

Global Metals Weekly

Green energy security meets metals reality

Nickel fundamentals are weak, and may stay that way

Nickel has been under pressure in recent months, as fundamentals have softened. Price declines have been accompanied by an increase in inventories. Not surprisingly, the weaker backdrop has also been mirrored by physical premia, which are trading well below the recent highs. Why has this happened? China, together with Indonesia, has boosted nickel supply, initially in nickel pig iron and chemicals, but refined nickel output is also increasing. China is now on the verge of becoming a net refined nickel exporter, when barely three years ago, its refined nickel imports accounted for 14% of total global supply. Unless China and Indonesia decide to cut supply, fundamentals on the nickel market will most likely remain weak.

Sino-Indonesian partnership dominates supply

Geopolitics and strategic interests are increasingly shaping metals. Indeed, Indonesia has become the dominant nickel producer, accounting for 55% of global supply, up from 7% in 2015. This large expansion has been heavily influenced by investment in industrial parks. Highlighting strong government interest, Morowali Industrial Park (IMIP) was signed off at a 2013 summit between China's President Xi Jinping, and Susilo Bambang Yudhoyono, the then President of Indonesia. Weda Bay Industrial Park (IWIP) is now ramping up production, bringing the largest nickel mine globally to the market. Indonesia has come a long way from exporting low value-added nickel ores. However, it is not done yet with its "downstreaming" industrial policy and has an eye on the EV battery industry.

Australia feels the heat; ups support for nickel producers

The Sino-Indonesian production ramp up has impacted Western miners, with BHP taking a \$2.5B write-down on its Western Australia assets, once seen as a potential "supplier of choice" to the car industry. Anglo American has written down its nickel business to zero. Western governments had adopted a 'hands-off' approach to mined resources, but this is changing. Indeed, Australia placed nickel on its critical material list, giving miners access to funding, Western Australia also cut royalties and the federal government is talking to peer countries about the strong ESG credentials of its producers.

US & EU looking at ways to make supply less concentrated

Meanwhile, the EU is looking to rewrite WTO global trade rules on industrial subsidies. It previously launched a trade case against Indonesia. Similarly, the US Department of Energy is also investigating ways to make its supply chain less concentrated, but beyond tapping partner countries, it is focussing also on innovation. The risk of deglobalisation, breaking up supply chains and tariff/non-tariff trade barriers is unlikely to go away any time soon; beyond that, ex-China is aware of how concentrated the supply chain is, so there is also a risk of nickel being engineered out of batteries.

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12663875

Timestamp: 27 February 2024 10:17AM EST

27 February 2024

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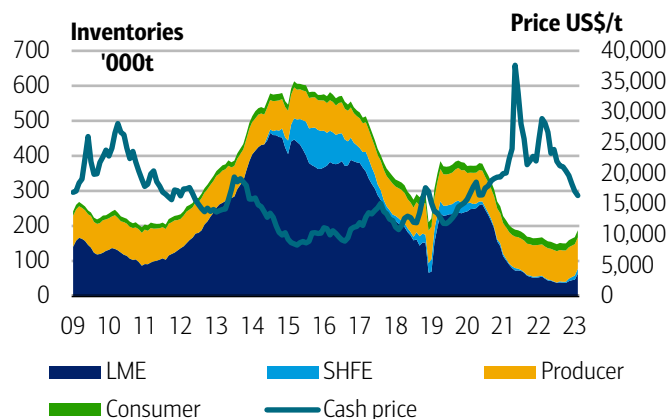
Sino-Indonesian nickel dominance

Nickel is no longer tight

Nickel has been under pressure in recent months, as fundamentals have softened. This is illustrated in Exhibit 1, which shows that price declines have been accompanied by an increase of inventories. Not surprisingly, the weaker backdrop has also been mirrored by physical premia¹, which are trading well below recent highs (Exhibit 2).

Exhibit 1: Nickel inventories and prices

Nickel prices have fallen as inventories have bottomed out

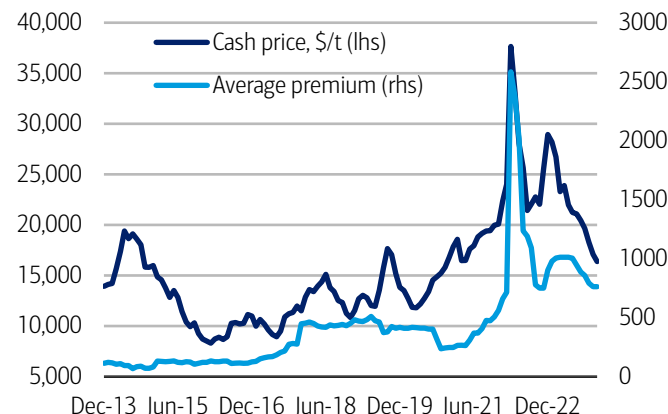


Source: Bloomberg, CRU, INSG, BofA Global Research

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Exhibit 2: Nickel prices and premia

The decline in nickel prices has been accompanied by falling premia



Source: CRU, BofA Global Research

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The domestic Chinese market has also eased

Nickel comes in different qualities: 1) Class 1 nickel is refined nickel traded on LME. 2) Class 2 nickel includes lower-grade ferronickel, but also nickel pig iron. Nickel pig iron is a low-grade alloy, invented in China as a cheaper alternative to pure nickel and used in the production of stainless steel.

Nickel is produced from sulphide and laterite ores. Sulphide ores are typically fire-refined in smelters. Laterite ores are often high-pressure acid leached (HPAL) to produce a high purity nickel, but can also be processed in rotary kiln electric furnaces to produce NPI or in smelters to produce ferro-nickel.

China's operators have invested in facilities that convert Class 2 NPI into nickel matte, a precursor material for battery-grade nickel sulphate

Fundamentals have eased in China too. Exhibit 3 highlights that domestic premia for refined nickel have fallen steadily. Why has this happened? There are a confluence of factors behind this dynamic but Exhibit 4 gives a first indication. The data shows that nickel sulphate, usually a premium product, traded at a negative differential to refined nickel at some stage, but that discount has now narrowed, as China's nickel manufacturers have been picking up spare units from the sulphate supply chain, converting them into refined nickel.

¹ Physical premia have to be paid on top of the quoted LME price; they can include items such as transportation cost and insurance. However, they are also an indicator for the tightness of regional markets.

Exhibit 3: Domestic physical premia

The premium on China's physical market over SHFE has declined



Source: Bloomberg, BofA Global Research

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Exhibit 4: China, nickel sulphate different to refined nickel

The nickel sulphate market is no longer as oversupplied as it used to be



Source: Bloomberg, BofA Global Research

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Indonesia is swamping the nickel market

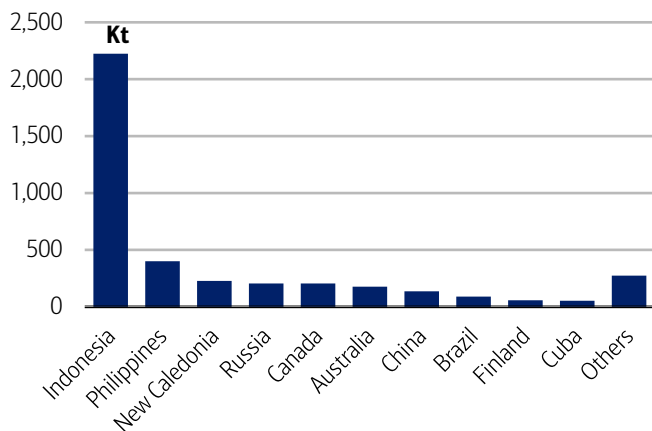
The rebalancing of the nickel market has been driven by sharp increases of Indonesian production through investment from predominantly Chinese operators.

