Global Metals Weekly

Commodity clouds in sunny Barcelona

Macro themes – big focus at Metals & Mining conference

We recently hosted our Metals and Mining conference in Barcelona. Investors we spoke to are constructive on most mined commodities longer term, although there is some apprehension on near-term fundamentals. Rio Tinto outlined that the world has become more unpredictable, though BHP noted that macroeconomic growth drivers remain favourable. In the near term, China is seen to be a stabilising factor for global economic growth and commodities demand, with the second half of the calendar year expected to be better than the first. Further out, population growth, rising living standards and urbanisation are supportive, as the megatrend of decarbonisation will likely be an amplifier.

Copper: supply from traditional leaching -1.2Mt by 2030

BHP reminded us that many of the major operating assets that form the backbone of copper supply today were discovered 20, 30 or 40 years ago. These mines are now mature and face headwinds from grade declines. Hence, a considerable amount of capital will need to be deployed in the coming decade just to stand still. While discovery of new copper mineralisation continues, finding large economic deposits is becoming rarer, with new greenfield discoveries tending to be deeper and more complex. Meanwhile, Freeport outlined scope to increase production from novel leaching by 400Kt. Yet, half of the potential is at Morenci, where we see production declining by around 200Kt over the coming decade. Hence, net growth will be smaller. The global picture is similar: production from traditional leaching, solvent extraction/electrowinning is set to drop by 1.2Mt by 2030. That decline rate is often not factored in.

Aluminium: balances on a knife edge

Alcoa sees 2023 aluminium balances on a knife edge, expecting a small surplus ex-China, but a deficit in China, where supply remains challenged, highlighted by the issues around hydro power in Yunnan province. At the same time, the country is bumping against its 45Mt capacity gap, which should limit output growth. Meanwhile, Alcoa says European customers are more confident, which means they are buying with slightly longer lead times; packaging and automotive are pockets of strength. Consumption in North America is a little weaker but still growing. As such, Midwest premiums remain relatively strong to attract imports. Meanwhile, the medium- to longer-term outlook on usage looks promising, also because aluminium is used in the cars of the future, whether electric vehicles or those using combustion technology.

Lithium supply growing strongly

Eramet, Pilbara and Sigma all show that lithium supply is powering ahead.

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Commodities
Global

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Near-term commodity headwinds

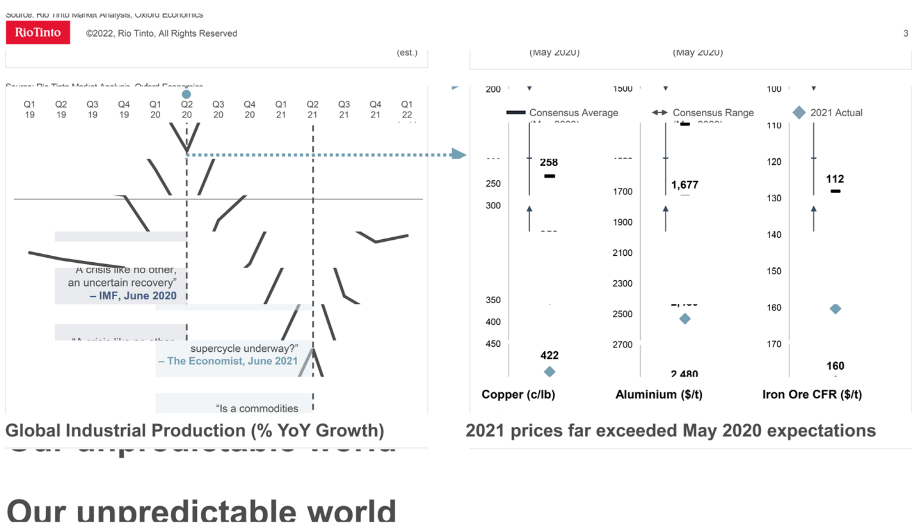
Miners appear constructive on growth

Our colleagues in equity research recently hosted the annual Metals and Mining conference in Barcelona and the team has summarised the event in a series of notes:

- Day 1 Conference feedback: The pivot to growth 17 May 2023; Day 2 of our Global Conference: "Big Gold", industrial metals, tech & innovation panels 18 May 2023; Day 3 of our Global Conference: Circular metals, trading & uranium panels & WRAP! 19 May 2023

With regard to commodities, one of the key takeaways is that investors are constructive most mined commodities longer term due to the energy transition, although there is some apprehension over near-term fundamentals. Rio Tinto outlined that the world has become more unpredictable, outlining, for instance, the volatility of industrial production (see chart below).

Exhibit 1: Industrial activity and prices
Economic activity and prices have been very volatile



Source: Rio Tinto

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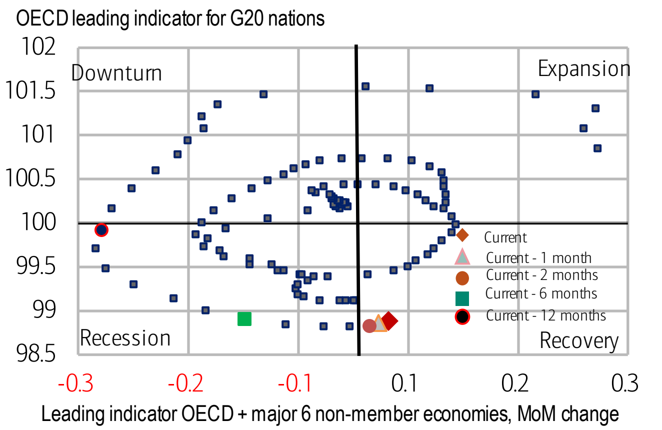
Favourable macro drivers near term – China a stabiliser

BHP said that macroeconomic growth drivers remain favourable. In the near term, the company sees China as a stabilising factor in global economic growth and commodities demand.

Indeed, China, coupled with India, is expected to provide roughly half of all global economic growth this year. At the same time, the company's CEO Mike Henry outlined that the second half of the calendar year should be better than the first. He highlighted construction especially, and therefore the steel value chain, noting that he recently visited China for the first time post the pandemic, and that he left feeling confident because of an upturn in leading indicators of resource-intensive activity.

Exhibit 2: Commodity business cycle

The business cycle, which is 6-months forward looking has flipped into "Recovery", which is typically bullish for copper



Source: Bloomberg, BofA Global Research

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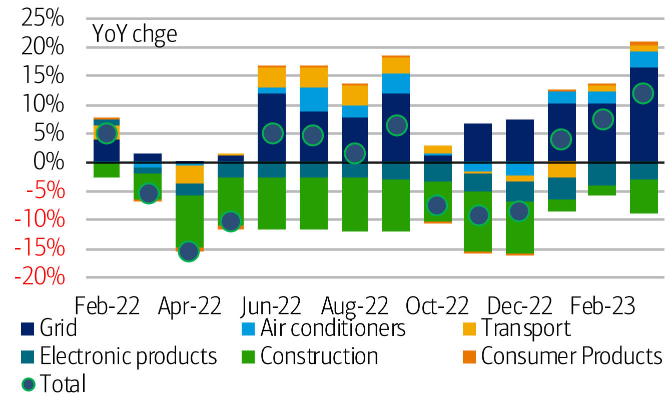
Exhibit 3: China, underlying copper demand

