THE OREGON GROUP

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BATTERY & INDUSTRIAL METALS

The Green Economy and Nickel's Generational Class I Supply Crunch

BATTERY & INDUSTRIAL METALS

Nickel's Dirty Little Secret

Stainless steel, transport, energy, healthcare, food contact materials, water, paper – each of these market sectors is utterly reliant on nickel. This is particularly so with modern and next generation lithium ion batteries which have up to 70% nickel content. As the fight against climate change intensifies, so too does the pressure on nickel supply, and in ways that are not yet widely appreciated.

While nickel is abundant, Class I nickel is less so, and as for Class I nickel that can be produced in an efficient, economic and environmentally responsible manner… well that is now, as they say, very "thin on the ground".

As nickel-consumers contend with their own decarbonization related upheavals, producers find themselves in an unprecedented period of conflicting pressures from increased demand, environmental, social and, increasingly, geopolitical sources.

With analyst consensus pointing to long-term growth, investment should be pouring into projects around the world. However, the Chinese-induced nickel price crash of 2007 left many Western investors and producers enduringly wary. In the absence of competition, China has increased its dominance in what is increasing viewed as a critical metal.

As Western governments finally wake up to the sorry state of domestic production, they are starting to take action. Some big shake ups could take place in the nickel industry during the coming years, but the longer Western money sits on the sidelines, the greater the upwards pressure on pricing.

The Oregon Group has delved into global nickel data, we've sat down with a variety of nickel insiders, and we've worked to separate fact from fiction. In this report, we share our findings.

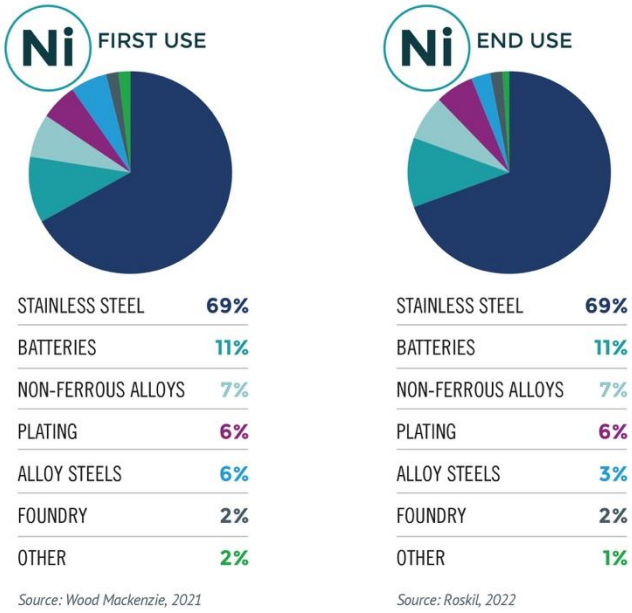
"Nowhere else will you find the issue of securing future supply more pronounced than in the nickel world, thanks to the wave of electrification intensifying across the globe."
A. Milewski, The Oregon Group (Mar, 2022)

"From only 7% of the total market in 2021, we expect battery use to grow to 40% of nickel consumption by 2040. That will push nickel demand to double in size."
A. Mitchel, Wood Mackezie, (Apr, 2022)

What's in this report

NICKEL MARKET BASICS

Nickel is the fifth most common element on earth and has a wide variety of applications thanks to its incredible chemical and physical properties. In particular, it is a key material for stainless and heat-resistant steel and is increasingly used in EV batteries.



While nickel is found throughout the world, most of the economic deposits, which occur in sulphide and laterite-type formations, are found in only a few jurisdictions. As a result, the bulk of the world's estimated reserves of 300 million tons are in Australia, Indonesia, South Africa, Russia and Canada.

The massive increase in nickel mining over the last 30 years has exhausted most of the known high-grade deposits. However, technological innovation has significantly changed nickel mining and processing, enabling the industry to successfully produce useable product from lower-grade ore.

It's important to note that nickel can be recycled indefinitely without degrading. According to the Nickel Institute, "*approximately 68% of all nickel available from consumer products is recycled and begins a new life cycle (reference year 2010); another 15% enters the carbon steel loop. However, around 17% still ends up in landfill, mainly in metal goods and waste electrical equipment.*"[i]

Nickel is an irreplaceable component of stainless steel (invented in 1913 by Harry Brearley of Sheffield, England), which still accounts for the bulk of nickel demand. Stainless steel is essential to modern life in most countries, used in everything from cutlery and cookware, to appliances, furnaces, medical equipment and even construction. Nickel's rise to fame as a battery metal began in the 1980's when the rechargeable nickel metal hydride (NiMH) batteries became popular with power tool manufacturers. By the 90's nickel-containing batteries were common in all popular electronic devices – most notably laptops and phones – and also found their first use as an EV battery.

With the consumer electronics industry fully matured, and stainless steel providing steady, albeit unexceptional, growth, it's the EV and the energy storage markets that have laid the path for major demand increases and a corresponding potential upcoming supply crunch.

