



# Nickel Market Update

March 2022

Vale Canada Limited  
Base Metals Marketing



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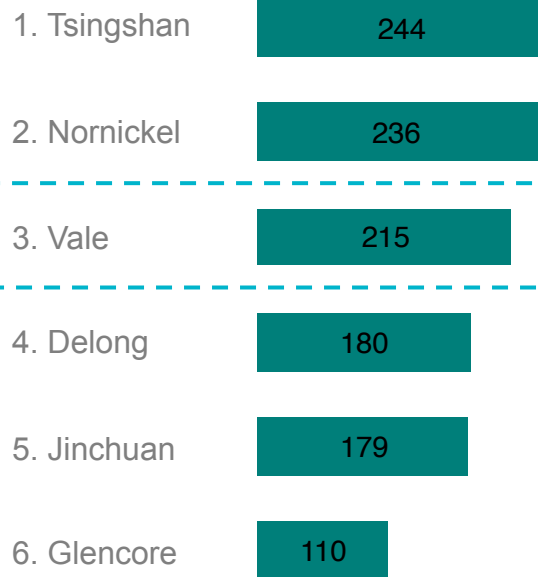
Disclaimer

# Table of Contents

- Introduction
- Nickel market overview
- Nickel use in plating
- Base metals and macro environment
- Recent prices and market movements
- Future outlook and trends for supply/demand/pricing

# We are one of the leading producers of nickel and cobalt and an important producer of copper – responsibly sourced across our global operations

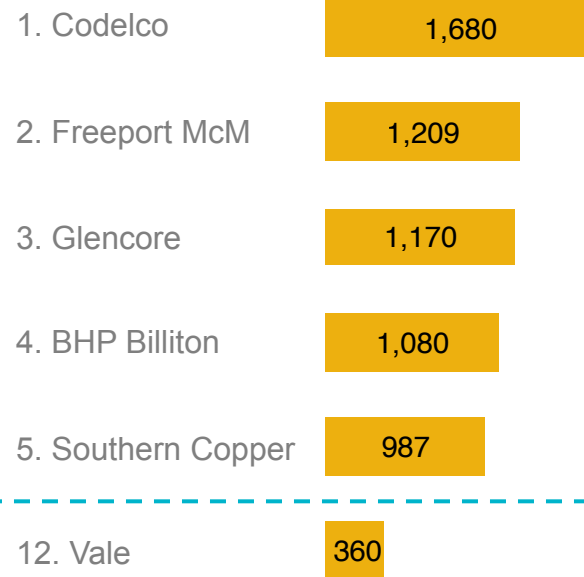
2020 Global Nickel Producers (Kt)



Global nickel production = 2,530 Kt

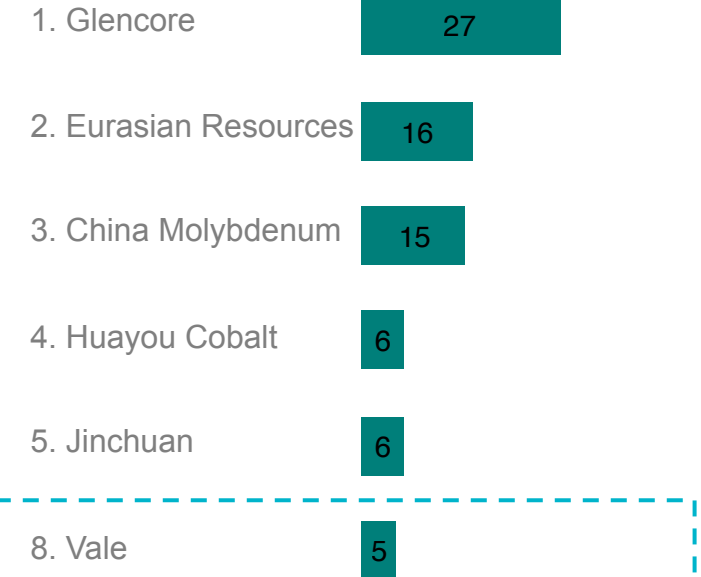
Source: Companies release, Vale analysis and Wood Mackenzie

2020 Global Mine Copper Producers (Kt)



Global mine production = 20,664 Kt

2020 Global Mine Cobalt producers (Kt)



Global mine production = 133 Kt

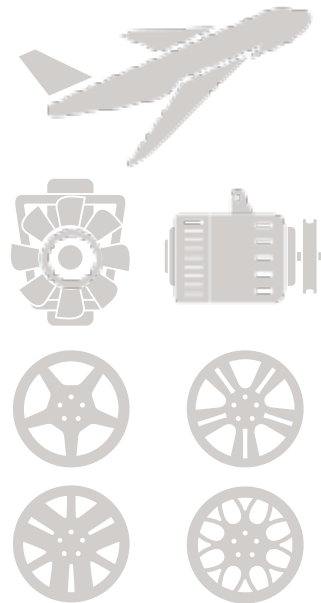
Source: Darton report, 2020-2021

# High level view of the nickel market:

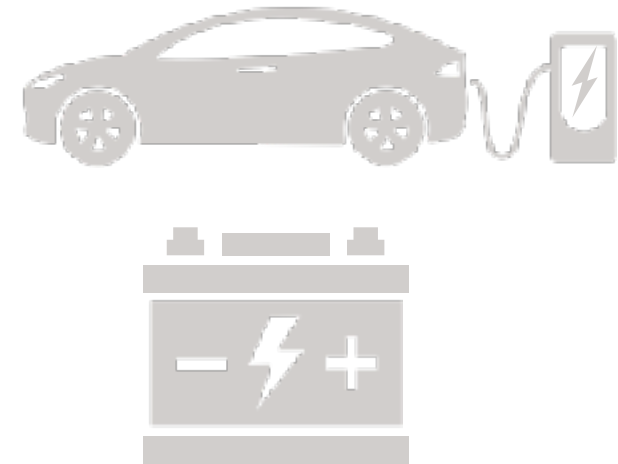
Demand for nickel products range from cutlery to automotive to aircraft engines and consumer electronics, and more recently, for batteries in electric vehicles.



