Commodity markets

Nickel market

Key market trends

The nickel rally that started at the London Metal Exchange (LME) in late March was driven by delays in issuing nickel ore mining permits in Indonesia, the LME's ban on Russian-origin nickel produced on or after 13 April 2024, the state of emergency in New Caledonia, and a broad-based price rally across all base metals, particularly in copper.

However, the price lost all the gains and declined to USD 17,000/t as early as June amid the announcements by the Indonesian government that additional nickel ore production quotas had been issued, which triggered the liquidation of long speculative positions. Despite subsequent closures of production assets, including BHP's Nickel West in Australia and IGO's Forrestania, the bearish sentiment continued to dominate the LME trading, so the price plunged to USD 15,500/t by the end of July.

In September, the LME nickel price rebounded to USD 17,000/t as the US Federal Reserve System lowered interest rates by 50 b.p., exceeding market expectations, and the Russian authorities announced potential restrictions on the exports of nickel in retaliation to Western sanctions. Later on, the People's Bank of China unveiled the most aggressive financial stimulus since the pandemic to achieve the government's growth target.

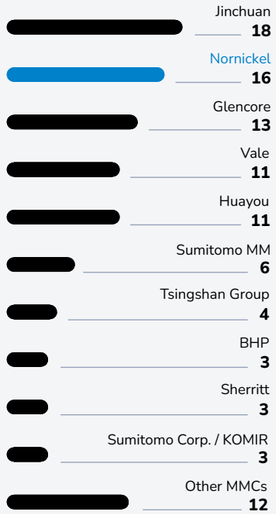
As a result, the price reached a three-month high of USD 18,000/t at the beginning of October as these measures significantly boosted market sentiment. Still, the price fell again after the Golden Week holiday as, after a more detailed look at the proposed stimulus package, the market found it insufficient.

By mid-November, the prices slumped to USD 15,300/t, despite news of Ambatovy's technical issues, Eramet's production cuts in Indonesia, and reports of curtailments by one of the largest Indonesian NPI producers due to tight nickel ore supplies. At year-end, the price fell below USD 15,000/t – its lowest level since 2020 – as it remained under pressure from weak market fundamentals.

As a result, the LME nickel price averaged USD 16,812/t in 2024, down 22% from the 2023 average of USD 21,474/t.

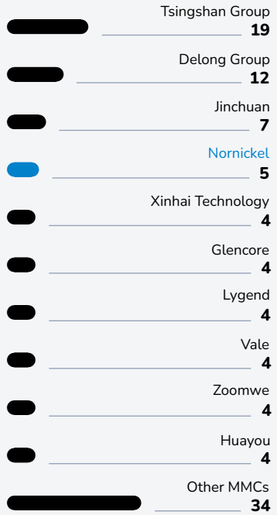
World's largest Class 1 nickel producers in 2024 (%)
Nornickel – No. 2

Sources: producer reports, Company analysis as of early March 2025



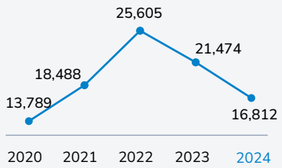
World's largest primary nickel producers in 2024 (%)
Nornickel – No. 4

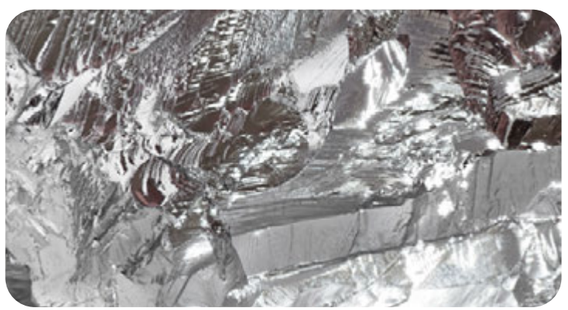
Sources: producer reports, Company analysis as of early March 2025



LME nickel price in 2024 (USD/T)

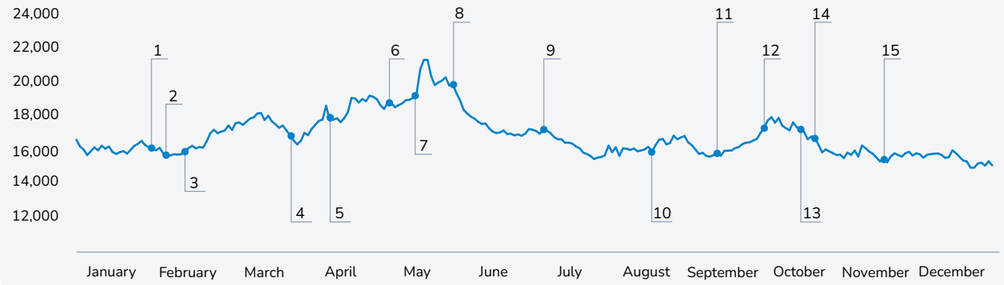
Source: London Metal Exchange, Company analysis





LME nickel price in 2024 (USD/T)

Source: London Metal Exchange, Company analysis



1. New Caledonia's Prony Resources faces cash crunch.
2. BHP flags possible production cuts at Nickel West in Australia.
3. Glencore to exit Koniambo, to place plant into C&M.
4. Indonesia issues production quotas for 65% of annual nickel ore demand.
5. LME bans new Russian-origin metal.
6. First Quantum Minerals puts Ravensthorpe into C&M.
7. State of emergency in New Caledonia.
8. Indonesia issues production quotas for 85%–90% of annual nickel ore demand.
9. BHP to close Nickel West.
10. IGO puts Forrestania into C&M.
11. Russia considers export restrictions on nickel.
12. China's government unveils new economic stimulus package.
13. Eramet cuts Indonesia ore production on mining permit setbacks.
14. Ambatovy suspends nickel output.
15. Indonesia considers changes in nickel ore royalties.