Indonesia has strategically boosted nickel supply

The magnitude of that investment is revealed in Exhibit 5, which shows the extent to which Indonesia's nickel production dwarfs that of peer countries. Indeed, Exhibit 6 suggests that Indonesia now accounts for 55% of global nickel mine supply.

Exhibit 5: Nickel supply by country

Indonesia is the largest nickel producer



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

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Exhibit 6: Breakdown of nickel production by country

Indonesia accounts for 55% of nickel production



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

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Indonesia's nickel industry got turbo-charged in 2013, when the country signed an agreement with China to develop integrated-industrial parks². Worryingly for Western nickel producers and the nickel market, after all the success of that initiative so far, Indonesia is not done yet, more on this below.

When it comes to nickel products, Indonesia has taken the following path:

² Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ): Nickel for the Energy Transition – A Developmental Perspective

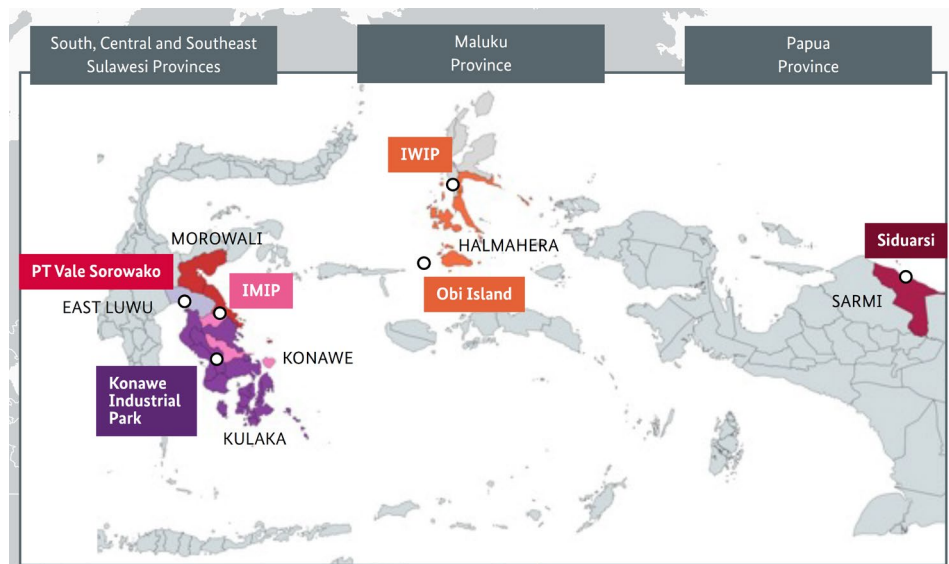
- After banning the exports of unprocessed nickel ores, operators built NPI facilities to provide feedstock for stainless steel mills. Accompanying that, Tsingshan built the world's largest stainless steel mill in Indonesia.
- As NPI supply increased, operators took the next step and converted the NPI into matte, which could then be processed into nickel sulphate.
- Pressure acid leaching sites that are producing a mixed hydroxide precipitate, which can be used to churn out nickel sulphate have also sprung up.

Three industrial parks stand out in the Sino-Indonesian investment push (Exhibit 7):

- **Indonesia Morowali Industrial Park (IMIP)** in Central Sulawesi
- **Indonesia Weda Bay Industrial Park (IWIP)** in North Maluku
- **Konawe Industrial Park**, which both began operation in 2020

Exhibit 7: Map of nickel assets in Indonesia

IMIP and IWIP are key assets



Source: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ): Nickel for the Energy Transition – A Developmental Perspective
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IMIP was the starting point, and keeps developing

The cooperation to develop IMIP was announced at a 2013 summit between China's President Xi Jinping, and Susilo Bambang Yudhoyono, then President of Indonesia, highlighting its strategic importance. During the trip, President Xi also referenced the Twenty First Century Maritime Silk Road. Of course, IMIP had appeal for both countries: China could gain access to nickel units, while Indonesia was able to move away from exporting unprocessed, low value-added nickel ores and develop a downstream industry.

According to Germany's Ministry for Economic Cooperation and Development, the total investment value of IMIP is estimated at \$7 billion, largely backed by Chinese banks, including China Eximbank and China Development Bank³.

The industrial park itself is a joint venture between China's Tsingshan and Indonesia's PT Bintang Delapan Development and was initially set up to produce nickel pig iron, a feedstock for stainless steel mills. Yet, the business model has since evolved and IMIP

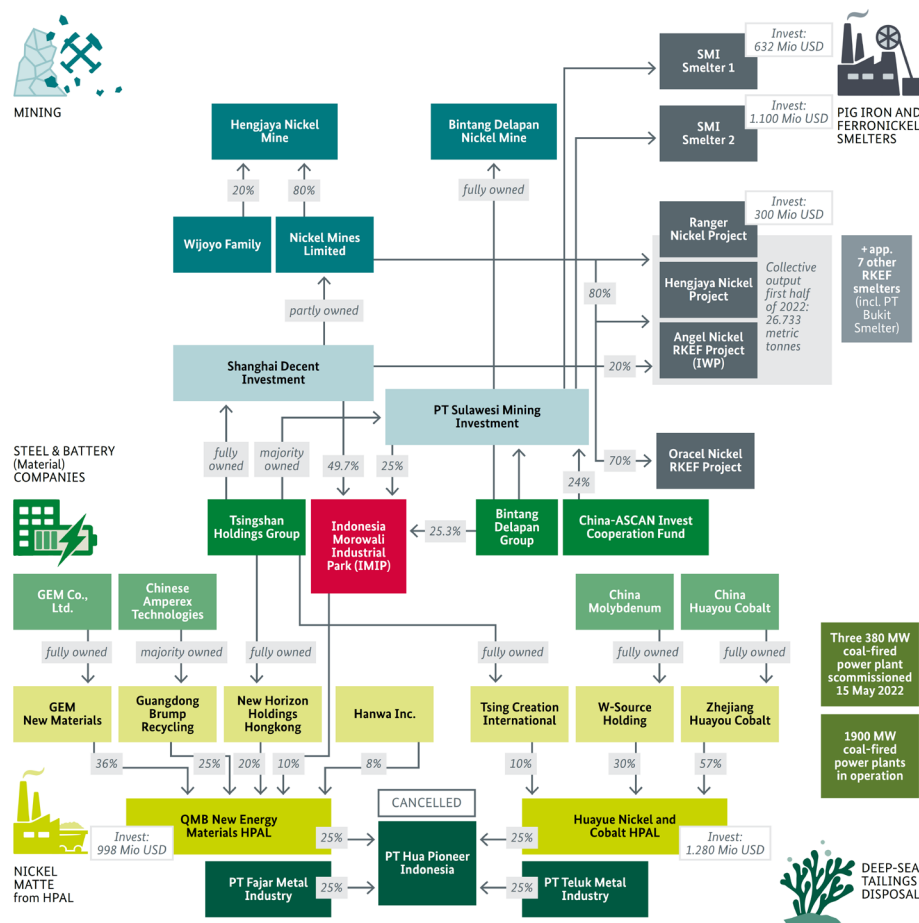
³ Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ): Nickel for the Energy Transition – A Developmental Perspective

has also become a production hub for battery-grade feedstock, as the following two HPAL projects have been launched:

- PT Huayue NiCo, which is owned by Tsingshan, China Molybdenum and Huayou Cobalt
- PT QMB New Energy Materials, owned by Chinese companies Jingmen GEM (GEM), Guangdong Brunp (CATL) and Tsingshan.