China's underlying copper demand has expanded, led by grid spending



Source: Bloomberg, BofA Global Research

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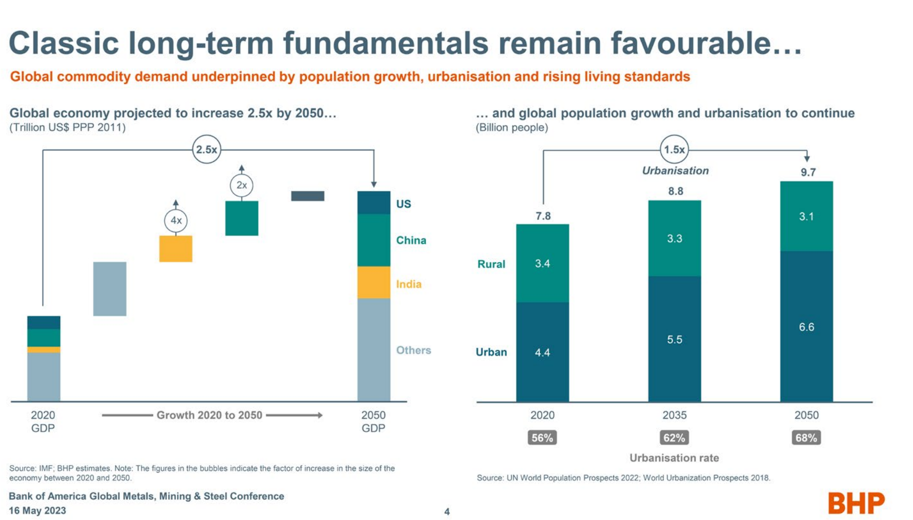
China's economy to double in size and India 4x by 2050

Meanwhile, the long-term outlook also remains positive. The global economy is expected to be 2.5 times larger by 2050, with China forecast to double in size, and India to expand four-fold. And, in capital investment, which is the most resource-intensive segment, China is expected to provide the most significant change, obviously coming off a large base, with India expected to grow too.

Exhibit 4: Long-term GDP and population outlook

Commodity demand is set to be underpinned by population growth, urbanisation and rising living standards



Source: BHP

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Climate change mean global economy could become more capital-intensive

BHP's work on the potential physical impacts of climate change also implies that the global economy could become even more capital-intensive, with increased capital stock turnover, and more defensive investments to mitigate climate risks. In addition to investments in adaptation, significant infrastructure will be required to facilitate decarbonisation.

By 2050, the global population is expected to increase by around 25 per cent while the urban population is expected to go from 4.4 billion today, to 6.6 billion. That is an extra

2.2 billion people who will enjoy a significant uplift in their incomes, in their consumption patterns and diet, while bringing additional demands for housing, commercial floor space, transport and logistics infrastructure, power and utilities. The megatrend of decarbonisation is likely to amplify that demand and, combined with the challenges of bringing on new supply, this indicates a positive outlook for commodities.

Copper – lack of economic discoveries

BHP reinforces how difficult the backdrop is for copper production

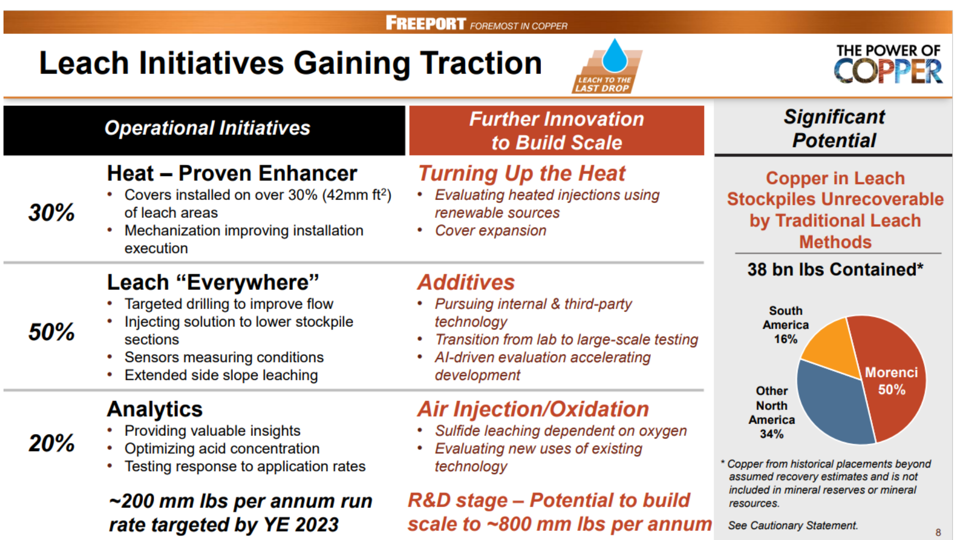
BHP reinforced a lack of economic discoveries. Indeed, the scale of new copper discoveries has decreased since the 1990s, which was the heyday for the South American copper belt. Many of the major operating assets that form the backbone of supply today were discovered 20, 30, or 40 years ago. They are now mature and facing grade decline headwinds, such that a considerable amount of capital is going to need to be deployed in the coming decade just to stand still. Whilst discovery of new copper mineralisation does continue, finding large economic deposits is becoming rarer, with new greenfield discoveries tending to be deeper and more complex. Beyond this, some of the most technically attractive deposits – higher grade, closer to surface – are increasingly skewed towards difficult operating jurisdictions. Greenfield projects are therefore becoming harder to come by, more technically challenging, more expensive and riskier, all of these leading to longer development timelines.

Projects around existing operations – brownfield expansions or proximate new developments – can also be difficult to develop because of permitting challenges, local stakeholder opposition and, in today's inflationary and labour market climate, higher costs. The industry has seen project after project run over time and over budget in recent years, while operational disruptions have roughly doubled from where they were in the late 2010s.

Novel leaching to help increase production, but net growth likely lower

Meanwhile, Freeport spoke about the opportunity from novel leaching, highlighting scope to increase copper production by about 400Kt. Yet, this figure comes with a caveat, with almost half of the opportunity at the Morenci mine, a site which could lose almost 200Kt of supply in the coming years. As such, novel leaching will help to replace some of those declines, a point also made by FCX, which confirmed that it is not planning to build any new infrastructure.

Exhibit 5: Freeport's outlook on novel leaching
Freeport is actively pushing novel leaching



Source: Freeport

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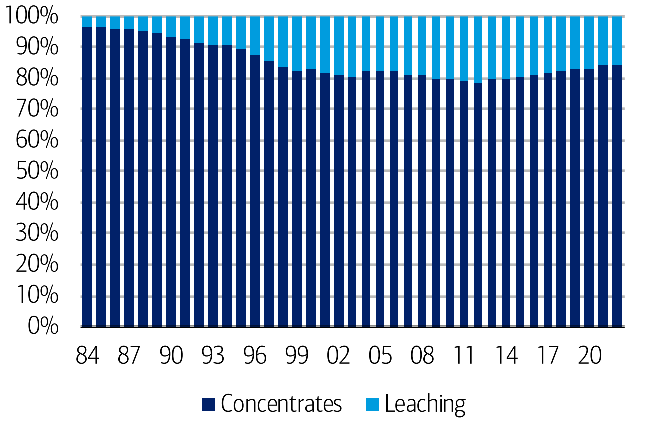
The picture is similar globally, with Exhibit 6 and Exhibit 7 outlining that supply from leaching operations will decline in the remainder of the decade. As such, and assuming that novel leaching will use existing infrastructure, the technology may need to reduce supply losses at traditional sites, before it can contribute to output increases.