Market balance

In 2024, primary nickel demand increased by 4% y-o-y to 3.39 mln t on the back of higher use in the stainless steel (+4% y-o-y), special steel (+8% y-o-y), and alloys (+8% y-o-y) sectors due to a robust environment in the aerospace and oil and gas industries, while consumption in the battery sector fell short of expectations (+4% y-o-y) due to low sales of non-Chinese NEVs (new energy vehicles: battery electric vehicles and plug-in hybrids) and a higher share of nickel-free LFP batteries.

Refined nickel output grew by only 3% y-o-y to 3.54 mln t as higher Indonesian NPI (+9% y-o-y) and Class 1 (+15% y-o-y) production was offset by lower supply of Chinese NPI (–15% y-o-y), ferronickel (–24% y-o-y), and low production of nickel chemicals (+1% y-o-y) which turned out to be lower than expected due to slower EV sales and lower share of nickel-based battery chemistries in China.

As a result, in 2024, the global nickel market had a surplus of approximately 150 kt, or 5% of annual consumption (compared to a surplus of 183 kt in 2023). The surplus was mainly concentrated in China-origin high-grade nickel, accumulated in LME-approved warehouses in Asia and other off-warrant inventories.

Overall, around half of all nickel producers were loss-making in the end of 2024, as surging Indonesian supply is weighing on high-cost operations all over the globe, predominantly in Australia and New Caledonia, which could be a potential upside for the nickel price. Considering the scale of potential supply curtailments in Indonesia and elsewhere, as well as the robustness of nickel use in the stainless steel, alloys, and special steel sectors, the market may become more balanced going forward.

Demand

The largest nickel-consuming countries are China, Indonesia, EU member states, Japan, the USA, and South Korea.

Stainless steel remained the key sector of primary nickel use in 2024 (about 65% of total demand).

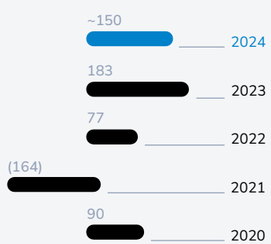
Stainless steel production uses almost all types of nickel feed (except for certain special products, such as nickel powder and compounds). However, since the quality of nickel used has almost no effect on stainless steel quality, steelmakers primarily use cheaper low-grade nickel such as NPI, ferronickel, and nickel oxide. As a result, the share of high-grade nickel used in stainless steel has decreased in recent years.

In 2024, global stainless steel production rose by 5% y-o-y to 63 mln t, driven by output growth in China (+4% y-o-y) and the rest of Asia (+9% y-o-y) amid a recovery in Indonesian production and new capacity additions in India. Meanwhile, stainless steel output in Europe grew by just 2% y-o-y due to destocking, operational issues at multiple facilities, and weak consumer demand. Stainless steel production in the Americas rose 3% y-o-y, also pressured by uncertainty in end-user demand.

The battery industry uses nickel as a key element in the production of precursor cathode active materials for batteries. In 2024, nickel use in the battery sector increased by only 4% to 0.5 mln t amid a slowdown in BEV sales and a surge in sales of plug-in hybrid electric vehicles (PHEVs), which have lower battery capacity and thus lower nickel content, as well as a growing share of nickel-free LFP batteries.

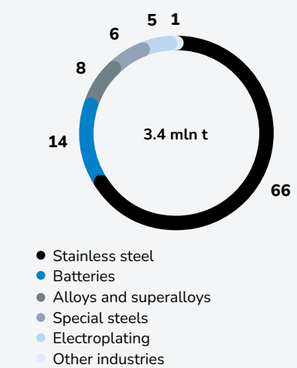
Nickel supply and demand balance, excluding changes in current reserves (KT)

Source: Company estimate as of March 2025



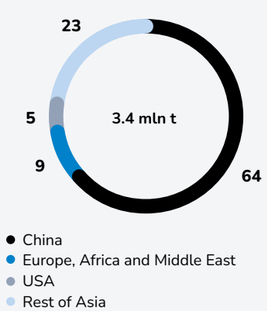
Primary nickel consumption by industry in 2024 (%)

Source: Company data



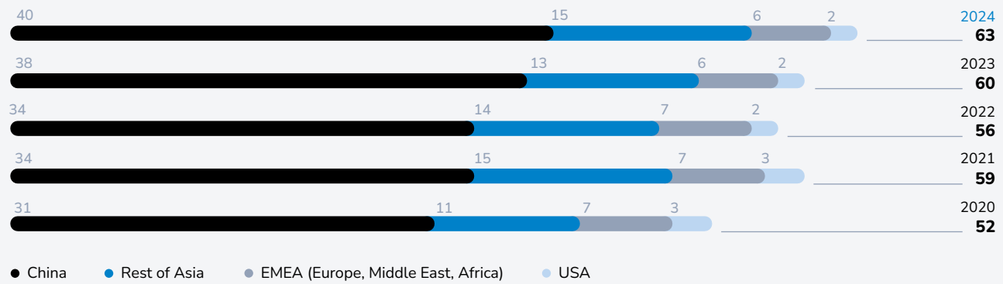
Primary nickel consumption by region in 2024 (%)

Source: Company data



Stainless steel production (MLN T[1])