A Question of Class

All metals require processing before use. However, with nickel, the disparities between processing for the largest source of demand (stainless steel) and the fastest growing source of demand (battery components) are important to note. Stainless steel and alloy producers can utilize low-quality nickel (Class II nickel). This gives miners and refiners great flexibility but contrasts with superalloy and battery producers who require nearly flawless levels of purity - a minimum of 99.8% (Class I nickel) is typically the starting point, but even higher purities are now being sought (nickel sulphate purity required for lithium ion battery production typically contains less than 100 parts per billion of magnetic material contaminants).

"*The chances of a major, new high-grade nickel discovery is becoming increasingly unlikely*."

The issue is that, of the approximately 3.0Mtpa[ii] of nickel mined and processed currently, about 60% is impure and comes in the form of ferronickel (aka nickel pig iron or "npi") - basically iron oxide ore from laterite deposits containing varying quantities of nickel. Turning NPI into Class I nickel is costly from a financial and an environmental perspective. In comparison, sulphide ores, which are predominant in producing pure nickel products, are far more efficient. It typically takes three times the energy to extract, refine and produce one tonne of nickel from laterite ore than it does from sulphide ore.

Unsurprisingly, the mining industry has done a comprehensive job of locating and developing the world's large, high-grade deposits. The last sulphide discovery with high grades and long life was Voisey's Bay, Canada, in 1993, which took twelve years to reach production. The chances of a major, new high-grade nickel discovery is increasingly unlikely.

THE BIG TRENDS

Overview

The green economy, energy transition, security of supply, geopolitics, and the disrupting impact of ESG… nickel fundamentals have never looked so good. Yet for many in the West, this remarkable and versatile metal remains off limits when it comes to financing new, domestic production. The nickel price crash in 2007, which secured Chinese dominance in the space, also wrecked the dreams of Western miners and investors who had, collectively, poured $billions into new nickel production capacity. However, although the West has been slow to tap its own nickel deposits, we believe the unstoppable trends driving demand will bring an end to this hesitancy. As it does so, major opportunities will emerge for investors.

The big trends at play in the nickel sector have their roots in the 1990's when China began its drive for commodity dominance. Since China has always lacked abundant domestic sources of minerals, it began to secure and control the sources of these raw materials elsewhere. The country's unprecedented infrastructure spending at that time set in motion a commodity super cycle and mining boom that lasted until the late 2000s.

With commodities like zinc, aluminum, bauxite, iron ore, copper and metallurgical coal, China found it easy to obtain sufficient supply, but for smaller markets such as cobalt and nickel it was a different story. So, China started securing concessions to control the massive laterite nickel deposits in Indonesia using a quid pro quo strategy. China soon started exporting the ores directly to its domestic furnaces repurposed from the iron industry, using them to make NPI. As the Indonesian government recognized the lost value in allowing export of unprocessed ore, it modified export regulations. In turn, China started to construct massive new NPI operations in Indonesia in order to satisfy newly enacted exported regulations.

Within a short timeframe, China added between 300,000-400,000 tonnes[iii] of NPI units to a one and a half million tonne market, pushing aside major producers such as Glencore, Vale, BHP and Norilsk. Although Indonesia repatriated much of the processing to improve domestic profits, by the time it did so, Western mining hopes for a robust, profitable Class II nickel industry had been dashed, and China had secured its leadership position.

The investments meant a double economic bonus for the Indonesian government. The new, Chinese-financed plants were inefficient and relied heavily on electrical power. However, they could be powered by cheap, thermal coal mined domestically in Indonesia thus creating another revenue stream. The only catch with this cheap nickel being the fact that it's environmentally dirty nickel.

Powering the Green Economy with... Batteries

Everyone knows about the lithium-ion battery. Ironically, these batteries actually contain anywhere from 30% to 80% nickel, with only a tiny proportion being lithium. As a result, nickel mining plays a mission-critical role. And don't expect next generation chemistries to change this fact because the new formations coming down the pipeline need even more nickel!

The battery sector is growing so fast that all eyes are fixed on Class I nickel supply. Forecasts vary from analyst to analyst, but the consensus is one of exponential growth. Wood Mackenzie, for example, states that batteries accounted for 7% of total nickel demand in 2021 but will grow to 40% by 2040[iv], leading to a doubling of global nickel demand. However, this prediction does not address the issues facing the refining of Class II nickel into Class I. In other words, the market still faces a Class I nickel supply crunch, the questions are: how severe is it, and how long will it last?

How do You Want Your Nickel... Clean or Cheap? You Can t Have Both

As the market learned in 2022, refining cheap, Class II nickel into battery-grade, Class I is technologically viable. However, what happens when most of the new, Class I nickel being promised by one of the world's largest nickel producers will come from mines that dump toxic tailings into the ocean, and from inefficient processing plants that emit dangerous fumes and burn coal for energy, as well as require further, massive investments of time and money?