Exhibit 6: Copper production by process
Leaching, i.e. solvent extraction/ electrowinning, has accounted for 20% of copper production, but its share is declining



Source: company reports, Woodmac, CRU, Platts, Bloomberg, BofA Global Research

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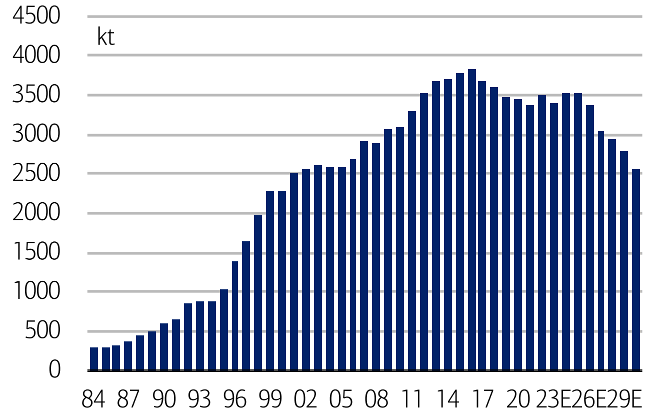
Exhibit 7: Leaching/ SX-EW production
The copper market will lose +1mt of production through the leaching route out to 2030



Source: company reports, Woodmac, CRU, Platts, Bloomberg, BofA Global Research

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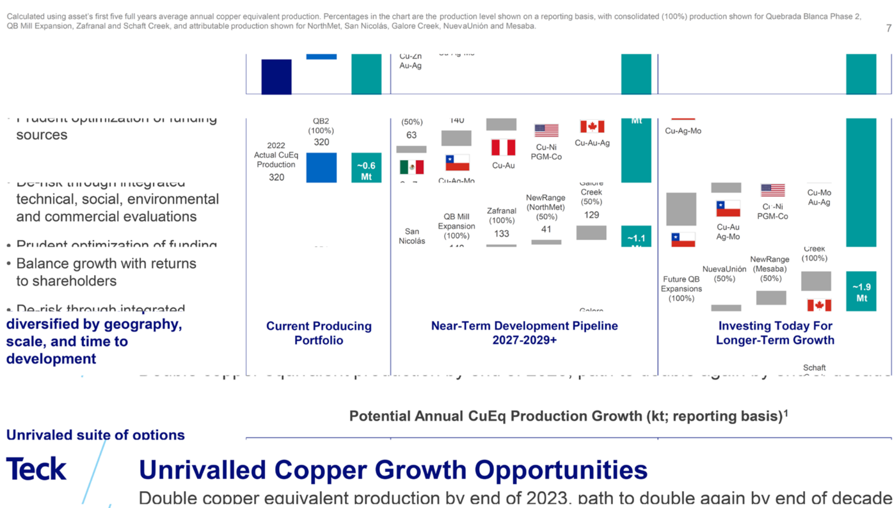
Remarkably, while operators like Glencore focus on M&A, others including Teck are building capacity (Exhibit 8), although this remains an exception.

Exhibit 8: Teck's project pipeline
Teck has proactively increased production



Source: Teck

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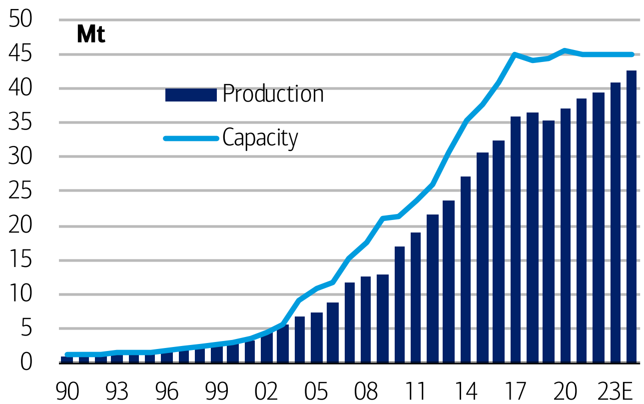
Aluminium – supply and demand are matching up

Alcoa sees 2023 aluminium balances on a knife edge., i.e., supply is matching up pretty well with demand. That said, CEO Roy Harvey noted that disruptions demonstrate that supply is challenging. Indeed, smelters in Yunnan, for instance, don't have hydro energy to operate, so 2mt of capacity is curtailed. He noted some uncertainty on how the situation in the province is shaping up, i.e., there are some concerns that the drought will persist, while there are also some indications that current rains will help ease the situation. At the same time though, the CEO acknowledged that China is starting to bump up against its 45 million tonne capacity cap, with the government not deviating from the need for an operating permit, i.e., smelters need to buy the permits from an already existing smelter rather than just ask for it from the government.

Exhibit 9: China, aluminium production and 45Mt cap
China's smelters are reaching for the capacity cap



Source: company reports, Woodmac, CRU, Platts, Bloomberg, BofA Global Research

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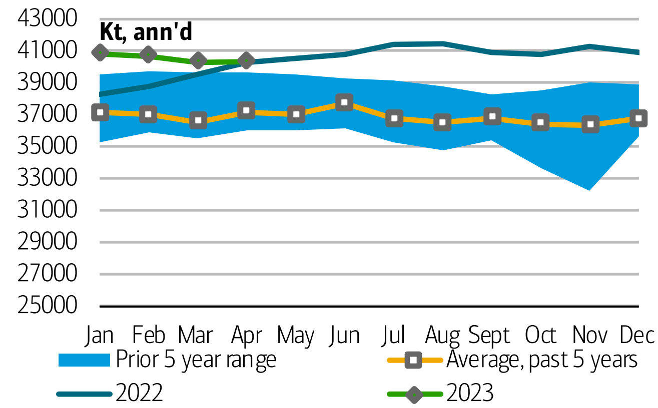
Exhibit 10: China, monthly aluminium production
China is punching well below its weight