Exhibit 8: IMIP ownership structure

IMIP has evolved rapidly in recent years



Source: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ): Nickel for the Energy Transition – A Developmental Perspective

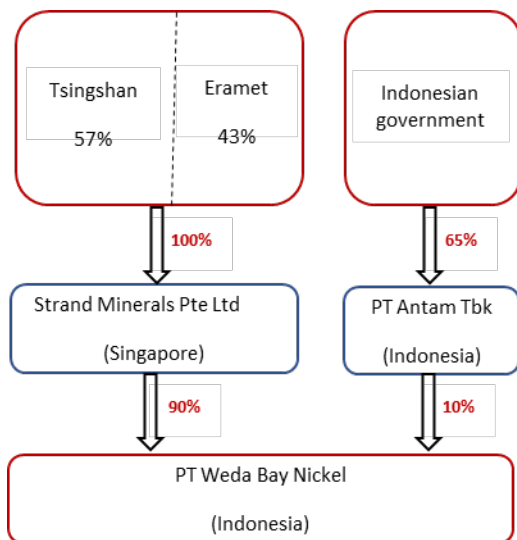
IWIP is now ramping up

Weda Bay Industrial Park (IWIP) on Halmahera Island in North Maluku Province has been the other major nickel hub coming online. The site began construction in 2018.

The Weda Bay operation is a partnership between Tsingshan, Eramet and the Indonesian government (Exhibit 9) and is set to become the largest nickel mine in the world, with a position in the first quartile of the industry cost curve (Exhibit 10). While Eramet will produce ferronickel, the mine is set up to supply several other plants onsite. Indeed, the commercial ore is hauled by truck from the mine to the storage areas of the metallurgical plant of the partnership or those of the industrial park of PT Indonesia Weda Bay Industrial Park (IWIP). These other nickel ferroalloy production plants also source their ore from PT Weda Bay Nickel, among other supply sources. For the latest note on Eramet, see [First take: FY23 Adjusted EBITDA beat](#).

Exhibit 9: Weda Bay ownership

Tsingshan and Eramet are key partners in Weda Bay

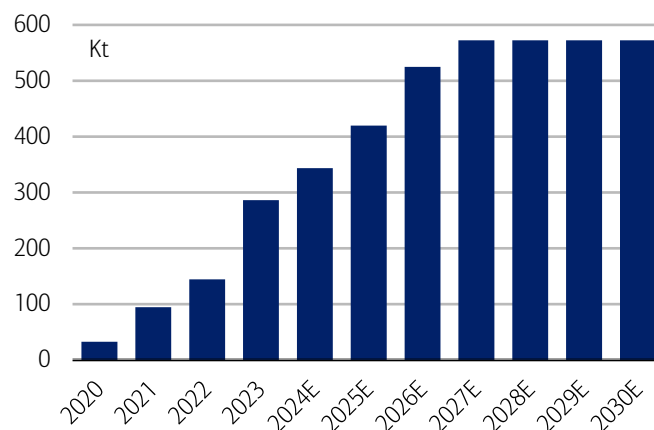


Source: Eramet, BofA Global Research

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Exhibit 10: Nickel production at Weda Bay

Weda Bay is set to become the largest nickel mine globally



Source: Eramet, BofA Global Research

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Konawe Industrial Zone is next

Finally, the government also established the Konawe Industrial Zone in Southeast Sulawesi, focusing on ferronickel development. The two main companies operating there are Virtue Dragon Nickel Industry and Obsidian Stainless Steel (OSS).

Indonesia is not done yet

After Indonesia started off as a nickel ore exporter to China, the government decided to build a more value-adding industry through a “downstreaming” industrial policy. While Indonesia has already come a long way, it is not done yet. Indeed, the creation of an integrated EV supply chain is at the core of Indonesia’s industrial policy, i.e., the country wants to operate all the way from mining/processing, to battery production and eventually EV manufacturing⁴.

To help facilitate this, the Indonesian government created Indonesia Battery Corporation (IBC), a state-owned enterprise, in 2021. Four SOEs have invested in the company, each with a 25% stake: PT Pertamina (the state oil/gas company); PT Perusahaan Listrik Negara (the state electricity utility); PT Indonesia Asahan Aluminium (the state aluminium company); and PT Timah (the state Tin mining company). As CSIS notes, IBC is expected to collaborate with foreign partners and to attract investment. The government is considering an export tax on nickel products with less than 70% nickel content (like ferronickel/nickel pig iron, but also MHP). It might also limit the construction of smelters producing nickel pig iron or ferronickel for steel production to optimise the use of its nickel resources for products for battery production. Ultimately, a roadmap published by the government outlines that Indonesia is looking to produce 600,000 units of four-wheeled EVs and 2.45 million units of two-wheeled EVs annually. Indonesia’s first EV battery cell plant, PT HKML Battery Indonesia, was opened in September 2021 by President Jokowi. It is the first EV battery plant in Southeast Asia. The project in Karawang, West Java, is a joint venture between Indonesia and South Korea’s Hyundai Motor Group and LG Energy Solution. Beyond that, the Indonesian government’s policies to encourage the development of an EV battery sector have stimulated interest and commitments from several leading battery producers, including Korea’s LG Chem, Samsung SDI and Chinese CATL, BYD as well as Japanese Panasonic.

⁴ Indonesia’s Nickel Industrial Strategy (csis.org)

Is Indonesia over-mining?

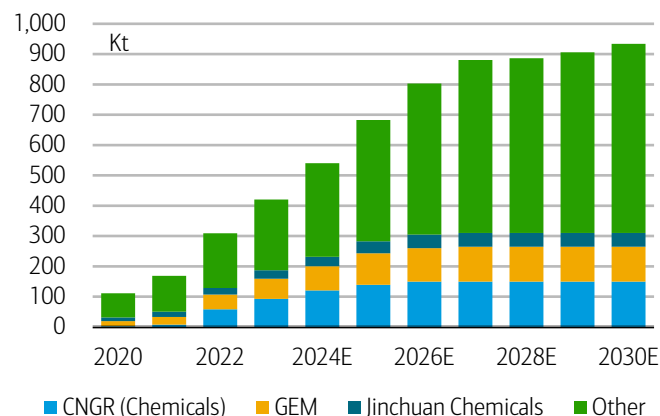
As nickel production is increasing rapidly, there have been concerns that the country's nickel reserves are being depleted. Ing Tri Winarno, the Director of Mineral and Coal Program Development at the Ministry of Energy and Mineral Resources, noted that the country has around 5 billion tons of nickel reserves, of which approximately 3.5 billion are high-grade nickel (saprolite) and another 1.5 billion are low-grade nickel (limonite). At the current rate, this suggests that Indonesia has 30 years of reserve life left, low by international comparison. The Ministry outlined that regions in eastern Indonesia are believed to hold significant untapped nickel potential.

China is no longer a significant refined nickel importer

The Sino-Indonesian partnership has also impacted domestic Chinese nickel production. Having initially prioritised investment in chemicals for China's electric vehicle industry, investors shifted focus and also boosted refining capacity, as the chemicals market has become oversupplied (Exhibit 12).

