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**Quintessentially
Nickel**

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KEY TAKEAWAYS

Earlier this year, we published a forecast that the nickel market would likely be in surplus this year. However, a series of supply curtailments together with exceptionally robust demand recovery and massive restocking throughout the value chain triggered by the logistical constraints have dramatically tightened the nickel market. As a result, we are now revising the 2021 market balance: we expect the market to swing to a -149 kt Ni deficit on the back of strong stainless and battery sectors as well as the significantly underperforming launch of Indonesian NPI capacities due to the COVID-related difficulties.

In 2022, we expect the market to swing to a +59 kt Ni surplus in the base case, mostly in low-grade nickel, and the high-grade nickel market is forecasted to be balanced with a risk of deficit. However, there is a high likelihood that the projected increase in supply could underperform yet again and the +20% YoY growth will not materialize, while nickel demand could remain as strong as it was in 2021.

<u>Nickel</u>	2020	2021E	2022E
Use	2.44 Mt +1%	2.85 Mt +17%	3.18 Mt +12%
Supply	2.53 Mt +5%	2.70 Mt +7%	3.24 Mt +20%
Market Balance	+82 kt	-149 kt	+59 kt
Low-grade Ni Balance	o kt	o kt	+59 kt
High-grade Ni Balance	+82 kt	-149 kt	o kt

Current nickel market tightness has led to dwindling LME nickel inventories (-143 kt Ni YTD), high market premiums across all shapes and locations, reopening of the SHFE/LME arbitrage window, which was continuously opened from July, and steep backwardation that amounted to over \$150/t Ni at the end of November.

Severe power curtailments in China have resulted in production halts across the whole nickel value chain, impacting both the supply and demand sides of the equation. In September, China's stainless steel production declined by -14% or -19 kt Ni MoM, although 300 series output, which generates higher margins and profitability, was less impacted than 200 less-nickel-containing series. However, lower nickel demand in September was more than offset by plunging Chinese NPI production (-29% or -12 kt Ni MoM) and lower NPI imports from Indonesia (-5 kt Ni MoM). As a result, Class 1 nickel demand in Chinese stainless steel has soared to 7 kt Ni (+4 kt Ni MoM) in September, while a growing share of nickel-intensive 8:1:1 battery chemistry helps mitigate the negative effect of PCAM production cuts, which was flat MoM in September. In October, the positive trend for Class 1 nickel use in Chinese stainless has been maintained (6 kt Ni or +3 kt Ni from August). So, according to our estimations, the power crunch has so far been net-positive for Class 1 nickel consumption in China.

On the one hand, the future nickel market balance will be dictated by the success of the NPI and HPAL production launches in Indonesia, although the reliance on one country poses a considerable risk to the market. On the other hand, long-term nickel demand will benefit from the developing EV sector driven by government incentives all over the world. In our base case scenario, we estimate the nickel consumption in batteries to grow above 1 Mt Ni by 2030 to 30% of total primary nickel demand, which may require further revisions given the continuous introduction of more ambitious carbon neutrality goals, subsidies-driven electrification and cost optimisation of the battery cell production. The battery value chain requires low carbon nickel units, which are likely to be in deficit considering the projected pace of electrification. Additionally, nickel's essential role as a critical metal for a low carbon economy is further enhanced by its ever-increasing usage in renewable energy.

MARKET BALANCE

Compared to our last report, we have revised the 2021 market balance from the initially expected surplus of +52 kt Ni to a -149 kt Ni deficit on the back of higher than expected recovery in stainless and robust demand from the battery sector along with slower than projected ramp-up of the Indonesian NPI capacities. In 2022, the market is expected to move to a mild surplus of +59 kt Ni, in our base case, but this figure remains vulnerable to possible underperformance of the planned aggressive NPI expansion in Indonesia.

For 2021, we raised our forecast of the primary nickel demand by +45 kt Ni to 2.85 Mt Ni. Lower stainless production in China (-2% YoY) caused by the power crunch is offset by the ramp-up of Indonesian stainless production (+90% YoY) and rampant nickel demand in the battery sector (+73% YoY), which benefits from exceptionally

strong BEV sales, while other non-stainless sectors are expected to grow by +7% YoY amid the post-COVID economic recovery and restocking across the value chain.

Our production forecast has been massively downgraded to 2.70 Mt Ni (-155 kt Ni) as the commissioning of Indonesian NPI capacities was slower than originally expected on the back of the COVID-related constraints at Tsingshan's Morowali and Delong projects. This is coupled with lower nickel metal production stemming from the strike at the Vale's Sudbury division and incidents in Norilsk as well as reduced FeNi production amid operational curtailments (Koniambo, Doniambo) and high energy prices (Kosovo's Ferronikeli).

In 2022, we expect the primary nickel consumption to reach 3.18 Mt Ni, rising by +12% YoY. It will be mainly driven by the growing stainless output (+9% YoY) with

some particularly strong growth in Indonesia (+14% YoY) and China (+10% YoY) and a moderate increase in Japan (+8% YoY) and Taiwan (+5% YoY). Robust nickel demand in batteries (+30% YoY) will be coupled with growth in other non-stainless applications (+7% YoY) alongside further improvements of the end-use demand.

This increase in consumption will be offset by a surge in the Indonesian NPI production (+32% YoY to 1.2 Mt Ni) and the production of nickel compounds for the EV market (+91% YoY to 390 kt Ni) upon the launch of the NPI-to-matte conversion facilities and HPAL projects, while Chinese NPI supply is expected to decline to 400 kt Ni in 2022.

As a result, we expect the market to flip to a mild surplus of +59 kt Ni in our base case, which will be concentrated in low-grade nickel due to the oversupply of NPI, while the high-grade nickel market will be more balanced with a risk of deficit. However, the market may yet swing back into the deficit as higher EV uptake and stronger stainless steel output could lead to a higher nickel demand, while the widely expected ramp-up of the Indonesian NPI capacities may underperform yet again because of the pandemic-related and operational constraints. In addition, this may be accompanied by further FeNi supply disruptions.

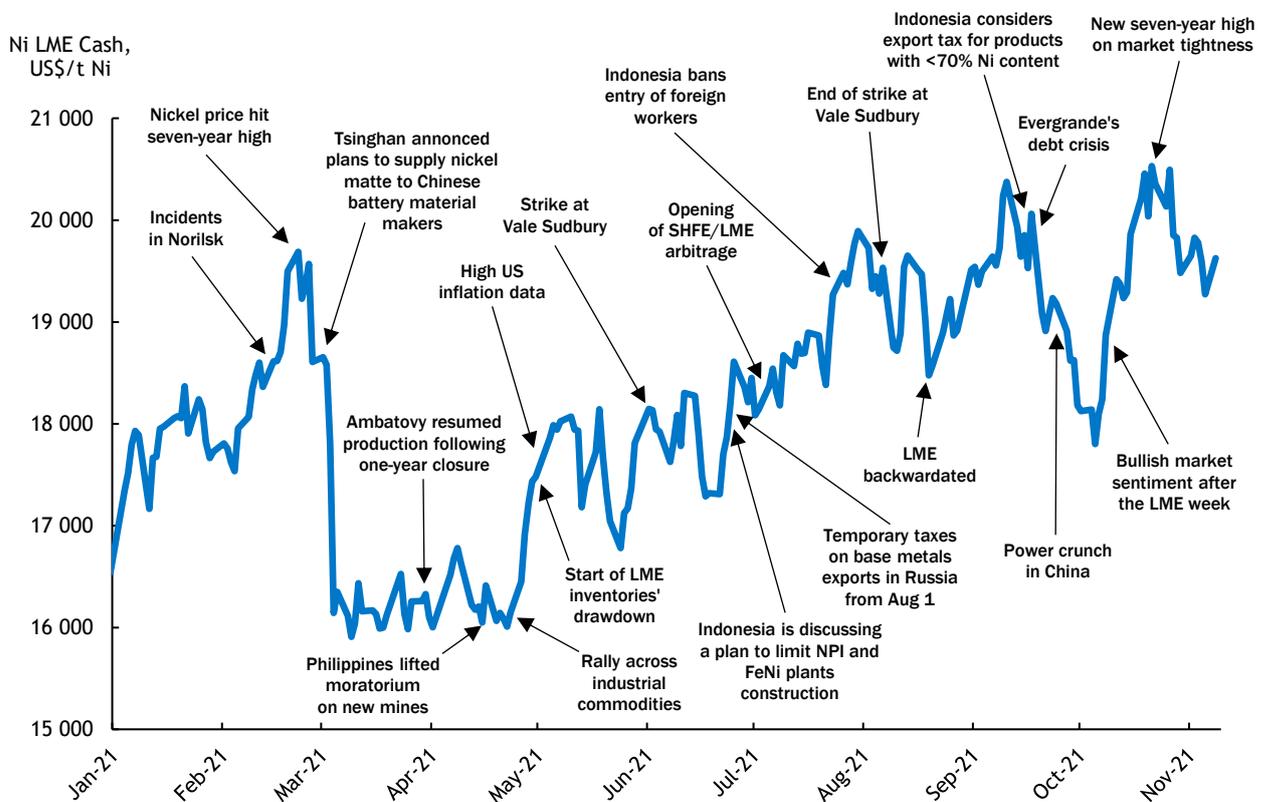
The current consensus is that the nickel market will swing to over 100 kt Ni surplus in 2023 onwards with deficits to

appear closer to 2030. This surplus results from the continuously growing Indonesian NPI production, partly being converted to matte, which will outpace the increasing demand from the stainless and battery sectors.

However, this surplus will predominantly fall on the Class 2 nickel side due to the oversupply of low-grade and high-carbon nickel units from Indonesian NPI.

On the one hand, Class 1 nickel will not be completely substituted from the stainless sector due to the minimum technical requirements and resilient demand in Europe and US, where the use of stainless scrap and low carbon Class 1 nickel is prioritised. On the other hand, nickel sulphate produced through the NPI process will not be fully integrated into the high-grade nickel battery value chain as many Asian producers technically rely on dissolution of Class 1 nickel and are less likely to change their production processes. *Given the environmental and economic constraints of the conversion, such as the possible negative netback between NPI and nickel sulphate prices and potential introduction of nickel carbon charges under the CBAM regulations, the commissioning of all announced NPI-to-matte capacities in Indonesia may not materialize. Thus, the forecasted surpluses are seem to be rather hypothetical with low probability.*

MARKET SENTIMENT



Sources: LME, NN Analysis

Following the May rally across all industrial commodities, the nickel price has still maintained its upside momentum. In the beginning of June, the nickel price was hovering around \$18,000/t but news that Russia is imposing temporary taxes on the exports of base metals and Indonesia is considering restrictions on the construction of new NPI and FeNi plants together with renewed worries that the rising number of COVID cases could have a negative impact on the country's nickel output caused the LME nickel price to hit a 5-month high of \$20,000/t Ni at the end of July.

In August, the increased price volatility was buoyed by some concerns over the spread of the COVID delta variant potentially hitting the global economic recovery. A month later, despite hawkish comments from the Federal Reserve, the nickel price surged to a seven-year high of \$20,400/t Ni on September 10, as strong market fundamentals and falling LME stocks increased the speculative demand. However, the Evergrande's debt crisis and widespread power curtailments in China eventually sent the price to below \$18,000/t – the lowest level since June.

The LME Week revealed the optimism of the market participants and triggered a price rally revival amid bullish sentiments among the traders and new supply concerns ranging from Vale's reduced production guidance and temporary suspension of Onça Puma's FeNi operations as well as unfavourable weather in the Philippines hitting the mine output in Q4. As a result, the LME nickel closed above \$20,500/t Ni in the end of October.

