1.35-million tonnes of the metal, or about 73%, in 2014.

China's share of global demand has increased from 5% to more than 50% over the past 15 years, with its consumption of 990 000 t in 2014 representing about 52% of total demand. Norilsk Nickel, the world's largest producer of the metal, forecasts that the Chinese stainless-steel industry will expand at a compound annual growth rate of 5% from 2015 to 2017, buoying nickel demand.

The Chinese Special Steel Association projects that stainless steel production in the Asian country, which amounted to 21.7-million tonnes in 2014, will increase to 25-million tonnes a year by 2020.

Based on the stainless steel production projection, some analysts forecast Chinese nickel demand to be about 1.18-million tonnes by 2020.

In the immediate term, Indonesian nickel ore stockpiles are expected to have depleted in late 2015. Although the Philippines has increased its ore exports to China, it can supply only 300 000 t/y to 350 000 t/y, leaving a shortfall in nickel pig iron (NPI) production of up to 200 000 t, which Chinese stainless-steel producers will have to source elsewhere.



Nickel reserves totalled 81-million tonnes in 2014

Picture by Duane Daws



Presented by:

Powertech 

Further, the closure of several NPI plants for environmental and financial reasons, though temporary, will further depress NPI production and increase demand for primary nickel by Chinese stainless steel producers.

Besides the stainless steel industry, solid growth in nickel consumption is expected from the global alloy and superalloy sectors, driven mainly by the aerospace industry. Global nickel consumption was 1.87-million tonnes in 2014 – up from the previous year's 1.78-million tonnes – and is expected to increase to 1.94-million tonnes in 2015.

Price

The London Metal Exchange (LME) nickel price spiked at about \$21 000/t in May 2014 on expectations of a supply deficit caused by the Indonesian ban on ore exports (in the event, the refined nickel market recorded a 93 000 t surplus in 2014).

A nickel price correction occurred in the latter half of 2014 as a result of increasing LME inventories, mainly owing to destocking in China and Russia, as well as lower growth in Chinese stainless steel production of 4.3% year-on-year and a 5.1% year-on-year decline in the rest of the world's production.

Three-month nickel on the LME was trading at about \$9 800/t at the end of September. Commentators from Citibank, Goldman Sachs and Morgan Stanley believe that prospects for a price rebound in 2015 are dim and expect a possible recovery only in 2016.

According to Goldman Sachs' estimates, nickel will average \$14 500/t in 2015.

Some analysts, however, believe that the metal could experience a recovery in the last quarter of 2015, which could give it a decent start in 2016.

Factors that could drive the recovery include Indonesia's decision to continue its ban on unprocessed ores.

Outlook

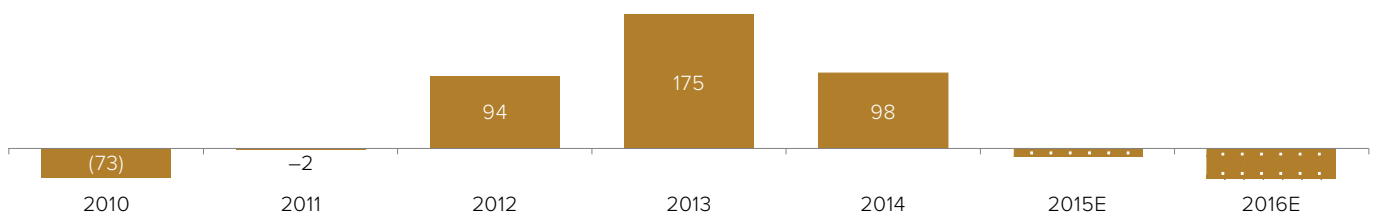
If the Indonesian ban on ore exports is sustained, Chinese NPI production, as well as ferronickel output in Japan and elsewhere, will be significantly affected, removing 300 000 t of nickel from the market.

However, increasing supply from new projects will likely offset the supply loss, with overall yearly production growth forecast to be 3% to 2017. Greenfield and brownfield projects contributed 230 000 t to 2014 nickel production, a figure that is expected to more than double by 2019.

The INSG forecasts that the global nickel market will swing into a 23 000 t deficit in 2016 from a small surplus in 2015. The INSG estimates that output will shrink to 1.95-million in 2015 and to 1.94-million in 2016, compared with 1.99-million in 2014, while demand, which increased from 1.78-million tonnes in 2013 to 1.87-million tonnes in 2014, is expected to increase further to 1.91-million tonnes in 2015 and 1.97-million tonnes in 2016.

However, the world's largest nickel producer, Norilsk, believes that the 2014 supply surplus was 175 000 t – bigger than the INSG estimate of 120 000 t – but that the market will swing into a small deficit in 2015, which will expand in 2016. Norilsk bases its forecast on its belief that new projects will not compensate for the NPI losses resulting from the Indonesian unprocessed ore export ban. The INSG believes that the growth in nickel demand in the US and Europe during 2015 will only be moderate, owing to a slower increase in stainless steel production, particularly during the first half of the year, although a better economic environment is expected to result in some improvement towards the end of the year.

Nickel market balance: growing market deficit



Source: Norilsk
E – estimate

Presented by:

Powertech



Lead

Global supply

According to the US Geological Survey, the world's identified lead resources totalled two-billion tonnes at the end of 2014. In recent years, significant lead resources have been discovered in association with zinc and/or silver or copper deposits in Australia, China, Ireland, Mexico, Peru, Portugal and Russia, as well as in Alaska, in the US. Reserves of the base metal were estimated at 87-million tonnes in 2014, with Australia and China hosting 40% and 16% respectively, Russia 11%, Peru 8%, Mexico and the US 6% each and India 3%. The rest of the world accounted for the remaining 10%.

China is the largest lead mining country, accounting for 47.7% of the five-million tonnes produced in 2014, compared with number two producer Australia's 14.6%. European countries accounted for 8.3%, the US 7.5%, Peru 5.6%, Mexico 5%, Canada 0.1% and the rest of the world 11.3%.

The global lead mine production figure in 2014 represented a 7.9% decline on 2013 output, mainly because of lower Chinese production. Overall lead mine production during the first six months of 2015 was 2.38-million tonnes, compared with 2.37-million tonnes during the first six months of 2014. Increases in China and Peru during this period were balanced by declines in Australia and Mexico.

The International Lead and Zinc Study Group (ILZSG) forecasts that lead mine production will increase by only 1.1% in 2015 to 5.05-million tonnes, with expected

increases in output in China, India, Mexico and Sweden partially balanced by reductions in Australia and Ireland. Australia has suffered the loss of about 85 000 t/y of lead mine production with the closure in February 2015 of the Paroo Station mine, owing to adverse prices. The closure of the Century mine by year-end will whittle down Australia's lead mine production capacity by a further 60 000 t/y.

In Ireland, mining operations will cease at Vedanta's Lisheen mine in October 2015.

Refined lead metal production – 54% of which comes from secondary lead, with the balance from primary production – declined from 11.76-million tonnes in 2013 to 10.96-million tonnes in 2014. Production during the first six months of 2015 amounted to 5.13-million tonnes, a 2.1% reduction on output for the first half of 2014, mainly owing to reductions in Canadian, Chinese, Peruvian and US production.

The ILZSG forecasts 2015 refined lead metal production to increase by 1.1% to 11.03-million tonnes, owing to increases in Belgium, Germany, Italy and the UK, where primary production was affected by the limited availability of bullion from Australia in 2014, as a result of a smelter fire at Glencore's Mount Isa operation.