In March, 2022, the nickel market was rocked by the announcement that Chinese nickel giant, Tsingshan, had agreed to supply 100,000 tonnes of nickel matte to battery midstream majors CNGR and Huayou Cobalt, which could be refined into battery precursor materials such as nickel sulphate. This called into question market assumptions that a colossal Class I supply crunch was coming.

The premise was that Tsingshan's matte would be created by converting lower-quality nickel pig iron (NPI) – an energy intensive process that is also high in greenhouse gas (GHG) emissions – a stark contrast with more environmentally-friendly nickel sulphide ores processed into matte.

Nearly a year later, NPI-to-matte production is indeed taking place, however, the lack of Class I nickel supply has still not been solved. The issue is that Tsingshan's matte needs further, expensive processing to create battery-grade material. To date, this additional refinery capacity has not been put into place as the matte has been going to refineries that already have the capability to refine nickel matte from sulphides.

It is true that Tsingshan has new Indonesia-based facilities under construction to produce refined nickel, but this is not a short term solution. Instead, Tsingshan announced in January, 2023[v], that it was in discussions with Chinese copper plants with a view to repurposing said plants as nickel refineries.

According to Bloomberg coverage of the news, this has the potential to double Chinese refined nickel production this year, adding roughly a fifth to global refined output and replenishing global exchange inventories, which are near multiyear lows. It would offset a potential 10% output reduction from Russia's Norilsk – the largest producer of refined metal.

We at The Oregon Group took the time to speak with one of the top engineers in the nickel sector and in his opinion, the costs in time and money associated with repurposing copper refineries are significant and not easily overcome (our understanding is that only the electrowinning section of a copper refinery can readily take nickel sulphate solution and produce nickel plate cathode. To deliver the nickel in the form of a nickel sulphate solution from matte will require complete overhaul and new equipment in any existing copper refinery). That's not to say Tsingshan won't proceed with the plan but it does pour cold water on the idea that the Class I shortage is about to be solved quickly. What it does do, of course, is serve as another scare tactic to delay domestic efforts and investments by other countries, such as those in the West.

It is all part of China's tried and true strategy to dominate the global battery supply chain. Given enough time, China will be able to complete construction and ramp up of its large HPAL plants in Indonesia, where major laterite deposits exist (at the time of this report, China had commissioned three new HPAL plants in Indonesia in 2022 out of an announced five).

However, as these expensive and highly complex plants near completion, sometime between now and 2024, an increasing problematic question is being asked: where will all the waste, or tailings, go?

Let's be clear, miners have been effectively and safely dealing with tailings for decades. However, let's consider this example: if you are mining a laterite nickel ore grading 1%, and you want to make 60,000 tonnes a year of nickel, you need to mine at least 6 million tonnes of material. With HPAL, you have to place all of that mined material into an autoclave (think of a submarine sized pressure vessel) before applying heat, adding sulphuric acid, and dissolving the ore inside.

Once you have extracted the usable nickel (and cobalt), you're left with a highly acidic solution containing iron, aluminum, magnesium and other elements that were present in the ore. You can't just dump that back into the active mine, it needs to go into a tailings management facility or tailings pond. And not only do you have to store a huge volume of acidic waste that increases with each day of production, but you also have to treat and dispose of the water that's flowing in (for every one tonne of ore you need approximately 1.5 tonnes of water).

Regions such as Australia, with its massive nickel deposits, have the advantage of vast land tracts

and a climate that that has a net evaporative effect on tailings ponds. The water evaporates, the material shrinks, and you're left with reduced complexity, risk and cost. You are also located in an area with very low seismic risk and a location that is not typically near the ocean, a major watershed or a population base.

Contrast that with the tropics, whether it be Cuba, Brazil, the Philippines, New Caledonia, or Indonesia, where rainfall is greater than evaporation every year and seismic activity is a consideration, and you have a serious tailings risk – aka potential exposure to a massive ecological disaster.

Many miners in these locations use vast tailings ponds containing a "sludge" of waste material that must be contained for decades before it can be covered and rehabilitated. Even then, water management of these legacy ponds is an ongoing issue as the run-off can be acidic for years.

Other miners discharge tailings into the ocean, which can be done in a controlled way if the proper circumstances are present, such as the right bathymetric (ocean depth) conditions to ensure tailings are discharged at a point of depth below the ocean's upwelling current and sunlight zones and will continue to sink to the bottom rather than well up and mix with the top layers of the sea and marine life. It is also dependent on the material being discharged and whether it is treated before discharge or simply disposed of. Some miners treat and neutralize 100% of their tailings prior to impoundment, storage and disposal. Other miners only partially treat and neutralize, some do nothing to their tailings. The degree of treatment is dependent on two major factors; cost and jurisdictional regulations in the country in which they operate.

Papua New Guinea has an advantage as it has several deep canyons around it, and several of their mines can dispose of their tailings into the ocean through deep-sea tailings placement. Other countries benefit from similar situations such as the West Coast of North America, Norway, the Philippines and some islands in the Caribbean.