Nickel stocks. A significant drawdown of the exchange inventories is seen this year, with its notable acceleration in the second half of the year. Currently, the stocks stand at 122 kt Ni, -143 kt Ni YTD, which is the lowest level since January 2020. This has supported both the strong demand and the upward momentum in prices. Most of this inventory has likely gone into China in order to be used in the battery sector, given the strong NEV sales and the shortage of intermediates for the nickel sulphate production. The share of cancelled warrants (earmarked for physical delivery) has grown to 45% (from the normal level of 25-30%) and to over 50% for briquettes.

Nickel market premiums increased across all shapes and locations on the back of robust consumer demand and tight supply. Logistical bottlenecks (high freight costs,

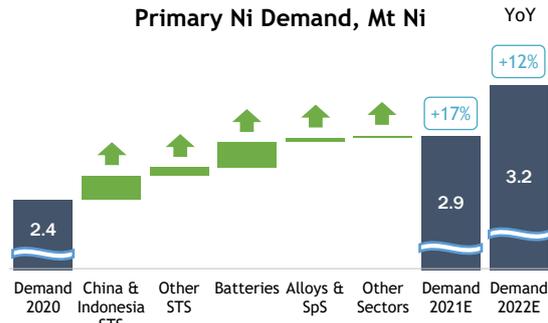
shortage of available containers, difficulties in securing vessel space, major sea-routes' disruptions) and higher cost of financing also put upward pressure on premiums adding to the inflationary effects. Particularly, the significant shortage of briquettes as well as other small shapes persists due to the strong demand from the battery sector and restocking across the value chain. Market participants are also increasingly aware of the emerging tightness in the availability of briquette warrants in the LME warehouses in Asia. According to Fastmarkets, some customers have begun accepting brands that had never been previously wanted or warrants for metal produced as far back as in 2012, while fresh cargoes in South Korea, Japan and Taiwan are being offered at a premium as high as \$1,000/t Ni.

Since July, **the SHFE/LME nickel arbitrage** has been continuously open indicating strong demand for nickel metal in China. The opening of the arbitrage window has underpinned the increasing FPC premium in China with some deals concluded above \$400/t Ni, which is the highest level since 2019. Currently, the arbitrage against Feb 2022 SHFE contract is in a negative zone close to -\$300/t Ni, although it may potentially swing back into the positive territory given the tight supply and resilient nickel metal demand from non-stainless applications

In October, **the FeNi discounts** in China significantly narrowed with some deals concluded even at a premium as a result of the tight FeNi supply amid the temporary suspension of Brazil's Onça Puma and the energy-related halt of Kosovo's Ferronikeli as well as the elevated NPI prices on the back of the reopening of some stainless steel mills after the earlier power cuts. FeNi CIF China was traded with a premium for the first time since Aug 2018 (by mid-2018, FeNi began to lose its appeal as a raw material input for stainless steel due to oversupply and lower NPI prices).

Not only the ever dwindling LME inventories and growing premiums, but a steep backwardation exerts further pressure on the nickel market. **The backwardation**, sustained from mid-August, has recently hit the \$200/t Ni mark. This reflects the persistent supply tightness and robust demand for the spot metal.

DEMAND

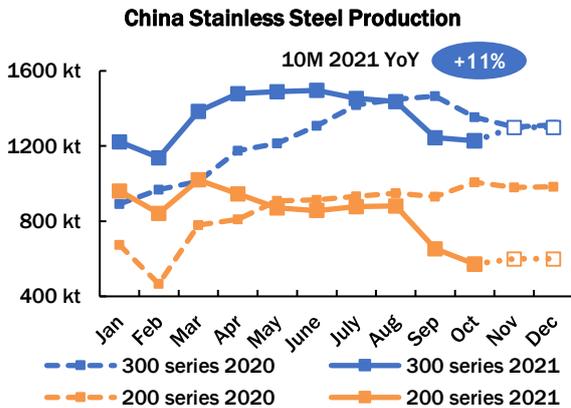


Source: NN Analysis

STAINLESS STEEL

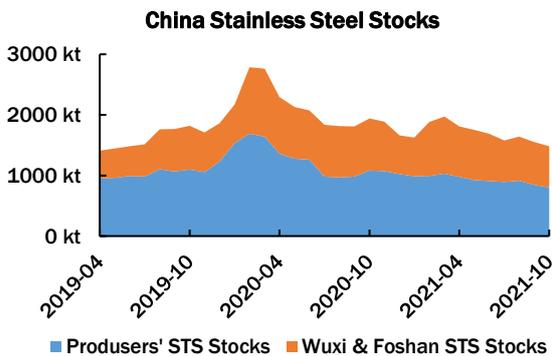
China

In the first half of 2021, China's stainless steel sector was exceptionally strong, and 300 series production grew by impressive +25% YoY.



Source: Zljsteel

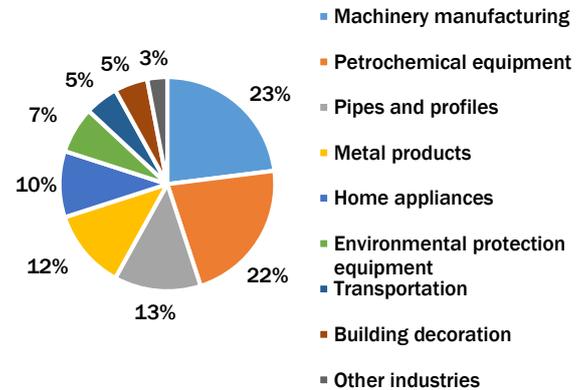
Despite the significant growth in stainless production, stocks in Wuxi and Foshan warehouses have been steadily declining on the back of robust consumer demand.



Source: Zljsteel

Below is the split of stainless steel end-use sectors in China. Our end-use study shows that machinery manufacturing and petrochemical equipment are the two main stainless steel consumers in the country. Each of those sectors increased its consumption by more than 1 Mt in January-August 2021.

Stainless End-Use in China in 8M 2021



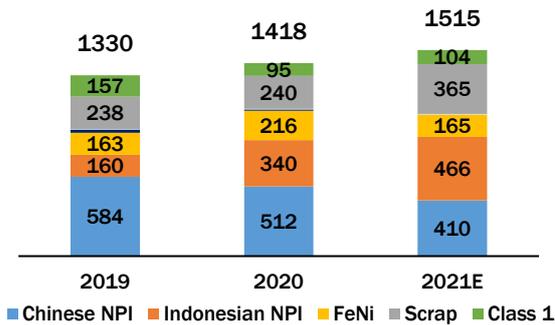
Stainless End-Use in China in 8M 2021, YoY

Building decoration	+198%	+775 kt
Home appliances	+70%	+962 kt
Pipes and profiles	+29%	+681 kt
Petrochemical equipment	+25%	+1,017 kt
Machinery manufacturing	+24%	+1,054 kt
Metal products	+2%	+55 kt
Environmental protection equipment	-7%	-131 kt
Transportation	-34%	-598 kt

Sources: Daming, NN Analysis

The stimulus programme launched by the Chinese government in 2020 has led to the construction boom, resulting in a threefold increase in stainless steel use in building and construction. However, we don't expect this trend to be maintained, as the government has recently started to take steps to reduce the burden of loans in the real estate business. It has also imposed restrictions on land sales to cool down the market. As a result, Evergrande Group as well as other big developers, have faced severe financial difficulties. A further decline in the construction of new properties is expected through the end of 2021 and, potentially, next year. Given the current situation, we don't expect building and construction to remain the key driver of growth from 2022 onwards. At the same time, stainless steel consumption by transportation industries has significantly declined due to lower demand from the automotive and shipbuilding sectors.

China Stainless Steel Demand, kt NI



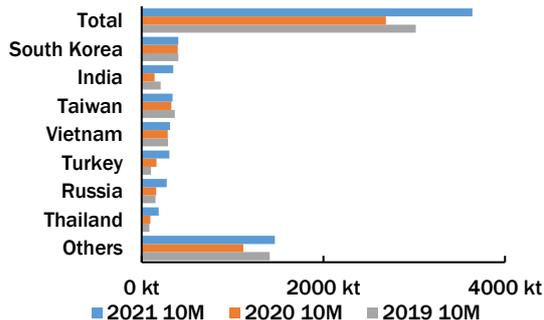
Sources: Mysteel, BGRIMM, ZIJSTEEL, NN Analysis

An increase in stainless steel production has led to a growing demand for additional nickel units. *Due to a decline in the Chinese NPI output, FeNi imports and lower than expected Indonesian NPI supply, we see robust Class 1 nickel consumption and a significant increase in the scrap ratio from 17% in 2020 to 24% in 2021.*

In the second half of 2021, 300 series production in China has lost its momentum because of chromium shortages caused by nationwide shutdowns in order to meet China's carbon emission target as well as lower supply from South Africa due to the power supply issues and logistical constraints. As a result, 300 series output decreased by -1% YoY in August. In September, production slumped by -15% YoY due to the power crunch, followed by a -9% decline in October. However, we expect that the measures taken by the government (described in a separate section below) will stabilize China's electricity supply in November-December, and 300 series output in Q4 will only be -4% lower on annual basis.

Overall, we expect the full year Chinese primary nickel consumption in stainless to decline by -2% YoY, which translates into 1,150 kt Ni.

China Stainless Steel Exports



Source: Trade Data

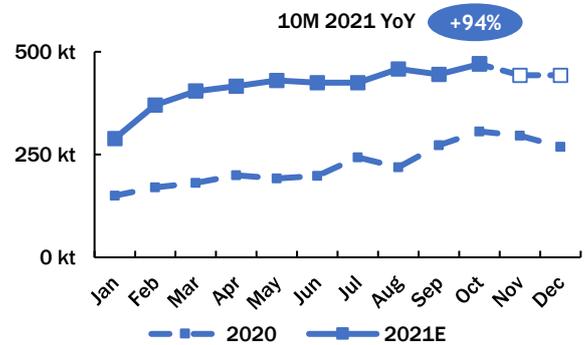
China stainless steel trade. In 10M 2021, stainless steel exports from China amounted to 3.6 Mt, increasing by +953 kt (+35% YoY), with exports to India surging by +206 kt (+143% YoY), to Turkey by +144 kt (+89% YoY) and to Russia by +117 kt (+73% YoY).

At the same time, stainless steel imports in China were at 2.5 Mt, rising by +1.1 Mt (+83%). This increase was mainly

attributed by higher supplies from Indonesia (+1 Mt or +115%).

Indonesia

Indonesia Stainless Steel Production



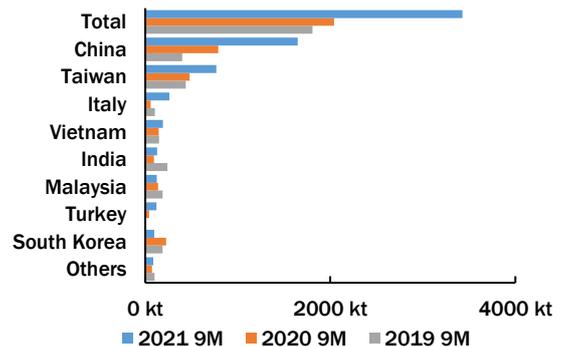
Source: ZIJSTEEL

Production of 300 series in Indonesia increased by significant 1.8 Mt in 9M 2021 (+101% YoY) to 3.7 Mt. Tsingshan's stainless output grew by 1.3 Mt (+92% YoY), and another 0.5 Mt (+132% YoY) were added by Delong.

We expect the total 300 series production in Indonesia to rise to 5 Mt in 2021 (+86% YoY), which translates into 381 kt (+90% YoY) of primary nickel demand. In 2022, Indonesian stainless nickel demand is expected to grow further by +14% YoY to 433 kt Ni.