Increases are also expected in China, India and the US, but these will be partially offset by reductions in Japan, South Korea and Peru, where operations at the La Oroya mine are again on hold, pending a decision on the future ownership of the plant.

World refined lead supply and usage 2010 to 2015 ('000 t)

						2014	2015	2015			
	2010	2011	2012	2013	2014	Jan-Jun		Mar	Apr	May	Jun
Mine production	4 183	4 651	4 937	5 336	5 048	2 368	2 375	379.0	395.1	397.8	435.7
Metal production	9 871	10 644	10 596	11 175	10 962	5 245	5 134	848.8	844.0	874.2	903.1
Metal use	9 825	10 478	10 524	11 158	10 925	5 244	5 108	834.3	843.3	880.0	903.5

Source: International Lead and Zinc Study Group

Presented by:

Powertech 



Global demand

About 80% of all lead is used in the production of lead-acid batteries for automotive and other applications. Smaller quantities are used in cable sheathing, ammunition and pigments, besides others. According to the ILZSG, demand for refined lead declined from 11.16-million tonnes in 2013 to 10.93-million tonnes in 2014.

Demand amounted to 5.11-million tonnes during the first half of 2015, compared with 5.24-million tonnes during the corresponding period in 2014. This was primarily due to declines of 4.3%, 8.6%, 2.4% and 4.5% in Europe, the US, China and South Korea respectively. The ILZSG forecasts that 2015 refined lead metal demand will come in at 11.05-million tonnes, a 1.1% year-on-year increase. While demand is expected to increase in Europe and the

US – by 0.8% and 1.2% respectively – demand in China, which consumes 40% to 50% of the world's lead, is being affected by a slowdown in sales of e-bikes, which are powered by lead-acid batteries and account for more than 30% of Chinese refined lead metal consumption.

Demand for e-bikes is decreasing as China's public transport system expands. In 2014, for example, e-bike production declined by 5%. Reduced use of e-bikes leads to more scrapping of units, which, in turn, could release huge volumes of scrap lead into the market, displacing some of the demand for primary lead. While the emergence of e-trikes is expected to pick up some of the slack resulting from the reduced use of e-bikes, many commentators are convinced that the expansion of the public transport system in China might signal the end of the e-bike/e-trike boon for lead.



E-bike production in China decreased by 5% in 2014

Picture by Life behind the Wall – Wordpress

Presented by:

Powertech 



Further, while Chinese demand for cars is expected to expand, it too has decelerated to single-digit growth, with the country's Association of Automobile Manufacturers forecasting 8% growth in passenger car sales in 2015. Further, plans to ban old, polluting vehicles could hinder growth in the Asian giant's vehicle population and, consequently, demand for replacement lead-acid batteries.

However, lead demand through industrial batteries – such as those used in information technology products and in telecommunications towers and by the rail sector – is expected to remain a growth area in China and globally, although the metal faces competition from alternative batteries.

Price

The lead price fell from a high of \$2 307/t in August 2014 to a low of \$1 672/t in March 2015 – the lowest since August 2010 – and closed June 2015 at \$1 761/t, with the long-term outlook remaining bearish.

The price drop is mainly attributable to the slower-than-expected growth in the demand for the metal in 2014.

According to the ILZSG, demand in 2014 grew by 1.4% to 11.28-million tonnes instead of 4.4% to 11.73-million, as had been expected.

Despite the market deficit, Credit Suisse expects the lead price to increase only gradually, rising from about \$2 000/t in the second quarter of 2015 to peak at about \$2 600/t in 2017.

This is in line with Goldman Sachs' prediction that the lead price will average \$2 083/t in 2016. This is

because exchange stocks of the metal remain high, at more than 200 000 t.

Outlook

After six consecutive years of concentrate surpluses, Credit Suisse forecasts that the lead market will be in deficit by 135 000 t in 2015 – comprising 65 000 t of lead in concentrate and 70 000 t of lead metal – with the deficit expected to widen in 2016 and 2017.

However, the ILZSG forecasts a close balance between refined lead metal supply and demand in 2015, but believes that there will be a market surplus of 97 000 t in 2016, largely as a result of increases in Chinese output.

One of the causes of the deficit is the slow growth in secondary refining, with the Chinese secondary refining sector struggling in 2014, as a result of shutdowns necessitated by environmental inspections, limited scrap battery supplies and sluggish demand for secondary product.

Credit Suisse expects only 1% growth in Chinese secondary output in 2015 as the sector continues to be restricted by environmental factors. However, the financial services company expects gradual recovery of the Chinese secondary sector as it modernises and complies with environmental regulations. While there was a refined lead deficit of 70 000 t in 2014, Credit Suisse points out that mine supply was adequate, resulting in a concentrate surplus totalling 160 000 t of contained lead. However, as mine supply growth slows to a projected 1% in 2015 and 3% in 2016, a concentrate and refined lead deficit is expected, given forecast consumption growth of 3.7%.



Lead ore stones

Picture by Bombay Harbour



Presented by:

Powertech

Selected base metals operations in Africa

Ambatovy, Madagascar – nickel/cobalt

Ambatovy is a vertically integrated nickel/cobalt mining, processing and refining operation jointly owned by Sherritt International, with a 40% stake, Sumitomo and Korea Resources, with 27.5% each, and SNC-Lavalin, with 5%. Sherritt is the operator of the joint venture (JV), the world's largest producer of finished nickel and finished cobalt from lateritic ore.

The yearly design capacity of the 29-year-life-of-mine operation is 60 000 t of nickel and 5 600 t of cobalt. Commissioning and start-up of the plant were completed in 2012, with commercial production starting in January 2014. Output for 2014 amounted to 27 231 t, with the ramp-up to 90% of nameplate capacity being achieved in the first half of 2015, despite a hydrogen sulphide leak and a strike. Production for 2015 is projected to be about 30 000 t of nickel. The Ambatovy operation is progressing towards financial completion. Five of these – for physical facilities, mining, marketing, port capacity and pipeline capacity – have since been obtained. On obtaining the outstanding certificates, the project financing will become nonrecourse to the JV partners.

Black Mountain, South Africa – zinc/lead/copper/silver

The Black Mountain mine, in South Africa's Northern Cape province, is a trackless mechanised underground mine of intermediate depth that uses the cut-and-fill mining method. It mines a polymetallic orebody and produces about 30 000 t/y of zinc, 50 000 t/y of lead and 3 000 t/y of copper – all in concentrate – and 50 t/y of silver. India's Vedanta, which holds a 74% stake in the mine, with the balance held by South Africa-based black-controlled group Exxaro, indicates that the Broken Hill Deeps and Swartberg orebodies at the mine offer potential for expansion.

Vedanta is undertaking an overall \$782-million zinc investment in Southern Africa, which entails the \$630-million Gamsberg project, a concentrator plant and associated infrastructure at Black Mountain, as well as an integrated roaster at the Skorpion Zinc refinery, in Namibia, to enable it to treat zinc sulphide ore from Gamsberg to produce high-grade zinc and also extend the operating life of the Skorpion zinc operation, which had previously been earmarked for closure in 2015.

Chambishi Metals, Zambia – copper/cobalt

Chambishi Metals is a Zambia-based toll processor of material mined at the Boss deposit, in the Democratic Republic of Congo (DRC), a JV between Eurasian Natural Resources Corporation (ENRC) and DRC State-owned Gecamines, and concentrate from ENRC's Frontier mine, also in the DRC. ENRC owns 90% of Chambishi Metals, with the balance held by ZCCM Investment Holdings. Chambishi Metals announced in April 2015 that it had closed its cobalt plant for three months, sending 170 workers home, owing to the unavailability of cobalt feed.