On the other hand, Indonesia is surrounded by shallow seas, and is not amenable to this option and many of the operating nickel mines are located in what people consider the "coral triangle" - the global center of marine biodiversity.

> "*The plain fact is that investors and governments increasingly want ethical and clean production…"*

This means the HPAL operations will be forced to store tailings on land and treat solutions before being released to the environment (and eventually the ocean). Considering the seismic and climate issues, there is no question that this route exposes miners and surrounding communities to increasing risk of structural failures and potentially catastrophic damage to the environment and communities.

The cost of failure could be very high indeed.

The plain fact is, consumers and governments increasingly want to see ethical and clean production – both because it's the right thing to do for the planet but also because of the risk and the severe consequences of failure.

A perfect example can be seen in the case of another crucial battery metal – cobalt. In 2017, word spread amongst consumers that artisanal producers in the Democratic Republic of Congo made use of child labour. Public outrage resulted in tech giants such as Google and Apple cutting off such producers and forcing remaining DRC suppliers to track and deliver an ethically clean product[vi].

A major consumer backlash in response to “dirty nickel” in their cars, laptops and phones is very easy to imagine. It has the potential to force Western manufacturers to act and demand a clean supply.

However, Chinese producers in Indonesia – set to flood the market with “dirty nickel” once their HPAL operations or NPI to matte conversion comes online – show no signs that they will employ best practice for their tailings and GHG emissions. Instead, they seem to be gambling on the fact that, with so few competitive operations in production, manufacturers will be utterly reliant on this product as they will become the sole source of supply, akin to the polysilicon business and solar panels.

It makes for a high stakes gamble. Will China be able to produce its stated volumes in the timeframe it claims and hook global manufacturers on cheap nickel to the point at which they will be forced to ignore the ecological damage being done through their chosen sources of supply? Many experts – including the storied Nickel Institute believe not.

There are far cleaner nickel sulphide mines in operation, and there are some massive nickel sulphide projects in North America – such as Giga Metal’s Turnagain project in British Columbia – that could be put into production given funding. These projects could produce nickel with a fraction of the environmental footprint of HPAL or NPI operations in Indonesia.

The deft and timely plays by Tsingshan have continued to delay Western investors who fear a repeat of events in 2007 when China KO’d the price of nickel using a flood of cheap NPI production to meet the needs of its stainless steel industry.

Is this paralysis going to continue? Recent signs are starting to suggest not, mainly thanks to security of supply and geopolitics.

Security of Supply & Geopolitics

For years, China had little in the way of real competition as it laid the foundations of dominance in the battery metals and rare earth supply chains. State-backed corporations were able to fund, partner and make agreements as they saw fit to secure the required resources while making it difficult for competitors to do likewise. Finally, at the eleventh hour, the West is waking up. As it does so, investment opportunities that were previously just wishful thinking, are beginning to solidify.

As a general rule of business, let your competition get too far ahead and you will find yourself out of the race. In the case of battery metals and rare earths, Western governments have realized that the stakes are too high to sit back any longer.

Before we get into this trend and its associated opportunities for investors, it's important to understand why and how China has used its economic might to gain prominence in key resources.

The why comes down to the fact that China lacks significant domestic resources and so must look outwards for the raw materials it needs.

As to the how, well put simply, its investment mandates are driven and supported by government policy, instead of free market forces. In the West, investors want to see a minimum of 8% return on investment before approving a project. Not so for the Chinese. The Chinese government sets national agenda in its five-year plans, and throws the national might of the world's second largest economy behind said objectives. Hence the massive investments in jurisdictions the West consider too risky, and in projects that do not have the same level of economic return expected by Western investors.

However, we are now starting to see governments, including the US and Canada, stepping forward with green economy and critical mineral plans and legislation. To be clear, these are not meaningless public relations stunts. The Inflation Reduction Act is arguably America's most significant climate legislation ever, and it is heavily aimed at supporting domestic clean energy and the related supply chains.

Then there is Canada's critical metals strategy – operating at both a Federal and Provincial level. It includes a variety of financial incentives and will potentially also include streamlined permitting processes for mines to boost critical metal production.

There's more. To the surprise of many, in November, 2022, Canada ordered three Chinese groups to divest their stakes in Canadian critical metals companies citing national security.[vii] Now, the companies in question are focused on lithium and not all of the assets were domestic but it signals that the country is not above forcing out foreign ownership.

More interesting is the EU carbon border tax. While not (yet) applicable to nickel-based products, the agreement, which is going through the final approval stage, will impose a tariff on imports of steel, cement, fertilizer and other products that have a heavy carbon footprint.

Canada's nickel companies would most certainly benefit from instituting a similar tax, as would the

environment. The country, which is host to around 20% of the world's known nickel reserves, taxes carbon from domestic producers, but is happy to import stainless steel from China that uses carbon-intensive nickel from Indonesia, without any such carbon levy. This is nickel with a greenhouse gas footprint approximately 30 times that of nickel that could be produced in Canada from projects like Giga's massive Turnagain nickel sulphide deposit.