In 9M 2021, stainless steel exports from Indonesia reached a record high of 3.4 Mt, increasing by +1.4 Mt (+68% YoY). Their main export destinations were China, Taiwan +288 kt (+60%) and Italy +200 kt (+330%). Taking into account that Delong mainly produces billets in Indonesia, all of which come to China without anti-dumping duties, this means that the increase of exports to Taiwan and Italy was mainly related to Tsingshan.

Indonesia Stainless Steel Exports



Source: Trade Data

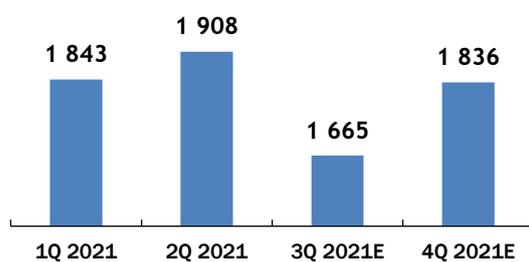
Europe

The recovery that started in 2H 2020, following the pandemic-related disruptions in stainless steel supply and demand, accelerated in 2021 as market participants continued restocking amid robust industrial activity. *Lead times at European mills have been exceptionally long, and order books are extending now up into 2Q 2022 in some cases.*

This rebound in demand combined with low inventory levels, limited imports due to protectionist trade policies and higher raw material, freight and energy costs have led to a surge in stainless steel prices, which so far the mills have been able to pass onto their customers. *Under these market conditions, major European mills posted this year some of their best quarters in recent history.*

Considering these factors, we have revised our forecast for the European wrought stainless steel output in 2021 upwards to 7.3 Mt, a +17% increase YoY, which is only slightly lower than the high levels we saw back in 2018. The demand for nickel is expected to rebound to 157 kt, from 137 kt in 2020.

Stainless Steel Production in Europe*, kt



*EU27, UK, Ukraine

Sources: Eurofer, NN Analysis

Nonetheless, we remain cautious regarding 2022 due to the challenges stemming from the escalating energy prices and a potential softening of the stainless steel demand. In fact, right now, *there are reports that distributors are running at slightly higher stocks than the average, which suggests that the restocking of the supply chain may be reaching saturation.* At the same time, mills are either planning or have already started to apply an energy surcharge, which in November stood at €75-200/t, according to several announcements. More mills will phase in the surcharge in December and January, possibly at higher rates than the current ones.

It remains uncertain whether buyers would accept these higher prices in the context of a slowdown in the demand. At the end of November stainless steel prices, as reported by Fastmarkets, were at \$4,200 – 4,300/t from \$2,050 – 2,100/t a year ago.

On this basis, we expect the nickel demand growth in Europe to stagnate at 158 kt, (+1% YoY) in 2022.

On the trade front, stainless steel imports have been growing at pace and keeping up with the demand in January-September 2021, ~+20% YoY, seemingly undeterred by the existing trade barriers in the form of safeguard quotas and anti-dumping duties.

To support their stainless steel producers and despite petitions from importers and consumers, in June 2021 the European Commission (EC) went ahead with prolonging the safeguard measures and maintaining the quotas for the countries exporting to the EU for another 3 years. These measures were initially introduced in 2018 following the US decision to impose tariffs on imports of steel under Section 232. However, at the end of October, the US

announced their intention to replace the blanket 25% tariff with tariff-rate quotas for steel “melted and poured” in the EU, which is positive for the European producers. While volumes under the quota have not yet been revealed, historically, the US imported on average ~310 kt of stainless steel from the EU27 in 2015-2017 and ~260 kt in 2018-2020 (all shapes included, i.e. semi-finished products, flat and long products, tubes & pipes).

Since our last issue, the EU extended the anti-dumping duties on cold rolled flats from China and Taiwan for another 5 years and, in addition, is carrying out an anti-subsidy investigation on cold rolled flats from India and Indonesia, which is due to be finalised in March 2022.

Apart from the safeguard measures and anti-dumping duties, the EU may also implement a Carbon Border Adjustment Mechanism (CBAM) with one of its declared aims being to set a fairer international trade competition ground for European producers. According to the latest EC’s CBAM proposal, European importers of steel will have to buy emission allowances to cover some of the GHG emissions associated with the production of imported steel products. CBAM is expected to start being rolled out in 2023 and be fully operational from 2026 onwards.

Having said that, it is not very clear whether stainless steel would be included in CBAM or not. The official proposal from July 2021 recommended not adding it to the list of candidate products, although it remained to be further discussed. Nonetheless, a major European mill announced in November that stainless steel has been included in the Mechanism. An official confirmation is yet to come.

USA

Just like in Europe, the stainless steel business in the US has seen a strong rebound starting in 4Q 2020, supported by the strong end use demand from the industrial machinery, appliances, construction and automotive industries.

The market conditions are expected to remain steady at least until the end of 1Q 2022.

On the downside, there are some concerns that customers, worried about the long lead times, are double-ordering. This could result in inflated inventories once the orders slow down, which eventually leads to a price correction.

Considering these factors, we expect the stainless steel melt wrought production in the US to reach 2.5 Mt in 2021. In terms of nickel, we revise the forecast of the nickel use to 42 kt for 2021 and expect it to remain at this level in 2022.

In the medium term, Biden’s Infrastructure Plan, would provide an additional impetus for the stainless steel demand in applications such as building & construction and water distribution systems. The bill, in a more slimmed-down version than initially planned for (\$1.2 tn vs. \$2.3 tn), was finally passed by the Congress in early November after months of negotiations.

Since the imposition of tariffs in 2018 by the Trump administration and until this year, stainless steel imports were generally at low levels. Import volumes of all stainless products year-to-date rose 30% YoY, reflecting both the

robustness of the demand and buyers' willingness to cover for the tariffs.

The recently negotiated deal between the US and EU to allow certain duty-free quotas for EU-produced steel is good news for US downstream manufacturers for whom these additional volumes may provide some price relief in times of market tightness. On the downside, there is a risk these imports may compete with the products melted by US mills.

In addition to this new trade deal, the US and the EU will be forming a Global Arrangement on Sustainable Steel and Aluminium to address overcapacity and decarbonisation, which could be joined by any "like-minded" nation. Essentially, it is a global alliance against the Chinese policies that are being perceived by the US and the EU as trade-distorting.

ALLOYS & SUPERALLOYS

Unfortunately, ever since the pandemic has put a hold on large capital projects and placed restrictions on mobility, the alloys and superalloys sector has not shown the same level of resilience as stainless steel.

Nonetheless, in 3Q 2021, the mills reported some normalisation in the demand for alloys, supported primarily by the chemical and electronics industries. In addition, oil & gas started to pick up and some major projects have already been confirmed with the European as well as US mills for 2022. This gives some upside potential to their nickel demand next year.

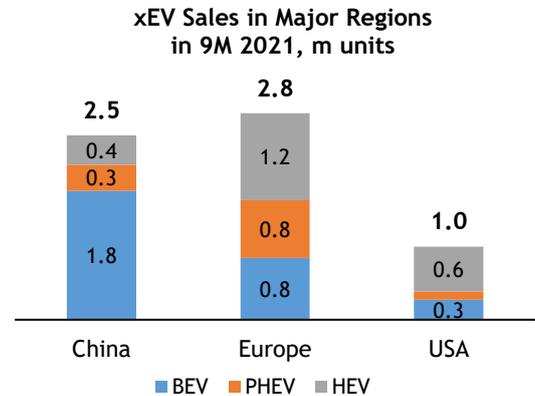
The activity in the superalloys sector, which is mainly driven by the aerospace industry, has been mostly subdued due to on-and-off travel restrictions imposed across the globe. While North America and Europe returned to almost normal air traffic levels, the rest of the world remains well below the pre-pandemic levels with the Asian average number of daily flights in September 2021 still being 40% lower than their levels of January 2020. But more importantly, the superalloys sector has been slow to recover due to uneven inventory levels in their long supply chain: while aircraft manufacturers have been increasing production, it has not yet been fully reflected on the raw materials side. For example, in January-September 2021, commercial aircraft deliveries by Airbus & Boeing were 50% higher year-on-year while engine deliveries by GE and P&W remained flat with some modest pick-up in Q3 only.

A stronger recovery in superalloys is expected to happen in 2022 and 2023 on the back of the demand synchronisation with the OEM production and the global air travel and freight traffic returning to some normality.

Overall, we expect the nickel use in standard alloys to rebound to 141 kt in 2021 (+7% YoY) and 149 kt in 2022 (+6% YoY). Meanwhile, the nickel use in superalloys is likely to increase by +5% YoY to 48 kt in 2021, followed by a stronger recovery of +10% in 2022 to 53 kt Ni.

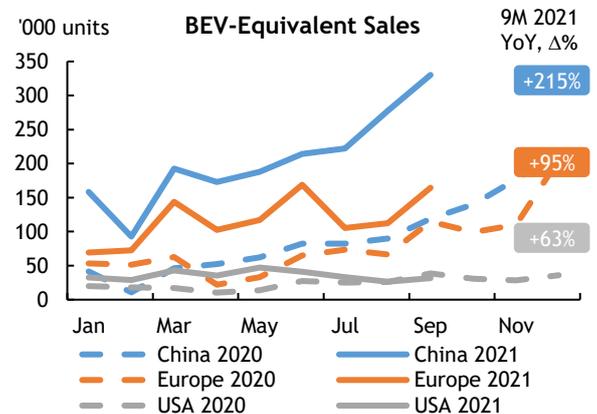
BATTERIES

We have revised our forecast for the BEV sales in 2021 upwards to 4.2m units and up to 1.8m units for the PHEV sales, which translates into rising *nickel demand in the battery sector and 389 kt (+73% YoY) of primary nickel demand* (356 kt Ni for Li-ion, 26 kt for NiMH and 7 kt for NiCd batteries). *In 2022, we see BEV sales at 5.9m units and PHEV sales at 2.3m units translating into 504 kt Ni (+30% YoY) of nickel use in the battery sector.*



Source: SNE Research

In 9M 2021, global BEV-equivalent sales¹ increased by exceptional +136% YoY. China was the epicentre of this growth with BEV-equivalent sales surging threefold, while the sales in Europe and the US increased by +95% YoY and +63% YoY respectively. The global BEV-equivalent sales in September were at record high, increasing by +17% from the previous peak registered in December 2020. We expect this trend to be maintained towards the end of the year, and the global BEV equivalent sales to reach 4.8m units, +86% YoY.



Source: SNE Research

The global electrification race continues to gather pace as an increasing number of battery-related investments have been announced in the last several months in China, Europe and North America. Global OEMs have also set targets for xEV sales by 2030 and have earmarked so far the total of \$300+ bn in investment for electrification.

¹ Under this methodology, HEV and PHEV are re-calculated in BEV equivalents according to their relative battery capacity ratio: HEV 2 KWh vs PHEV 12 KWh vs BEV 55 KWh

In Europe, the drive for building a local supply chain continues to be propelled by public policy and legislation. In July 2021, the EC has unveiled its *Fit for 55* climate package containing legislative initiatives for achieving the goals of the *Green Deal*, among which there is a provision that all new cars registered as of 2035 should be zero-emission. In addition, member states will be required to install charging and refuelling points at regular intervals on major highways (every 60 km for electric charging and every 150 km for hydrogen refuelling).

Since our last issue, several gigafactory capacity expansion plans were reported in Sweden, Finland, France, UK and Italy with some of the expansions being led by the OEMs such as Stellantis, Renault-Mitsubishi-Nissan and Volvo. For the 27 announced projects, we've updated our estimate of their total cell production capacity from 850 GWh to over 1 TWh by 2030.

The pace of electrification initiatives has recently accelerated in North America too. On the policy side, in August 2021 President Biden signed an executive order that sets a target for half of all cars sold in the country to be zero-emission vehicles by 2030. This paradigm shift to an electric future is also underlined by the Bipartisan Infrastructure Deal which will provide funding of \$7.5 bn for building a nationwide EV charging network and \$3 bn as a grant program to support the development of the North American battery material processing industry.