Dikulushi, DRC – copper/silver

Owned by Australia-based Mawson West, the Dikulushi copper/silver mine was placed on care and maintenance in January 2015, owing to deteriorating commodity prices and lower-than-expected copper and silver production.

A study to determine an appropriate mining strategy, economics and structure to assess future operation opportunities at the Dikulushi mine is still in progress, and any mineral resource updates will be deferred until this study has been completed. No production or sales are expected from Dikulushi in the immediate future.

Presented by:

Powertech 



During 2014, the mine produced 3 000 t of copper in concentrate – well below expectations. The operation's performance continued to be affected by mining dilution, resulting in lower-than-expected mined ore grades.

Kansanshi, Zambia – copper/gold

First Quantum Minerals (FQM) holds an 80% stake in the Kansanshi mine, Africa's largest copper mine, with the balance held by a subsidiary of ZCCM Investment Holdings.

The mine, near the Zambian town of Solwezi, has undergone several expansions since it began operating in 2005. From an initial production capacity of 110 000 t of copper, it is now capable of producing 340 000 t/y of copper and more than 120 000 oz/y of gold, with a multistage expansion aiming to increase copper production capacity to about 400 000 t in 2015.

Like other mining operations in Zambia, the Kansanshi mine has been subjected to power rationing by the State-run Zambia Electricity Supply Corporation (Zesco). During the first half of 2015, supplies to Kansanshi were reduced to 117 MW from the steady-state level of 153 MW, while supplies to FQM's Sentinel project were reduced to 42 MW from 55 MW.

Full supplies to Kansanshi and Sentinel were restored on August 6, 2015. While FQM believes that some restrictions might be imposed during the remainder of 2015, Zesco has given the assurance that it has contracted independent power producers, such as Maamba Collieries and Itzhi Tezhi Power Corporation, to procure more electricity by the end of 2015.

Kapulo, DRC – copper/silver

Owned by Australia-based Mawson West, the Kapulo copper/silver opencut mine, in the DRC's Katanga province, has proven reserves totalling 3.4-million tonnes at 3.72% copper, enough to sustain mining operations for about six years at an average output of 19 400 t/y of copper in concentrate. At the end of the mine life, an additional 653 000 t at 1.05% copper will remain in low-grade stockpiles.

Construction activities at Kapulo were concluded during the first quarter of 2015, with commercial production starting on July 1, following consistent production

during June 2015. The mine produced 1 640 t of copper in concentrate in July 2015.

Kipoi, DRC – copper

Australian-listed Tiger Resources' Kipoi copper mine, in the DRC's Katanga province, comprises five known copper deposits – Kipoi Central, Kipoi North, Kileba, Judeira and Kaminafitwe – which boasted total resources of 938 000 t of copper as at December 31, 2014.

Tiger Resources has adopted a staged development approach at Kipoi, with Stage 1, which was implemented from 2011 to 2014 and during which a heavy-media separation plant (HMS) plant was built, entailing the mining of a high-grade zone of copper mineralisation.

Copper cathode production started in May 2014 as Stage 2 of operations, and the mine's solvent-extraction and electrowinning (SX-EW) plant was expected to produce 25 000 t of copper during its first year of operation, with a future increase to 50 000 t/y envisaged.

Following the first 12 months of SX-EW operations, opportunities have been identified to debottleneck the operation to increase production and reduce operating costs. These include limiting materials handling using an overland conveyor from the former HMS plant to the agglomerator and adding more electrowinning cells, which, Tiger Resources believes, could increase monthly production by as much as 30% for a modest capital outlay.

The Kipoi mine is realising the price benefits resulting from the growing supply of sulphuric acid in Southern African markets. Sulphuric acid is the principal reagent used to irrigate heap-leach pads and is the second-largest component of processing costs at Kipoi. While 2015 budgets were set using \$365/t as the assumed price of acid, long-term contracts have been entered into for delivery at a cost of \$235/t.

Lumwana, Zambia – copper

Owned by Toronto-listed mining major Barrick Gold, the Lumwana copper mine boasted 3.33-billion pounds of proven and probable copper reserves as at the end of 2014. The mine produced 214-million pounds of copper in 2014 and an increase to about 250-million pounds is expected in 2015.

Presented by:

Powertech 



Barrick announced in December 2014 that it would halt operations at the mine after Zambian lawmakers had approved the tripling of mining royalties to 20%. However, this decision was reversed in April 2015, after the Zambian government had decided to reduce the royalty rate to 9% and reintroduce a 30% profit tax.

Barrick had warned that the proposed 20% royalty tax would make the Lumwana mine unprofitable.

Mopani Copper Mines, Zambia – copper/cobalt

Mopani Copper Mines is 73.1%-owned by Glencore, with the other shareholders being FQM (6.9%) and ZCCM Investment Holdings (10%). It is an integrated copper and cobalt producer whose operations comprise four underground mines, a concentrator and a cobalt plant in the town of Kitwe, as well as an underground mine, a concentrator and a refinery in the town of Mufulira. The company also operates two SX-EW plants at Mufulira and two at Nkana.

Mopani completed a \$74-million upgrade of the Mufulira refinery in May 2015, a project it said would reduce energy consumption and hasten production.

CEO Johan Jansen, however, stated in June 2015 that the planned construction of a concentrator remained on hold until the company was paid the value-added tax (VAT) refund it was owed by government. The Zambian government has since relaxed the rules that had prevented \$600-million in VAT refunds from being paid to mining companies. Jansen said at a conference in Lusaka, the Zambian capital, in June 2015, that his board had told him to use the estimated \$200-million the company was owed to build the concentrator.

Mopani had warned in October 2014 that the withholding of the refunds would force it to suspend some of its projects.

Nkomati Nickel, South Africa – nickel/copper/chrome/platinum-group metals

Located in the Machadodorp area of Mpumalanga, the Nkomati mine comprises an underground shaft and an openpit, as well as two enrichment plants. It is the

largest producer of nickel concentrate on the African continent. The concentrate also contains copper, cobalt, chrome and platinum-group metals (PGMs). As of mid-2014, proven and probable reserves totalled 114.5-million tonnes of ore, including 360 000 t of nickel, 133 000 t of copper and 3.4-million ounces of PGMs.

During 2014, nickel production decreased by 1% to 22 874 t, while chromite sales increased by 52% to 341 809 t.

OJSC MMC Norilsk Nickel announced in April 2015 that it had completed the sale of its 85% in Tati Nickel Mining Company to Botswana's BCL (Limited), in a deal that also entailed Norilsk selling its 50% shareholding in the Nkomati mine to BCL. The two transactions amounted to \$337-million.

For BCL, the transaction has strategic significance, as it allows for the treatment of Tati Nickel and Nkomati concentrate at BCL's smelter, in Botswana, thus optimising that operation.

Rosh Pinah, Namibia – zinc/lead

The Rosh Pinah underground mine, in south-western Namibia, is 80.1%-owned by Glencore. It produced 113 818 t of zinc concentrate in 2014, a 20% increase on 2013 production, while lead production increased by 18% to 20 551 t.

Rosh Pinah announced in June 2015 that it intended retrenching 124 of the mine's workforce, owing to adverse market conditions.