How far will the West go in terms of promoting domestic growth and leveling the playing field with international carbon levies has yet to become clear. However, in 2021, Canada began officially exploring the potential of what it calls Border Carbon Adjustments (BCA). The goal, according to the announcement is to "consider how this approach could help Canada meet its climate targets, while ensuring a fair environment for businesses."[viii] The results have yet to be published but it signals that the trend of the West seeking to level the playing field is gaining pace.

When Low Grade is the New High Grade (aka: the Compelling Case for Low-Grade Sulphides)

Incoming Trend Alert! Waking up to China's head start in the nickel race is one thing, catching up is another matter entirely. Between carbon border taxes, growing consumer unhappiness with products made from "dirty" metals, and various other initiatives, Chinese-controlled nickel looks likely to lose some of its price advantages. However, for that to matter, the West needs new sources of supply that tick the right boxes. The good news? It has massive, undeveloped deposits in its own back yard. There's just one catch.

As we've already mentioned, about 60% of current nickel production is in the form of ferronickel (iron-containing nickel ranging from a low of 2% to a high of 75%) – a form not suitable for direct use in batteries without high monetary and environmental costs. That's where sulphide ores come in, which regardless of grade, are faster, simpler, and cleaner to process using simple froth flotation, which has been utilized in mining for over a century.

The last sulphide discovery that had size, quality, and long life was the 1993 Voisey's Bay discovery, Canada. In the nearly three decades since, no other 'high-grade, long life" deposit has been discovered. The conclusion? If the West is serious about avoiding complete dependence upon China then future supply must come from undeveloped Western-based resources previously considered uneconomical due to grade.

However, not every low-grade deposit will be suitable. As battery manufacturers race to price parity with the internal combustion engine, they are seeking improved production efficiencies and the elimination of costly steps in their supply chain. For example, it is increasingly apparent that cathode manufacturers are looking for mixed hydroxides (MHP), like that produced at Ramu in Papua New Guinea, or mixed sulphides, like those produced by SMM in Coral Bay, Taganito or Terrafame in Finland.

The problem is that supplies of these partially processed nickel materials are limited. The remaining option is high-grade nickel concentrates. This is where previously undeveloped projects, such as Giga Metals' Turnagain or Waterton's Dumont deposits – both in Canada – come into play.

Both Turnagain and Dumont have been around since the 1970s and are considered massive deposits, each containing over 10 billion pounds of nickel (enough to power 60 million EVs at 80kg/EV of Ni). Both are sulphide deposits that can be upgraded into a nickel-rich sulphide concentrate (NiS) of about 20% nickel content. This means projects such as these are well positioned because the capital cost of development is about 50% of that of HPAL (the process for converting laterite ores to MHP or mixed sulphides), and actual cash costs will be more than competitive with HPAL. Also, sulphides have the advantage of free sulphur by-product for the cell manufacturer and are materially less greenhouse-gas intensive than processing laterite ores.

With battery-grade nickel demand set to grow exponentially over the long term, and limited sources of existing supply, we at The Oregon Group believes that continuing to ignore sulphide deposits considered to be 'low grade 'will soon no longer be viable in a world desperate for battery-grade nickel products.