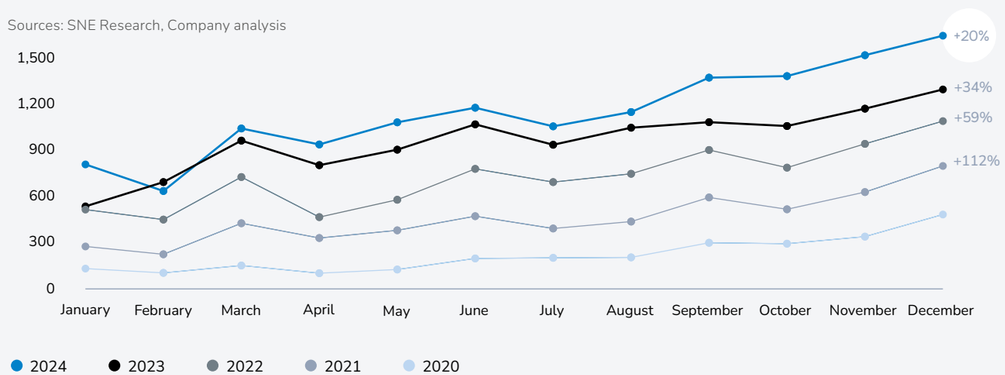
Sources: Eurofer, ISSF, USGS, SMR, METI, TSIIA, Company data



Global sales of electric vehicles

(THOUSAND UNITS)

Sources: SNE Research, Company analysis



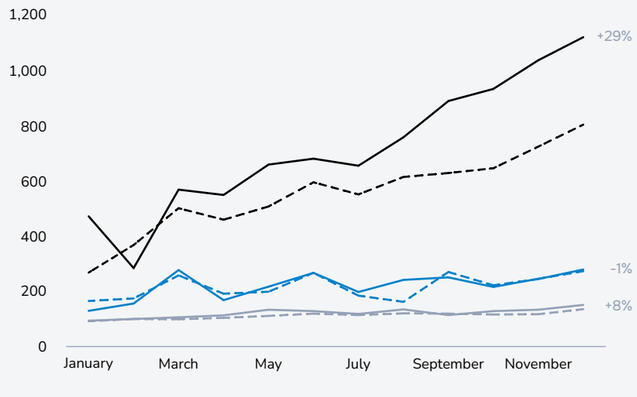
[1] Figures may not sum up due to rounding.

In 2024, global BEV-equivalent sales[1] grew 20% y-o-y. Sales in China jumped by 29% y-o-y, primarily driven by rising PHEV sales, which surged by 79% y-o-y, while the growth rate of BEV sales was materially smaller (+21% y-o-y). In 2024, NEV sales in China reached a record penetration rate of 48%, being almost on par with internal combustion engine (ICE) vehicles, prompted by the intensive rollout of new models by domestic automakers as well as state support. For example, the Chinese government continued to promote vehicle trade-in subsidies during the year by doubling the cash handout for consumers who replace their ICE cars or old EVs with a new NEV.

However, as some metrics suggest, the domestic market might have reached a state of saturation given the intensifying competition, so China turned its attention to foreign markets by raising its vehicle exports from 500 thousand units in the 2010s to 6.4 million in 2024, over 20% of which were NEVs. We expect this trend to continue in the medium term as Chinese OEMs are likely to boost low-cost EV exports to developing economies, including Southeast Asia, the Middle East, and Latin America.

Sales of electric vehicles by region in 2024 (THOUSAND UNITS)

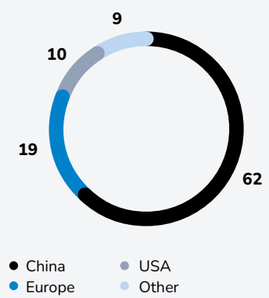
Sources: SNE Research, Company analysis



In Europe, 2024 recorded a remarkable deceleration in electric vehicle adoption efforts. European BEV-equivalent sales declined by 1% y-o-y due to a withdrawal of policy support in some countries (notably in Germany and France) and lower affordability of EVs for consumers as the ICE counterparts remain more price competitive.

Sales of electric vehicles by region in 2024 (%)

Sources: SNE Research, Company analysis



Moreover, companies like Northvolt, which have long been considered the backbone of Europe's battery sector, filed for bankruptcy as they struggled to compete with Asian producers. They are also grappling with an unexpected drop in demand for electric vehicles, which points to an uncertain future.

In 2024, the European Union imposed tariffs on Chinese-made EVs as the concerns about unfair trade practices and the impact of Chinese subsidies on the EU market grew. These tariffs, which could range from 17% to 35% depending on the manufacturer, were implemented on 31 October 2024. We expect this decision to constrain European EV sales even more, which will have a negative impact on the EU transport electrification plans in the medium term.

The US EV market was sending similarly mixed signals throughout the year, with growth continuing, but slower than previously anticipated (+8% y-o-y).

After Trump's re-election, there have been some developments regarding the future of the Inflation Reduction Act (IRA) and the US electric vehicle sector. Trump has declared his intention to roll back significant portions of the IRA, particularly focusing on unspent funds. His administration may also reduce and divert some of the funding planned for similar projects and EV adoption incentives. However, certain aspects of the IRA, especially those supporting US-based manufacturing of EVs, could be preserved, as some Republicans recognise the value of fostering local production.

The overall growing popularity of electric and hybrid cars, along with the evolution of cathode technology towards nickel-intensive types, adds to the tailwinds for significant growth in primary nickel demand in batteries in the long run. Despite the mounting competition across technologies, high-nickel formulations will remain the preferred option for automakers owing to their higher energy density, longer range, and better recyclability. Meanwhile, this figure may require further upward revisions given the continuous introduction of more ambitious carbon neutrality goals, subsidies-driven transport electrification, and cost optimisation of battery cell production.

In 2024, nickel use in **other industries** (alloys, special steels, plating, etc.) increased by 6%, or 0.7 mln t, amid the steady recovery in industrial demand and robust economic performance in the aerospace and oil and gas sectors.