**Stainless Steel**  
(~70%)



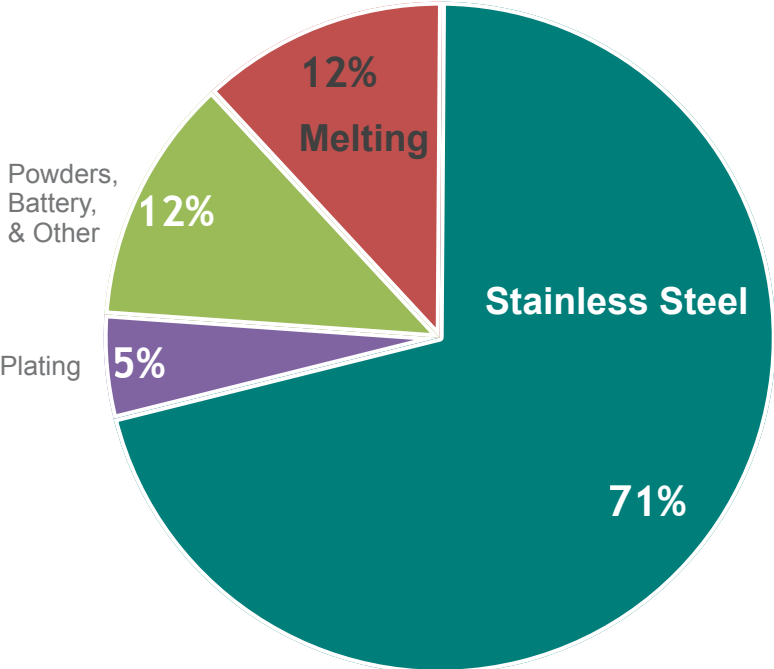
**Plating, alloy,  
foundry, sintering**  
(~25%)



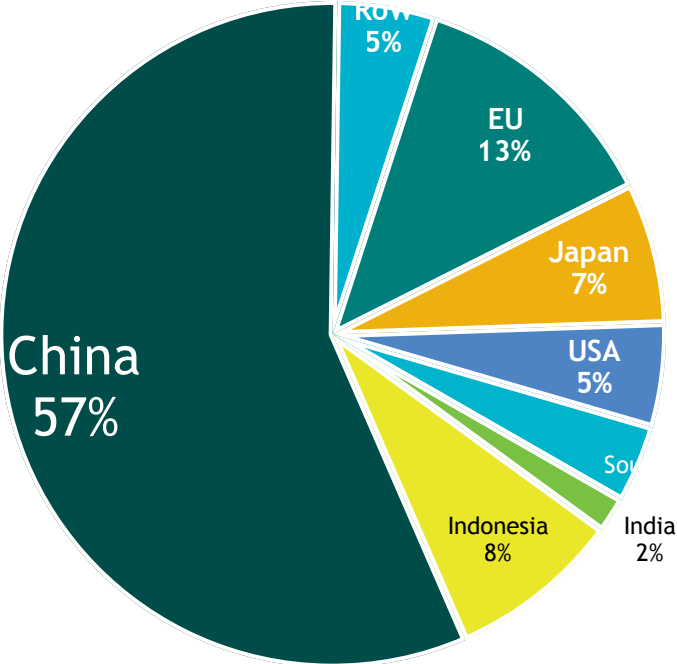
**Battery (~5%)**

# Stainless steel continues to be the primary consuming sector, high concentration in China.

2020 Global Nickel Market Segments



2020 Global Market Geography



# Nickel use in plating:



## Nickel Anode Markets (1000's of tonnes metal)

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026
RoW	148.0	146.9	124.7	133.0	139.0	141.4	143.7	146.0	149.7
USA + CAN	11.8	11.5	9.4	10.6	11.8	12.1	12.4	12.6	13.2
Europe									
Japan									
India									
China + Taiwan									