Amid this "green tidal wave", some American OEMs have started partnering with the battery cell makers to build gigafactories meeting their future requirements. These collaborations include GM and LG Energy Solution, Ford and SKI On, Stellantis and LG Energy Solution, Stellantis and Samsung SDI, while a year ago, there were only 8 existing and announced plants in North America with Tesla leading the way. Today there are around 20 new and expansion projects in the US and Canada with the expected total capacity of over 650 GWh by 2030.

Considering the significant influx of the end of life batteries in the next decade as well as massive demand for raw materials by the gigafactories, battery recycling is becoming a key legislative priority in the West. The EU is currently adopting a new Battery Regulation to create a legal framework for a circular economy in batteries and make certain recycled contents (for Ni, 4% as of 2030 and 12% as of 2035) mandatory for battery producers, inter alia. At the same time, the US Bipartisan Infrastructure Deal authorises a \$3 bn grant programme for the development of the domestic and North American battery manufacturing and recycling facilities. Increasingly, battery recyclers and OEMs seek to cooperate to form closed loop systems (e.g. Li-Cycle cooperating with GM

and LG Energy Solution, Redwood Materials with Ford, Battery Resourcers with Honda, Veolia with Renault, Remondis with Daimler, Duesenfeld with BMW, etc.)

It should be noted though that current recycling technologies tend to generate low value due to lower material extraction rates and the lack of automation when facing a wide variety of battery designs and chemistries. Nonetheless, the new wave of investments and partnerships in recycling along with strong support from the governments should provide some stimulus to improve the technology and recovery rates with hydrometallurgy becoming the technology of choice.

Tesla has recently announced that it is shifting to cheaper LFP batteries globally, reaffirming its last year's strategic move to resort to the use of the cheapest components only to deliver the lower-cost models. Mercedes has also claimed to switch to less powerful LFP batteries for electric models in the lower price segment from 2024. ***Although LFP is a low cost alternative to the NCM batteries and currently costs 10-20% less than NCM 523, it suffers from a number of serious drawbacks such as lower energy density, longer charging time, higher self-discharging rate and poor performance in low temperatures. They significantly limit the potential for the LFP batteries' deployment in the long-range, high-tier EVs, which have to use the more advanced nickel-intensive NCA, NCM 811 and NCM 9:0,5:0,5 chemistries.***

In the long run, higher energy density is needed to optimize costs, increase range and deliver smaller battery systems. LFP lacks a clear technology to achieve this, which will limit its further market share potential, while LFP cost advantages is projected to dissipate by 2025.

Additionally, LFP provides low economic incentives for recyclers. As a result, any proper recycling of the LFP batteries may become impossible to achieve, especially bearing in mind the future mandatory high recovery rates that are currently being considered in the EU. Unlike LFP, the NCM technology does meet the objectives of sustainability and circular economy. Overall, we expect the impact of Tesla's and Mercedes' announcement on the nickel demand to be very limited as there is no sustainable alternative to the use of nickel-based batteries, and the companies do not plan to develop the LFP value chain by themselves.

Overall, the LFP technology is unlikely to gain wide acceptance outside China given a number of technical constraints, its limited recyclability and international IP protection of the patents, which owned by the Chinese companies. Currently, we do not see any major LFP CAM capacities being built outside China.

POWER CRUNCH IN CHINA

The unprecedentedly soft credit policy launched by the major economies in response to the pandemic has led to an increase in fixed assets and industrial production investment. At the same time, companies have strived to catch up with the production losses that occurred during the lockdowns and significantly increased their output in 2021. As a result, the growth of electricity consumption in China has soared by +12% YoY in 9M 2021. Nearly 70% of China's power generation relies on coal, which is the key to ensure domestic power generation, but the growth rate of the coal production have remained almost flat.

China is a coal-rich country. However, due to a series of mid-to-long-term state initiatives, such as the transformation of the energy generation structure and the "dual-carbon" policy, the coal production did not expand fast enough. Normally, China's coal output grows in line with the country's long-term economic development pace.

The pandemic shock had disrupted the global trade, and a subsequent tsunami of delayed overseas orders pushed China's industrial demand for energy up into the previously unknown territory. In addition, this year's abnormal weather badly affected the hydroelectric power generation in the Southwest regions and the wind power generation in the Northeast. All this has resulted in a severe power shortage.

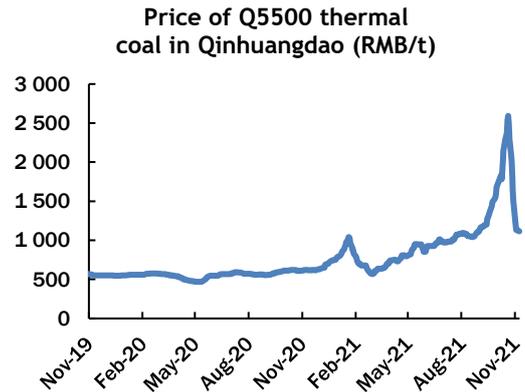
To secure sufficient coal inventories for the upcoming winter season, China took a number of measures, such as the release of new coal capacities and curtailment of electricity supplies to the energy-intensive industries.

As a result of enforced power cuts, Chinese stainless steel production declined by -14% MoM, and the NPI production decreased by -29% MoM in September. However, as was already discussed, Class 1 nickel consumption in Chinese stainless have even increased given tighter domestic NPI supply and lower NPI imports from Indonesia, thus, the power crunch has so far been net-positive for Class 1 nickel demand in China.

Following the measures taken by the government to ease the coal market tightness, China has immediately

expanded domestic coal production. Since mid-to-late October, the national daily average coal output remained above 11.5 Mt for several consecutive days, an increase of nearly +1.1 Mt from the end of September, reaching a maximum of 11.7 Mt, which was the new peak of the daily output.

According to the National Development and Reform Commission, the coal supply to power plants exceeded coal consumption by 2 Mt on October 23, and the level of coal inventories at power plants has normalized. The coal prices were coming back to the normal levels, while the supply and demand became balanced.

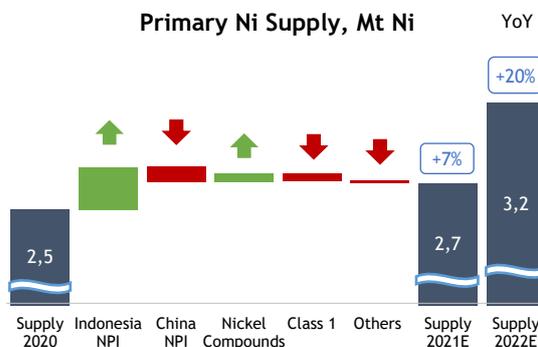


Source: Wind

The spike in coal prices has led to rising electricity prices, which account for around 20% of Chinese NPI cost. In turn, domestic NPI cost increased by +6% MoM in October, despite a -4% MoM decline in ore prices, which account for 50% of total NPI cost. The current NPI cost inflation is making margins of Chinese NPI producers quite unsustainable.

Overall, we believe that an acute shortage of coal in China is over. Our base case assumes the Chinese power supply will stabilise by the end of the year, and output to normalize at the beginning of 2022.

SUPPLY



Source: NN Analysis

A lot of producers all over the globe are still affected by the pandemic-related disruptions as COVID waves follow one another throughout the year as new strains emerge. The oversupply of nickel that emerged in 4Q 2019 and persisted in 2020 was followed by a deficit in 2021. We believe that this deficit will most likely persist for the rest of the year and then swing into the re-emerging mild surplus in 2022 onwards, although it will be concentrated on Class 2 nickel due to the oversupply of NPI, while Class 1 nickel tightness is likely to continue. **We have revised our forecast for the refined nickel production to increase by +7% YoY in 2021, reaching 2.70 Mt Ni, from our earlier estimate of +13%.** Based on our current estimates, **the primary nickel production will grow further to over 3.2 Mt Ni in 2022 (+20% YoY)** driven by the extraordinary growth

of the Indonesian NPI capacities at 1.2 Mt Ni (+32% YoY) and the continuous growth of nickel compounds for the battery sector (+91% YoY to 390 kt Ni) from HPAL and battery scrap.

LOW-GRADE NICKEL

NPI Indonesia

Indonesian NPI continues to be the major driver of the supply growth but at a lower than expected momentum due to slower launches and ramp-ups of the capacities, COVID-related disruptions and the conversion of some furnaces to matte production.

In our May issue, we estimated the Indonesian NPI production to reach 990 kt Ni in 2021. But due to a number of reasons, the actual production by Tsingshan in Morowali and by Delong turned out to be much lower, which led to lower availability of NPI for shipping to China.

One of the reasons for the forecast review is that Morowali Industrial Park had launched only 4 RKEF lines instead of the initially planned 8. Moreover, the NPI's average nickel content dropped from around 14.5% in the second half of 2020 to 13.4% in 2021 due to the depletion of the high-grade nickel ore reserves.

Also, we expected that PT Obsidian Stainless Steel JV between Delong and Xiamen Xiangyu would add 19 RKEFs, which would bring the total capacity to 32 lines, but due to the COVID-related restrictions to obtain entry visa permits for the Chinese workers, the company was able to ramp up only 7 RKEFs in January-September. We expect now that this project will have 22 lines operational by the end of 2021.

At the same time, PT Gunbuster, which, according to the satellite images, showed significant progress between October 2020 and April 2021, was also impacted by COVID-related restrictions. As a result, we don't expect this project to start production in 2021.

Indonesia Weda Bay Industrial Park is a different story as it has been performing quite well in 2021. IWIP put 12 RKEFs into operation in January-June. In October, Tsingshan started operation at the largest RKEF line with a total capacity of 60 MVA, translating into ~14 ktpa Ni. In total, they plan to install 6 such lines by the end of 2021 in Weda Bay. In 2022, IWIP is expected to add 12 RKEFs, which will bring the total capacity to 485 ktpa Ni.

Overall, we estimate the total 2021 NPI production in Indonesia to reach 874 kt Ni (+48% YoY).

In March, Tsingshan announced its plans to supply NPI-based nickel matte starting from October 2021. *However, a robust increase of 300 series' production in China resulted in NPI being traded with a premium to the LME, which swayed the conversion below the positive netback zone.* As a result, Tsingshan started trial matte production only in November. Meanwhile, CNGR and Huayou are going to launch its own matte production in 2022. One company will launch its project in Morowali and another in Weda Bay. Assuming that Indonesia will continue ramping up new capacities in 2022, we expect NPI to return to discounts, and the conversion to become economically viable next year. *However, one of the biggest concerns limiting the NPI-to-matte conversion is its very high*

carbon footprint at 45 kg CO₂/kg Ni eq. and over 60 kg CO₂/kg Ni eq. with impact of deforestation since the coal power plants are their only source of electricity. In order to address this issue, Tsingshan announced the construction of a renewable energy base and stated to build 2 GW of solar and wind capacity, but it will reduce the carbon footprint by ~20% only and will require ~US\$3bn and 5 years to complete.

We estimate the NPI production in Indonesia to reach 1,243 kt Ni in 2022, of which 90 kt Ni will be the NPI-to-matte conversion.

NPI China

In 9M 2021, the NPI production in China declined by ~65 kt Ni (-17% YoY). At the same time, nickel ore imports from the Philippines increased by +8.2 Mt YoY. Our understanding is that the decline in output was caused by significantly lower ore inventories depleted by the robust NPI demand in 2020, lower nickel content in ores imported from the Philippines (average grade declined by ~4% YoY), and lower imports from New Caledonia (-167 kt or ~10% YoY).

We expect the Chinese NPI production to reach 410 kt Ni (-20% YoY) in 2021 and 400 kt Ni in 2022.