Supply

High-grade nickel is produced in the form of nickel cathodes, briquettes, pellets and powder, rounds, and other small special forms as well as chemical compounds, both from sulphide and from more common and available laterite raw materials. In 2024, the leading producers of high-grade nickel were Jinchuan, Nornickel, Huayou, Glencore, Vale, Zoomwe, and Sumitomo Metal Mining (SMM).

Low-grade nickel includes nickel pig iron, ferronickel, nickel oxide and utility nickel, which are produced from laterite raw materials only. In 2024, the key producers of low-grade nickel were Indonesian and Chinese NPI smelters, owned by Tsingshan and Delong, as well as the largest ferronickel producers: South32, Anglo American, POSCO, Eramet, etc.

The nickel market had been fundamentally divided into the low-grade and high-grade segments. However, these markets became interconnected once the practical implementation of the NPI-to-matte conversion started in early 2021 along with the massive HPAL[1] capacity additions, and the launch of nickel cathode production from low-grade Indonesian feed sources in 2023.

[1] Under this methodology, HEV and PHEV are recalculated according to their relative battery capacity ratio: HEV 2 kWh vs PHEV 20 kWh vs BEV 60 kWh.

[1] High pressure acid leaching processes.

Refined nickel production increased by 3% y-o-y to 3.5 mln t in 2024, according to our estimates.

Supply growth in 2024 was mainly driven by the ongoing expansion of Indonesian NPI and HPAL intermediates projects as well as increased production of nickel cathodes in China and Indonesia from Indonesian materials. On the other hand, this growth was offset by a decline in Chinese NPI output, global FeNi and non-Chinese Class 1 production cutbacks as well as a slowdown in global nickel compounds output.

At the same time, potential production curtailments due to an unstable price environment and operational challenges faced by many producers could serve as a balancing factor in the oversupplied market, as around half of all nickel producers are loss-making at the 2024-end price.

Production of high-grade nickel grew 11% to 1.4 mln t in 2024.

Class 1 nickel output grew by 15% y-o-y to 1 mln t, surpassing both the absolute and relative growth rates of NPI production for the first time in a long while. Class 1 nickel production was steadily growing, mainly due to the launch of new nickel cathode capacities in China and Indonesia.

On top of this, Class 1 nickel production grew in Japan (driven by higher converter matte exports from Indonesia), South Africa (due to a release of built-up work-in-progress inventory at Anglo American Platinum), and Norway (as Glencore ramped up to design capacity following supply chain disruptions caused by strikes in 2022). However, output declined in Australia (due to the shutdown and subsequent mothballing of BHP's operations) and Madagascar (due to persistent operational difficulties and high production costs).

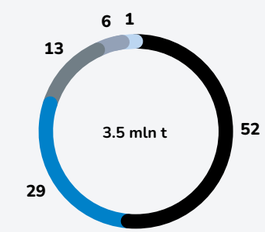
Nornickel slightly reduced its nickel output in 2024 due to the full overhaul and subsequent ramp-up of flash smelting furnace No. 2 (FSF-2) in the second half of 2024. Despite this, nickel output exceeded the Company's full-year production guidance.

During the year, **production of nickel compounds**, including nickel sulphate from primary sources (excluding sulphate produced by Class 1 nickel dissolution), increased only marginally by 1% y-o-y. This was largely due to lower demand from the battery sector amid slowing EV sales and a declining share of nickel-containing batteries as well as a shift from nickel sulphate to Class 1 production in China and supply reductions by a number of Western producers.

Low-grade nickel output declined by 1% y-o-y to 2.2 mln t.

Primary nickel production by product in 2024 (%)

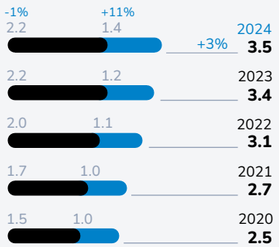
Source: Company data



- Nickel pig iron
- Class 1
- Nickel compounds
- FeNi
- Nickel oxide and utility nickel

Primary nickel production (MLN T[1])

Source: Company data

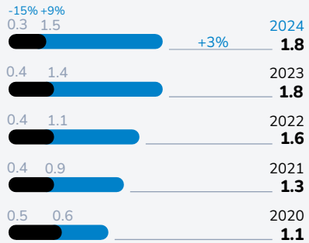


- Low grade nickel
- High grade nickel

PRIMARY NICKEL PRODUCTION CAN BE DIVIDED INTO THE HIGH-GRADE AND LOW-GRADE NICKEL SEGMENTS.

NPI production (KT[1])

Source: Company data



- China
- Indonesia

Indonesia continued to grow its NPI production capacities. Since 2015, Indonesia's NPI output had been steadily increasing at double-digit rates annually. However, 2024 marked a shift in this trend as growth slowed to 9% y-o-y over 12M 2024 amid delays in issuing new nickel ore mining quotas, which began to emerge in the second half of 2023.

In addition to restricted ore availability, producers are facing declining nickel grades as high-grade ore reserves in the country are being rapidly depleted. This trend is evident in the decreasing nickel content of Indonesia's exported NPI. As a result, consumers are forced to rely on ores with high Mg and Si content, which presents additional metallurgical complexities. To mitigate these issues, nickel ore imports from the Philippines have been significantly increased in order to use those for blending purposes.

As a result, Indonesia's NPI output was 1.5 mln t in 2024.

China's NPI production continued to decline in 2024, falling by 15% y-o-y to 0.3 mln t, due to increased competition from cheaper Indonesian NPI and the fact that most producers were operating at negative margins.

In 2024, **ferronickel output** continued to decline rapidly, falling to 0.2 mln t of nickel (down 24% y-o-y). The primary factors behind the decrease are the continuing negative price dynamics (FeNi is traded at a discount to the LME nickel price), high production costs, and low capacity utilisation rates shown by multiple major producers. For instance, there were production shutdowns across several sites, including facilities in New Caledonia, North Macedonia, Serbia, and the Dominican Republic. Technical, operational, and financial difficulties were also observed at projects in Japan, Myanmar, and Brazil.