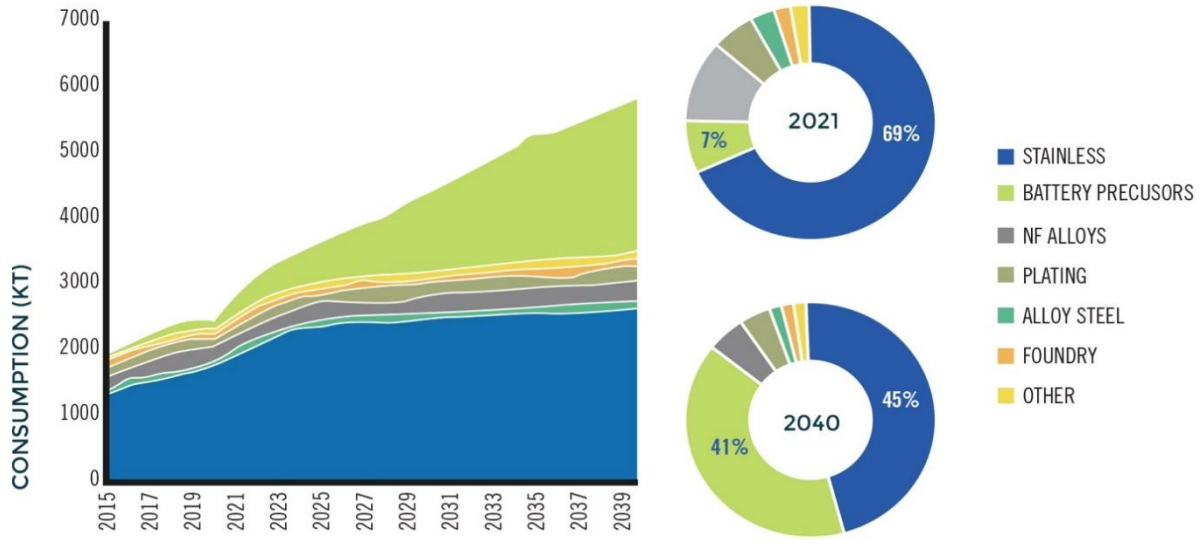
NICKEL DEMAND

Nickel demand is a relatively straightforward story and the figures speak for themselves. The metal has many uses but when it comes to discussing future, global demand, it really comes down to just two factors: near-term expansion of the vast stainless steel industry, and continued, massive growth of the battery industry. China dominates both market sectors and currently consumes approximately 55% of global nickel demand. Indonesia is a close second, while Europe and North America lag significantly behind.

We'll start with stainless steel. When it comes to nickel consumption, the industry is a hungry beast that requires around 60% of global supply. It is dominated by China and Indonesia – both of which continue to add melt shop capacity. While analysts differ on the precise rate of growth expected over the coming years, there is consensus that over the near-term, the stainless steel production will grow at a strong rate, before moving into a slower rate of expansion. That's right, even when it slows, production – and thus nickel demand – will still grow.

Then we have batteries. Benchmark Mineral Intelligence, a leading independent authority in battery metal market analysis, estimates that global demand for nickel in batteries could hit 1.3 million tonnes annually by 2030 – up from 150,000 tonnes of nickel in 2020.[ix] That's close to 1000% growth, and the increasing trend towards nickel-rich battery chemistries such as nickel-manganese-cobalt-622 and nickel-manganese-cobalt-811 could further accelerate this trend. Now consider that total global nickel output in 2022 was about 3.0 million tonnes, of which the bulk was Class II nickel used by the stainless steel industry, and you realize the scale of Class I production required is daunting.

For us, these charts tell the whole story…



Source: Wood Mackenzie,

NICKEL SUPPLY

Nickel-containing ores are mined in more than 25 countries, some of which also have infrastructure for recycling nickel. Despite these facts, analyst consensus is that current sources of supply will be insufficient to meet mid-term demand. Where predictions differ is exactly when the deficit will hit, how it will be filled, and who will fill it. To be clear, the stainless steel industry has all the nickel it needs now and in the foreseeable future. When we talk about approaching deficits, we're talking about nickel required for the battery sector, aka Class I nickel.

Indonesia may be the world's largest nickel producer (by a long way) but the power behind the throne is China. The Chinese spotted the upcoming Class I supply issue years ago and invested in High Pressure Acid Leach (HPAL) operations, based in Indonesia following the successful implementation of this technology at Ramu, in Papua New Guinea. These projects take, on average, a decade from the start of construction to full capacity. Given the industry's track record, industry insiders, many of them members of The Nickel Institute, believe China's new capacity will take longer and cost more to execute successfully. Admittedly, given that the Chinese approach differs from Western miners, it may be a more compressed timeline, helped by the fact that the Chinese are basically taking carbon copies of Ramu and constructing them in Indonesia. The drawback is that not all of the operations will perform at the same efficiency/capacity because the ore sources all differ in nickel grade, mineralogy and impurity levels.

Also, as we've already mentioned, these facilities are energy intensive, rely on electricity supplied by coal power stations, and have to deal with the problem of toxic tailings.

TOP NICKEL PRODUCING COUNTRIES

1. **Indonesia**
   Mine production: 1 million MT
2. **Philippines**
   Mine production: 370,000 MT
3. **Russia**
   Mine production: 250,000 MT
4. **New Caledonia**
   Mine production: 190,000 MT
5. **Australia**
   Mine production: 160,000 MT
6. **Canada**
   Mine production: 130,000 MT
7. **China**
   Mine production: 120,000 MT
8. **Brazil**
   Mine production: 100,000 MT
9. **United States**
   Mine production: 18,000 MT

Source: US Geological Survey, 2022

Of additional importance is the following issue: Given the limited supply sources that are available, production from these new Chinese plants will almost certainly be used to feed Chinese domestic demand. As supply tightens, this will leave Western battery companies such as Panasonic, Umicore, and BASF, scrambling to secure sufficient suitable nickel. In such a scenario, the nickel price can be expected to rise rapidly, and that's even before we consider factors such as how fast the world transitions to low-carbon electricity and electric vehicles. The faster the transition, the tougher it will be on China's new and near-term nickel supply, and when we say tougher, we mean nickel prices are going to rise even further, even faster.

The big question then, is when can we expect the deficit to hit? At the time of this report, independent analyst Wood Mackenzie points to sufficient supply through the mid 2020's due to production ramp up in Indonesia. After that, the continuing projected demand growth will outstrip new supply and shortly thereafter is when the gap is expected to kick in. We at The Oregon Group have spoken to several battery manufacturers outside of China and anticipate supply problems occurring sooner as a result of the trends we've identified. Either way, consensus points clearly to an approaching supply deficit.