Source: IAI, BofA Global Research

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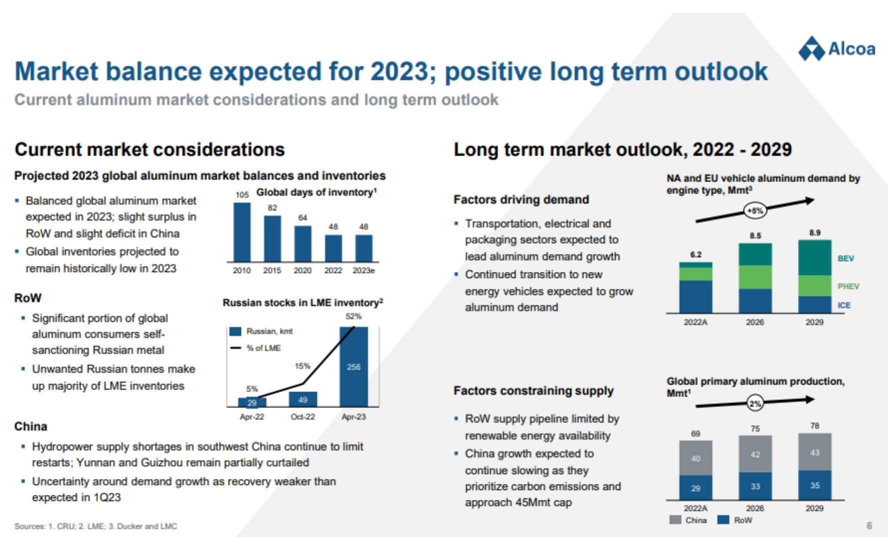
This means China will eventually either only convert old technology to new technology, as in Yunnan, or companies will start looking abroad. And when firms go outside of China, Alcoa noted they are faced with the same barriers that other operators have, e.g., availability of renewable energy is one concern, because no one really wants to run a coal-fired power plant connected to a smelter today. Beyond that, another question is how to build the associated infrastructure. As such, a lot of the advantages that Chinese companies enjoy at home, especially in terms of technology and infrastructure, don't necessarily hold true abroad.

Exhibit 11: Alcoa expects a balanced market for 2023
Demand is set to grow longer-term, but supply will be constrained



Source: Alcoa

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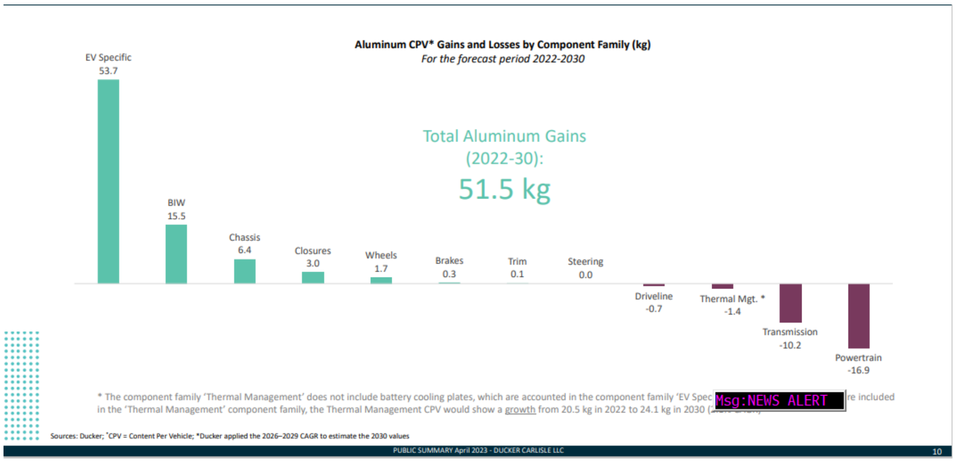
Some demand challenges especially in North America and China

Alcoa acknowledged demand challenges, with aluminium completely tied to the economic cycle and the uncertainty around growth in North American or China impacting how much is consumed. Alcoa also stated that European customers are more confident, which means they're buying with a little longer lead times. By sector, packaging and automotive are pockets of strength. Meanwhile, demand in North America is probably a little weaker, with the recent banking issues denting confidence. Six to nine months out, Mr Harvey estimated that consumption in North America will be a little weaker but still growing, i.e., it is neither really good, not really bad. As such, Midwest premiums continue to be relatively strong to attract imports. Notwithstanding, the medium- to longer-term outlook on usage looks promising, with aluminium embedded in the cars of the future, whether electric vehicles or combustion technology.

Exhibit 12: Aluminium demand gains in EVs
The highest aluminium gains will come from the 'EV Specific' family - nearly 54 kg more aluminium per vehicle will be needed in 2030 compared to 2022 for EV specific components. The need for additional aluminium content in BIW will also be significant - more than 15 additional kg



Source: Ducker/ European Aluminium; Aluminium Content in Passenger Vehicles (Europe) Assessment 2022 and Outlook 2026, 203

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Customers moved away from willingness to buy Russian metal

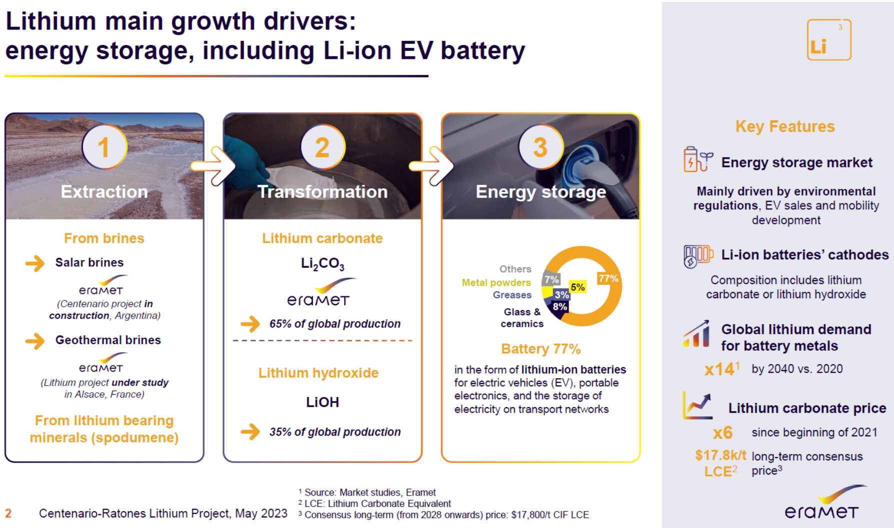
Touching on the war in Ukraine, Alcoa said that that a lot of its customers have moved away from the willingness to purchase Russian metal. Right now, sanctions are almost *de facto* for most consumers/ customers. Yet, until they are formally declared, for example, London Metal Exchange (LME) will not stop accepting Russian metal at its the warehouses.

According to the LME's latest set of figures, 52 percent of the material in LME warehouses is now of Russian origin, with the remainder mostly Indian metal. Mr Harvey also mentioned the headlines suggesting that Indian is metal going out, and Russian metal is coming in. The CEO added that, at some point, only Russian metal will be left in the LME warehouse, which will change dynamics in terms of the value of LME aluminium. Indeed, he said that the LME price point will become a discounted price for Russian metal. And, on top of that, the market needs to factor in larger premiums to reflect shortfalls in North America, but also in Europe. Ultimately, there is a risk that this erodes the basis for LME pricing.

Lithium – can supply keep up with demand?

Finally, with lithium demand growing exponentially, there has been a lot of focus on whether supply can keep up (Exhibit 13). We hosted Eramet, Pilbara and Sigma on our lithium panel.