Exhibit 11: China, chemicals production

China boosted nickel feedstock for EV manufacturers

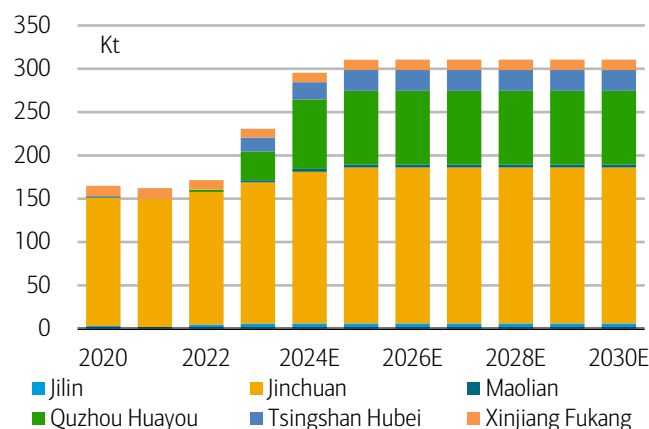


Source: company reports, Woodmac, CRU, INSG, BofA Global Research

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Exhibit 12: China, refined production

As the chemicals market has become oversupplied, China also boosted refined capacity



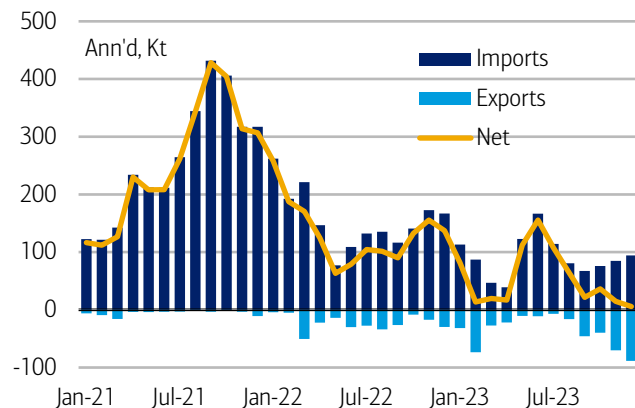
Source: company reports, Woodmac, CRU, INSG, BofA Global Research

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Of course, that investment also had an impact on China's interactions with the global market. This is mirrored by Exhibit 13, which shows that the country's refined nickel imports have declined steadily, at the same time as exports have risen.

Exhibit 13: China, refined nickel trade

China has become a net nickel exporter

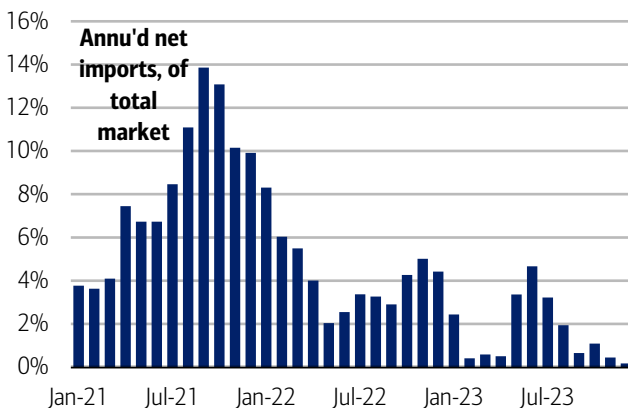


Source: Bloomberg, BofA Global Research

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Exhibit 14: China, net nickel exports of total market

At some stage, China's refined imports ran at 14% of global supply



Source: Bloomberg, BofA Global Research

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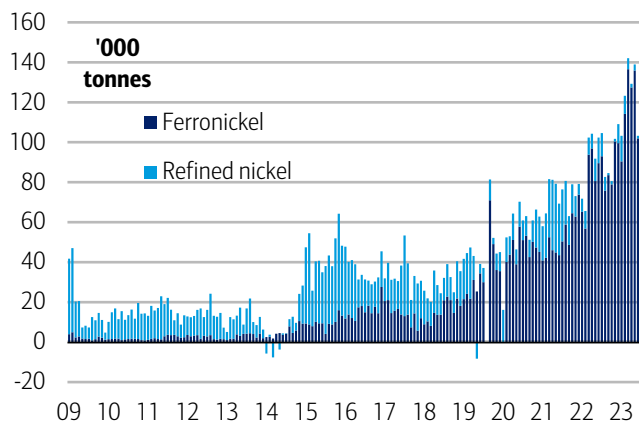
Indeed, just three years back, China refined nickel imports were equivalent to around 14% of total global nickel supply. This has now fallen to zero.

China also cuts nickel pig iron production

China's nickel consumers have taken full advantage of rising nickel production in Indonesia (Exhibit 15), which has put pressure on domestic NPI producers, as Exhibit 16 highlights.

Exhibit 15: China, nickel imports

China has boosted imports of Class 2 nickel

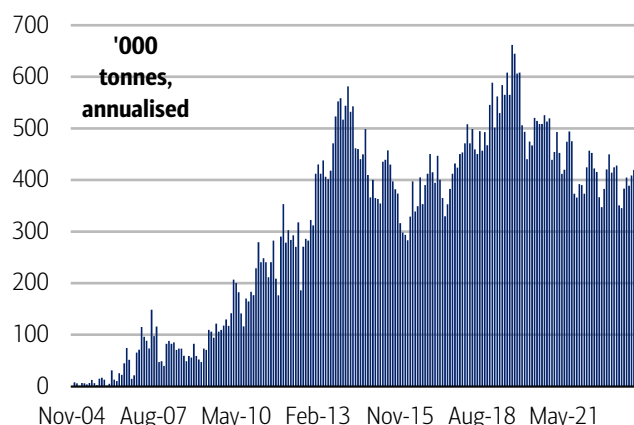


Source: Bloomberg, BofA Global Research

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Exhibit 16: China, nickel pig iron production

China's nickel pig iron production has declined



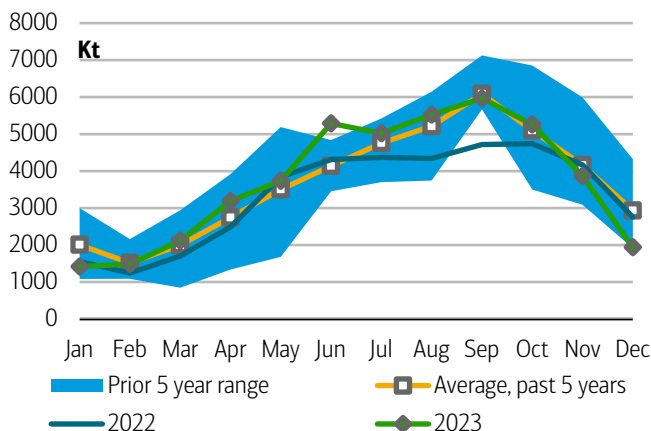
Source: Bloomberg, BofA Global Research

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Of course, pressure on domestic Chinese nickel pig iron production has also been driven by a ban on Indonesian nickel ore exports, meaning that concentrates purchases have remained within longer-term ranges (Exhibit 17). While the Philippines has become the supplier of choice (Exhibit 18), we note that the country cracked down on its nickel industry a few years back over environmental concerns. As such, further declines in Chinese NPI production could help reduce nickel oversupplies.