Skorpion Zinc, Namibia – zinc

The Skorpion zinc mine, which is located near the southern Namibian town of Rosh Pinah, is owned by Vedanta and produced 102 000 t of refined zinc metal in 2014.

The current deposit will be depleted in 2017, but Vedanta reported in June 2015 that the mine's operating life would be extended by two years to the 2019 financial year. This would be achieved by deepening the current openpit to access additional reserves. The diversified miner added that while mine production would end in 2019, the processing of stockpiled oxide ore would continue until the 2020 financial year.



An integrated 150 000 t/y roaster is planned to be built at the mine's refinery to enable it to treat zinc sulphide ore from the new Gamsberg mine.

Tati Nickel, Botswana – nickel/copper/palladium/platinum

The Tati nickel operation, about 45 km east of the north-eastern Botswana town of Francistown, comprises the Selkirk underground mine and the Phoenix mine, which is 15 km away and is being developed as an opencast mine because of the depletion of copper and nickel ores that can be accessed through underground mining, as well as the 12-million-tonne-a-year Phoenix Enrichment Plant.

The Tati nickel operation is 85%-owned by BCL Limited, with the Botswana government holding the balance of the shareholding.

As at December 31, 2014, the measured and indicated mineral resources at the Selkirk deposit totalled 124-million tonnes of sulphide ore with average nickel and copper content of 0.23% and 0.27% respectively. The Phoenix deposit contained 106-million measured and indicated resources averaging 0.21% nickel and 0.17% copper.

The Tati operation produced 9.18-million tonnes of ore with an average of 0.15% for 6 400 t of nickel in concentrate in 2014. This was a 20.5% decline on the previous year's production, attributable mainly to lower nickel content in the ore.

BCL GM Daniel Mahupela, whose company acquired Russian group OJSC MMC Norilsk Nickel's 85% stake in Tati Nickel in early 2015, believes that there is an excellent opportunity to expand the Phoenix mine and restart openpit mining at Selkirk, thus extending the operating life to 2023.

There are also significant exploration opportunities within the Tati mining lease area and adjacent prospecting licences held by the company.

Tschudi, Namibia – copper

Owned by Aim-listed Weatherly International, the Tschudi mine, in Namibia, started commercial production in February 2015, with output for the quarter ended June 30, 2015, amounting to 2 257 t of grade-A copper cathode, more than 50% of design capacity.

Output for the 2015 calendar year is projected to be 10 000 t, with a production rate of 17 000 t/y sustained thereafter over an 11-year operating life.

The copper cathode final product, which contains 99.99% pure copper, means that refined copper metal is being produced in Namibia for the first time.

The new mine's sophisticated on-site processing facility, comprising heap-leaching and SX-EW steps, takes copper processing beyond the capabilities of a conventional smelter, with the downstream value-addition activities of a copper refinery taking place on the mine site itself.



Weatherly International's Tschudi copper mine operations

Picture by Logiman

Presented by:

Powertech 



Selected base metals projects in Africa

Asmara, Eritrea – copper/zinc/gold/silver

Being developed by a joint venture (JV) in which Canada's Sunridge Gold Corporation owns a 60% interest and the Eritrean National Mining Corporation 40%, the Asmara copper/zinc/gold/silver project comprises four advanced deposits – Debarwa, Emba Derho, Adi Nefas and Gupo – and two so-called pipeline deposits: Adi Rassi and Kodadu.

The project, for which a feasibility study was completed in 2013, will be developed in three phases – 1A and 1B, Phase 2 and Phase 3.

In Phase 1A, high-grade copper direct shipping ore will be mined at Debarwa from October 2015, with the first shipment expected in the second quarter of 2016. Phase 1B will entail the mining of near-surface gold ore and the recovery of gold by heap leaching.

During Phase 2, supergene copper will be mined from the Debarwa and Emba Derho deposits and processed at a flotation plant at Emba Derho at a nominal rate of two-million tonnes a year. The final copper concentrate and gold and silver will be shipped to overseas smelters.

Full production will be attained in Phase 3 and will include the processing of primary copper and zinc ores from the Debarwa, Adi Nefas and Emba Derho deposits at the Emba Derho flotation plant. The final copper and zinc concentrate, as well as gold and silver by-products, will also be shipped to overseas smelters.

At full production, the Asmara project will produce 83 000 t of zinc, 29 000 t of copper, 42 000 oz of gold and one-million ounces of silver each year over eight years. The life-of-mine is 17 years.

The JV partners signed a mining agreement with the Eritrean Ministry of Energy and Mines in September

2015, paving the way for the issuing of three mining licences. This will allow the JV to secure debt finance to fund the development of Phase 1, whose \$32-million budget was approved earlier in 2015.

Central operations, Namibia – copper

While Aim-listed Weatherly International maintains its focus on the ramp-up of its Tschudi mine, in Namibia, where production is exceeding expectations, the company plans to convert its Otjihase and Matchless mines (Central operations) to a project development status as the company prepares them for future production expansion.

The installed processing infrastructure at Otjihase is capable of treating much greater volumes of copper ore than the two underground mines have been producing for the past five years.

The identified mineral resources at the Central operations are considered to be sufficient to support viable plans for increased production volumes when copper prices improve and sufficient mine development work has been completed.

The suspension of the operations will allow Weatherly to develop a plan to prepare for a resumption of production at expanded volumes when copper prices improve.

Key activities during the project development phase include maintaining the mining and processing infrastructure in good condition ready for the resumption of operations; investing in upgrading the definition of mineral resources at the Central operations; and creating new access tunnels into areas planned for future underground mining.

Weatherly will also continue to evaluate the opportunities in the region surrounding Otjihase, which is

Presented by:

Powertech 



known to host several copper deposits. The regional endowment presents additional potential for further expansion of production.

Owing to synergies provided by its Otjihase concentrator, Weatherly is well positioned to materially lower the unit costs of production. The company believes that an expanded business unit, based on the Otjihase and Matchless assets, will significantly enhance capability for weathering any future downturns in the commodity price cycle.

Kalongwe, DRC – copper/cobalt

The Kalongwe copper/cobalt project, in the Democratic Republic of Congo's (DRC's) Katanga province, is owned by a JV comprising Australia's Regal Resources and Traxys Europe, each with a 30% shareholding, and La Generale Industrielle et Commercial au Congo, with 40%. Regal, which is providing funding for the acquisition of the project, as well as for exploration and feasibility studies on a 50:50 basis with Traxys, has the right to acquire an additional 20% interest at the definitive feasibility stage.

Regal is engaged in advanced negotiations to acquire Traxys's 30% interest, as well as a further option to acquire up to 80% of the project.

A scoping study completed in April 2015 indicated potential for an economically viable standalone mine.

On a base case of one-million tonnes a year of heavy mineral separation (HMS) throughput, the project is expected to produce 21 249 t/y of copper and will require a capital investment of A\$38.9-million.

Regal reports that potential exists for a Stage 2 solvent extraction and electrowinning (SX-EW) plant to extend the life-of-mine.

The DRC Ministry of Mines has approved the project's technical study report and environmental study report, which were submitted to support an application for a permit to establish a mine and associated infrastructure. As a consequence of these approvals, a recommendation has been sent to the Minister of Mines that the Kalongwe permit be converted into a mining permit. Once approval has been received, the JV partners will be required to transfer 5% of their 100% holding in the Kalongwe permit to the DRC State.

Kamoa, DRC – copper

Canada's Ivanhoe Mines and Chinese company Zijin Mining Group have agreed to jointly develop the Kamoa copper deposit, in the DRC's Katanga province.