Exhibit 13: Lithium demand growth drivers
Lithium demand is driven by EVs, but energy storage also matters



Source: Eramet

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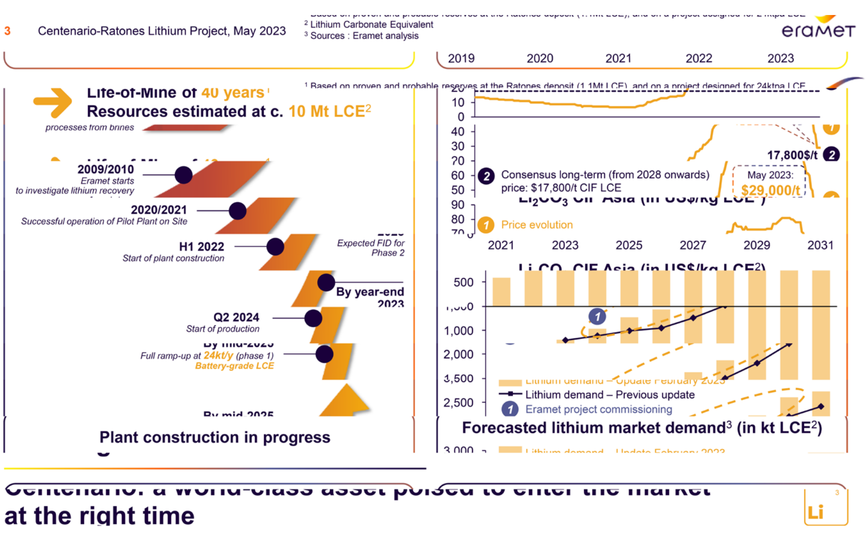
Eramet – Ratones project in construction phase

Eramet discovered its Ratones project in 2009, so has been working on it for 15 years, proceeding to construction over the past 18 months. The site will be run on Direct Lithium Extraction (DLE), with a 90% recovery, after 10 years spent on developing technology and process. DLE is more Environmental, Social, and Governance (ESG) friendly than traditional brine extraction, where water usage and recycling can be a challenge. Beyond that, Eramet is also focused on minimising waste generation. Phase 1 production is targeted at around 24kt of LCE (first quartile cash cost), but there is the potential to double/triple production to 75kt of LCE per annum in the next couple of years.

Exhibit 14: Production at Eramet and global demand
Eramet is ramping up production at the same time as demand is increasing



Source: Eramet

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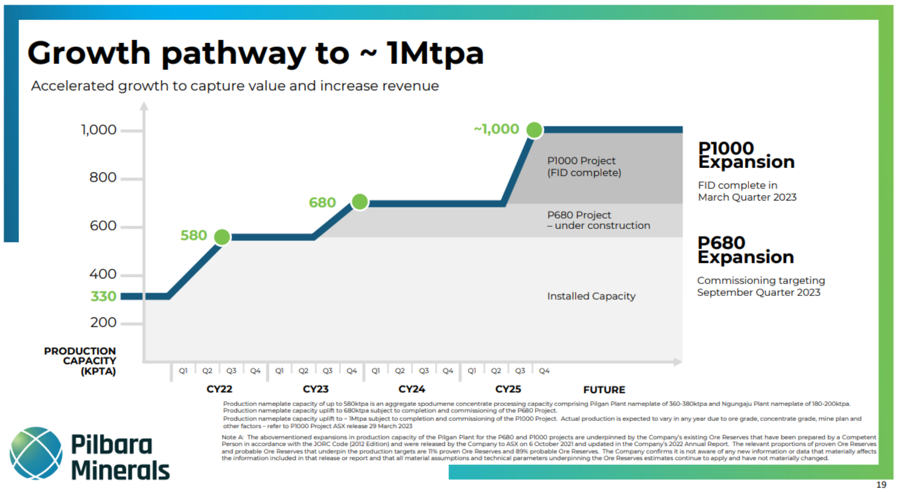
Eramet is operating at a well-established mining area. Economically, Argentina is a challenging location, with inflation close to 100%. The country has put in place measures to incentivize projects and protect foreign miners. As such, Eramet is unphased by operating in the South American nation.

Pilbara Minerals – to produce 8% of lithium supply this year

Meanwhile, Pilbara runs a hard-rock operation, which is gradually increasing output (Exhibit 16). The company's CEO Dale Henderson highlighted that that lithium hard-rock mining can be difficult on chemical complexities. In fact, he emphasized that, in contrast to widely held perceptions, that DLE may be easier than hard-rock mining: Flotation is more complex and is energy-intensive.

Exhibit 16: Pilbara Minerals production outlook
Pilbara Minerals is looking to gradually increase production



Source: Pilbara Minerals

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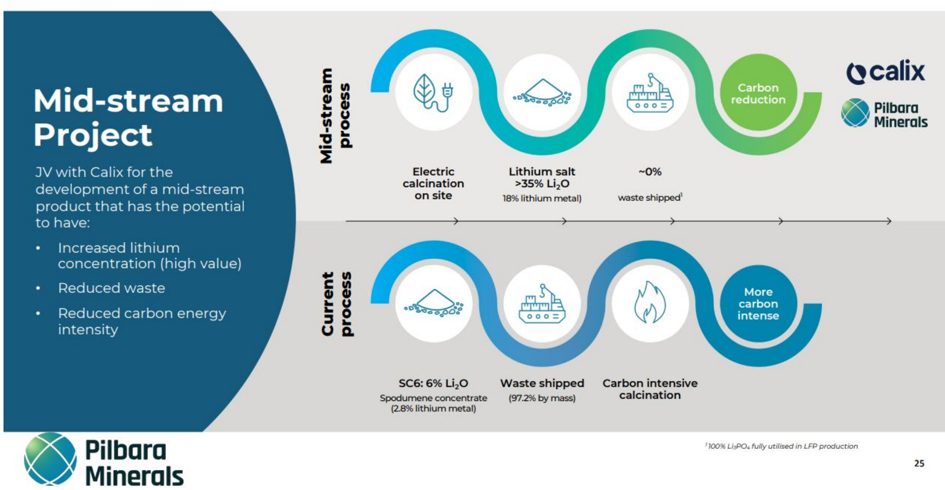
While Pilbara is focused on mining, it is also moving downstream, ultimately looking to dispatch a higher-value lithium salt, whose production is at the same time less onerous than producing battery grade material, so Pilbara is looking to hit a sweat spot.

Exhibit 17: Pilbara mid-stream projects
Pilbara is moving further downstream



Source: Pilbara Minerals

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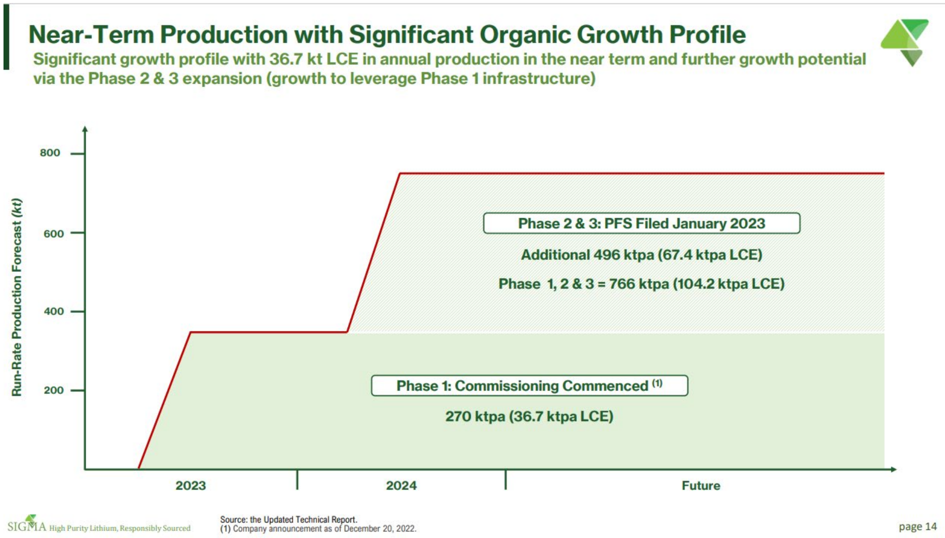
Sigma: America's next major lithium project

Sigma has large-scale green lithium hard-rock production, with high purity, high grade and the company is fully funded for production expansion. A key focus is dry stake tailings, with clean power and almost zero carbon.