Exhibit 17: China concentrates imports

China's concentrates remain within longer-term ranges

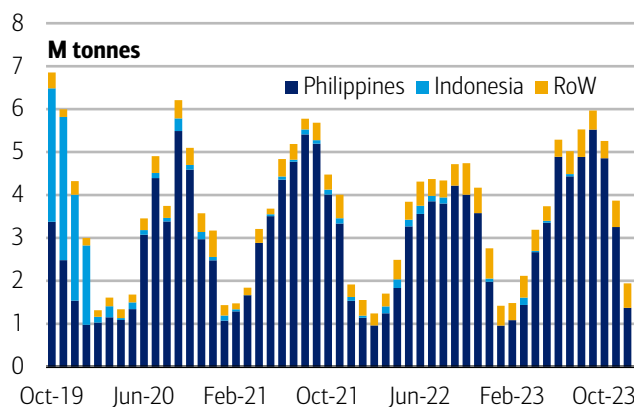


Source: Bloomberg, BofA Global Research

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Exhibit 18: China concentrates imports

Indonesia is no longer sending nickel units to China



Source: Bloomberg, BofA Global Research

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Governments are reacting

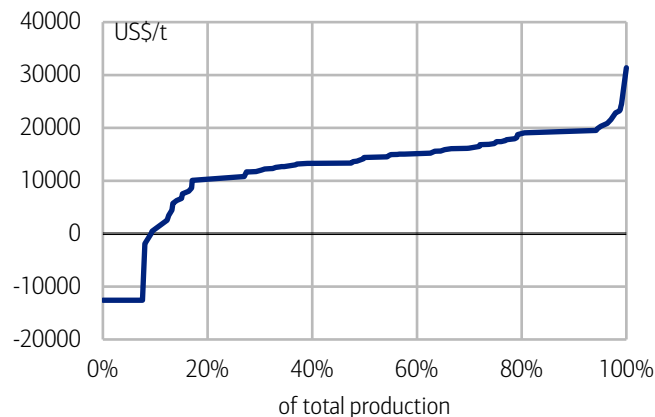
Australia places nickel on the critical raw materials list

While the Sino-Indonesian approach to develop an integrated nickel industry is strategic, building overcapacity is not always economic. Exhibit 20 illustrates this, aggregating the cost curve by country. The chart shows that Indonesia's emergence has flattened the

cost curve, an uncomfortable environment for producers, especially those that don't have the same strategic support as Chinese and Indonesian operators.

Exhibit 19: Nickel cost curve

Many nickel producers are not profitable with prices at \$16,000/t

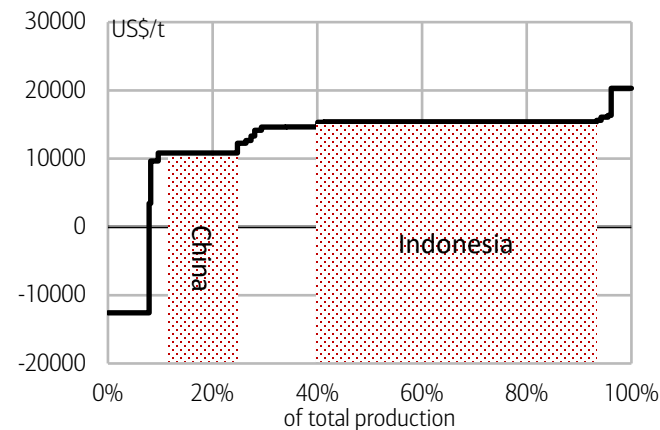


Source: Woodmac, BofA Global Research

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Exhibit 20: Nickel cost curve

The nickel cost curve has flattened



Source: Woodmac, BofA Global Research

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BHP writes down Nickel West

Just a few years back, BHP's Nickel West operation in Australia was seen as the "supplier of choice" of nickel sulphate for the Western EV industry. Yet, price declines over production increases from Indonesia/China have taken their toll.

This has been reflected in comments from BHP's CEO Mike Henry who said: "This is an uncertain time for the Western Australia nickel industry and we are taking action to address the current market conditions. We are reducing operating costs at Western Australia Nickel and reviewing our capital plans for Nickel West and West Musgrave. [...] BHP integrated the West Musgrave project (acquired from OZ Minerals) with the Nickel West operations to create the Western Australia Nickel business unit. [...] BHP will recognise a non-cash impairment charge of approximately US\$2.5 billion (post tax) (approximately US\$3.5 billion pre-tax) against the carrying value of Western Australia Nickel. Due to the deterioration in the short-term and medium-term outlook for nickel, BHP has lowered its nickel price assumptions. In addition, capital costs for Western Australia Nickel have increased due to inflation. The impairment reduces the carrying value of Western Australia Nickel's net operating assets to negative US\$0.3 billion, including closure and rehabilitation provisions of approximately US\$0.9 billion". See here for the latest note on [BHP](#).

Australia places nickel on its Critical Minerals List

Reacting to these headwinds, Australia's Resources Minister Madeleine King decided to put nickel on the Critical Minerals List⁵, giving nickel producers access to financing under

⁵ Nickel placed on critical minerals list | Ministers for the Department of Industry, Science and Resources

the \$4 billion Critical Minerals Facility⁶ and critical minerals-related grant programs, such as the International Partnerships Program⁷ (\$40 million).

Commenting on that decision, Minister King said that the “nickel industry faces substantial structural challenges that cannot be addressed overnight. The international nickel price is forecast to stay relatively low through 2024, and likely for several years to come until the surplus of nickel in the market is corrected. In the meantime, this puts further Australian nickel operations at risk. Given impacts to our domestic capacity and noting the broader market developments presently unfolding in the nickel sector, [...] we must be proactive in addressing the recent developments, including by adding nickel to the Critical Minerals List”. Notably, beyond the financial support, Australia is also looking at ESG, outlining that nickel is produced to higher environmental, social and governance (ESG) standards in Australia than at many of its competitors. Linked to that, Minister King said she had been discussing with international counterparts in US, Canada and EU to ensure the high standards applied in Australian mining and production of nickel and other critical minerals are reflected in future pricing on international markets. A key sentence in the reason of Australia’s government is that “Australian nickel producers must be able to compete fairly in international markets. We are determined to make this happen”.

This highlights that Western governments are switching from a laissez-faire, open-market approach and are increasingly ringfencing existing supply chains, while also building new ones to ensure access to raw materials critical for the energy transition. This has also been visible in the decision⁸ by Western Australia’s state government to support nickel producers through a “Nickel Financial Assistance Program”, which will deliver a 50% royalty rebate for 18 months, when prices are below \$20,000 per tonne, repayable over 24 months.

The EU is looking to redesign global trade rules

The European Union is also increasingly focused on creating a more level playing field. As Western nations have left a vacuum in supply chains, China has actively built a critical raw materials supply chain, often, as in Indonesia, with strategic financial support.

The EU recently outlined that China needs to play a constructive role in talks at the World Trade Organisation to reform global trade rules on industrial subsidies or risk that rivals will be setting their own policies at China’s expense. Indeed, European Trade Commissioner Valdis Dombrovskis noted that “It’s important what kind of position China takes in those discussions”; “if those issues are left unaddressed, then different countries will start addressing them one by one according to their own understanding and political dynamics”.

In January, Germany’s government said that it would give the KfW access to EUR1 billion in funds to support projects aimed at raw material extraction, processing and recycling.