Ivanhoe has discovered an indicated resource of 739-million tonnes grading 2.67% copper, containing 43.5-billion pounds of the metal, and an inferred resource of 227-million tonnes grading 1.96% copper, containing 9.8-billion pounds. A 1% copper cutoff grade and a minimum vertical mining thickness of 3 m were applied in each case.

Ivanhoe is proposing two principal phases of development, with the first targeting production of high-grade copper mineralisation from shallow underground resources to yield a high-value concentrate. Initial mill feed will come from Kansoko Sud and will lead into the Centrale area of Kamoa's gently dipping mineralisation zones, which collectively host an estimated indicated resource of 224-million tonnes grading 3.85% copper at a 3% copper cutoff and a minimum 3 m vertical mining thickness. The second phase will entail a major expansion of the mine and mill, as well as the construction of a large smelter.



Core logging at the Kamoa project

Picture by Ivanhoe Mines



Presented by:

Powertech

A feasibility study on the project is expected at the end of 2016.

Under the terms of the agreement between Ivanhoe and Zijin, the latter, through its subsidiary, Gold Mountains International Mining, will buy a 49.5% interest in Kamoa Holding – an Ivanhoe subsidiary that owns 95% of the Kamoa project – for \$412-million.

Zijin will make an initial cash payment of \$206-million on closing the transaction, which was expected at the end of July 2015, a deadline that was subsequently extended by 15 business days. Ivanhoe has also agreed to sell 1% of its stake in Kamoa Holding to Hong Kong-based Crystal River Global for \$8.32-million.

Zijin has committed to arranging project financing for 65% of the capital required to develop the first phase of the project, after which it will have the right to acquire Crystal River's 1% interest in Kamoa Holding.

Meanwhile, the DRC government, which has a 5% shareholding in the project, has lent its support to Ivanhoe Mines' planned sale of its stake in the Kamoa mine to Zijin. The approval comes after government reportedly wanted to block the Ivanhoe-Zijin deal until it decided what it wanted to do about its own part in the venture.

Ivanhoe has also agreed to sell an additional 15% stake in the mine to the DRC government.

Production at the mine is expected to begin by the end of 2018.

Kangaluwi, Zambia – copper

Australian-listed Zambezi Resources' 100%-owned Kangaluwi copper project, located in Zambia's Lower Zambezi National Park, boasts mineral resources estimated at 46-million tonnes at 0.67% copper for 300 000 t contained copper from three deposits at a 0.3% copper cutoff grade.

The project is targeting 7 500 t/y of copper cathode production from an openpit mine.

An appeal by conservation groups against the decision to allow Zambezi Resources to develop the project was

heard in February 2015. A ruling on the appeal was initially scheduled to be handed down on April 28, 2015, but was postponed. The decision on the appeal will be handed down together with the decision on the stay of execution, which remains in place, pending the outcome of the appeal.

Kipoi, DRC – copper

Located in the DRC's Katanga province, the Kipoi project, being developed by Australia's Tiger Resources, comprises a 12 km sequence of mineralised roan sediments that host at least five known deposits, with Joint Ore Reserves Committee-compliant resources reported at three of them.

Tiger is following a phased development approach, with the first stage targeting the treatment of only high-grade oxide material through an HMS plant. This plant was superseded by a SX-EW plant that produced its first cathode in May 2014, reaching its nameplate capacity of 25 000 t/y in September of the same year.

The SX-EW facility, which will produce LME grade-A copper cathode at the mine site, can potentially be expanded to 50 000 t/y for capital expenditure of \$111-million under the project's second phase. The expansion, however, is on hold, pending the receipt of appropriate long-term financing, with an expected 14-month development period expected from the time the project is approved.

A third phase would entail the installation of a crusher and tank leach at a cost of \$70-million; however, metallurgical testwork is under way to optimise Phase 3 heap feed and potentially sustain a 50 000 t/y rate without having to spend \$46-million on a tank leach using whole ore leaching.

Meanwhile, a study for the debottlenecking of the SX-EW plant has revealed that copper production could be increased from the nameplate capacity of 25 000 t/y to 32 500 t/y. The project would cost \$25-million. Debottlenecking work is expected to be completed within an eight-month period; if work starts in the fourth quarter of 2015, the project will be completed in the third quarter of 2016.

The heap-and-leach feed schedule has been optimised to provide sufficient recoverable copper to sustain

Presented by:

Powertech 



production at 25 000 t/y and ramp up to 32 500 t/y in late 2016.

Kipushi, DRC – copper/zinc/germanium/lead

The Kipushi project, which is 69%-owned by Canada's Ivanhoe Mines, with the balance held by DRC parastatal Gecamines, is based on a high-grade underground mine near Lubumbashi, in Katanga province, that produced 6.6-million tonnes of zinc and four-million tonnes of copper from 60-million tonnes of ore grading 11% zinc and about 7% copper between 1924 and 1993. It also produced 278 t of germanium between 1956 and 1978. Gecamines' mine-level plans for Kipushi also report the presence of precious metals, especially silver and rhenium, but there is no formal record of production of these metals on the property.

The Kipushi mine, which had been on care and maintenance since 1993, was flooded in 2011, owing to a lack of pump maintenance over an extended period. A dewatering exercise initiated in 2011 resulted in

access being restored to the mine's principal haulage level at 1 150 m below the surface. Since then, crews have been upgrading underground infrastructure to permanently stabilise the water levels and support a drilling programme that started in March 2014. A total of 21 241 m of drilling had been completed in 91 holes by the second quarter of 2015 and Ivanhoe expected to complete the remaining portion of the exploration drilling programme in the third quarter.

Ivanhoe is working with South African company MSA to finalise an updated mineral resource estimate for the Kipushi project that will incorporate all the drill results received to date.

The independent estimate is expected to be published in the third quarter of 2015.

Kitumba, Zambia – copper

The Kitumba copper project, in the Mumbwa district of Zambia's Central province, is being developed by Intrepid, which acquired the previous owner, fellow Australian-listed company Blackthorn Resources, in 2014.



Underground drilling exploration at the Kipushi project

Picture by Ivanhoe Mines

Presented by:

Powertech 



Using a 1% copper cutoff, the Kitumba deposit is estimated to host a total measured, indicated and inferred mineral resource of 27.9-million tonnes at 2.2% copper for a total of 614 000 t of the metal.

The project has proven and probable reserves of 21.9-million tonnes at 2.2% copper.

Intrepid released the results of an option study on the project in October 2015.

Under the options studied an extensive redesign of the development plan, based on a reduced production rate, has confirmed the economic potential of the project, based on a long-term copper price of \$3.11/lb.

A number of mining and processing plant-related scenarios were considered, resulting in seven case options being evaluated, including a variable mine production profile.

Under the preferred project development option copper recovery of 91% is envisaged, with copper cathode production of up to 40 000 t/y, with an average of 37 000 t/y produced over the project's 13-year mine life.

The underground operation will produce 1.5-million tonnes to 2-million tonnes a year run of mine, with an average head grade of 2.2% copper. The project's mine life has been increased from 11 years to 13 years.

A decision to progress the Kitumba project to full feasibility will be made in early 2016, following the completion of exploration drilling and metallurgical testing.

Lift II, South Africa – copper

The Lift II project is being implemented by Palabora Mining Company at its mine in South Africa's Limpopo province, where it has been producing copper for decades, initially as a large opencast operation, and as an underground block-cave operation known as Lift I since 2002. The initial plan envisaged the Lift I resource being depleted by 2020, but the closure of Lift I has been brought forward to December 2015, owing to dilution from the North wall failure.