INVESTING IN NICKEL

The case for long-term, explosive growth in nickel demand, and the corresponding opportunity for investors is clear. The global energy transition and many other areas of decarbonization need nickel and lots of it. This will drive and maintain high commodity prices and in doing so will affect the value of related investments. However, if you're an investor looking to get into nickel then you're probably asking, "what are my pure play nickel choices?" and the answer, we're sorry to say, is that your choices are very limited. In this section, we take a broad look at nickel investing.

Nickel ETFs

If you don't have the time to dig deep into the nickel supply chain and identify the best investment opportunities, then an ETF could be a good choice. ETFs can provide that broad exposure you may be looking for. Examples include:

iPath Series B Bloomberg Nickel Subindex Total Return ETN

TICKER: JJN, PRIMARY EXCHANGE: NYSE

An exchange-traded note issued in the US. It follows the price of nickel futures contracts as opposed to buying physical nickel. As a result, it doesn't precisely match nickel market prices for nickel. However, it provides direct exposure to nickel.

Global X Nickel Miners ETF

TICKER: NICK, PRIMARY EXCHANGE: NYSE

The Global X Nickel Miners ETF (NICK) is a popular nickel ETF. It tracks the performance of a basket of companies involved in the mining, refining, and production of nickel.

VanEck Green Metals ETF

TICKER: GMET, PRIMARY EXCHANGE: NYSE

VanEck Green Metals ETF (GMET) seeks to track as closely as possible, before fees and expenses, the price and yield performance of the MVIS® Global Clean-Tech Metals Index (MVGMETTR), which is intended to track the performance of companies involved in the production, refining, processing and recycling of green metals. It's a theme based approach rather than pure play nickel.

Nickel Stocks

Producers, developers, explorers… nickel stocks can provide excellent exposure to nickel but come with varying degrees of risk. Below are some of the noteworthy companies in the supply chain and, following that, a short list of companies The Oregon Group considers interesting - each with its own unique value proposition.

THE MAJORS

The big boys (aka The Majors) are diversified producers. They certainly have the size, so you'll get your exposure to nickel, but it will come with a variety of other exposures. As far a nickel plays go, these are the equivalent of dipping your toe in the water. If that sounds interesting, here are a few to consider, each of which is either US or UK listed.

GLENCORE

Glencore

TICKER: GLEN, PRIMARY EXCHANGE: LSE

Glencore plc is a Swiss multinational commodity trading and mining company with headquarters in Baar, Switzerland.

BHP

BHP

TICKER: BHP, PRIMARY EXCHANGE: NYSE

BHP Group Limited is an Australian multinational involved in mining, metals, natural gas and petroleum.

VALE

Vale

TICKER: VALE, PRIMARY EXCHANGE: NYSE

The largest producer of iron ore, pellets and nickel. Additional operations in manganese, ferroalloys, copper, gold, silver, and cobalt.

AngloAmerican

Anglo American

TICKER: AAL, PRIMARY EXCHANGE: LSE

Multinational mining company. It is the world's largest producer of platinum, with around 40% of world output, as well as being a major producer of diamonds, copper, nickel, iron ore and steelmaking coal.

DEVELOPERS & EXPLORERS

Each of these companies has assets located in Canada, which is consistently ranked as one of the most attractive mining jurisdictions in the world. Moreover, the country has recently introduced new, critical metals incentives programs at the Federal and Provincial levels. Now, developing a nickel mine isn't cheap. In fact, it's expensive and can take around five years to complete on average. That means the developers and their investors need to be confident that prices are going to be sufficiently high over the long term for the mine to make financial sense. We at The Oregon Group believe that the trends will keep nickel prices high. If you're of a similar mindset, here are a few exploration and development plays you might look at.

Canada Nickel

TICKER: CNC, PRIMARY EXCHANGE: TSX-V

Flagship project (Crawford) is a large scale, lower grade, open pit nickel sulphide project. Located in the established Timmins mining camp it has a preliminary economic assessment showing robust economics, including US$1.2 billion after-tax NPV8% and 16% after-tax IRR. Final feasibility study resource in mine plan to target upper end of 1.3 to 1.8 billion tonnes.

Gigametals Corporation

TICKER: GIGA, PRIMARY EXCHANGE: TSX-V

Giga Metals has formed a joint venture with Mitsubishi Corporation to advance its Turnagain nickel/cobalt project in BC, Canada. The Preliminary Economic Assessment (PEA) models production of an average of 33,000 tonnes of nickel per year over a 37 year mine life and the company is fully funded to complete the Prefeasibility Study in H1 2023.

FPX

TICKER: FPX, PRIMARY EXCHANGE: TSX-V

Flagship project (Baptiste) has been projected to be among world's 10 largest nickel mines by annual output, sporting a 35-year mine life with significant expansion potential. Additional project advantages include potential for low carbon intensity production, as well as a high-value, strategic products grading 63% Ni with low impurities.