⁶ [Critical Minerals Facility – Policies - IEA](#): The Australian government established the Critical Minerals Facility. The Facility is managed by Export Finance Australia and provides financing to projects that are aligned with the Australian Government’s Critical Minerals Strategy. The Facility has been funded with \$2 billion AUD to help projects suffering from gaps in private finance to overcome these gaps and get off the ground. The funding can come in the form of loans, loan guarantees, bonds and working capital support and is intended as a complement to commercial financing. In October 2023, Australia announced a AUD\$2 billion (USD1.3 billion) expansion in critical minerals financing as part of its effort to move toward clean energy and boost exports, doubling the capacity of Australia’s Critical Minerals Facility to finance mining and processing projects for materials vital to high-end manufacturing and industry

⁷ International Partnerships in Critical Minerals | business.gov.au: The International Partnerships in Critical Minerals Program provides critical minerals business up to \$20 million in funding to grow end-to-end supply chains with Australia’s international partners

⁸ Cook Government acting to protect WA nickel industry jobs | Western Australian Government (www.wa.gov.au)

The DoE investigates technological solutions

The US Department of Energy is also looking into raw materials supply chains, noting some of the obstacles. Interestingly, innovation features heavily.

The DoE confirms⁹ that high-quality nickel deposits are rare, while processing techniques are complex and energy-intensive. As such, possible options around resource constraints include the following:

- US deposits tend to be sulphide bodies, which are ideal for Class I nickel production, but further chemical/spatial exploration and characterisation of deposits and faster permitting processes are needed.
- Subsea nickel resources in US Pacific Territories could be explored, but this would need legal and regulatory support. There is also an opportunity to simplify the extraction process and reduce energy intensity by directly converting ore concentrate to nickel sulphate using electrochemical processes.

The DoE adds that most nickel refining is vertically integrated or located in China. To develop and expand nickel refining in the US, access to nickel intermediates or nickel concentrate from strategic international allies is necessary, with domestic mines in regions such as Minnesota and Michigan an alternative option.

That said, the Department of Energy also highlights that current nickel prices do not support investment in new mines and processing facilities with high capital costs, unless nickel prices reach closer to \$20/kg. As such, there are different possible approaches:

- A reduction in refining costs and plant size through innovations like deep eutectic solvents that could eliminate the solvent extraction stage. Alternate routes to produce battery grade nickel must also be explored. It should be noted that not all Class I nickel is battery grade (e.g., difficult to leach full plate cathode) and some Class II nickel is suitable as battery grade (e.g., mixed hydroxide precipitate).
- Recycling should also be a key focus for domestic production of nickel, given that 68% of nickel in consumption is from recycled sources. Hydrometallurgical recycling process involving solvent extraction, electro-refining and electrowinning can be used to extract nickel from secondary sources including spent lithium-ion and NiMH batteries. Nickel extraction from recycled batteries could have lower energy and chemical intensity efficient than ore refining because recycled batteries have lower levels of impurities and higher concentration of nickel.
- Finally, energy and chemical intensity of nickel could also be reduced by co-locating smelters, which significantly reduces transportation energy use, emissions, and costs. Nickel could be transformed into cathode precursors at the source site. Redesigning the process to recycle water run-off for material processing, recovering and using waste heat and steam within smelting and refining processes, eliminating tailings dam, and improving geological survey methods by leveraging artificial intelligence and data analytics are some other approaches suggested to reduce energy and chemical intensity of nickel production. Using renewable sources of electricity to power a variety of pyro-, hydro- and vapormetallurgy processes can reduce greenhouse gas emissions. Process optimisation and green chemistry could be explored as ways to reduce consumption of chemical reagents and minimise the quantities and impacts of mine tailings.

⁹ EERE Battery Critical Materials Supply Chain Workshop Read Ahead Document_DRAFT.pdf (energy.gov)

Appendix

Table 1: Commodity prices, exchange rates, equity indices, yields and inventories

Metal prices have stabilized

Base metals	Cash, \$/t	3-month, \$/t	Cash, WoW change	3-month, WoW change
Aluminium	2,138	2,180	-2.8%	-1.7%
Copper	8,475	8,568	0.8%	0.9%
Lead	2,106	2,096	1.6%	1.5%
Nickel	17,272	17,495	7.2%	7.0%
Tin	26,137	26,382	-2.4%	-2.2%
Zinc	2,367	2,405	0.4%	0.8%
LMEX	3,693		0.5%	
	Cash, c/lb	3-month, c/lb		
Aluminium	97	99		
Copper	384	389		
Lead	96	95		
Nickel	783	794		
Tin	1,186	1,197		
Zinc	107	109		
Other commodities, freight, exchange rates, equities and yields	Spot	WoW change		
Gold, \$/oz	2,035	1.1%		
Silver, \$/oz	23	-2.0%		
Platinum, \$/oz	902	-0.8%		
Palladium, \$/oz	976	2.6%		
Iron ore, China fines cfr \$/dmt	126	-3.7%		
Brent, \$/bbl	82	-2.2%		
Baltic Dry Index	1,866	15.9%		
EUR/USD	1.082	0.4%		
Dow Jones Industrial Average	39,132	1.3%		
10-year US Treasury yield	4.249	-0.7%		
ICE BofA Commodity index, ER	411	-1.5%		
ICE BofA Commodity index Industrial Metals, ER	174	0.7%		
ICE BofA Commodity index Precious Metals, ER	218	1.0%		
ICE BofA Commodity index Energy, ER	498	-2.1%		
Exchange stocks and cancelled warrants	Stocks, tonnes	WoW change	Canc. warrants, tonnes	Canc. warr., of stocks
Aluminium				
LME	581,800	8.8%	198,850	34.2%
Shanghai	173,482	65.6%		
Total aluminium	755,282	18.1%		
Copper				
LME	127,825	-2.2%	22,575	17.7%
Comex	25,932	14.9%		
Shanghai	181,323	109.6%		
Total copper	335,080	39.8%		
Lead				
LME	172,250	-3.0%	18,900	11.0%
Shanghai	50,142	32.9%		
Total lead	222,392	3.3%		
Nickel				
LME	69,972	-2.2%	4,356	6.2%
Shanghai	17,758	11.2%		
Total nickel	87,730	0.3%		
Tin	6,000	0.8%	1,140	19.0%
Zinc				
LME	268,600	1.4%	33,050	12.3%
Shanghai	88,611	163.8%		
Total zinc	357,211	19.7%		

Source: BofA Global Research

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Exhibit 21: Price forecasts, fundamental drivers and risks