[1] Figures may not sum up due to rounding.

[1] Figures may not sum up due to rounding.

Copper market

Key market trends

In 2024, copper demand showed a positive trend, rising to 26.4 mln t, up 3% y-o-y, on the back of electricity grid expansion drive, the development of renewable projects, and the continued push for transport electrification. The start of monetary policy easing in the world's major economies also generally supported industrial production and associated copper consumption.

At the same time, demand growth was weaker than previously expected due to a slowdown in the global economy, primarily in China – the world's largest copper consumer. Total exchange inventories on the LME, SHFE, and CME jumped 103% to 432 kt, while bonded stocks in China surged 136% from the start of the year, reaching 19 kt.

During the year, copper prices showed positive trends, remaining within the USD 8,100–10,800/t range. The price hit a record high in May amid market concerns over concentrate shortages caused by the shutdown of the Cobre Panama mine due to local protests as well as Anglo American's reduced production plans and Vale's operational difficulties. These factors put significant downward pressure on copper concentrate TC/RC rates, prompting Chinese smelters and refiners to revise their production plans and increasing the risk of refined copper shortages. This, combined with increased investor activity, drove prices to a record high of USD 10,860/t at the end of May.

World's largest copper producers in 2024 (%)
Nornickel – No. 13

Sources: producer reports, Company analysis as of early March 2025

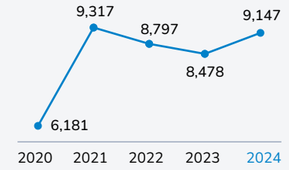
Towards mid-year, the market trend reversed. Weaker-than-expected demand growth, mixed economic signals from China, and a rise in exchange inventories to multi-year highs negatively impacted the metal price, driving it down to USD 8,600/t in early August. By September, the price had recovered to USD 9,800/t on the back of lower interest rates in the USA, an economic stimulus package announced by the Chinese government, and a decline in global exchange inventories.

However, market optimism had waned by October as participants changed their views about the effectiveness of the Chinese government's economic stimulus package in bolstering industrial demand. As a result, prices followed a downward trend for the remainder of the year, hitting USD 8,700/t in December.

In 2024, the LME copper price averaged at USD 9,147/t vs USD 8,478/t in 2023 (+8%).

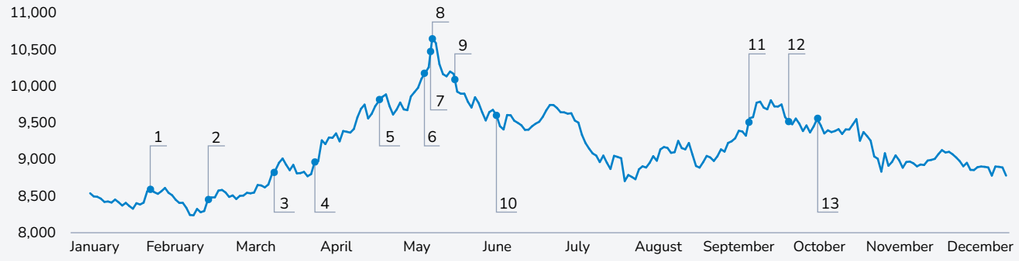
Average annual copper prices (USD/T)

Source: London Metal Exchange (cash settlement)



LME copper price in 2024 (USD/T)

Source: London Metal Exchange, Company analysis



1. First China Smelters Purchase Team's (CSPT) meeting, discussing output cuts.
2. Vale's Sossego mine licence suspended.
3. CSPT announces postponements in commissioning new smelting capacities and expansion projects, discusses production cuts.
4. CSPT decides to cut production by 5%–10%.
5. BHP makes a USD 39 billion bid for Anglo American.
6. Anglo American rejects BHP's takeover offer.
7. COMEX copper short squeeze.
8. Record high copper price.
9. Indonesia issues copper export permits for Freeport and Amman.
10. Record-high refined copper exports from China buoyed by the open arbitrage window (global prices higher than domestic price levels).
11. China announces a new economic stimulus package.
12. Fire at Freeport's smelter.
13. China announces a new economic support package, worth USD 1.4 trillion.

Market balance

In 2024, copper mine output increased by 2% to 22.9 mln t, and refined copper production by 3% to 26.6 mln t. Global refined copper consumption totalled 26.4 mln t, up 3%. Overall, the copper market was balanced in 2024, with a statistical surplus of 0.2 mln t, or less than 1% of global consumption.

Demand

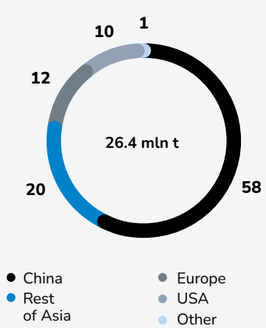
In 2024, global refined copper consumption totalled 26.4 mln t, up 3% y-o-y.

China demonstrated positive growth momentum in consumption, increasing it by 4% to 15.3 mln t. Despite the government's aggressive stimulus efforts, demand growth was weaker than expected due to the ongoing construction crisis and mixed macroeconomic data in the country. Imports of refined copper to China increased 7% y-o-y to 3.8 mln t, while imports of scrap and concentrates grew 13% and 2% to 2.2 mln t and 28.2 mln t, respectively.

In Europe, consumption slightly declined by 1% to 3.1 mln t, while North America showed a positive trend with a 2% increase to 2.2 mln t. Consumption in Asia (excluding China) also grew by 2%, reaching 5.3 mln t. In Russia, apparent primary copper consumption is estimated at 360 kt.