Nickel Creek Platinum

TICKER: NCP, PRIMARY EXCHANGE: TSX

Flagship project (Nickel Shaw) is host to over 1.8 billion pounds of nickel, 1.1 billion pounds of copper, 5.7 million ounces of platinum group metals ("PGM's") and 107 million pounds of cobalt in the measured and indicated. Exceptional access to infrastructure, located three hours west of the city of Whitehorse via the paved Alaska Highway, which also provides year-round access to deep sea shipping ports in southern Alaska.

The following company has been chosen for its individual strengths, its potential upside, and its level of direct exposure to nickel. It also manages to avoid investment in Indonesia-based operations which, while vast, we believe will also face increasing ESG headwinds as time progresses.

Nickel 28 Capital Corp.

TICKER: NKL, PRIMARY EXCHANGE: TSX-V

Direct Exposure to Nickel. Upside from Multiple Streams, Royalties & Direct Interests

Nickel 28 is a unique option for investors looking for direct, well-managed exposure to nickel. The company owns a significant interest in the producing Ramu Nickel mine as well as royalties on the advanced, high-quality, Canadian-based nickel sulphide deposits of Dumont and Turnagain. It is one of the few nickel producers listed on the TSX/TSX-V and in total the Company manages a portfolio of 13 nickel and cobalt royalties on development and exploration projects in Canada, Australia and Papua New Guinea. What this means for shareholders is near-term revenue and cash flow, diversified asset exposure, and additional future avenues for growth, all managed by a disciplined, experienced management team.

Let's talk about Ramu, of which Nickel 28 owns 8.56% of joint-venture interest. This is a producing, long-life and world-class nickel cobalt operation located in Papua New Guinea. In 2022, the operation produced approximately 34,000 tonnes of contained nickel and 3,000 tonnes of contained cobalt. That ranks it as one of the world's largest producers of Mixed Hydroxide Precipitate (MHP).

Ramu consistently ranks as either number one or two in terms of cost effectiveness amongst the global HPAL operations, as published by Wood Mackenzie, and continues to achieve or surpass nameplate capacity. This highlights the skills of the facility management and workforce in general. It is also in direct contrast to the HPAL operations sitting in Indonesia.

It should be noted that Ramu Nickel sales were inconsistent during late 2021 and H1 2022 but the mine owners remain on track to fully repay the construction debt (approx...$73 million outstanding as of October 31, 2022) sometime during 2024.

In terms of the broader portfolio, highlights include a 1.75% NSR in the construction-ready Dumont project in Quebec, Canada, a 1.7% GRR in the construction-ready Nyngan project in Australia, and a 2.0% NSR in the massive Turnagain project in British Columbia, Canada which, in August 2022 became the main asset in the newly formed JV between Giga Metals and Japan's Mitsubishi Corporation confirming it's on the radar of major players as a long term source of nickel and cobalt.

Canadian based Nickel 28 also will continue to invest in a battery metals-focused portfolio of streams, royalties and direct interest in mineral properties containing battery metals.

Here's what we also like: Management, which includes Anthony Milewski – co-founder of The Oregon Group – are the largest shareholders with more 25% of the company and, in late 2021 and early 2022, the Company repurchased over 1.3 million shares. This speaks volumes regarding insider confidence in the direction and upside for the company, such as the rapid pace of debt repayment, the dividend on the horizon, and an acquisition strategy positioned to take advantage of the trends identified in this report on nickel.

THE OREGON GROUP PROJECTIONS

As the saying goes, “something’s gotta give”. Either the existing, undeveloped projects with dramatically superior environmental footprints get financed, or the world accepts that the energy transition and green technology will be hooked on large quantities of “dirty nickel” and reliant on the Chinese to deliver such nickel worldwide. The latter of course comes with a huge risk. Specifically, what happens when consumers boycott companies that use dirty nickel?

If such boycotts occur, what options are even available to manufacturers? We could very easily see a scramble of epic proportions for the sources of clean nickel that are available. In such circumstances there will be some clear winners and losers, not to mention huge price spikes in nickel.

Nor can miners turn to a convenient pipeline of near-term, low emission production. Why? Well, the few undeveloped projects with the required size and ESG creds have more marginal economics than Western investors are used to, and the reason the Chinese haven’t stepped in to finance them is because said projects are sitting in North America.

Sure, there is plenty of exploration going on right now but economic mines are not discovered, developed, and permitted overnight, especially when the end product is Class I nickel.

The next few years will be a time of significant change for nickel as the mining industry repositions itself to feed the battery industry more effectively. As a result, we believe the historically dismissed, low-grade sulphide deposits in stable jurisdictions are going to have the inside track, not the laterite deposits of tropical countries such as Indonesia, the Philippines, and Cuba.

Bottom Line

The Class I nickel shortage is not going away soon and will remain a source of upwards price pressure for some time to come. If you are not already positioned, now is the time to consider getting involved.

SOURCES

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