We are bullish a range of cyclical commodities

Metal	2024E	2025E	Fundamental drivers		Risks (D = downside; U = upside)	
Aluminium	\$2,563/t 116c/lb	\$3,000/t 136c/lb	<ul style="list-style-type: none"> China is almost operating at its 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 has been strong, so exports will likely remain capped We expect rising deficits going forward 		<ul style="list-style-type: none"> 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	\$8,625/t 391c/lb	\$10,500/t 476c/lb	<ul style="list-style-type: none"> Demand in China has been patchy, but grid spending has completely offset weakness in housing. Demand may be more balanced in 2024, and should hold up. Copper to rally, if the government pushes leads to broader recovery Inventories are low, which is supportive, but could also increase volatility We expect a small surplus for 2024 		<ul style="list-style-type: none"> 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	\$2,000/t 91c/lb	\$1,750/t 79c/lb	<ul style="list-style-type: none"> There are no immediate scrap or concentrates shortages, suggesting the market could flip back into surplus China's demand has slowed structurally, as the ebike market has matured 		<ul style="list-style-type: none"> 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	\$18,750/t 851c/lb	\$20,000/t 907c/lb	<ul style="list-style-type: none"> 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 2024, with prices increasingly supported by costs 		<ul style="list-style-type: none"> D: NPI producers don't close shop; ore inventories last for longer and more ores are imported from the Philippines. D: Faster ramp-up of Indonesian NPI production D: Stainless steel demand remains subdued 	
Zinc	\$2,375/t 108c/lb	\$2,250/t 102c/lb	<ul style="list-style-type: none"> The zinc market has been better supplied, as demand from galvanisers has subsided Zinc may remain an underperformer, but immediate downside more limited, also because costs have shifted higher on inflation The surpluses could disappear, if more mine close 		<ul style="list-style-type: none"> 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	\$1,975/oz	\$2,150/oz	<ul style="list-style-type: none"> Gold has been a trade on US rates. The rally past \$2,000/oz subsided as the Fed signalled a resumption of rate hikes. Until the end of the hiking cycle is reached, gold prices will remain capped. If rate cuts come before 2Q24, gold could end next year at \$2,400/oz Central bank buying has been strong, but not sufficient; a Fed pivot may bring more investors into the market Gold to rally in 2H24 		<ul style="list-style-type: none"> 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	\$23.26/oz	\$24.75/oz	<ul style="list-style-type: none"> 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 Bottoming out of the global economy in 2024 should also help industrial demand 		<ul style="list-style-type: none"> U: Investors returning to the market U: China's imports to rise D: ETF liquidation D: More supply 	
Platinum	\$1,050/oz	\$1,250/oz	<ul style="list-style-type: none"> Palladium is slowly moving into surplus, keeping pressure on prices. More production discipline is necessary. Any supply cuts may reduce the palladium surpluses, but will likely push platinum into a deficit, so prices might diverge. PGMs are in a difficult spot. 		<ul style="list-style-type: none"> 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 	
Palladium	\$750/oz	\$500/oz				
Iron Ore	\$125/t CIF	\$90/t CIF	<ul style="list-style-type: none"> Iron ore inventories at China's mills are extremely low. Production cuts at mills, along with higher steel demand should support steel prices, likely pulling iron ore higher as well near-term 		<ul style="list-style-type: none"> D: China's steel production slowing sharply U: Mine closures/slowdown in production increases 	
HCC Thermal coal	\$270/t \$150t	\$215/t \$125/t	<ul style="list-style-type: none"> Thermal coal prices to come under pressure as supply is increasing and the energy emergency normalises Normalisation of supply should also contribute to lower met coal prices 		<ul style="list-style-type: none"> D: Lack of supply discipline U: Chinese steel production stronger (HCC) U: mine closures 	

Colours indicate our stance on each commodity: Green = bullish, Yellow = neutral, Red = cautious. **Source:** BofA Global Research estimates

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Exhibit 22: Commodity price forecasts

Copper and aluminium are stabilizing, we are still bearish lithium

		Current	1Q24E	2Q24E	3Q24E	4Q24E	1Q25E	2Q25E	2023E	2024E	2025E	2026E	2027E	2028E	LT price
Base metals															
Aluminium	US\$/t	2,138	2,250	2,500	2,750	2,750	3,000	3,000	2,268	2,563	3,000	3,250	3,015	2,781	2,546
	US\$/lb	97	102	113	125	125	136	136	103	116	136	147	137	126	115
Copper	US\$/t	8,475	8,000	8,500	8,750	9,250	10,000	10,000	8,442	8,625	10,500	9,500	9,539	9,578	9,617
	US\$/lb	384	363	386	397	420	454	454	383	391	476	431	433	434	436
Lead	US\$/t	2,106	2,000	2,000	2,000	2,000	1,750	1,750	2,156	2,000	1,750	2,024	2,217	2,409	2,602
	US\$/lb	96	91	91	91	91	79	79	98	91	79	92	101	109	118
Nickel	US\$/t	17,272	18,500	18,500	19,000	19,000	20,000	20,000	21,786	18,750	20,000	20,000	19,141	18,283	17,424
	US\$/lb	783	839	839	862	862	907	907	988	851	907	907	868	829	790
NPI, 8-12%	CNY/t		1,032	1,032	1,032	1,032	1,062	1,062	1,129	1,032	1,062	1,102	1,138	1,174	1,210
Zinc	US\$/t	2,367	2,500	2,500	2,250	2,250	2,250	2,250	2,648	2,375	2,250	2,424	2,596	2,769	2,942
	US\$/lb	107	113	113	102	102	102	102	120	108	102	110	118	126	133
Precious metals															
Gold, nominal	US\$/oz	2,033	1,950	1,950	2,000	2,000	2,100	2,100	1,924	1,975	2,150	2,096	2,095	2,094	2,093
Gold, real	US\$/oz		1,950	1,950	2,000	2,000	2,049	2,049	1,924	1,975	2,098	1,995	1,946	1,898	1,850
Silver, nominal	US\$/oz	22.57	22.50	23.00	23.53	24.00	24.50	24.50	23.20	23.26	24.75	26.07	27.18	28.30	29.42
Silver, real	US\$/oz		22.50	23.00	23.53	24.00	23.90	23.90	23.20	23.26	24.15	24.81	25.21	25.60	26.00
Platinum	US\$/oz	888	1,000	1,000	1,100	1,100	1,250	1,250	976	1,050	1,250	1,322	1,372	1,421	1,471
Palladium	US\$/oz	966	900	800	700	600	500	500	1,379	750	500	500	824	1,147	1,471
		Current	1Q24E	2Q24E	3Q24E	4Q24E	1Q25E	2Q25E	2023E	2024E	2025E	2026E	2027E	2028E	LT price
Bulk Commodities															
Hard coking coal	US\$/t fob	314	360	280	210	230	240	190	290	270	215	205	212	219	226
Semi-soft	US\$/t fob	153	238	185	139	152	158	125	220	178	142	135	134	133	132
Thermal Coal	US\$/t fob	125	148	148	151	153	125	125	176	150	125	112	112	113	113
Iron ore fines	US\$/t CIF	121	150	130	120	100	90	90	115	125	90	90	94	98	102
		Current	1Q24E	2Q24E	3Q24E	4Q24E	1Q25E	2Q25E	2023E	2024E	2025E	2026E	2027E	2028E	LT price
Other materials															
Lithium spodumene	US\$/t	850	850	500	500	750	1,000	1,500	3,821	650	1,438	1,750	1,650	1,550	1,450
Lithium carbonate	US\$/t	13,500	13,500	10,000	8,250	10,250	12,000	16,000	40,469	10,500	15,500	18,000	18,667	19,333	20,000
Lithium hydroxide	US\$/t	13,000	14,000	11,000	9,700	11,750	13,500	17,500	44,500	11,613	17,000	19,500	20,167	20,833	21,500
Alumina	\$/t	366	340	340	340	340	348	348	343	340	348	357	375	394	412
Uranium	\$/lb		75.00	77.50	80.00	80.00	75.00	75.00	58.91	78.13	75.00	70.00	65.00	60.00	55.00
Molybdenum	\$/lb	20.4	18.10	18.10	18.10	18.10	18.10	18.10	23.99	18.10	18.10	18.10	16.32	14.54	12.76
Cobalt	\$/lb	16.0	18.00	18.00	18.00	18.00	18.00	18.00	17.57	18.00	18.00	18.44	19.84	21.23	22.63
Manganese ore	\$/dmtu	4.20	4.35	4.35	4.35	4.35	4.35	4.35	4.79	4.35	4.35	4.93	5.52	6.11	6.70
Steel, HRC															
HRC, Europe	US\$/t	703	719	701	639	674	721	702	767	683	714				
HRC, US	US\$/t	970	1,130	1,020	882	805	799	799	975	959	799				
HRC, China	US\$/t	545	568	585	602	623	592	597	565	595	602				
		Current	1Q24E	2Q24E	3Q24E	4Q24E	1Q25E	2Q25E	2023E	2024E	2025E	2026E	2027E	2028E	LT price
WTI	US\$/bbl	76	73	75	77	75	57	57	79	75	57	57	57	57	57
Brent	US\$/bbl	81	78	80	82	80	60	60	83	80	60	60	60	60	60
Henry Hub	US\$/MMBtu	1.7	2.9	2.5	3.0	3.6	2.6	2.6	2.7	3.0	2.6	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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Supply and demand balances