## Nickel Plating End Use Segments

Utensils, Furniture,  
Coinage, Others

Automotive

Wire/Heat Ex. Tanks

Electronics

Rail/Air/Marine/Bicycle

Appliance

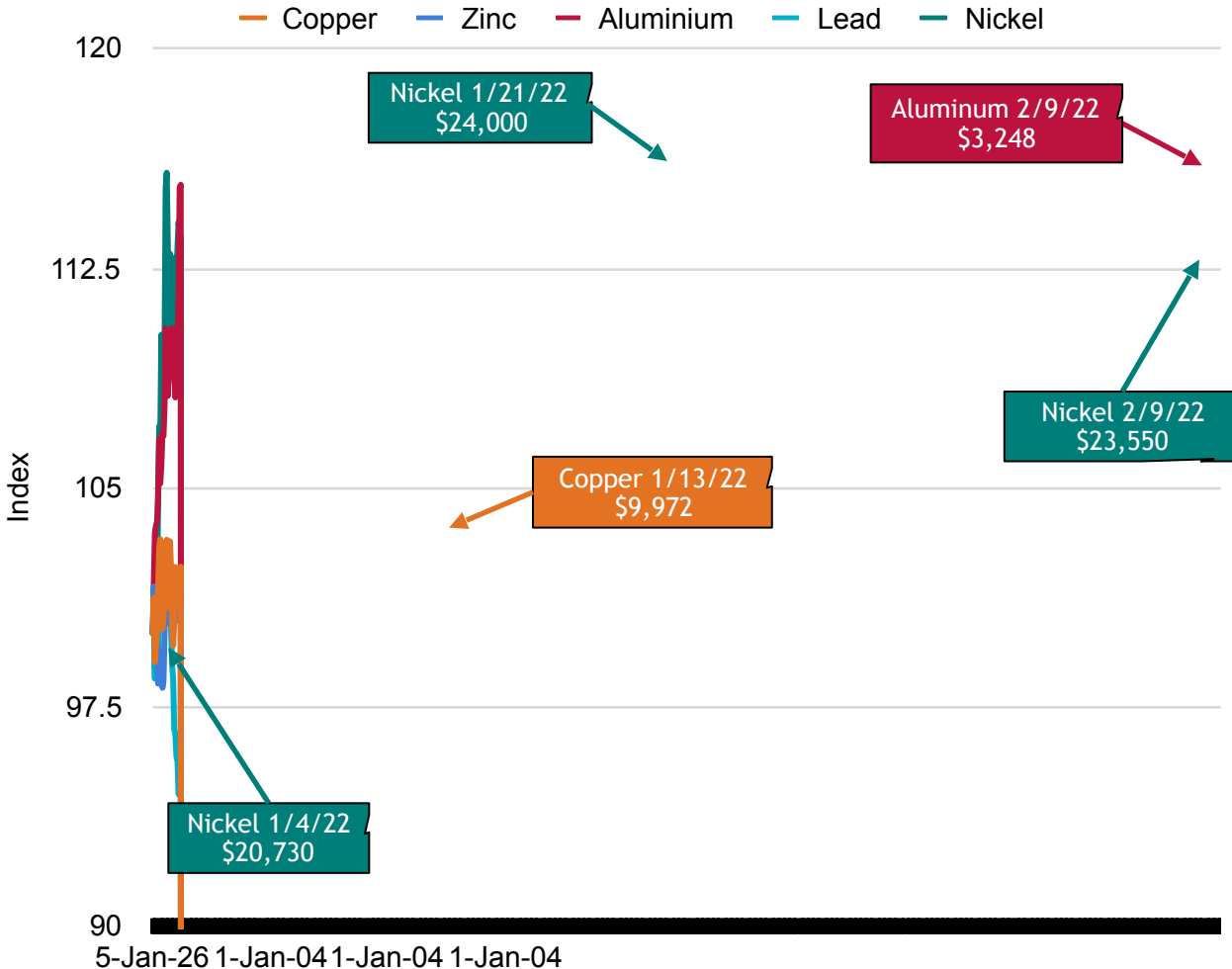
2018    2019    2020    2021    2022    2023    2024    2025    2026



# Tight supplies and low inventories lead to price spikes



## Base Metal Price Indexes



The base metals complex edged down from a record high mid-month as traders weighed tight supplies against worries of a seasonal slowdown in demand.

### Aluminum

- Aluminum prices have reached a 13-year high, due to supply tightness caused by production curtailments and closures in Europe due to high energy costs, as well as issues in China and uncertainty over possible sanctions on Russia.

### Lead

- Consumption for lead was moderate during the Chinese New Year and it is expected that supply will increase in 2022.

### Nickel

- After peaking mid-January on robust EV demand, reduction in China NPI production due to power rationing, continued declines in LME inventories, short covering, and renewed concerns of an Indonesia export tax, prices moderated as Tsingshan confirmed first shipment of matte converted from NPI to China.

### Russia/Ukraine Conflict:

- Russia accounts for around 4-6% of global refined production of copper, aluminum, and nickel, with aluminum most at risk if there were to be a disruption in exports given that Russia accounts for ~14% of ex-China aluminum supply.
- Indirect impacts also exist as sanctions could hit gas flows to Europe. Energy-intensive smelters are already concerned with high electricity prices, which have resulted in aluminum capacity reductions and steelmakers charging energy premiums on their product prices in recent months.



# Extended Russia/Ukraine conflict could lead to stagflation in Europe as energy prices rise even further



## Fluid situation depends on duration of Russia/Ukraine conflict

- No disruptions to major oil and gas pipelines through Ukraine yet
- Private sector self-sanctioning against Russian energy sector
- Large energy companies divesting from Russia (BP, Exxon, Shell, etc.)

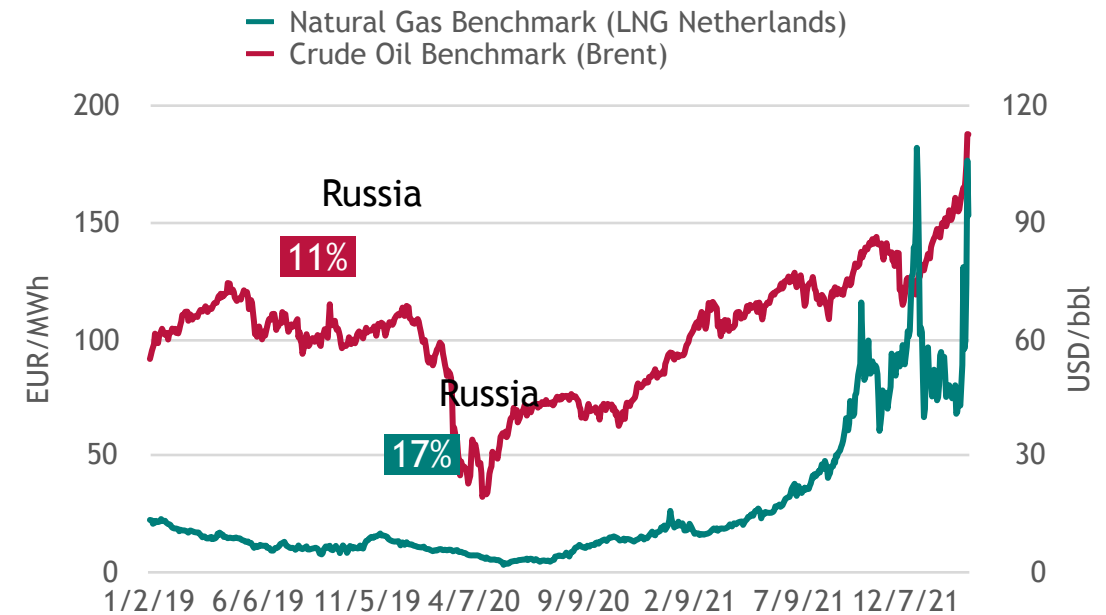
## Oil Impact (Russia prod: 11 MMbbl/d; exports: 4 MMbbl/d)