Importantly, the Philippines will hold an election in May 2022 to choose a successor to President Rodrigo Duterte, who is ending his single six-year term. The new president may introduce some changes to the mining policy, but we don't expect it to affect their 2022 production.

Ferronickel

The ferronickel output in 2021 remains almost unchanged at 380 kt Ni (-1% YoY) mainly because of Glencore's Koniambo still working as a single line operation due to the technical issues and the production cuts at Tagaung Taung's nickel operation in Myanmar (Burma) caused by the Burmese military coup. Eramet's Doniambo production declined as the mine and the FeNi plant were affected by the COVID-related disruptions. Brazilian Onça Puma hasn't yet reached its designed capacity either because of the operational challenges, extended maintenance, and the short-term license suspension, while the Greece-based Larco has been gradually reducing its FeNi output for the last couple of years as it balances on the verge of bankruptcy.

On the other hand, Colombian Cerro Matoso operation is taking action to return to its normal annual volumes after the major maintenance in 4Q 2020, Dominican's Falcondo has increased its output closer to its nameplate capacity and Japanese Pamco is also recovering after the 2020 decrease.

We estimate that 2022 ferronickel production will grow further to 423 kt Ni (+11% YoY) on the back of Onça Puma's ramp-up to its designed capacity, Koniambo's second furnace restart, and Doniambo's full recovery after the COVID-19 exposure crises. Cerro Matoso is expected to reach its nameplate capacity and Tagaung Taung's operation to return to its normal production rates.

However, we foresee some problems emerging at the Fenix nickel project in Guatemala, which faces the extractive licence withdrawal and social unrest due to the

environmental issues. NewCo Ferronikeli project in Kosovo has halted its production indefinitely because of an increase in electricity prices while Larco that has already been put up for sale due to its poor financial state might be put on C&M in 2022. All that adds some additional degree of uncertainty to our FeNi forecast.

Nickel Oxide & Utility Nickel

We forecast a further decline in the Ni oxide and utility nickel output to 40 kt Ni (-28% YoY) in 2021 as a result of Vale Indonesia's nickel matte production fall in the first nine months of 2021 compared to the same period a year ago due to the maintenance issues, Vale's 2020 decision to shut down the refinery and produce nickel hydroxide cake only at their VNC site (operations was sold to Prony Resources in 2021) while their Dalian JV refinery is put on C&M. Vale reported recently a failure of the briquetting machine at the Matsuzaka refinery, which might also lead to lower plant output this year.

It is expected that the Ni oxide and utility nickel production will grow only slightly to 43 kt Ni (+11%) in 2022 or even remain flat as Dalian JV is likely to remain mothballed and based on the PT Vale's announcement that it expects below-normal nickel matte production next year as furnace rebuilding delays brought about by the pandemic continue to impact their output.

HIGH-GRADE NICKEL

Class 1 Nickel

Nickel metal production has been suffering from operational issues, strikes and pandemic-related disruptions, which precludes the producers from reaching their pre-pandemic production levels.

Vale's Copper Cliff pellets and powder production has declined YoY as a result of the labour disputes at Sudbury. Nornickel production has been impacted due to the incidents at Norilsk concentrator and the groundwater inflow at Oktyabrsky and Taimyrsky mines. Glencore has reduced the production at its Murrin-Murrin nickel-cobalt plant in Western Australia due to the repair works on the acid plant, which took place in March, and a periodic major statutory maintenance shut-down, which was carried out across five weeks in May and June 2021. BHP's Nickel West production has been impacted by the planned repairs at the Kalgoorlie Smelter, Kwinana Refinery and the Leinster & Kambalda concentrators. BHP's metal nickel production has also decreased on the back of the switch from nickel briquettes to the nickel sulphate crystals production, which was finally launched earlier this year after several postponements.

On the other hand, Ambatovy, which restarted its operations in late March 2021 after a one-year halt, is ramping up its production in order to achieve stable operation levels. Anglo American is returning to its designed capacity, reflecting stable performance from the ACP Phase A unit after its restart in November 2020. Sandouville, badly affected by the pandemic in 2020, has increased its 2021 nickel cathodes output YoY while its takeover by Sibanye-Stillwater has recently started. *Taking into account all these developments, our current Class 1 production forecast for 2021 is set at 794 kt (-6% YoY).*

We expect the 2022 nickel metal production to grow to 832 kt Ni (+5% YoY) as major producers will benefit from the repairs and maintenance completed in 2020-2021, which pave the way for higher production, with no severe disruptions expected.

Nickel Compounds

As the world is moving towards net-zero emissions, the governments across the globe are introducing transport electrification programmes & subsidies, developing recharging infrastructure and setting the deadlines for internal combustion engine-powered vehicles bans, while major automakers are widening their EV model ranges. All this translates into a nickel demand by the battery sector growing robustly. To meet this growing demand, additional supply needs to be added to keep the market in balance. The supply outlook for nickel sulphate will be largely determined by the future availability of the feed from both primary and secondary sources. Nickel sulphate can be produced from various feed sources using different production routes either directly from such intermediates as MHP, MSP, nickel matte and crude nickel sulphate, by Class 1 nickel (as powder and briquettes) dissolution, or by processing of recycled materials.

We expect the production of nickel compounds from the primary sources, excluding Class 1 nickel dissolution, to increase to 205 kt Ni (+40% YoY) on the back of robust EV sales and solid nickel demand from the battery sector.

We estimate the nickel chemicals production to grow further to 390 kt Ni (+91% YoY) in 2022. It will be driven by the expected launches and ramp-ups of the new HPAL capacities in Indonesia and the NPI-to-matte conversion as well as BHP's Kwinana in Australia, ramp-up of Prony Resources' project in New Caledonia (ex. VNC), Terrafame's Talvivaara in Finland, the recently commissioned Thakadu nickel sulphate plant in South Africa and Hellenic Minerals plant in Cyprus.

In 2021, volumes of Class 1 nickel dissolution, which is being used as a balancer for missing nickel units, have increased more than twofold to circa 200 kt Ni due to the shortage of intermediates and delays in the launch of HPAL and NPI-to-matte conversion, while demand from the NEV manufacturers has remained exceptionally strong. A number of producers in China, South Korea and Taiwan are operating at full capacity, which has generated robust demand for nickel briquettes and powder in Asia. *In 2022, we expect the volume of Class 1 nickel dissolution to decline on a yearly basis, but it is still projected to be above the 2020 level and will amount to around 150 kt Ni.*

HPAL Indonesia

We have seven Indonesian HPAL projects on our watch list, five of which are expected to ramp up before 2025.

A joint venture of Lygend and Harita launched a 37 ktpa Ni capacity in 2021, while additional 18 ktpa Ni are scheduled for 2022 and further 65 ktpa Ni for 2023, which will bring the total capacity to 120 ktpa Ni.

PT Huayue Nickel and Cobalt with its 60 ktpa Ni capacity is going to start operations by the end of 2021. We still do not observe any activity at PT QMB New Energy Materials. This project with its 55 ktpa Ni capacity is likely to ramp up in 2023.

In May, Huayou announced its plans to build a new HPAL project PT Huafei in Weda Bay. The project aims to produce around 120 ktpa Ni starting from 2023. Weda Bay is also a place for the CBL project, which is a joint venture of Lygend and CATL with around 40 ktpa Ni capacity. CBL is expected to start production in 2024.

Overall, around 400 ktpa Ni of HPAL capacity are expected to come into operation by 2025.

RUSSIA

In 9M 2021, the output of all key metals decreased due to the temporary suspension of the Oktyabrsky and Taimyrsky underground mines' and Norilsk Concentrator's operations. Currently, the Oktyabrsky mine is operating at full capacity, which was already achieved by the middle of May. The Taimyrsky mine resumed its operation in early June and is expected to return to its full capacity by the beginning of December. The Norilsk Concentrator has already restored its full operational capacity. Taking into account the already achieved progress in the recovery of the production facilities of its Norilsk division, Nornickel re-confirms its 2021 nickel production guidance from the Company's Russian feedstock to be within the earlier announced range of 190-200 kt Ni.

In 9M 2021, the total nickel output decreased by -23% YoY to 130 kt, practically all of which (127 kt) were produced from the Company's own Russian feed. This decrease in the production was caused by the temporary suspension of the mining operations at Oktyabrsky and Taimyrsky underground mines after the flooding, as well as the temporary suspension of the Norilsk Concentrator and its consequent repairs.

Following the growing importance of ESG as well as the global ambition to reach carbon neutrality, Nornickel has started producing carbon-neutral nickel. Zero CO₂

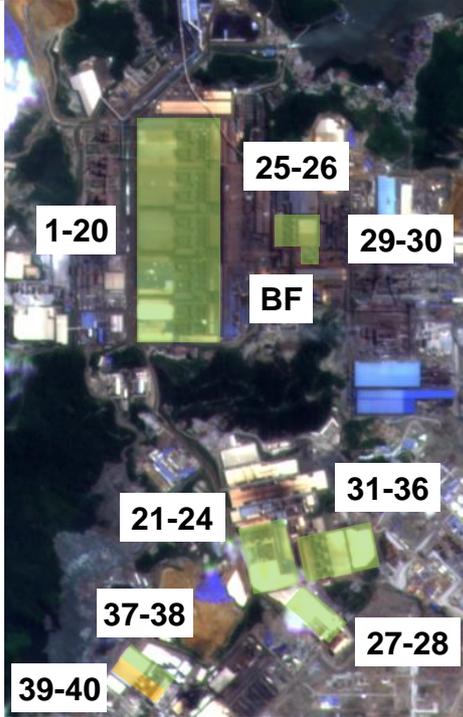
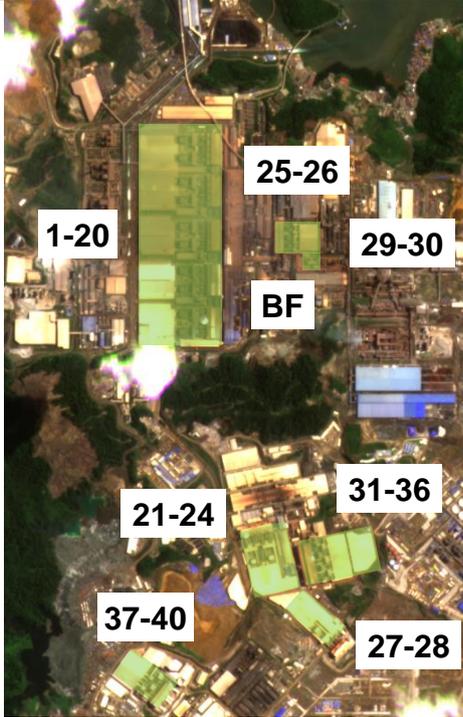
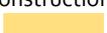
footprint has been achieved thanks to the Company's continuous efforts to cut its CO₂ emissions at all stages of the production chain, from underground ore mining to processing and refining. A very low carbon footprint has been achieved mainly through the upgrade of the hydro power plant that feeds Nornickel's production facilities in the Norilsk Industrial District. Nornickel has also invested in modernisation of other power generating facilities, including the complete overhaul of the generating units at the Ust-Khantaiskaya hydro power plant. As a result, the share of renewable sources in the Company's energy mix has increased to 55% for the Norilsk Industrial District and 46% for the whole group. It has allowed to reduce CO₂ emission by 48 kt over 2019-2020, which has been independently verified by Ernst & Young (EY), with additional emission reduction is currently under review. Taking into account the carbon footprint at 8.1 kg CO₂/kg Ni eq., the Company expects to produce up to 8 kt of carbon-neutral nickel in 2021.

Further CO₂ emission reduction initiatives scheduled in 2021-2025 will make it possible to produce up to 35 kt per year in 2025. The steps to mitigate carbon impacts include the upgrade of electric-powered equipment, rollouts of the automated control and metering systems, the reduction of heat losses in buildings and pipelines, and decommissioning of obsolete power generating facilities.