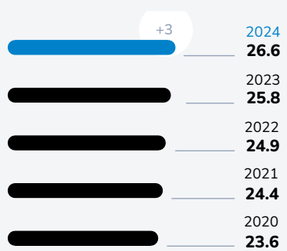
Refined copper consumption by region in 2024 (%)

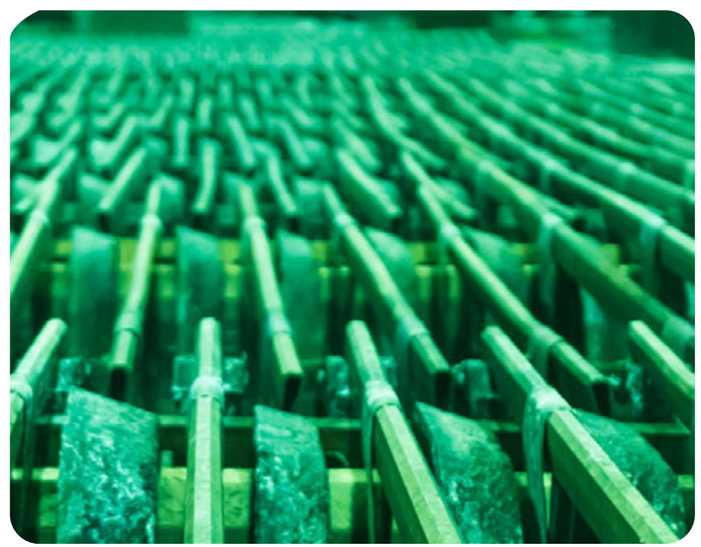
Sources: Company data, CRU



Production of refined copper (MLN T)

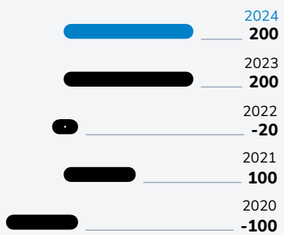
Sources: Company data, CRU





Refined copper market balance (MLN T)

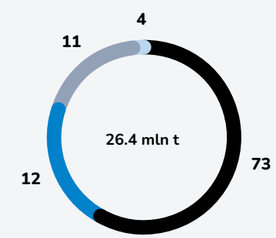
Source: Company analysis as of February 2025



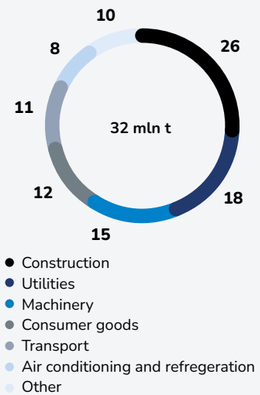
Refined copper consumption by industry in 2024 (%)

Sources: Company data, CRU

First use



End use



Supply

Global copper production increased by 2% to 22.9 mln t driven by the launch of new and expansion of existing projects.

Chile, the world's top copper producer, increased mine output by 3% to 5.4 mln t in 2024, while Peru's output fell 2% y-o-y to 2.7 mln t.

Africa managed to increase production by 9% to 4.1 mln t, with the Democratic Republic of the Congo (DRC) contributing most of the growth through Ivanhoe's Kamoa-Kakula project and overtaking Peru to become the world's second-largest copper producer.

China increased its copper-in-concentrate production by 2% to 1.9 mln t, while Indonesia's copper mine output rose to 1.1 mln t, up 13% y-o-y.

In North America, mined production of copper declined by 4% to 2.2 mln t. In the USA, output fell by 5% to 1.1 mln t; in Canada, by 3% to 400 kt; and in Mexico, by 2% to 0.7 mln t.

Refined copper production grew 3% y-o-y to 26.6 mln t amid new capacity launches in China. In South and Central America, copper cathode output fell by 6% to 2.4 mln t, with Chile recording the largest decline in refined copper production. Africa saw a 9% increase in production to 2.6 mln t, while Asia (including China) ramped up its output by 5% to 16.3 mln t. China's refined copper output increased by 9% to 12 mln t, while in Japan it decreased marginally by 1% to 1.5 mln t. Production in Europe was flat year-on-year at 3.5 mln t, while copper output in North America increased by 2% to 1.5 mln t.

The world's largest copper mining countries are Chile, Peru, the Democratic Republic of the Congo, China, and the USA.

PGM market

Stillwater mine in the USA starting from 2025. Price increases are limited by the significant volumes of spent autocatalyst scrap hoarded by recyclers, which can be released once more favourable price levels are reached.

Key market trends

Palladium

The palladium price moved predominantly within the USD 900–1,100/oz range during the year. In summer, it hit a low of USD 858/oz, pressured by unprecedentedly large short speculative positions on the exchanges and lower metal inventories at automakers and autocatalyst producers. In October, the price responded to a sharp reduction in short speculative positions and a request by US administration officials for G7 members to consider an import ban on Russian palladium and titanium, pushing it to USD 1,232/oz for the first time in 2024.

The PGM basket price found its strong fundamental support as half of South African PGM mines are unprofitable at the current prices. No project closures were announced in 2024 as almost all PGM producers had sufficient financial resources and were able to cross-subsidise. However, Sibanye-Stillwater announced plans to cut production at its high-cost

The average annual price of palladium fell by 26% y-o-y to USD 984/oz in 2024.