- Market refusing to deal with Russian oil; tankers of Russian oil unable to unload; Canada officially bans imports, U.S. still allowing
- **Risk:** A suspension of Russian oil would drive up global oil prices and increase inflation
- **Levers:** IEA authorized release of 60 million barrels (of 1.5 billion) from members' strategic petroleum reserves, Iran Nuclear Deal (+4 MMbbl/d), OPEC+ spare capacity (+7 MMbbl/d) [Global Demand: ~100 MMbbl/d]

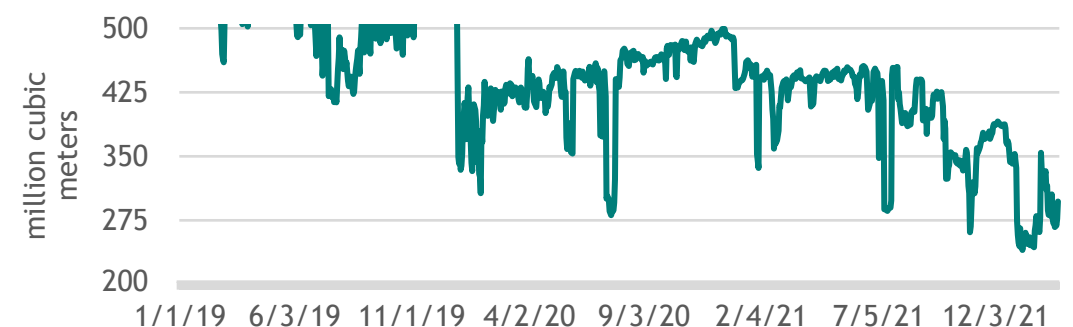
## Gas Impact (Russia prod: 62 bcfd; exports: 23 bcfd)

- Physical deliveries of gas from Russia to Europe remain largely unchanged
- Russia gas accounts for ~1/3 of European gas supply and 20% flows through Ukraine
- **Risk:** Cutting off all natural gas exports to Europe could lead to massive power shortages and **exorbitant price levels** that could drive European economies into long-term recessions or worse, **stagflation**
- **Levers:** Current reserves (post-milder winter), LNG imports (spare regasification capacity), Coal/Nuclear extensions, Renewable push ("EU strategy for secure, clean energy to be unveiled March 8"), [IEA Plan](#)

Crude Oil and Natural Gas Prices and Production Share



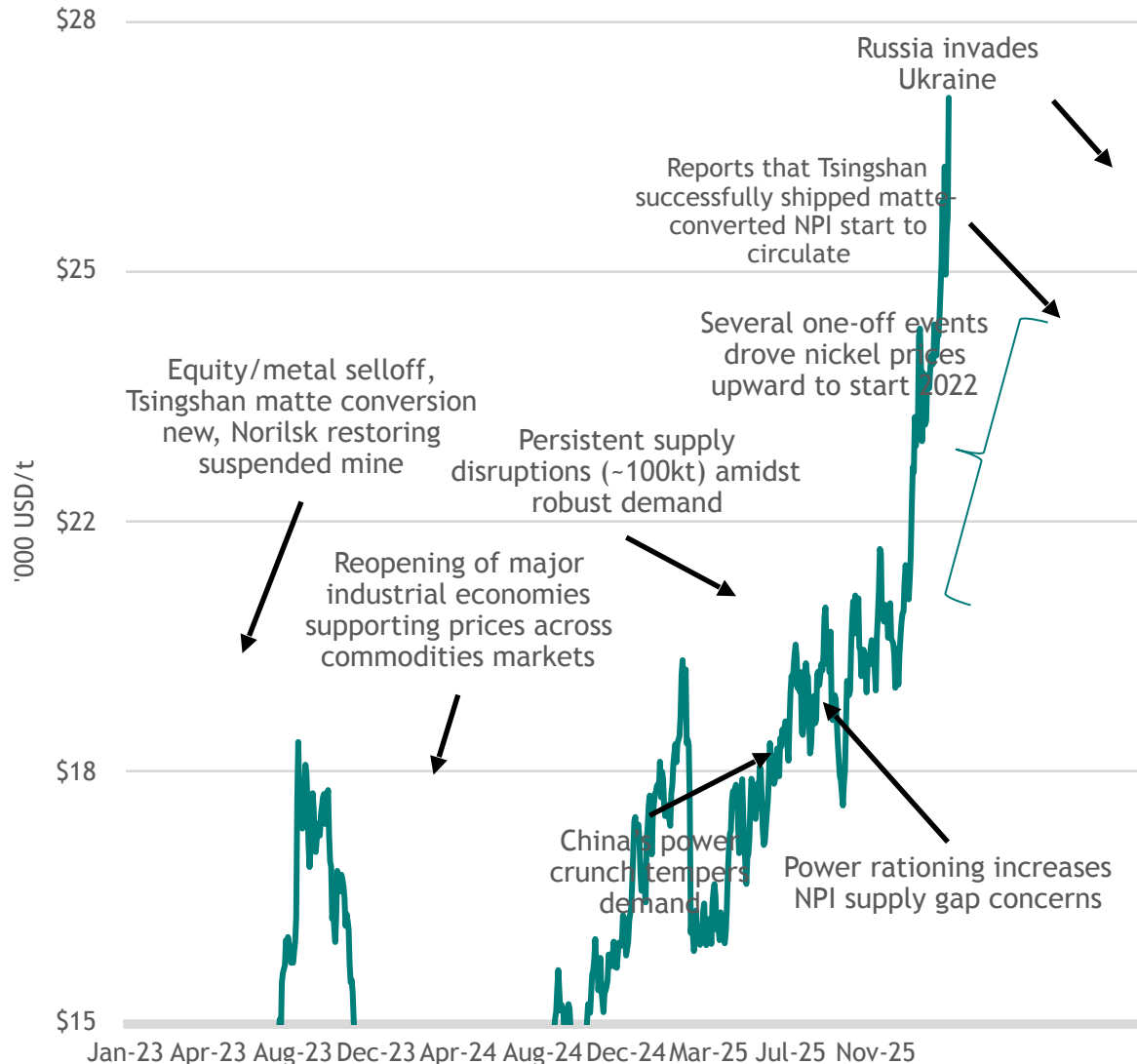
Gas Supply from Russia and Belarus to Ukraine and EU