The R9.3-billion Lift II project, for which board approval was granted in March 2015, will develop a new mining

footprint 450 m below Lift I, extending the life-of-mine to 2033. The approval followed an extensive investment in prefeasibility and feasibility studies, as well as early works development that amounted to R2-billion.

Construction on the project, which started in March 2015, will continue until 2020.

Lumwana West, Zambia – copper

Australia-based Argonaut Resources has a 90% interest in the Lumwana West copper project, in Zambia's North-Western province, which is prospective for large-tonnage low- to medium-grade copper deposits. Chilean copper major Antofagasta is spending \$3.9-million to earn a 25% interest in the project and could increase its stake to 70% by spending \$18.9-million on exploration and completing a feasibility study. The project is focused on testing major target areas previously defined by Argonaut and new targets generated by a regional soil sampling programme.

Argonaut reported in May 2015 that three regional targets – Sharamba, Kamafamba and Mufuka – had been prioritised for drill testing.

Namib, Namibia – lead/zinc

London-based North River Resources is aiming to start production at the Namib project, near Swakopmund, in the near term. The project has a current Joint Ore Reserves Committee-compliant resource of 1.3-million tonnes, comprising an underground in situ metal inventory of 30 709 t of lead, 80 640 t of zinc and 1.76-million ounces of silver.

North River has concluded a project equity agreement with Greenstone Resources for up to \$12-million, which will be used to progress the project to production.

Nkana mine Synclinorium shaft, Zambia – copper/cobalt

Glencore's majority-owned subsidiary, Mopani Copper Mines, completed sinking the \$323-million 1 280 m main Synclinorium shaft, at Nkana mine, at the end of September 2014, and the erection of a new headgear and a winder, as well as the roping up of the shaft, is scheduled for 2015. Commissioning will take place in December 2015.

Presented by:

Powertech 



The project entailed the construction of a 7-m-diameter main shaft and a 6-m-diameter ventilation shaft to depths of 1 277 m and 1 167 m respectively and will enable the mine to access an estimated 115-million tonnes of ore at a grade of 1.9% copper and 0.09% cobalt.

The new shaft will allow for ore production at Nkana to be maintained at above four-million tonnes a year by 2017 and extend the life-of-mine by 25 years.

Omitiomire, Namibia – copper

The Omitiomire copper project, located about 140 km north-east of Windhoek, is being developed by Craton Mining & Exploration, the Namibian subsidiary of Australia-based International Base Metals. As at the end of August 2014, the project boasted a measured resource of 4.4-million tonnes of ore grading 0.85% copper, an indicated resource of 93.4-million tonnes of ore grading 0.52% and an inferred resource of 136.9-million tonnes of ore grading 0.54%.

Craton intends developing the project in two phases, with the first entailing the mining of near-surface oxide and mixed oxide-sulphide ore. The second phase will be a larger project based on the deeper sulphide resource at Omitiomire, as well as other resources that might be discovered within trucking distance of Omitiomire.

Meanwhile, litigation involving two neighbours of the farm Omitiomire, on which the proposed mine is to be built, could delay development, which was scheduled to start in 2016. The neighbours have appealed the decision of the Environmental Commission to grant the project an environmental clearance certificate and are also seeking a High Court review of the Ministry of Mines and Energy's decision to award Craton a mining licence.

Trident, Zambia – copper

Acquired by First Quantum Minerals (FQM) in 2010 through its acquisition of exploration company Kiwara, the Trident project, in northern Zambia, comprises five large-scale mining licences that cover two declared resource deposits – Sentinel and Enterprise – and numerous exploration targets.

The Sentinel copper mine is being commissioned, with production launched in September 2015, and the

Enterprise nickel mine is scheduled to start operating late in 2015 or in 2016, depending on market conditions.

The Sentinel and Enterprise mines are expected to operate for 15 years and eight years respectively.

The Sentinel deposit has a total measured and indicated resource of 1.03-billion tonnes grading 0.51% copper, and proven and probable reserves of 774.2-million tonnes grading 0.5% copper.

The mine will target sulphide ores that will be processed on site to produce an estimated 26% copper concentrate, which will be transported to smelters in Zambia for the extraction and refining of copper.

The mine's processing facility will have a target throughput rate of 55-million tonnes of ore a year at an average grade of 0.5% copper. Higher grades are expected in the first six years of the life-of-mine, which will provide production rates of 260 000 t/y to 300 000 t/y of copper.

The Enterprise deposit hosts measured and indicated resources of 40.1-million tonnes grading 1.07% nickel, and proven and probable reserves of 32.7-million tonnes grading 1.1% nickel.

The envisaged four-million-tonne-a-year Enterprise operation has capacity to produce 38 000 t/y of nickel on average, with scope to increase to 60 000 t/y of nickel.

Construction of the Enterprise plant had reached the 95% completion mark in August 2015, and it was expected that it could be commissioned on Sentinel copper ore before the decision is taken to proceed with commercial mining at the Enterprise pit.

The capital cost to develop the Sentinel and Enterprise mines is estimated at \$2.1-billion, including the development of infrastructure associated with the mines. Meanwhile, owing to electricity shortages attributable to drought, FQM has idled the Sentinel processing plant and redirected electricity supply to its Kansanshi mine so that it can operate as close as possible to capacity and maintain its development momentum.

Consequently, the ramp-up and commercial production date for the mine will be delayed indefinitely.



Presented by:

Powertech

Base metals outlook

The strengthening dollar does not bode well for base metals because, like other commodities, they typically exhibit an inverse relationship with the US currency, with their prices tending to weaken when the dollar strengthens and to strengthen when the dollar softens. This is because commodities, including base metals, are generally priced in dollars.

Further weighing down base metals prices, is China's, the world's largest metals consumer, gross domestic product (GDP) growth, which slowed in the first quarter of 2015 to 7% – the country's new target figure, which is below the 7.4% growth rate in 2014. In July 2015, the Organisation for Economic Cooperation and Development revised its 2015 GDP growth forecast for China from 3.6% to 3.1%, and the 2016 forecast from 3.9% to 3.8%.

Chinese demand for base metals has also been affected by a slowdown in the oversupplied real estate market. Some analysts believe it will likely take two to three years to clear the backlog of unsold inventory in that market. This would require developers

to suspend or severely curtail new property development for at least a year and allow demand to catch up with supply, which would be negative for base metals.

Advisory services firm Moody's stated in September 2015 that a perceived sharper-than-expected slowing of the Chinese economy, limited supply response from commodity producers, overcapacity in global steel markets, reduced energy costs and a strong US dollar were creating unprecedented adverse conditions for base metals, driving prices down to levels close to those seen in the 2008/9 financial crisis, but with drawn-out recovery prospects. Moody's states that there is little impetus to materially reverse the recent slide in base metal prices, which it expects to remain in lower ranges for a relatively long timeframe.

The outlook for base metals – which limped their way through the better part of 2014 – is, therefore, not particularly encouraging, given the continuing strengthening of the dollar and slowing economic growth in China.



The strengthening dollar does not bode well for base metals

Picture by Exxaro

Presented by:

Powertech 



Main sources

African Review. DR Congo-China JV to produce copper by end 2015 (May 25, 2015).

AllAfrica.com. Craton delays Omitiomire copper project (April 30, 2015).