Platinum

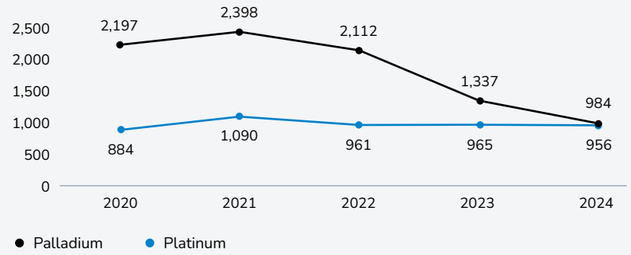
Throughout in 2024, the platinum price remained within the USD 900–1,100/oz range. A rally in the gold market, mainly driven by central bank purchases, dragged along silver but had no effect on platinum prices. This was largely due to market optimism about continued growth in industrial demand for silver, while expectations for platinum consumption growth were more subdued amid a slowdown in the rollout of hydrogen technologies.

Shrinking margins of South African PGM mines and the possibility of price-elastic palladium-for-platinum substitution in certain industrial applications put a cap on both upside and downside platinum price movements.

The average annual price of platinum fell by 1% y-o-y to USD 956/oz in 2024.

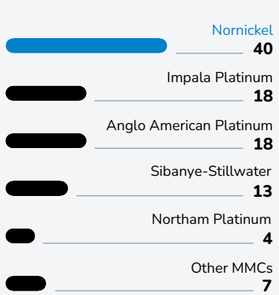
Average annual PGM prices (USD/OZ)

Source: Company analysis



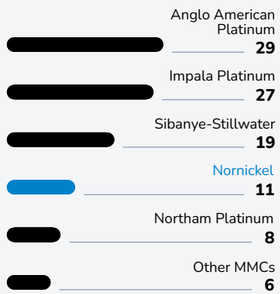
World's largest palladium producers in 2024 (%)[1]

Nornickel – No. 1

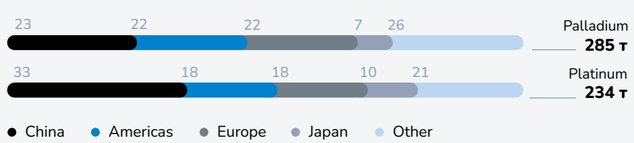


World's largest platinum producers in 2024 (%)[1]

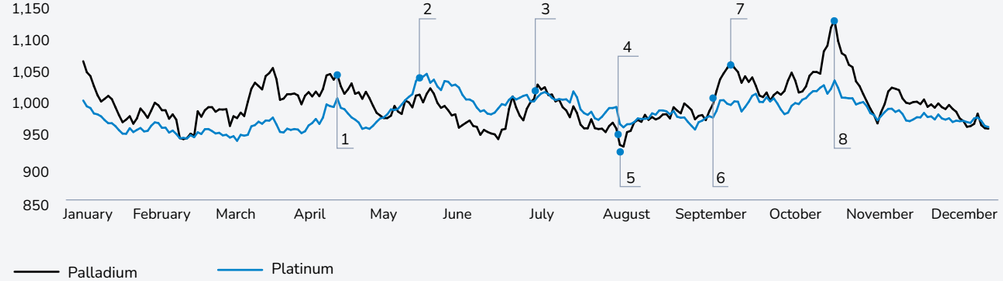
Nornickel – No. 4



PGM consumption by region in 2024 (%)



Palladium and platinum prices in 2024 (LPPM)



1. The anticipation of mine supply cuts in the South African PGM mining industry drives platinum's price to a nearly 12-month high.
2. A pro-business coalition government is formed in South Africa, strengthening the South African rand, which increases MPG production costs in dollars and supports PGM prices.
3. Lack of spot metal availability, growth of palladium leasing companies coupled with an upcoming NYMEX futures rolling.
4. Rising US recession fears.
5. China's net imports of palladium plunge to the lowest monthly level since August 2023.
6. Russian President Vladimir Putin raises an issue of possible uranium, titanium, and nickel export restrictions, which increases the fear of palladium being drawn into the discussion too.
7. Sibanye-Stillwater to halve PGM production at its Stillwater mine in 2025.
8. Reports of US administration officials asking G7 members to consider an import ban on Russian palladium and titanium. Palladium short positions on NYMEX shrink drastically.

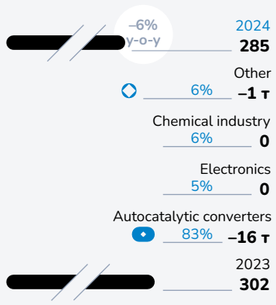
[1] Refined metal output including production from third-party feedstock and production from own feedstock by third parties under tolling agreements. Sources: producer reports, Company analysis as of early March 2025.

Market balance

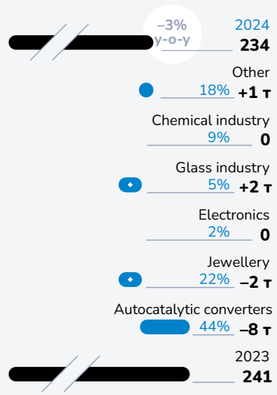
In 2024, the palladium market moved from a deficit to balance amid an accelerated decline in demand relative to supply. Demand was under pressure mainly due to PGM thrifting programmes in autocatalyst production in China, Japan, and the USA. The overall weak performance in the automotive industry, along with ongoing – albeit slowing – transport electrification, also took their toll. At the same time, the decline in metal supply was less pronounced, primarily due to reduced recycling volumes, while primary production remained stable: lower metal mining in North America and South Africa was offset by higher output in Russia.

The platinum market was nearly balanced amid stagnation in both supply and demand. Metal consumption was under pressure due to stagnant auto production, a declining market share of diesel vehicles coupled with lower overall PGM loadings per vehicle, and weakening demand for jewellery.

Palladium: consumption by industry (%) and by application (T) in 2024



Platinum: consumption by industry (%) and by application (T) in 2024



Demand

In 2024, industrial consumption of palladium declined by 17 tonnes (down 6%) y-o-y to 285 tonnes, while industrial demand for platinum decreased by 6 tonnes (down 3%) to 234 tonnes.