The company started to produce in April, and is guiding for 130kt of lithium concentrate this year and 400kt in FY24. CEO Ana Gardner also highlighted that scale is important in lithium mining, as customers prefer to deal with large producers to ensure

stable supply.

Exhibit 15: Sigma production outlook
Sigma is gradually increasing production



Source: Sigma Lithium

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An interesting take-away from the miners is that they have no plans to imminently cut production even though prices decline further. There were suggestions that an oversupplied market may make assets cheaper – look out for further M&A!

Appendix

Exhibit 18: Price forecasts, fundamental drivers and risks
We are bullish on a range of cyclical commodities

Metal	2023E	2024E	Fundamental drivers	Risks (D = downside; U = upside)
Aluminium	$2,661/t 121c/lb	$3,500/t 159c/lb	• China is reaching for a 45mt capacity cap and smelters ex-China have closed capacity • China's smelters remain under pressure on hydro power shortages. At the same time, demand should pick up, so exports will likely remain capped. • We expect rising **deficits** going forward	• D: No production discipline in China/ World ex-China • D: China exports more • U: Smelter restraint and/or production disruptions reduce output • U: Stronger than anticipated demand growth
Copper	$9,427/t 428c/lb	$9,875/t 448c/lb	• Copper rallied as China re-opened. Yet, fundamentals need to catch up on seasonalities and a rebound of the economy • Demand in China has been patchy, but grid spending has completely offset weakness in housing. Demand may be more balanced in 2023, but it should hold up • Inventories are low, which is supportive, but could also increase volatility • We expect a small **surplus** for 2023	• D: China re-exports metal • D: Global demand slows sharply into next year • U: Strong restocking through the supply chain on improved confidence • U: Continued production disruptions in coming quarters
Lead	$2,108t 96c/lb	$2,000/t 91c/lb	• There are no immediate scrap and concentrates shortages, suggesting the market could flip back into surplus • China's demand has slowed structurally, as the ebike market has matured	• D: Destocking in China or higher lead exports from the country. • U: Strong seasonal demand for replacement batteries after cold/ hot winter/ summer months
Nickel	$23,222/t 1053c/lb	$21,250/t 964c/lb	• Nickel demand from electric vehicle producers should rise in the coming years, yet more NPI is being converted to nickel sulphate • China has built conversion capacity, which should take about 100Kt of Indonesian units into the refined market • Indonesian supply may prevent shortages near-term, but further out, more material is required • We expect a **surplus** for 2023, but **deficits** beyond	• D: NPI producers don't close shop; ore inventories last for longer and more ores are imported form the Philippines. • D: Faster ramp-up of Indonesian NPI production • D: Stainless steel demand remains subdued
Zinc	$2,905/t 132c/lb	$2,500/t 113c/lb	• The project pipeline is not well filled with high quality operations • Zinc may remain an underperformer, but immediate downside more limited, also because smelter closures in Europe have not been offset by supply additions elsewhere	• D: Unreported inventories exist on the zinc market. More metal could become available • D: The zinc market is fragmented. There is evidence that miners, especially in China, could consider further output increases
Gold	$2,009/oz	$2,061/oz	• Gold has been a trade on US rates. Banking volatility is not the same as a banking crisis. Yet, it may accelerate an end to the hiking cycle. This is bullish because gold is a trade on rates. • Central bank buying has been strong, but not sufficient; a Fed pivot may bring more investors into the market. • Gold to rally into year-end 2023.	• D: Deterioration of investor sentiment • D: Real rates become more positive; sustained USD rally • D: High gold prices deter buyers of physical gold; increased scrap supply
Silver	$24.55/oz	$25.75/oz	• The silver market has rebalanced on production discipline and demand from new applications including solar panels • As more spending on solar panels come through, silver should rally	• U: Investors returning to the market • U: China's imports to rise • D: ETF liquidation • D: More supply
Platinum Palladium	$1,186/oz $1,520/oz	$1,465/oz $1,632/oz	• Palladium is slowly moving into surplus, likely keeping prices capped. • Supply problems in South Africa have reduced platinum supply. The hydrogen economy and substitution should push the metal up	• D: Jewellery demand suffers due to rising prices. • D: In palladium, the risk of deliveries from Russian stockpiles has not gone away • D: Demand from key buyers like Europe not increasing • U: Production disruptions reduce availability of PT and PD
Iron Ore	$118/t CIF	$79/t CIF	• The iron ore market will likely be oversupplied in 2023. Yet, seasonal supply losses over La Nina in 1Q has already pushed prices above $120/t. • A restocking by mills may take them to $150/t by mid-year	• D: China's steel production slowing sharply • U: Mine closures/slowdown in production increases
HCC Thermal coal	$281/t $199t	$249/t $160/t	• Thermal coal prices to come under pressure as supply is increasing and the energy emergency normalises • A normalisation of supply should also contribute to lower met coal prices	• D: Lack of supply discipline • U: Chinese steel production stronger (HCC) • U: mine closures
Brent and WTI crude oil	$88/bbl $82/bbl	$90/bbl $84/bbl	• We project Brent and WTI to average $88/bbl and $82/bbl, respectively, in 2023. • The global oil balance should stay tight in 2023, supported by rebounding Asia demand, slower non-OPEC growth, and OPEC+ mopping up excesses. • We forecast global demand growth to slow to 1.8mn b/d YoY in 2023 from 2.3mn b/d in 2022. • Non-OPEC supply should grow roughly 1.6mn b/d YoY in 2023 from 1.9mn b/d in 2022. • We project total US crude and NGL supply to rise 1mn b/d in 2023 and 600k b/d in 2024. • OPEC crude oil supplies are set to rise 300k b/d in 2023 and remain about flat in 2024 as OPEC+ actively manages balances.	