Austex Mining. Presentation by Rob Murdoch at the Australian Copper Conference (June 16-17, 2015).

BizNews.com. Zambia buckles on mining royalty tax – Cabinet approves changes (April 14, 2015).

BizNews.com. Leaked new DRC mining code seeks higher royalties, bigger govt stakes (April 15, 2015).

Bloomberg. Ex-Lonmin CEO Mills seeks \$40 million to restart Zambia mine (May 22, 2015).

Bloomberg. Goldman gets more bearish on metals, cuts copper outlook (July 22, 2015).

Botswana Guardian. Boseto copper mine closes (February 27, 2015).

Business Day. Vedanta to put \$782m into local zinc mine (November 14, 2014).

Business Day. Zambia to ration power to mines (June 30, 2015).

Business Report. DRC: Forecast for growth slashed (June 10, 2015).

Business Standard. Copper to remain subdued on rising production, falling demand (April 7, 2015).

Copper Investing News. 10 top copper-producing countries (April 15, 2015).

Credit Suisse. Commodities forecasts (April 9, 2015).

Daily Telegraph. Copper lifts on Glencore closures (September 8, 2015).

Fastmarkets.com. Nickel analysis and forecast Q2 2015 (May 12, 2015).

Fastmarkets.com. Overview of the lead market Q2 2015 (May 12, 2015).

Financial Post. Outlook for base metal prices continues to grow cloudier: BMO (August 25, 2015).

Financial Times. Copper's supply glut takes shine off short-term price outlook (June 23, 2015).

Financial Times. Glencore deals mining blow to African copper producers (September 8, 2015).

Georesources. Intrepid Mines updates mineral resource estimate for Kitumba – copper tonnage reduction (August 19, 2015).

Glencore. Investor day (December 10, 2014).



Presented by:

Powertech

Hellening Shipping News. Outlook still negative for base metals as investor sentiment remains cautious (June 29, 2015).

ICSG, INSG and ILZSG. Presentation by secretary-general Don Smale, entitled 'Review and outlook for copper, nickel, lead and zinc' (May 28-29, 2015).

International Copper Study Group. Copper: preliminary data for 1st half of 2015 (September 21, 2015).

International Lead and Zinc Study Group. Review of trends in 2014 (February 23, 2014).

International Lead and Zinc Study Group. Press release: ILZSG spring 2015 meetings/forecasts (April 22, 2015).

International Lead and Zinc Study Group. Press release (July 15, 2015).

International Lead and Zinc Study Group. Press release (August 17, 2015).

International Nickel Study Group. INSG April 2015 meetings (April 21, 2015).

Ivanhoe Mines. Ivanhoe Mines announces financial results and review of operations for the second quarter of 2015 (August 12, 2015).

Investing News. New nickel supply to ramp up 2015 to 2016 (March 15, 2015).

Investing News. 10 top nickel-producing countries (April 20, 2015).

Investing News. BMO sees long-term potential for 'strong' nickel price recovery (July 15, 2015).

Investing News. Nickel price rises as Vale halts production (August 17, 2015).

Katanga Mining Week. Lack of electricity supply stalls mining in Katanga, DRC (June 24, 2015).

Metal Bulletin. RBC cuts zinc price forecasts for 2015/16 on lower demand, global growth (June 17, 2015).

Mineweb. Copper heading for 1.5 million tonne deficit by 2018 (February 19, 2015).

Mineweb. Zambia 2015 copper output to dip on tax dispute – Yaluma (June 11, 2015).

Mineweb. Chile injects \$225m in fresh capital into Codelco (July 2, 2015).

Mining.com. Chile mulls making water desalination mandatory for miners (January 9, 2015).

Mining.com. Yukon Zinc temporarily closing Wolverine mine (January 27, 2015).

Mining.com. Expansion of Chile's Sierra Gorda may cost up to \$2bn (March 5, 2015).

Mining.com. World's largest copper producer Chile slashes 2015 output forecast (April 7, 2015).

Mining.com. Zambia mulls cutting mining royalties even further (June 3, 2015).

Mining.com. SNC-Lavalin awarded early works for Kitumba copper project (June 10, 2015).

Mining.com. Congo mulls suspending Ivanhoe's Kamoa stake sale to Zijin (June 17, 2015).

Mining.com. The go-to junior for a tightening zinc market (June 21, 2015).

Mining.com. Glencore fights back – to slash debt by \$10bn, halt copper mines in Africa (September 7, 2015).

Mining.com. Zambia orders Vedanta unit to get rid of Chilean copper (September 14, 2015).

Miningmx. Zambia starts repaying \$600m in VAT refunds (June 30, 2015).

Mining News. Glencore's Zambia mining unit completes refinery upgrade (May 21, 2015).

Mining News. Zambia's MCM delays copper project pending \$300m tax refund (June 19, 2015).

Mining Review. Palabora Copper's R9.3bn life-of-mine extension project approved (March 10, 2015).

Mining Review. Botswana's BCL picks up Norilsk Nickel Africa assets for \$337m (April 8, 2015).

Mining Review. Nevsun Resources Bisha zinc expansion 60% complete (April 23, 2015).

Mining Review. Full power restored at First Quantum Minerals Kansanshi, Sentinel operations (August 7, 2015).



Mining Technology. Codelco plans \$4bn investment to extend life of old mines (April 29, 2015).

Mining Technology. Copper – due for a turnaround (June 22, 2015).

Mining Weekly. Blackburn sells Perkoa interest to Glencore (April 16, 2014).

Mining Weekly. Mawson West places Dikulushi mine on care and maintenance (January 21, 2015).

Mining Weekly. Ambatovy ramp-up suffers setback following February fatality (March 10, 2015).

Mining Weekly. Zinc metal deficit expected to intensify – Glencore (March 18, 2015).

Mining Weekly. Construction starts on Palabora Copper's R9.3bn Lift II project (March 27, 2015).

Mining Weekly. Copper supply surplus to linger into 2016 – report (April 15, 2015).

Mining Weekly. Kalongwe proves up for Regal. (April 21, 2015).

Mining Weekly. Nevsun makes progress with Eritrean zinc expansion (April 22, 2015).

Mining Weekly. Ntaka Hill divestment gets Tanzania FCC nod (April 23, 2015).

Mining Weekly. Ivanhoe, Zijin Mining partner to develop DRC copper discovery (May 26, 2015).

Mining Weekly. Base Metals on 'negative' watch as low prices, slowing growth stales outlook – Moody's (May 29, 2015).

Mining Weekly. Tigers mulls Kipoi debottlenecking after hitting output high (June 11, 2015).

Mining Weekly. Record production recorded at Kipoi (July 10, 2015).

Mining Weekly. BNC's Trojan lifts nickel output to record highs (July 21, 2015).

Mining Weekly. Tschudi mine produces 2 257 t of copper in Q2 (July 22, 2015).

Mining Weekly. First blast at Vedanta's new \$630m Gamsberg zinc mine (July 27, 2015).

Mining Weekly. \$750m Dugald River gets the go-ahead (July 29, 2015).

Mining Weekly. Weakened nickel, gold prices weigh on Mwana's FY earnings (July 29, 2015).

Mining Weekly. Ivahoe, Zijin extend Kamoa transaction completion date (August 4, 2015).

Mining Weekly. Mincor battles falling nickel prices, higher costs (August 13, 2015).

Mining Weekly. Zambia forecasts lower growth, larger deficit as copper earnings shrink (August 31, 2015).