Nornickel has achieved significant results in reducing its environmental footprint in the regions of its operations and cemented its leadership in the global nickel industry in ESG and sustainability.

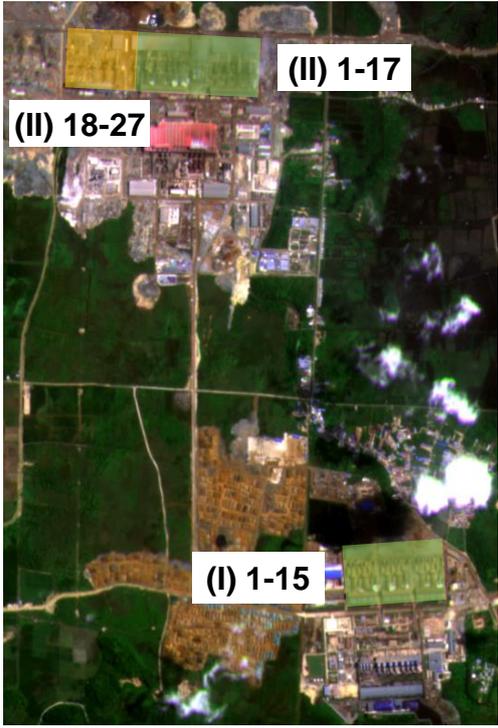
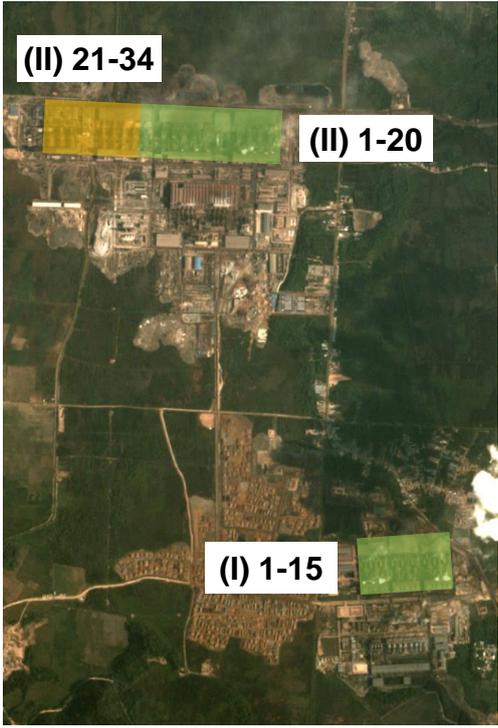
Nornickel's customers enjoy the products with one of the lowest CO₂ footprints among the industry peers and a fully transparent production flow. For more details, please see our May issue.

SUPPLEMENTARY MATERIALS

Figure 1: Indonesia Morowali Industrial Park		
Date	May 2021	Aug 2021
Satellite Image		
Lines under Construction 	2 = 20 kt Ni	0
Completed Lines 	38+1BF = 371 kt Ni (annual capacity)	40+1BF = 390 kt Ni (annual capacity)

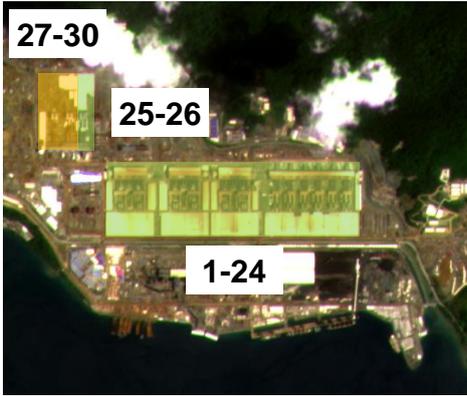
Sources: Planet Labs Inc, Mysteel, NN Analysis

Figure 2: Delong (PT Obsidian and PT Virtue Dragon)

Date	Apr 2021	Oct 2021
Satellite Image		
Lines under Construction	10 = 68 kt Ni (annual capacity)	14 = 95 kt Ni (annual capacity)
Completed Lines	32 = 217 kt Ni (annual capacity)	35 = 237 kt Ni (annual capacity)

Sources: Planet Labs Inc, Mysteel, NN Analysis

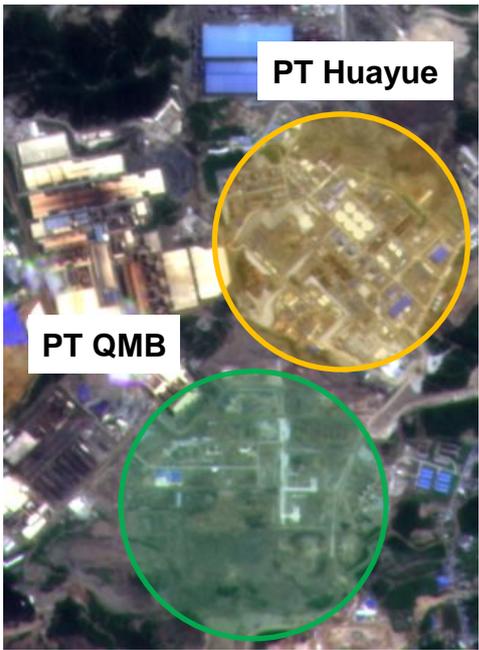
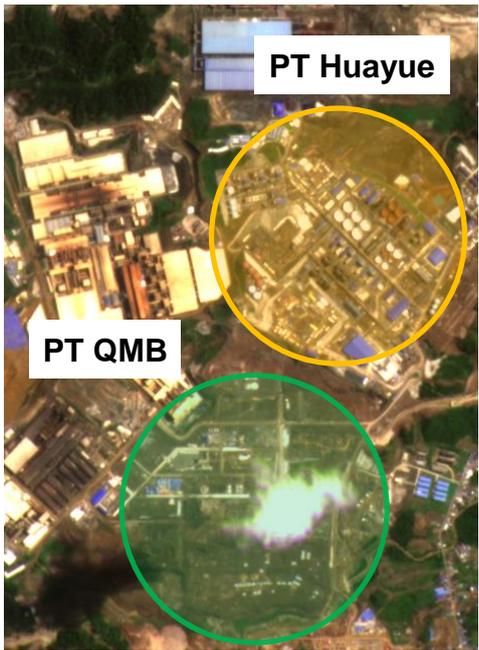
Figure 3: Indonesia Weda Bay Industrial Park

Date	Apr 2021	Oct 2021
Satellite Image		
Lines under Construction	4 = 37 kt Ni (annual capacity)	4 = 58 kt Ni (annual capacity)
Completed Lines	20 = 187 kt Ni (annual capacity)	26 = 253 kt Ni (annual capacity)

Sources: Planet Labs Inc, Mysteel, NN Analysis

Figure 4: PT Gunbuster		
Date	Apr 2021	Sep 2021
Satellite Image		
Lines under Construction	32 = 217 kt Ni (annual capacity)	32 = 217 kt Ni (annual capacity)
Completed Lines	0	0

Sources: Planet Labs Inc, Mysteel, NN Analysis

Figure 5: Morowali HPAL Projects (PT QMB New Energy Materials and PT Huayue Nickel and Cobalt)		
Date	Apr 2021	Aug 2021
Satellite Image		

Sources: Planet Labs Inc, Mysteel, NN Analysis

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GLOSSARY OF TERMS

Abbreviation	Term
\$bn	Billion US dollars
\$tn	Trillion US dollars
BEV	Battery electric vehicle
CAM	Cathode active material
CO ₂	Carbon dioxide
C&M	Care and maintenance
EMEA	Europe, Middle East, Africa
ESG	Environmental, social, governance
FeNi	Ferronickel
GWh	Gigawatt-hours
HEV	Hybrid electric vehicle
HPAL	High-pressure acid leaching
IWIP	Indonesia Weda Bay Industrial Park
JV	Joint venture
kt	Thousand tonnes
ktpa	Thousand tonnes per annum
LFP	Lithium iron phosphate battery
LME	London Metal Exchange
MHP	Mixed hydroxide precipitate
MoM	Month-on-month
MSP	Mixed sulphide precipitate
Mt	Million tonnes
MVA	Megavolt-ampere
NCM	Nickel cobalt manganese battery
NCMA	Nickel cobalt manganese aluminium battery
NEV	New energy vehicle (battery electric and plug-in)
Ni	Nickel
NiCd	Nickel-cadmium battery
NiMH	Nickel metal hydride battery
NPI	Nickel pig iron
OEM	Original equipment manufacturer
PCAM	Precursor cathode active material
PHEV	Plug-in hybrid
RKEF	Rotary kiln furnace
SHFE	Shanghai Futures Exchange
TWh	Terawatt-hours
xEV	BEV, PHEV, HEV
YoY	Year-on-year
YTD	Year-to-date

29 November 2021

Nickel & Palladium: Macro Drivers and Financial Flows

Risks of Economic Quicksand

Global

Commodities | Strategy

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Macro Drivers and Financial Flows

Naturally occurring quicksand can be described in simple terms as a saturated mixture of fine sand and clay particles. When left undisturbed the billions of particles have the combined characteristics of a firm solid but when pressure is suddenly applied it liquefies, loses strength and the ability to bear weight.

The global economy appears to resemble a patch of quicksand at present. When left undisturbed (for example by monetary policy announcements or mistakes, or by new Covid-19 variants, or ill-tempered political rhetoric) progression is relatively smooth and predictable. However, when disturbed by external forces, the risks of asset prices (including commodities) being sucked down rises exponentially.

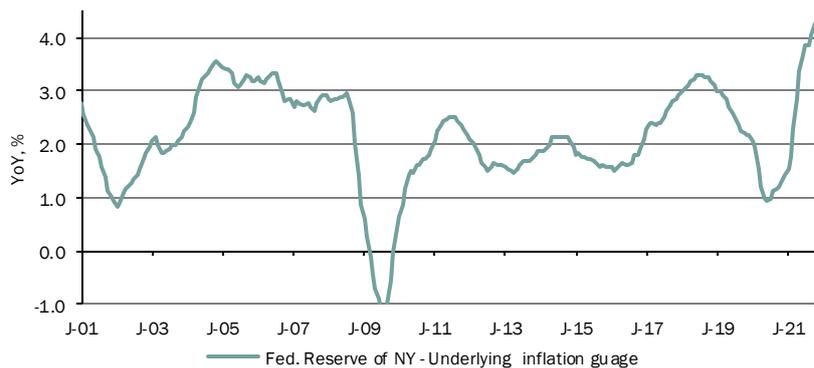
We still believe submersion into the quagmire is likely to be avoided. Nevertheless, our confidence in that relatively benign outcome is being tested at present by rising volatility into year-end, which is partly a result of fevered headlines about the latest Covid variant.

Covid pandemic, inflation epidemic

Are the current inflation pressures transitory or becoming entrenched? Economists in the transitory camp point out that base effects from energy price rises in particular will start to fall out of year-on-year inflation figures from the end of Q1 2022 onwards. The worst of effects of Covid-related supply chain price pressures on inflation data will start to diminish by the end of Q2.

Those who believe policymakers have underestimated the breadth and likely persistence of inflationary pressures point to wage increases, real estate, and the potential for Covid and weather-related impacts to drive agricultural commodity prices much higher than they currently are. Even broad-based measures of prices have surged to multi-decade highs.

The FRBNY gauge of underlying inflation aims to capture sustained movements in inflation and includes a wider set of inputs than CPI.



Source: The Bloomberg™ Professional service

There is no doubt that inflation has accelerated faster than predicted, and has been more broad based than anticipated, whichever is your preferred measure. The unpredictable macro-economic spillover effects of Covid have included unforeseen tightness in labour markets, transportation, supply chains and sectors of real estate.