Colours indicate our stance on each commodity: Green = bullish, Yellow = neutral, Red = cautious. 2020E/2024E = period averages. **Source:** BofA Global Research estimates

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Supply and demand balances

Exhibit 22: Aluminium supply and demand balance

Deficits set to increase

'000 tonnes	2021	2022	2023E	2024E	2025E
Global production	**67765**	**68356**	**70427**	**73628**	**74714**
YoY change	3.6%	0.9%	3.0%	4.5%	1.5%
Global consumption	**68693**	**69219**	**71960**	**75558**	**79336**
YoY change	7.6%	0.8%	4.0%	5.0%	5.0%
Balance	**-927**	**-863**	**-1534**	**-1930**	**-4622**
Market inventories	9142	8279	6745	4816	193
Weeks of world demand	6.9	6.2	4.9	3.3	0.1
LME Cash ($/t)	**2474**	**2706**	**2661**	**3500**	**3668**
LME Cash (c/lb)	**112**	**123**	**121**	**159**	**166**

Source: SNL, Woodmac, CRU, Bloomberg, company reports, IAI, BofA Global Research

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Exhibit 23: Copper supply and demand balance

Balanced market in 2023E

'000 tonnes	2021	2022	2023E	2024E	2025E
Global production	**24611**	**24918**	**25863**	**27184**	**27834**
YoY change	5.0%	1.2%	3.8%	5.1%	2.4%
Global consumption	**24825**	**25019**	**25811**	**26844**	**27918**
YoY change	3.6%	0.8%	3.2%	4.0%	4.0%
Balance	**-214**	**-101**	**52**	**340**	**-84**
Market inventories	1164	1063	1114	1454	1370
Weeks of world demand	2.4	2.2	2.2	2.8	2.6
LME Cash ($/t)	**9321**	**8822**	**9427**	**9875**	**10500**
LME Cash (c/lb)	**423**	**400**	**428**	**448**	**476**

Source: SNL, Woodmac, CRU, Bloomberg, company reports, ICSG, BofA Global Research

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Exhibit 24: Lead supply and demand balance

Lead should not be in short supply

'000 tonnes	2021	2022	2023E	2024E	2025E
Global production	**13183**	**13472**	**13712**	**13837**	**13908**
YoY change	4.5%	2.2%	1.8%	0.9%	0.5%
Global consumption	**13127**	**13343**	**13631**	**13938**	**14070**
YoY change	4.5%	1.6%	2.2%	2.3%	0.9%
Balance	**56**	**129**	**81**	**-102**	**-162**
Market inventories	706	834	916	814	652
Weeks of world demand	2.8	3.3	3.5	3.0	2.4
LME Cash ($/t)	**2200**	**2149**	**2108**	**2000**	**1750**
LME Cash (c/lb)	**100**	**97**	**96**	**91**	**79**

Source: SNL, Woodmac, CRU, Bloomberg, company reports, ILZSG, BofA Global Research

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Exhibit 25: Nickel supply and demand balance

Class 1 nickel may remain tight

'000 tonnes	2021	2022	2023E	2024E	2025E
Global production	**2799**	**3264**	**3521**	**3794**	**3970**
YoY change	8.1%	16.6%	7.9%	7.7%	8.9%
Global consumption	**2675**	**2670**	**3317**	**3779**	**3857**
YoY change	14.0%	-0.2%	24.2%	13.9%	10.5%
Balance, incl. NPI oversupply	**124**	**594**	**204**	**15**	**113**
Balance, excl. NPI oversupply	**4**	**145**	**62**	**-255**	**-236**
Market inventories	392	537	598	343	108
Weeks of world demand	7.6	10.4	9.4	4.7	1.5
LME price ($/t)	**18455**	**25707**	**23222**	**21250**	**25000**
LME price (c/lb)	**837**	**1166**	**1053**	**964**	**1134**

Source: SNL, Woodmac, CRU, Bloomberg, company reports, INSG, BofA Global Research

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Exhibit 26: Zinc supply and demand balance

Project pipeline not a significant risk

'000 tonnes	2021	2022	2023E	2024E	2025E
Global production	**14412**	**13500**	**14000**	**15150**	**15900**
YoY change	1.9%	-6.3%	3.7%	8.2%	5.0%
Global consumption	**13984**	**13837**	**14039**	**14334**	**14635**
YoY change	6.2%	-1.1%	1.5%	2.1%	2.1%
Balance	**427**	**-337**	**-39**	**816**	**1265**
Market inventories	1185	848	808	1624	2889
Weeks of world demand	4.4	3.2	3.0	5.9	10.3
LME Cash ($/t)	**3003**	**3482**	**2905**	**2500**	**2250**
LME Cash (c/lb)	**136**	**158**	**132**	**113**	**102**

Source: SNL, Woodmac, CRU, Bloomberg, company reports, ILZSG, BofA Global Research

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Exhibit 27: Iron ore supply and demand balance

Flipping back into surplus

Wet Mt	2021	2022E	2023E	2024E	2025E
Global production	**2,270**	**2,302**	**2,331**	**2,472**	**2,576**
YoY change	0.5%	1.4%	1.2%	6.1%	4.2%
Global consumption	**2,301**	**2,223**	**2,292**	**2,344**	**2,361**
YoY change	-0.5%	-3.4%	3.1%	2.3%	0.7%
Balance	**-32**	**79**	**39**	**128**	**215**
Iron ore price (US$/t)	**160**	**117**	**98**	**79**	**82**

Source: Company reports, CRU, Bloomberg, BofA Global Research estimates

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Exhibit 28: Platinum supply and demand balance

Substitution, a rebound of auto and hydrogen are all bullish

'000 ounces	2021	2022	2023E	2024E	2025E
Global production	**7767**	**7054**	**7054**	**8023**	**8220**
YoY change	21.4%	-9.2%	0.0%	13.7%	2.5%
Global consumption	**7888**	**6532**	**7458**	**7608**	**7962**
YoY change	11.5%	-17.2%	14.2%	2.0%	4.7%
Balance	**-121**	**522**	**-404**	**416**	**258**
Spot ($/oz)	1092	964	1186	1465	1453

Source: Matthey, company reports, BofA Global Research estimates

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Exhibit 29: Palladium supply and demand balance

Palladium will likely be oversupplied in the medium term

'000 ounces	2021	2022	2023E	2024E	2025E
Global production	**10,010**	**9,686**	**9,651**	**10,515**	**10,899**
YoY change	9.5%	-3.2%	-0.4%	8.9%	3.7%
Global consumption	**9,943**	**10,096**	**9,204**	**9,114**	**8,865**
YoY change	0.6%	1.5%	-8.8%	-1.0%	-2.7%
Balance	**67**	**-409**	**448**	**1,401**	**2,034**
Spot ($/oz)	2,399	2,110	1,520	1,632	1,564