Mining Weekly. Moody's cuts commodity price assumptions on 'extraordinarily adverse' conditions, dimmed outlook (September 11, 2015).

Mining Weekly. Katanga to continue with \$880m investment plan (September 14, 2015).

Mining Weekly. Copper has not bottomed yet, lower prices needed to cut more supplies – BofA Merrill Lynch (September 18, 2015).

Mining Weekly. Zinc falls to 5 yr low as LME stocks rise (September 23, 2015).

Mining Weekly. Peruvian miner Milpo sees zinc output rising to nearly 300 000 t (September 25, 2015).

Mining Weekly. Base metals prices to improve in medium term (October 8, 2015).

Mining Weekly. Global market seen in 23 000 t deficit in 2016 (October 8, 2015).

Mining Weekly. Goldman lowers 2016 price forecasts for nickel, zinc, lead (October 9, 2015).

Mining Weekly. China base metal demand to inch up next year may pick up in H2 (October 9, 2015).

Mining Weekly. Copper at risk of sliding below 4 000 t goldman (October 10, 2015).

Mining Weekly. Anglo-Glencore Collahuasi copper mine postpones expansion plans (October 14, 2015).

Modern Mining. Kalahari Copperbelt to get new underground mine (January 2015).

Moneyweb. Glencore's Zambia mining unit completes refinery upgrade (May 21, 2015).

Moneyweb. Supply of quality copper concentrates shrinks (July 6, 2015).

Nickel Asia Corporation. Analysts Presentation (May 2015).

Norilsk Nickel. Annual report 2014.

Norilsk Nickel. 2015 strategy update – building new Norilsk.



Presented by:

Powertech

Platts. Supply cuts required to see price improvement in nickel market – Deutsche Bank (September 29, 2015).

Project IQ. Palabora Copper's R9.3bn extension approved (March 10, 2015).

Recycling International. Copper production deficit widens in 2014 (April 13, 2015).

Regal Resources. Quarterly report for period ending June 30, 2015 (July 31, 2015).

Research Channel Africa. Lift II copper project, South Africa (September 5, 2014).

Research Channel Africa. Mopani Synclinorium shaft project, Zambia (October 3, 2014).

Research Channel Africa. Kitumba copper project, Zambia (February 13, 2015).

Research Channel Africa. Tschudi copper project, Namibia (February 20, 2015).

Research Channel Africa. Kipushi mine rehabilitation and redevelopment project, Democratic Republic of Congo (February 27, 2015).

Research Channel Africa. Kangalawi copper project, Zambia (March 13, 2015).

Research Channel Africa. Kalongwe copper/cobalt project, Democratic Republic of Congo (May 22, 2015).

Research Channel Africa. Trident project, including the Sentinel copper mine and Enterprise nickel mine, Zambia (August 7, 2015).

Research Channel Africa. Kamoanga copper project, Katanga, Democratic Republic of Congo (August 7, 2015).

Research Channel Africa. Kipoi copper project, Democratic Republic of Congo (August 7, 2015).

Reuters. Chile copper mine water use seen rising rapidly in next decade (January 13, 2015).

Reuters. MMG sees sharp 2015 output drop at ageing Century zinc mine (January 14, 2015).

Reuters. Sunridge announces \$32m 2015 budget and programme for Asmara project, Eritrea (February 3, 2015).

Reuters. Glencore to cut 124 jobs at Namibia zinc and lead mine (February 12, 2015).

Reuters. Cupric to spend \$200m to build Botswana copper mine (July 7, 2015).

Reuters. Warning China demand means larger lead market surplus: Reuters poll (July 23, 2015).

Reuters. Lower copper prices to hit Zambia revenue receipts (September 10, 2015).

Reuters. China's CNMC says followed the law in closing Zambian copper mine (September 14, 2015).

Reuters. Mine closures will slow Zambian growth, rating agency Moody's says (September 14, 2015).

Reuters. Glencore inventory sale could sink world zinc prices further (September 18, 2015).

Reuters. Congo drops objections to Ivanhoe Mines' copper deal (September 23, 2015).

Reuters. Zambia's 2015 copper output seen down 15% on low demand (October 14, 2015).

ResfaNews. Sunridge to get mining licence for Asmara project (June 27, 2015).

Scotiabank. Metal prices, currencies and global growth, outlook 2015-2016 (April 14, 2015).

Sheritt International. Analyst and investor day (March 25, 2015).

The African Report. South Africa's Palabora halts copper mine operations after protests (August 5, 2015).

The Economist Intelligence Unit. Sicomin project to start producing copper before end-2015 (May 22, 2015).

The Global Mail. Barrick rescinds plan to halt operations at Lumwana mine, Zambia says (April 23, 2015).

The Hindu Business Line. Lead outlook grey on cooling prices (March 29, 2015).

The Northern Miner. CRU Group sees copper supply deficit in 2018 (April 15, 2015).



Presented by:

Powertech

The Northern Star. Copper is shining bright (June 14, 2015).

The Post. Zambia records decline in 2014 copper production (February 1, 2015).

The Street. Bruce Always of Thomson Reuters GFMS talks copper prices (April 29, 2015).

Transport World Africa. \$500 million secured for Zambian copper rail line (June 20, 2015).

Yahoo Finance. Vedanta to extend life of Skorpion zinc mine (June 2, 2015).

The Wall Street Journal. Barrick won't close Zambia copper mine after royalty cut (April 24, 2015).

The Wall Street Journal. Glencore, Barrick Gold looking to sell Tanzania nickel project (May 13, 2015).

Zambia Ministry of Mines, Energy and Water Development. Presentation by chief mining engineer Fred Banda at the Japan-Zambia Business Forum (March 4, 2015).

<http://minerals.usgs.gov>

<http://www.alararesources.com>

<http://www.arm.co.za>

<http://www.barrick.com>

<http://www.first-quantum.com>

<http://www.interbasemetals.com>

<http://www.ivanhoemines.com>

<http://www.mawsonwest.com>

<http://www.nevsun.com>

<http://www.nornik.ru>

<http://www.northriverresources.com>

<http://www.regalresources.com>

<http://www.sherritt.com>

<http://www.sunridgegold.com>

<http://tigerresources.com.au>

<http://www.trevali.com>

<http://www.vedanta-zincinternational.com>

<http://www.weatherleyplc.com>

<http://www.zambeziresources.com>

<http://zccm-ih.com.zm>



Presented by:

Powertech 

Base Metals 2015: A review of Africa's base metals sectors

The material contained in this report was compiled by Creamer Media (Pty) Ltd's Research Unit, based in Johannesburg, South Africa. It has been compiled from sources believed to be reliable, but no warranty is made as to the accuracy of such information.

Creamer Media's aim is to present its reports in an impartial, user-friendly format for easy reference. The reports draw on material published over the past 12 months and are a summary of other sources of information published in *Engineering News* and *Mining Weekly*, as well as of information available in the public domain. The report does not purport to provide analysis of market trends.

This report is designed to be a source of information for subscribers to Creamer Media's *Research Channel Africa* and Creamer Media's *MiningWeekly.com* Research, and is not to be reproduced or published for any other purpose. In particular, the report may not be republished on any other websites and it may not be reproduced or redistributed in any manner.

© Copyright Creamer Media (Pty) Ltd

Presented by:



Powertech 



To subscribe to *Research Channel Africa* or purchase this report contact:
Creamer Media (Pty) Ltd | tel +27 11 622 3744 | fax +27 11 622 9350 | email subscriptions@creamermedia.co.za



Presented by:

Powertech