Forward expectations of inflation reflect the nearby price pressures



Source: The Bloomberg™ Professional service

Gauges of forward perceptions of inflation have similarly shot up, with five-year US breakeven rates surpassing 3%. For a world that has become used to negative real rates, that is a shock.

But have central banks kept the monetary taps turned on for too long, risking a period of uncontrolled price rises, or should investors still have confidence in the Federal Reserve and other G7 central banks?

It is clear that the pace of monetary expansion is slowing and policymakers in many regions are using communication and monetary tools to try to calm both nerves and speculative excesses. Nevertheless, annualised money supply growth in the US is still in double-digits so normalisation is a long way off by any measure, even taking into account that agreement on where the base line of normal lies is not easy.

The phrase “moral hazard” appears to have been deleted from financial dictionaries

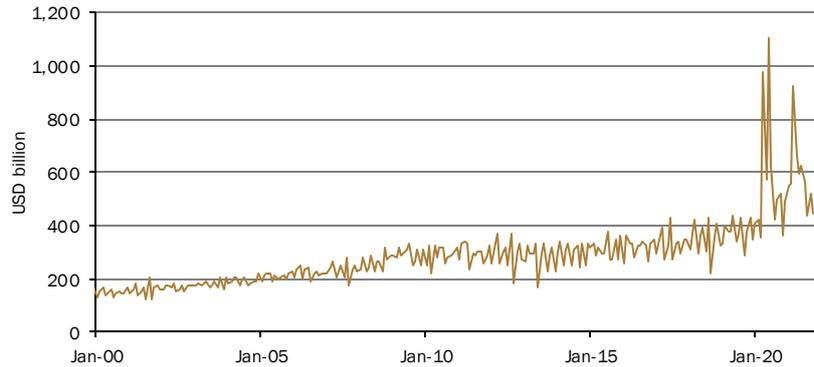
Tightening but monetary conditions are certainly not tight. And more direct stimulus is coming



Source: The Bloomberg™ Professional service

At the same time, fiscal deficits continue to set unprecedented records as government borrowing to support economic activity continues to run hot. Given a choice between electoral support and a larger budget deficit, most politicians will choose the former and leave the problems of the latter to a successor. That is perhaps a slightly cynical worldview but the phrase “moral hazard” appears to have been deleted from financial dictionaries.

Trying to spend your way out of trouble: the picture of US Treasury Federal Budget net outlays is indicative of government responses globally to Cov-19



Source: The Bloomberg™ Professional service

The borrow and spend theme will continue to dominate in 2022, though more of the spending will be targeted at investment and less of it at directly compensating businesses and employees for lost earnings.

The highest profile spending plans tend to be those of the US government, partly because of scale and partly because of the partisan nature of US politics. The Biden presidency has succeeded in pushing a \$1 trillion, five-year infrastructure spending package into law. This will allocate billions of dollars to road and bridge repairs, public transport investment, electric grid modernisation, water and wastewater improvements, and charging infrastructure to support electric vehicle growth.

A \$1.75 trillion social spending and climate change bill still has to be approved by the Senate but amongst other things would involve additional investment in affordable housing and tax credits to incentivise the uptake of electric vehicles.

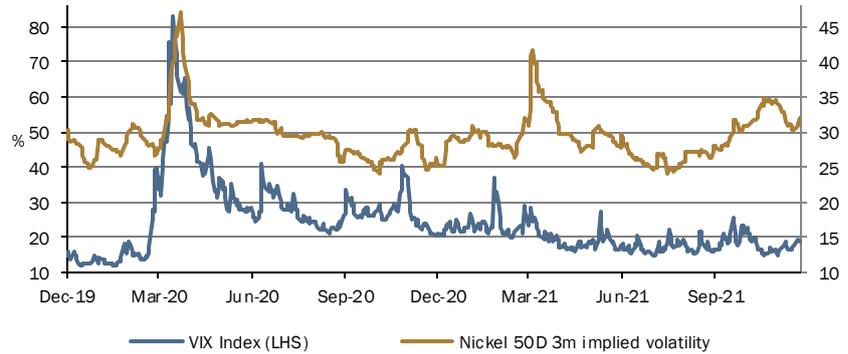
It is not at all clear how much of the funds are truly new and how much will be diverted from existing programs. Nor is it clear how quickly funds will be disbursed to the different initiatives. But the emphasis on capital investment is important (assuming it persists through the next US election cycle) for what is a consumer-led, tertiary economy.

How this translates into demand for metals (whether for consumption or inflation hedge) is extraordinarily difficult to predict. On balance it is of course positive but quantifying that positivity into tonnes of nickel or ounces of palladium is a top-down exercise in assumptions, extrapolations and estimation. In the short-term markets are focused much more on near-term issues such as deferral of auto production and sales, container shipping rates, energy costs, and the cost and availability of working capital.

The uncertainty has been feeding through into another upcycle in commodity price volatility. For palladium that increase in volatility has been driven by the proverbial rug having been pulled from under the price. Since our last report, palladium has fallen by around 40%, and there have been several days when the price has dropped by more than 5%.

Nickel has been almost the polar opposite, rallying by around 20% over the past six months. Implied option volatility has picked up over the same period, reflecting some whippy moves, notably from September onwards. However, the difference in the current and market anticipated supply/demand balance between the two metals is stark.

Increasing nickel volatility has been reflective of commodity specific factors rather than broad asset price moves.



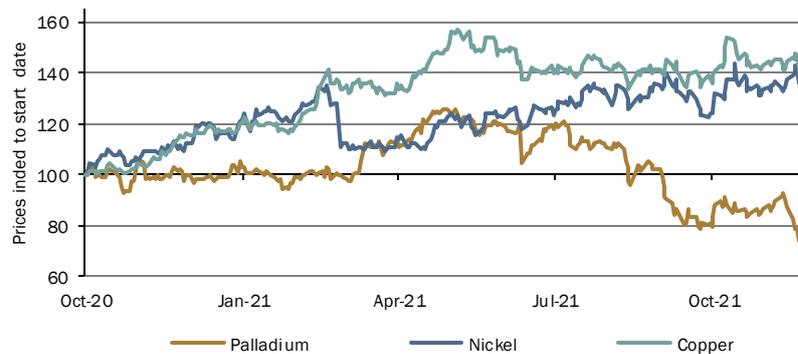
Source: The Bloomberg™ Professional service

Divergent commodity fundamentals

The chart below tells the story of the relative performance of palladium, copper and nickel over the past 12 months. In essence, it illustrates the difference between metals whose demand is leveraged to the pace of vehicle electrification (copper and nickel) with one that may have good applications in a hydrogen economy in but which will face sizeable headwinds in the meantime (palladium).

The influence of EV battery demand on overall nickel consumption and the pace of market penetration of EVs and decline of conventional gasoline car sales are both often overstated in our view. Nevertheless, the market is in no doubt that the nickel supply-demand balance is far more attractive for investment than palladium.

Rock down to electric avenue...



Source: The Bloomberg™ Professional service

That outlook has been reflected for some time in the palladium futures market. Speculative long positions were cut aggressively as the pandemic spread in early 2020 and have not recovered. Nor do we expect many to be tempted to back in again soon. At some point the largest natural buyers (auto companies) will step back in and buy more spot and forward metal but picking the bottom right now is highly risky.

Investor disinterest indicative of a turning point?

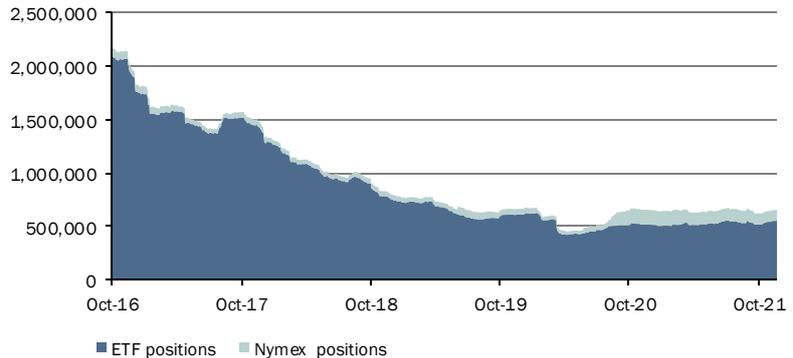
Speculators unlikely to rush to buy the current slump



Source: The Bloomberg™ Professional service

There has been some churn in ETF holdings of metal. For the year-to-date, the total of metal held has climbed by around 50,000 oz. However, compared to where those holdings were pre-pandemic that is a very modest movement and it is definitely far too soon to suggest that long-term strategic investment might be returning.

Hard to spot the modest upturn in palladium ETF stocks on a five year chart



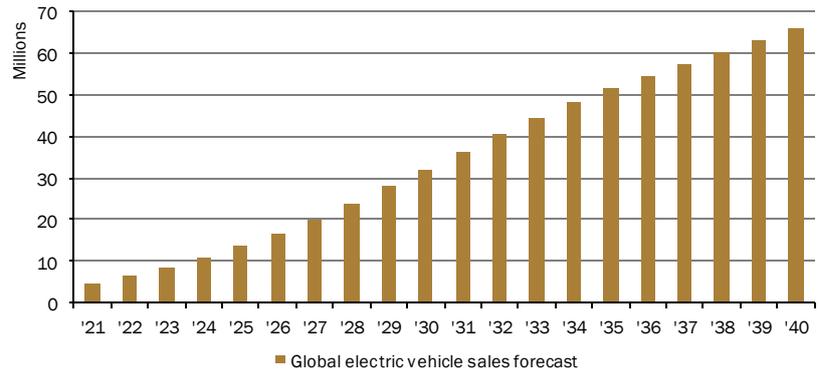
Source: The Bloomberg™ Professional service

We believe there is a strong probability that when the Covid storm finally passes there will be a rapid rebound in both consumer and business demand for new vehicles. That demand will meet an industry running with low inventories of finished goods. And so a demand surge plus re-stocking cycle could prove to be a powerful force for a recovery in the palladium price, and that recovery may persist for longer than the market anticipates. But in our assessment that scenario is highly unlikely to emerge in the next six months.

Nickel – well placed

If you wanted to pick one commodity with a good demand story, then nickel is a candidate with some strong credentials. EVs, gigafactories, and grid-connected battery storage investments get many headlines, most of which are generally positive for nickel.

Investors want exposure to electric vehicle sales growth



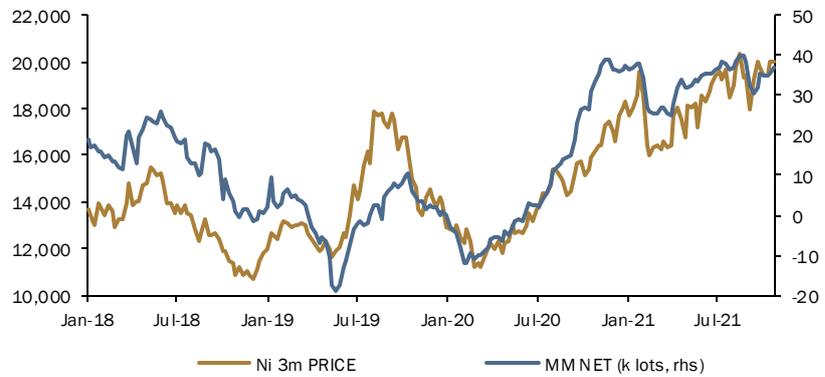
Source: Bloomberg NEF, The Bloomberg™ Professional service

The demand outlook for the more mundane stainless steel side of nickel demand is in decent shape too, and it often is forgotten that today the stainless sector accounts for about nine times the consumption of primary nickel units than batteries.

Stainless steel is set to benefit in broad terms from a focus on infrastructure investment and rapid growth in the healthcare sector. So the combination of a large end use with a solid demand growth outlook and a small end use sector with a very rapid growth outlook is clearly appealing.