# Recent Nickel Price Movements Explained



## LME Nickel Cash Price



### Demand

#### Stainless

- Chinese austenitic stainless production decreased 13% MoM in January as mills reduced output amid power constraints in an effort to curb emissions around the Beijing Olympics. Indonesia stainless production increased 9% in January.
- Total visible Chinese austenitic stainless stocks decreased by 10% in January led by declines in 300 series indicating persistent downstream demand.

#### Battery

- EV sales were up 20% MoM in December driven by increased sales out of China and Europe. Preliminary Europe sales show MoM decreases in January, partially due to seasonal slowdowns.
- Germany and France extended subsidy schemes, initially planned to reduce in Jan. 2022. China is expected to reduce subsidies by 30% in 2022 (previously reduced by 20% in 2021; 10% in 2020).

#### Other

- Boeing and Airbus aircraft deliveries seasonally decreased 53% in January MoM; a 32% increase YoY. Global commercial flights are currently sitting at 92% of pre-COVID levels (2019).
- The first-use high value market is expected to increase marginally the first quarter with increases in plating partially offset by expected decreases in foundry and alloy steel applications.

### Supply

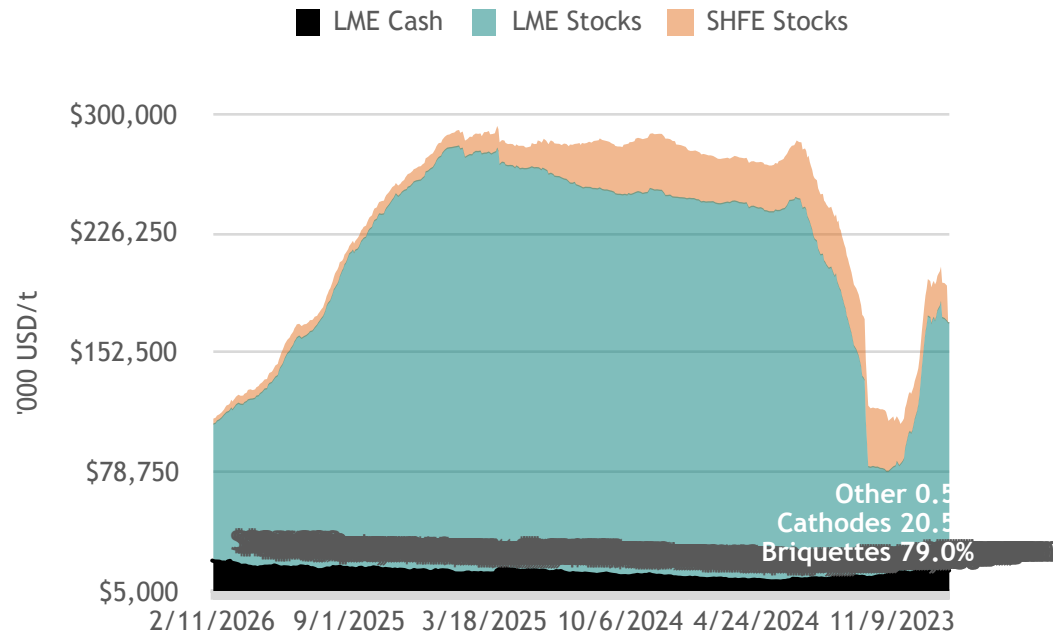
- According to SMM, Chinese NPI output declined by 18% YoY to 31.7 kt in Jan 2022 driven by seasonal ore supply from the Philippines and power cuts resulting in temporary smelter shutdowns; Indonesian NPI supply grew 27% YoY to 82 kt in Jan 2022.
- Boliden resumed nickel matte production at Harjavalta smelter mid Jan 2022 after slag explosion forced operations to stop end of Dec 2021. The company will also invest in a new nickel line to increase raw material supply capacity and reduce CO2 emissions by 15-20%.
- First two shipments of Tsingshan's Ni matte converted from NPI have shipped and will be delivered to Huayou & CNGR. Currently, the output is below 2021 guidance, but may catch-up.
- Nornickel's consolidated Ni production declined by 18% to 193 kt (190 kt from own feed) in 2021 due to multiple operational failures. 2022 guidance of 205-215 kt Ni from own feed impacted by planned furnace maintenance at Nadezhda smelter
- Glencore's Ni production of 102.3 kt was 7.9 kt (7%) lower than in 2020 due to maintenance issues at Murrin Murrin and operating issues at Koniombo. 2022 guidance of 110-120 kt Ni.