Source: Matthey, company reports, BofA Global Research estimates

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Price forecasts

Exhibit 30: Commodity price forecasts

We are bullish aluminium, copper, gold and platinum

		Current	1Q23E	2Q23E	3Q23E	4Q23E	1Q24E	2Q24E	2022E	2023E	2024E	2025E	2026E	2027E	LT price
Base metals															
Aluminium	US$/t	2,245	2,445	2,450	2,750	3,000	3,250	3,250	2,706	2,661	3,500	3,668	3,097	2,494	2,369
	USc/lb	102	111	111	125	136	147	147	123	121	159	166	140	113	107
Copper	US$/t	7,915	8,956	9,250	9,500	10,000	10,500	10,000	8,822	9,427	9,875	10,500	9,607	8,523	8,315
	USc/lb	359	406	420	431	454	476	454	400	428	448	476	436	387	377
Lead	US$/t	2,073	2,131	2,200	2,050	2,050	2,000	2,000	2,149	2,108	2,000	1,750	2,110	2,493	2,638
	USc/lb	94	97	100	93	93	91	91	97	96	91	79	96	113	120
Nickel	US$/t	21,054	26,389	24,000	22,500	20,000	22,500	22,500	25,707	23,222	21,250	25,000	21,161	17,103	16,267
	USc/lb	955	1,197	1,089	1,021	907	1,021	1,021	1,166	1,053	964	1,134	960	776	738
NPI, 8-12%	CNY/t		1,000	1,000	1,000	1,000	1,032	1,032	1,424	1,000	1,032	1,062	1,117	1,175	1,210
Zinc	US$/t	2,259	3,122	3,000	2,750	2,750	2,500	2,500	3,482	2,905	2,500	2,250	2,482	2,729	2,841
	USc/lb	102	142	136	125	125	113	113	158	132	113	102	113	124	129
Precious metals															
Gold, nominal	US$/oz	1,954	1,885	1,950	2,000	2,200	2,300	2,000	1,803	2,009	2,061	1,900	1,965	2,036	2,088
Gold, real	US$/oz		1,885	1,950	2,000	2,200	2,244	1,951	1,803	2,009	2,011	1,808	1,805	1,801	1,800
Silver, nominal	US$/oz	23.16	22.47	23.24	25.00	27.50	26.00	27.00	21.80	24.55	25.75	23.50	26.12	28.93	30.16
Silver, real	US$/oz		22.47	23.24	25.00	27.50	25.37	26.34	21.80	24.55	25.12	22.37	23.92	25.56	26.00
Platinum	US$/oz	1,027	996	1,000	1,250	1,500	1,465	1,465	964	1,186	1,465	1,453	1,464	1,476	1,503
Palladium	US$/oz	1,442	1,578	1,500	1,500	1,500	1,632	1,632	2,110	1,520	1,632	1,564	1,527	1,489	1,503
		Current	**1Q23E**	**2Q23E**	**3Q23E**	**4Q23E**	**1Q24E**	**2Q24E**	**2022E**	**2023E**	**2024E**	**2025E**	**2026E**	**2027E**	**LT price**
Bulk Commodities															
Hard coking coal	US$/t fob	222	300	300	250	275	249	249	370	281	249	218	193	167	162
Semi-soft	US$/t fob	204	202	202	168	168	168	168	277	185	168	147	130	112	109
Thermal Coal	US$/t fob	160	256	177	179	184	181	166	357	199	160	125	108	91	87
Iron ore fines	US$/t CIF	98	110	150	120	90	79	79	120	118	79	82	85	89	91
Other materials															
Lithium spodumene	US$/t	3,250	5,950	4,500	5,000	4,700	4,000	3,500	4,498	5,038	3,375	3,250	2,429	1,488	
Lithium carbonate	US$/t	33,600	67,234	40,000	45,000	43,000	35,000	35,000	71,531	48,809	32,500	32,500	27,730	21,967	
Lithium hydroxide	US$/t	32,950	70,805	50,000	55,000	44,500	36,500	36,500	70,142	55,076	34,000	34,000	29,235	23,479	
Alumina	$/t	340	331	331	331	331	340	340	362	331	340	348	361	374	384
Uranium	$/lb		50.28	55.00	60.00	58.00	60.00	65.00	50.17	55.82	66.25	75.00	67.08	59.17	52.55
Molybdenum	$/lb	22	33.48	19.10	19.10	19.10	19.10	19.10	18.74	22.70	19.10	16.50	14.45	12.29	11.89
Cobalt	$/lb	15	18.51	18.51	18.51	18.51	18.51	18.51	31.04	18.51	18.51	18.51	18.92	19.38	19.81
Manganese ore	$/dmtu	5	5.67	5.67	5.67	5.67	5.52	5.52	6.06	5.67	5.52	5.65	5.86	6.09	6.25
Steel, HRC															
HRC, Europe	US$/t	643	832	970	722	714	727	729	950	809	729				
HRC, US	US$/t	1,135	948	1,268	992	827	772	827	1,122	1,009	849				
HRC, China	US$/t	535	558	556	575	571	568	585	663	565	595				
Energy		**Current**	**1Q23E**	**2Q23E**	**3Q23E**	**4Q23E**	**1Q24E**	**2Q24E**	**2022E**	**2023E**	**2024E**	**2025E**	**2026E**	**2027E**	**LT price**
Brent	US$/bbl	76.7	82.0	76.0	80.0	82.0	90.0	90.0	100.2	80.0	90.0	60.0	60.0	60.0	60.0
WTI	US$/bbl	72.4	76.0	72.0	75.0	77.0	84.0	84.0	95.3	75.0	84.0	57.0	57.0	57.0	57.0
Henry Hub	US$/MMBtu	2.3	2.7	2.3	2.8	3.3	4.0	4.0	6.7	2.7	4.0	2.6	2.6	2.6	2.6

Note: quarterly energy forecasts are period-end, rest are period averages; **Source:** BofA Global Research

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Key Market Data

Exhibit 31: Commodity prices, exchange rates, equity indices, yields and inventories
The China COVID reopening trade has fizzled out for now

Base metals	Cash, $/t	3-month, $/t	Cash, WoW change	3-month, WoW change
Aluminium	2,245	2,231	-2.1%	-2.3%
Copper	7,915	7,963	-2.6%	-2.6%
Lead	2,073	2,074	0.6%	0.9%
Nickel	21,054	21,228	1.2%	1.4%
Tin	24,803	24,607	-1.8%	-1.6%
Zinc	2,259	2,272	-7.8%	-7.6%
LMEX	3,600		-2.4%	
	Cash, c/lb	**3-month, c/lb**		
Aluminium	102	101		
Copper	359	361		
Lead	94	94		
Nickel	955	963		
Tin	1,125	1,116		
Zinc	102	103		
Other commodities, freight, exchange rates, equities and yields	**Spot**	**WoW change**		
Gold, $/oz	1,941	-0.8%		
Silver, $/oz	23	-3.2%		
Platinum, $/oz	1,026	-2.9%		
Palladium, $/oz	1,422	-3.4%		
Iron ore, China fines cfr $/dmt	104	-3.6%		
Brent, $/bbl	76	0.5%		
Baltic Dry Index	1,215	-13.3%		
EUR/USD	1.073	-0.4%		
Dow Jones Industrial Average	32,765	-2.3%		
10-year US Treasury yield	3.820	4.7%		
ICE BofA Commodity index, ER	395	-0.6%		
ICE BofA Commodity index Industrial Metals, ER	175	-2.7%		
ICE BofA Commodity index Precious Metals, ER	218	-1.0%		
ICE BofA Commodity index Energy, ER	447	-0.1%		
Exchange stocks and cancelled warrants	**Stocks, tonnes**	**WoW change**	**Canc. warrants, tonnes**	**Canc. warr., of stocks**
Aluminium				
LME	575,475	3.4%	177,275	30.8%
Shanghai	186,158	-8.9%		
Total aluminium	761,633	0.1%		
Copper				
LME	96,950	7.1%	350	0.4%
Comex	25,138	0.2%		
Shanghai	102,511	-13.4%		
Total copper	224,599	-4.0%		
Lead				
LME	35,475	4.6%	2,875	8.1%
Shanghai	25,617	-20.2%		
Total lead	61,092	-7.5%		
Nickel				
LME	38,916	-0.7%	2,406	6.2%
Shanghai	908	-47.7%		
Total nickel	39,824	-2.7%		
Tin	1,890	10.5%	145	7.7%
Zinc				
LME	63,450	33.5%	2,425	3.8%
Shanghai	54,698	-7.6%		
Total zinc	118,148	10.7%		

Source: BofA Global Research

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