If we use LME data on investment fund net positions as a proxy for broader investment flows it appears that investors are positioned accordingly:

Given the global economic uncertainty, the solidity of investment fund positioning in nickel has been impressive in recent months



Source: The Bloomberg™ Professional service

In China, speculation in commodities has been actively discouraged and SHFE futures flows are more representative of commercial hedging, though there is certainly an arbitrage component to the data. The recent move in SHFE front month nickel price back to CNY150,000/tonne has seen a pick-up in activity.

Firmer prices drawing back hedging volumes and position taking on SHFE

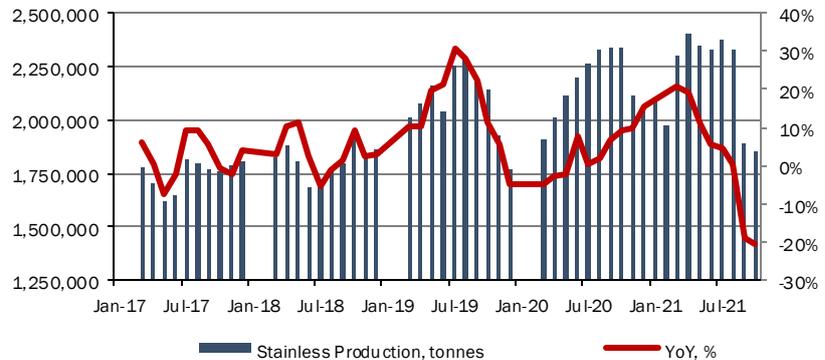


Source: The Bloomberg™ Professional service

In the short-term, however, demand for nickel is being affected by the normal seasonal winter slowdown in Chinese stainless steel demand and production. This year rising power costs and power rationing for heavy industry users in some areas has exacerbated that trend, though the pressure appears to be easing. The softening of demand into year-end has started to weigh on Chinese domestic stainless steel prices, although the feedback from there into LME nickel prices is indirect.

To date, pessimism about the outlook for Chinese real estate activity has not fed into domestic nickel prices but that may become more of a feature from now through to Chinese New Year. Complicating the picture on-shore is a temporary hiatus in the issuing of VAT invoices for importers of all goods, and with onshore stocks of refined nickel briquettes and plate currently low, that may sustain premiums.

Chinese stainless mills easing back after a strong period of production



Source: The Bloomberg™ Professional service

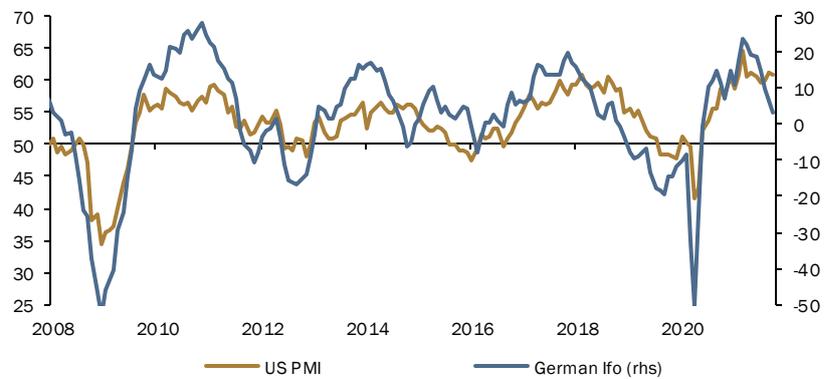
LME stocks of refined nickel, meanwhile, have drawn down steadily since the middle of the year, with on-warrant inventories down to around 60kt from over 200kt in Q2. Unsurprisingly, nearby nickel spreads have tightened markedly, with the cash-3 month backwardation nearing \$200/t recently.

Outlook

Even before the latest headlines about what has been termed the Omicron variant of the Cov-19 virus the macroeconomic data were indicating a slowing in activity and weakening in expectations. A combination of diverse factors including power costs, the inflation and interest rate outlook, shortages of skilled labour, and semiconductor chip shortages, were acting as a brake. There is a risk now that an unremarkable fluctuation in the business cycle could be exaggerated by reactions (possibly over-reactions) to the latest variant and turn into a short, sharp and unwelcome shock.

PMI manufacturing surveys in Europe have taken a sharp turn for the worse, though remain well in expansionary territory for now. The US headline PMI indicator is holding up well for now but is almost certain to soften into Q1 from here.

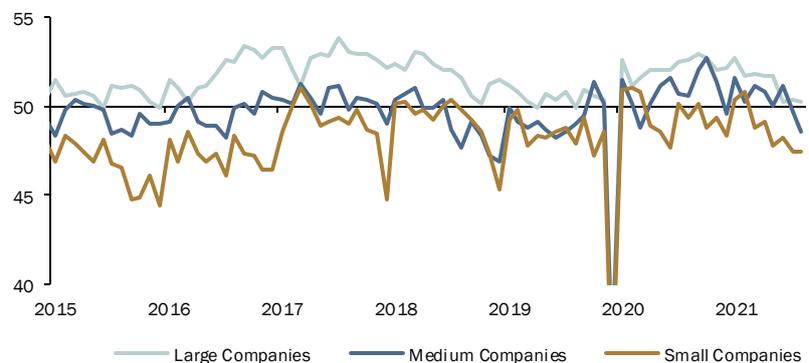
Short-term European outlook darkened again by Covid



Source: The Bloomberg™ Professional service

Unfortunately, the pattern of Chinese PMI data resembles the chart of the German Ifo survey more than the US PMI. Logistics difficulties, rising input costs, the ongoing China Evergrande debt concerns, and a weakening external environment are feeding into reduced optimism amongst all segments of Chinese manufacturing.

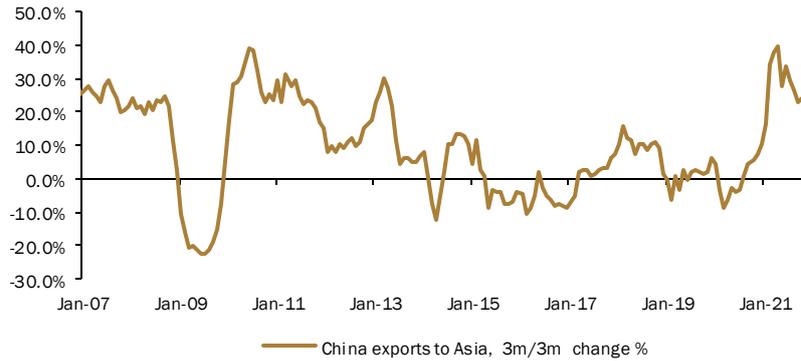
Chinese manufacturing: activity and optimism softening into year-end



Source: The Bloomberg™ Professional service

The concern about the external environment may be overblown as exports to Asia are growing at a healthy clip, still recovering from the worst of the pandemic's disruption. But a slowdown from what was an unsustainable surge is becoming increasingly apparent.

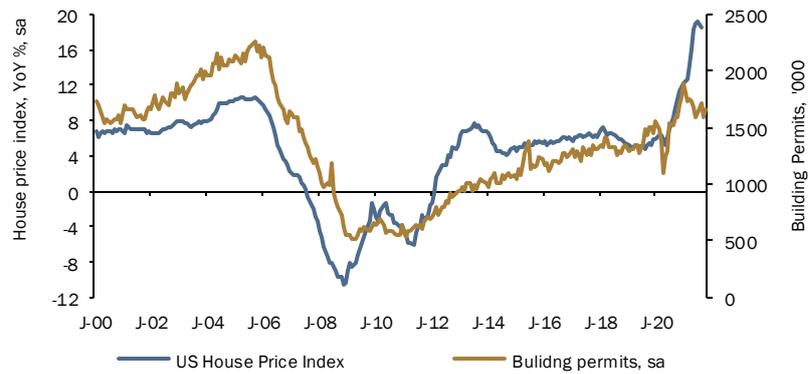
China's exports to still on a solid trend but the pace is slowing



Source: The Bloomberg™ Professional service

In better news, the real estate market in North America continues to boom. Mortgage rates have ticked up from rock bottom but are still highly favourable and consumer leverage remains low. This sector is one, we think, that is likely to be a highlight of the next six months.

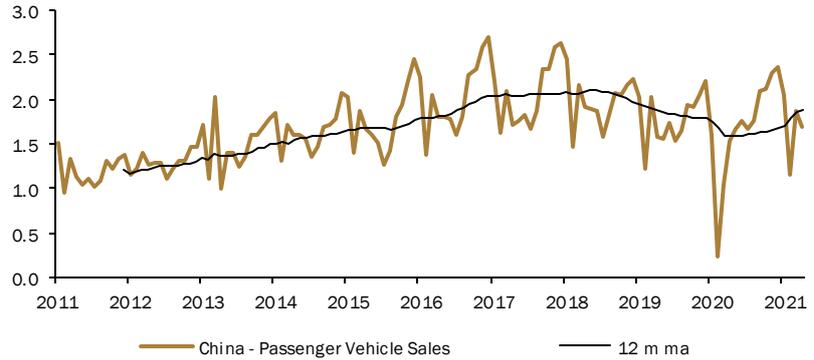
US real estate likely to pause for breath but remains in good health



Source: The Bloomberg™ Professional service

In contrast, the global auto sector is still showing signs of duress as the global semiconductor shortage persists. Optimists suggest that the worst of the shortages has passed, and we concur with that view. However, it will take another 6 months at least for newly built manufacturing capacity to be commissioned and ramp up sufficiently to make a difference. In the meantime, production shortages may constrain sales growth in China through Q1 but the outlook for the second half is brighter.

Recovery in China car sales likely to ease off during Q1 2022

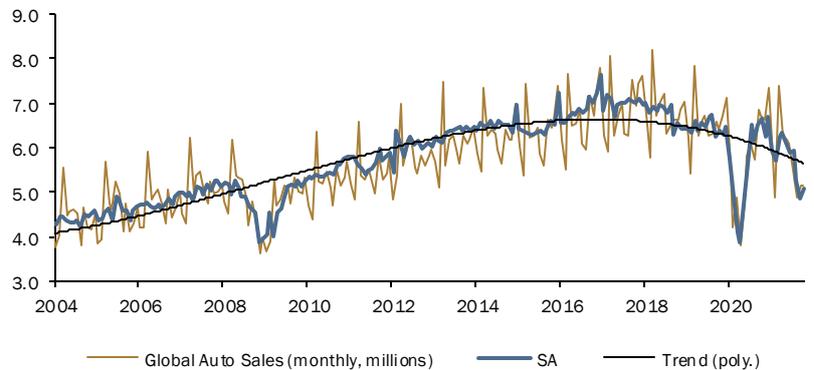


Source: The Bloomberg™ Professional service

At a global level, the short-term outlook has turned bleaker, notably in Europe where the effects of the semiconductor shortage have become even more acute. October was the worst month for new car sales on record by some measures, with a seasonally adjusted annual rate of just over 11 million vehicles and year on year declines in the major markets of around 30%.

The only way may be up from that nadir but Covid-related lock-downs are re-emerging now across the continent and that will ensure the rebound is anaemic for the next quarter at least.

The global auto sales recovery has been deferred by persistent chip shortages



Source: The Bloomberg™ Professional service

On a brighter note, estimates suggest that the US light vehicle market is 3 or 4 months ahead of Europe in terms of an easing of the semiconductor shortage and manufacturing rates. August was dismal in terms of year on year decline, September was bad but less bad than August, and the October numbers were almost respectable in comparison.

So in conclusion, macro risks are on the up and are coinciding both with some typically idiosyncratic year-end liquidity and financial market stresses as well as a softening in the broader business and inventory cycle.

Our sense is that the global economy should be able to traverse the soft patch without those risks becoming systemic. The way to survive quicksand is not to panic. Central banks and policymakers would do well to remember that as we move into 2022.

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