### Price

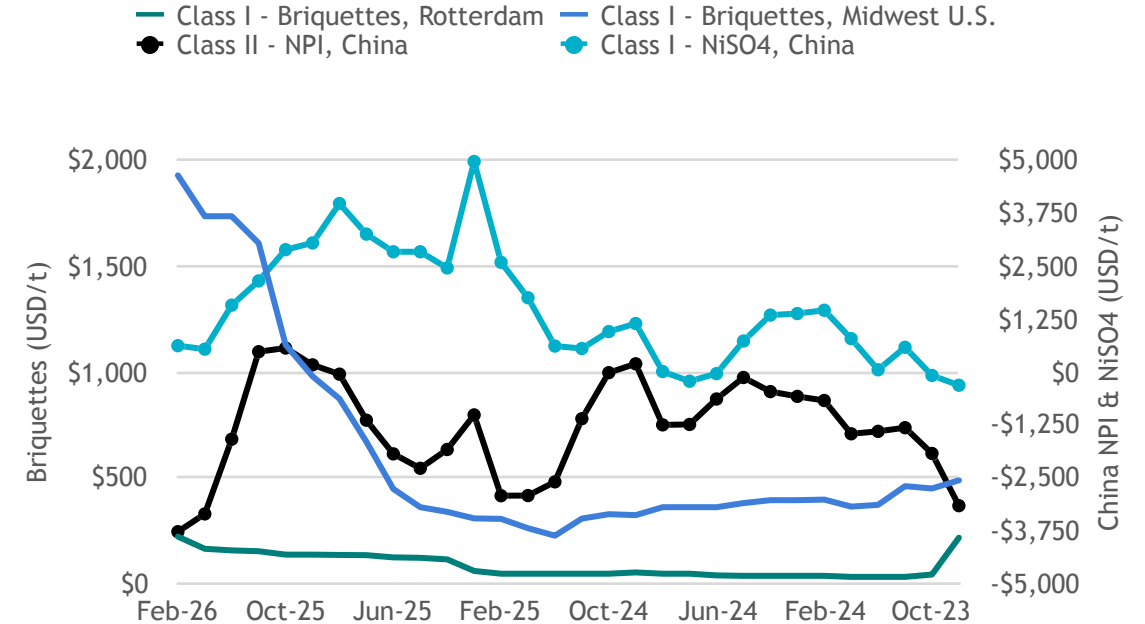
- January prices averaged **\$22,326/t** vs. **\$20,070/t** in December, up 11% MoM. Robust EV demand, reduction in China NPI production due to power rationing, continued declines in LME inventories, short covering, renewed concerns of an Indonesia export tax and fears of sanctions on Russian supply due to Russia-Ukraine conflict are some of the key drivers behind the spike in nickel prices.

# LME Nickel prices and market premiums indicate an undersupplied market

## Nickel Prices and Inventories



## Nickel Premiums/Discounts



- Nickel **prices peaked at \$24,000/t** in January on continued **inventory draws**, steep backwardation and **short covering**, renewed concerns of an **Indonesia export tax** on NPI/FeNi and fears of **sanctions on Russia supply** due to Russia and Ukraine conflict. Nickel prices ended January just above \$22,300/t, before beginning to increase again in February.
- Several **announcements related to nickel development projects** (e.g. Tesla and Talon Metals nickel supply contract and BHP investment in Tanzania nickel mine), **supported pricing** further.
- **LME inventories continue to decline** currently sitting at 85 kt (1.6 weeks demand) **down 17% from end of December**.

# Nickel is seeing the emergence of three markets with varying balances



## Batteries

Demand vs. Supply (ktpa Ni)

- Demand
- Recycled
- Class I Diverted from High Value

2019 2020 2021 2022 2026 2031

- In the **short term**, **excess units** from the melting markets can **absorb incremental demand** in the EV market
- **Post-2023** **substantial deficits** emerge

## Alloys, Plating, Sintering etc.

Demand vs. Supply (ktpa Ni)

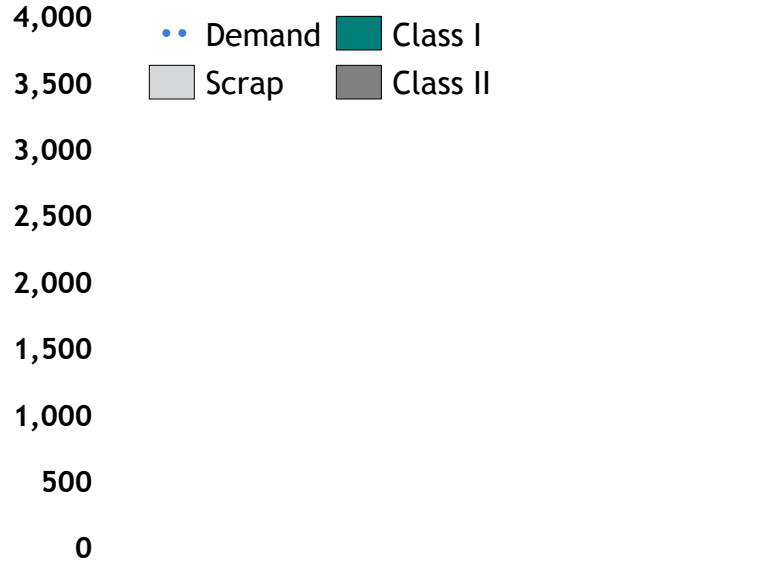
- Demand
- Class I + Chemicals
- Diverted to Battery Demand