Automotive industry. Exhaust treatment systems account for the bulk of total PGM consumption. In this sector, palladium and platinum are used in catalytic converters, which are mandatory for road transport and legally regulated in most countries. These solutions drastically reduce emissions of hazardous substances.

Due to their unique catalytic properties ensuring effective chemical reactions throughout the entire vehicle life cycle, there are almost no alternatives to PGMs in this sector.

ICE-powered vehicles continue to account for 85% of production, while all-electric vehicles make up only 15% of total vehicle output. That said, the trend throughout 2024 was that transport electrification was driven primarily by hybrids rather than all-electric vehicles, which do not use catalytic converters. Sales of all-electric vehicles increased by only 15% compared to an increase of over 20% for plug-in hybrids.

The main consumers of PGMs are China, EU countries, Japan, and the USA.

In addition, 2024 saw a softening of transport electrification policies as the new US administration took office and tax credits for EV purchases were scrapped in Europe.

Palladium consumption by the industry was down by 16 tonnes to 233 tonnes, while platinum use also fell, down 8 tonnes to 98 tonnes.

Electronics. Palladium has found its way into the electronics industry primarily as a material for capacitors and motherboards, while platinum is used in hard drives. In 2024, palladium consumption in the electronics industry increased slightly to 16 tonnes on the back of stronger sales of household appliances. Platinum demand from the industry stayed flat at 5 tonnes.

Despite manufacturers' efforts to optimise the use of precious metals in electronics, market growth has been strong enough to support steady consumption volumes.

Chemical industry. Platinum use in chemical catalysts rose slightly to 21 tonnes in 2024, while palladium consumption also increased, reaching 19 tonnes The key drivers of consumption were capacity additions for the production of pyroxene (using platinum-based catalysts) and purified terephthalic acid (using palladium-based catalysts) in China.

Healthcare. Palladium consumption in this industry declined by 1 tonne to 5 tonnes, driven by a shift to alternative materials in dental prosthetics, primarily in Japan. Platinum consumption in this sector increased by 1 tonne to 9 tonnes on the back of growth in the usage of platinum-based medical devices, including platinum-based pacemakers, stents, implants, and cancer medicines.

Jewellery. Platinum demand in China – the world's largest platinum jewellery market – declined as consumers shifted towards gold amid rising gold prices and limited marketing support for platinum jewellery sales. At the same time, slowing inflation and consequent lower interest rates in Europe and the USA support jewellery demand in developed economies, which partially offsets negative trends in the Chinese market. Platinum use in jewellery decreased by 2 tonnes to 52 tonnes in 2024, while palladium consumption in the industry remained unchanged at 5 tonnes.

Glass industry. Bushings are platinum components used in the production of various types of glass products, including fiberglass and optical glass. Platinum demand in this industry increased by 2 tonnes to 14 tonnes in 2024, driven by both the growth in fibreglass production and the substitution of rhodium with platinum in these applications.

Investments. Palladium and platinum are widely used as an investment instrument. Physical investments may vary from coins and smaller bars to investments in ETFs. Palladium stocks in ETFs increased by 8.2 tonnes to 24.4 tonnes in 2024, while platinum stocks also grew by 7.7 tonnes to 103.2 tonnes.

Supply

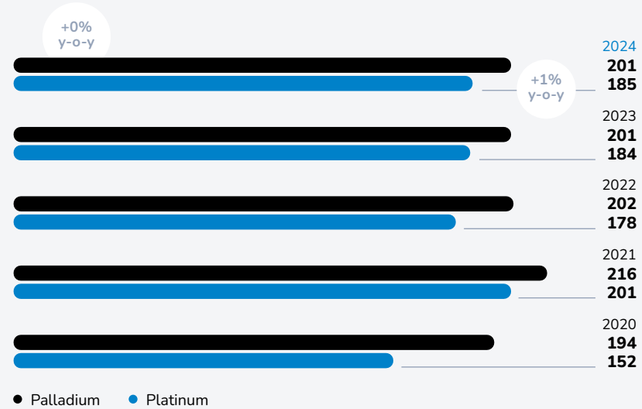
In 2024, primary refined palladium production remained unchanged from the prior year at 201 tonnes, while platinum output grew by 1% to 185 tonnes.

In Russia, the world's leading palladium producer, Nornickel completed repair work on Nadezhda Metallurgical Plant's flash smelting furnace No. 2 (FSF-2) ahead of schedule in the third quarter of 2024, increasing its throughput by 25% and exceeding production targets.

In South Africa, the world's largest producer of platinum, a drop in metal mining production was offset by a decline in work-in-process inventories. As a result, palladium and platinum production was flat at 75 and 133 tonnes, respectively.

Primary PGM production (T)

Source: Company data



Similarly, Zimbabwe's primary palladium and platinum output in 2024 remained almost unchanged from the previous year, totalling 13 and 18 tonnes, respectively.

Palladium production in North America rose by 1 tonne to 27 tonnes, while platinum output was flat at 9 tonnes. The recovery in production came on the back of a low base in 2023, when the Stillwater mine experienced technical difficulties.

The main sources of secondary PGM supply are spent automotive exhaust catalysts as well as recycled jewellery and electronic devices.

In 2024, recycled palladium and platinum production decreased by 4 tonnes and 2 tonnes to 83 tonnes and 44 tonnes, respectively. This marked decline in recycling volumes was driven by higher interest rates, which led consumers to postpone new vehicle purchases until prices normalise. For this reason, the flow of used vehicles to scrapyards has declined, reducing the supply of recycled metals as well. In addition, in a low PGM price environment, auto recyclers have been postponing the release of spent catalysts or metal recovery in anticipation of a price rebound.