Table 2: Aluminium supply and demand balance

Deficits set to increase

'000 tonnes	2022	2023	2024E	2025E	2026E
Global production	68,342	69,881	72,280	73,902	75,238
YoY change	1.4%	2.3%	3.4%	2.2%	1.8%
Global consumption	69,061	70,415	73,447	76,385	79,440
YoY change	0.7%	2.0%	4.3%	4.0%	4.0%
Balance	-719	-534	-1,167	-2,483	-4,203
Market inventories	8,576	9,120	7,953	5,470	
Weeks of world demand	6.5	6.7	5.6	3.7	
LME Cash (\$/t)	2,706	2,268	2,563	3,000	3,250
LME Cash (c/lb)	123	103	116	136	147

Source: SNL, Woodmac, CRU, Bloomberg, company reports, IAI, BofA Global Research
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Table 4: Nickel supply and demand balance

Nickel to be well supplied

'000 tonnes	2022	2023	2024E	2025E	2026E
Global production	2,918	3,309	3,801	4,171	4,529
YoY change	11.6%	13.4%	14.9%	10.0%	11.6%
Global consumption	3,087	3,287	3,468	3,833	4,127
YoY change	0.1%	6.5%	5.5%	8.9%	6.0%
Balance, incl. NPI oversupply	-169	21	333	338	402
Market inventories	223	244	577	915	1,318
Weeks of world demand	3.8	3.9	8.7	12.4	0.0
LME price (\$/t)	25,707	21,786	18,750	20,000	20,000
LME price (c/lb)	1,166	988	851	907	907

Source: SNL, Woodmac, CRU, Bloomberg, company reports, INSG, BofA Global Research
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Exhibit 23: Iron ore supply and demand balance

Flipping back into surplus

Wet Mt	2022	2023E	2024E	2025E	2026E
Global production	2,363	2,375	2,422	2,504	2,544
YoY change	2.2%	0.5%	2.0%	3.4%	1.6%
Global consumption	2,301	2,348	2,372	2,374	2,386
YoY change	-5.0%	2.1%	1.0%	0.1%	0.5%
Balance	63	27	50	130	157
Iron ore price (US\$/t)	120	115	125	90	90

Source: Woodmac, CRU, Bloomberg, company reports, BofA Global Research estimates
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Exhibit 25: Platinum supply and demand balance

Supply cuts could flip the market into a deeper deficit

'000 ounces	2022	2023	2024E	2025E	2026E
Global production	6,530	6,584	7,364	7,785	7,884
YoY change	-13.9%	0.8%	11.9%	5.7%	1.3%
Global consumption	6,057	7,231	7,411	7,516	7,662
YoY change	-22.8%	19.4%	2.5%	1.4%	1.9%
Balance	473	-647	-47	269	222
Spot (\$/oz)	964	976	1,050	1,250	1,322

Source: Matthey, company reports, BofA Global Research estimates
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Table 3: Copper supply and demand balance

Balanced market in 2023E

'000 tonnes	2022	2023	2024E	2025E	2026E
Global production	24,717	26,418	26,508	27,655	28,318
YoY change	1.5%	6.9%	0.3%	4.3%	2.4%
Global consumption	25,164	26,061	26,868	27,943	29,061
YoY change	0.9%	3.6%	3.1%	4.0%	4.0%
Balance	-447	357	-360	-288	-743
Market inventories	1,030	1,016	656	367	
Weeks of world demand	2.1	2.0	1.3	0.7	
LME Cash (\$/t)	8,822	8,442	8,625	10,500	9,500
LME Cash (c/lb)	400	383	391	476	431

Source: SNL, Woodmac, CRU, Bloomberg, company reports, ICSG, BofA Global Research
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Table 5: Zinc supply and demand balance

Project pipeline not a significant risk

	2022	2023	2024E	2025E	2026E
Global production	13,919	14,000	15,150	15,900	16,150
YoY change	-2.8%	0.6%	8.2%	5.0%	1.6%
Global consumption	13,607	13,513	14,104	14,400	14,703
YoY change	-3.2%	-0.7%	4.4%	2.1%	2.1%
Balance	312	487	1,046	1,500	1,447
Market inventories	3,482	2,648	2,375	2,250	2,424
Weeks of world demand	13.3	10.2	8.8	8.1	8.6
LME Cash (\$/t)	3,482	2,648	2,375	2,250	2,424
LME Cash (c/lb)	158	120	108	102	110

Source: SNL, Woodmac, CRU, Bloomberg, company reports, ILZSG, BofA Global Research
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Exhibit 24: Metallurgical coal supply and demand balance

Deficit to persist

Mt	2022	2023E	2024E	2025E	2025E
Global production	904	950	977	1,001	1,010
YoY change	-0.6%	5.1%	3.3%	2.4%	0.9%
Global consumption	925	971	993	991	1,003
YoY change	-1.4%	4.9%	2.3%	-0.2%	1.2%
Balance	-21	-21	-15	10	7
Met coal price (US\$/t)	365	290	270	215	205

Source: Woodmac, McCloskey, company reports, BofA Global Research estimates
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Exhibit 26: Palladium supply and demand balance

Rising surpluses ahead

'000 ounces	2022	2023	2024E	2025E	2026E
Global production	9,377	9,400	9,970	10,572	10,819
YoY change	-4.5%	0.2%	6.1%	6.0%	2.3%
Global consumption	9,829	9,710	8,771	8,434	8,024
YoY change	-3.2%	-1.2%	-9.7%	-3.8%	-4.9%
Balance	-452	-310	1,199	2,138	2,795
Spot (\$/oz)	2,110	1,379	750	500	500

Source: Matthey, company reports, BofA Global Research estimates
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Table 6: Lithium supply and demand balance

The lithium market is increasingly oversupplied

tonnes	2022	2023	2024E	2025E	2026E
Global production	657,337	897,532	1,245,682	1,704,066	1,986,158
YoY change	-2.5%	36.5%	38.8%	36.8%	16.6%
Global consumption	688,335	869,496	1,120,566	1,410,128	1,778,390
YoY change	48.5%	26.3%	28.9%	25.8%	26.1%
Balance	-30,998	28,036	125,115	293,938	207,768
Spot (\$/t)	71,531	45,980	10,500	15,500	18,000

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

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Table 7: Cobalt supply and demand balance

The cobalt market needs some supply cuts

tonnes	2022	2023	2024E	2025E	2026E
Global production	198,235	231,241	274,225	301,692	309,256
YoY change	25.4%	16.6%	18.6%	10.0%	2.5%
Global consumption	186,279	210,900	250,033	291,266	335,607
YoY change	17.0%	13.2%	18.6%	16.5%	15.2%
Balance	11,956	20,341	24,192	10,425	-26,351
Spot (\$/t)	68,428	38,733	39,681	39,681	40,652

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

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