2019 2020 2021 2022 2026 2031

- **Deficits** likely to emerge as battery demand captures market share

## Stainless Steel

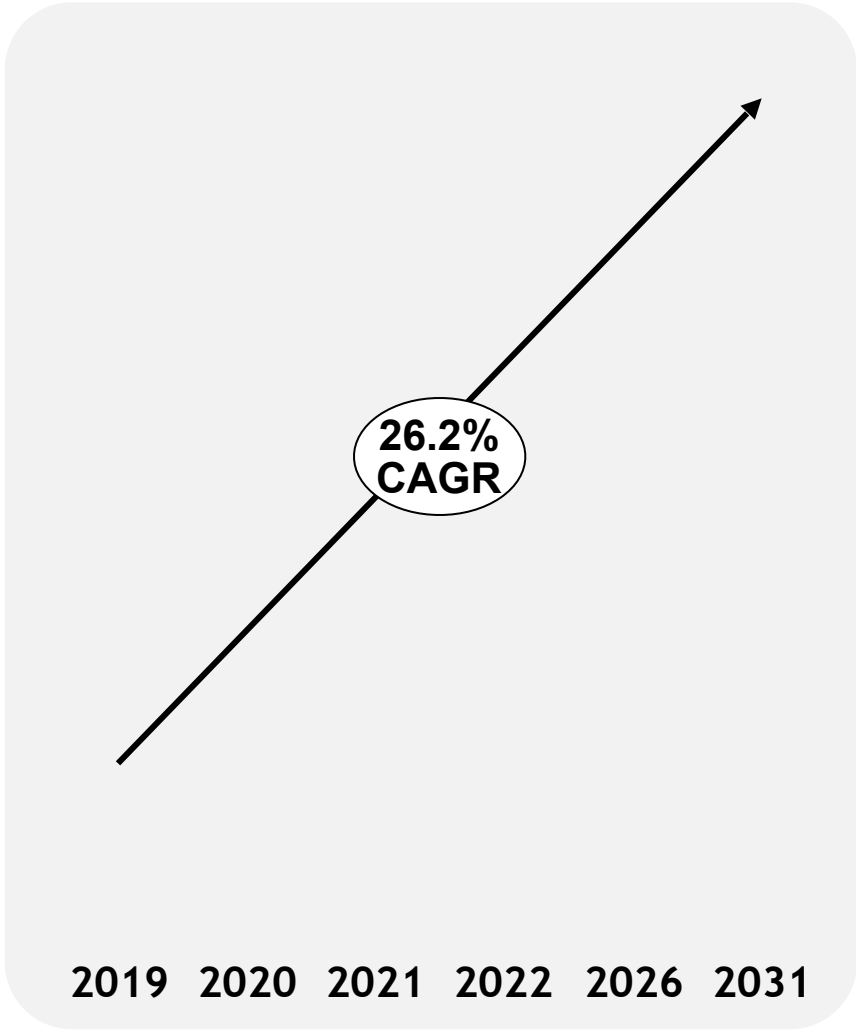
Demand vs. Supply (ktpa Ni)






2019 2020 2021 2022 2026 2031

- **Stainless steel demand is marginally outpacing supply in the short term;** NPI, FeNi and scrap expected to fill supply gaps in the medium term
- **Longer-term**, the market will be **oversupplied**

# Battery Demand



## KEY DRIVERS

 <b>EV Units</b> <ul style="list-style-type: none"><li>• EV Sales</li><li>• Subsidies &amp; Incentives</li><li>• Model Availability</li></ul>	 <b>Other Batteries</b> <ul style="list-style-type: none"><li>• Stationary Storage</li><li>• Consumer Electronics</li></ul>	 <b>Nickel Intensity</b> <ul style="list-style-type: none"><li>• Performance Parity</li><li>• Cost</li><li>• Range</li><li>• Battery Chemistry</li></ul>
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# In 2020, EV sales were over 3 million and 4% of total vehicle sales; by 2040, forecast 85 million with a penetration rate of 63%

## Passenger EV Sales Forecast (millions cars), by Analyst/Region

■ BEV
 ■ PHEV

	2020	2021	2025	2026	2030	2040
EU	1.36	2.20	6.00	7.01	12.18	19.68
China	1.26	2.49	6.32	7.38	13.98	33.14
US/CAN	0.36	0.77	2.39	2.85	6.36	18.03
<b>Global</b>	<b>3.11</b>	<b>5.66</b>	<b>15.40</b>	<b>18.15</b>	<b>34.61</b>	<b>86.74</b>
Penetration Rate	4%	7%	17%	20%	34%	63%

Note: \*STEPS: stated policies scenario; SDS: sustainable development scenario



# Base Metals are critical to support the transition to a low carbon economy



Renewable Energy



Charging Stations and Infrastructure

**Cu**  
Copper



**Li**  
Lithium



1 part  
Lithium  
Carbonate

**Mn**  
Manganese



1 part  
Aluminum  
or Manganese  
Sulphate

**Al**  
Aluminium

**Co**  
Cobalt



1 part  
Cobalt  
Sulphate

**Ni**  
Nickel

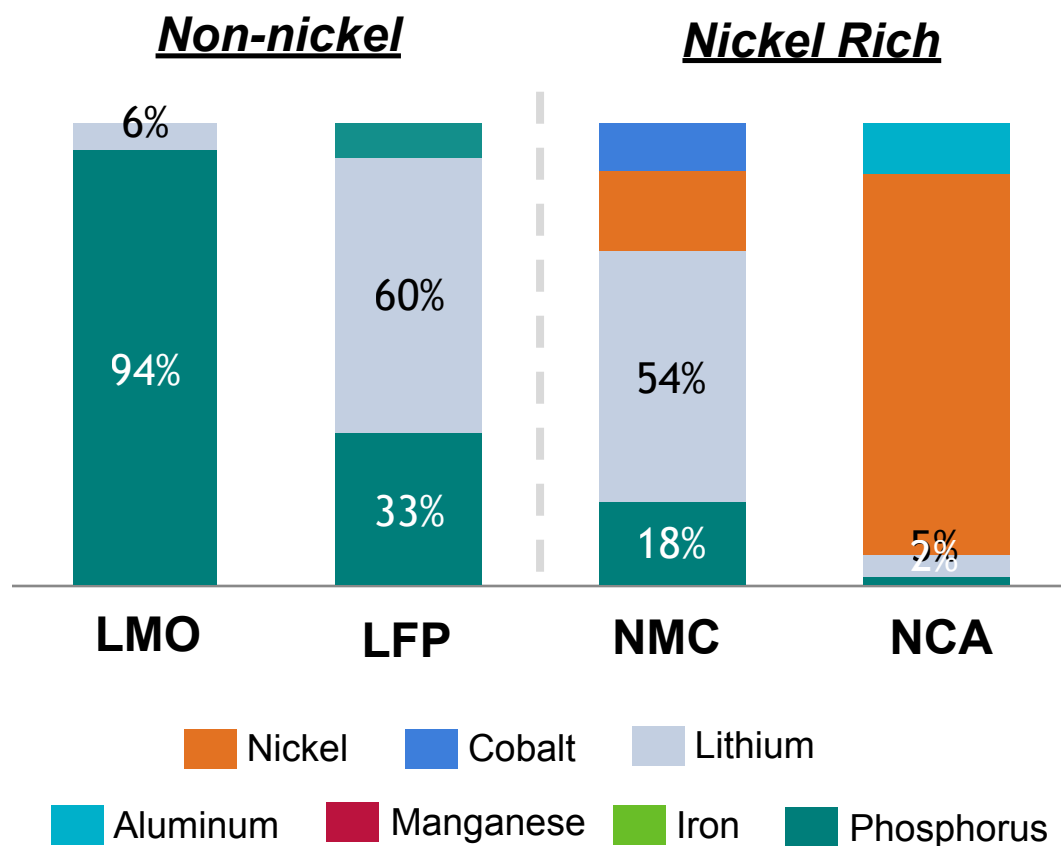


8 parts  
Nickel  
Sulphate

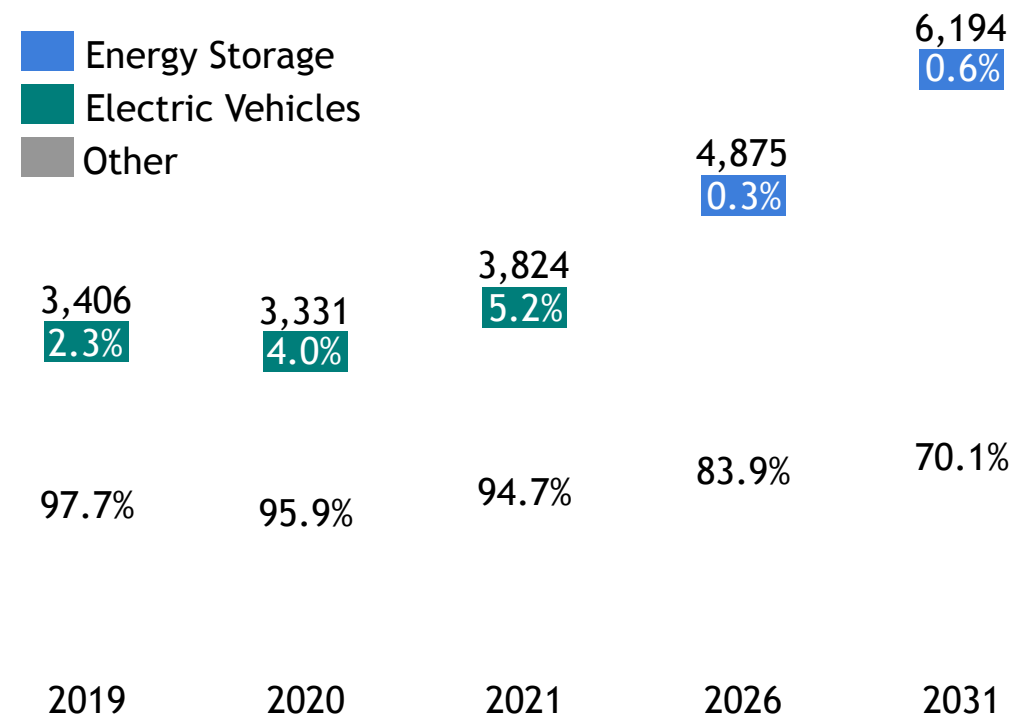


# Nickel-rich NCA and NMC batteries are two of the most used batteries; demand in EVs and energy storage leads to increased nickel use

Lithium Battery Chemistries for Passenger EVs



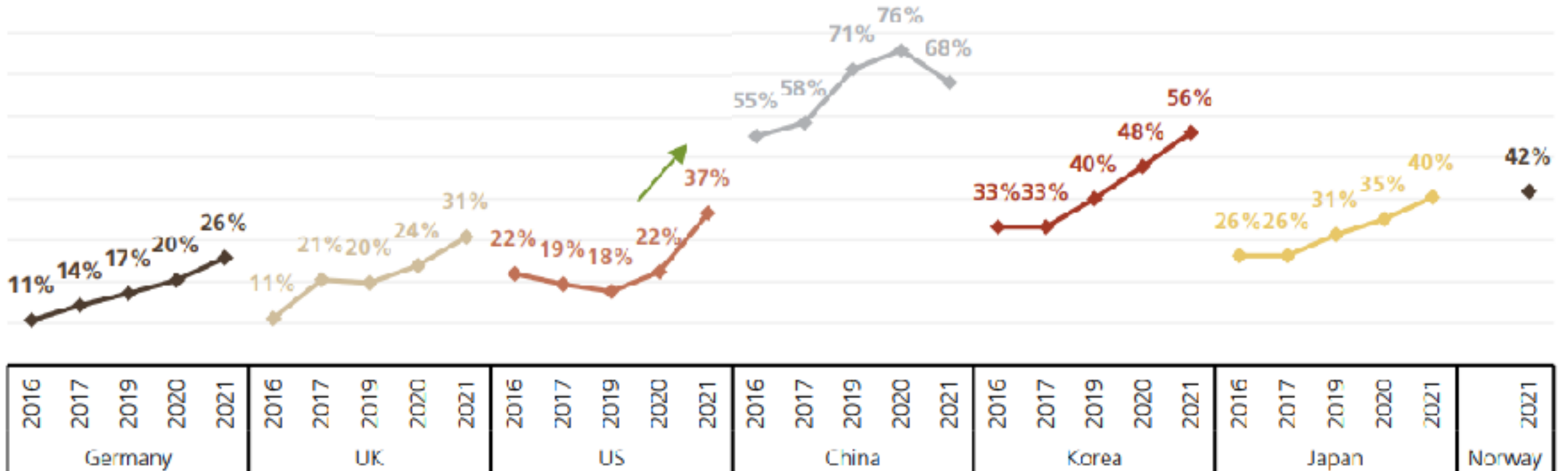
Global Nickel Demand inc. Scrap (kt)





# Consumer sentiment for EVs is improving rapidly – even in areas where actual sales are lagging, like North America

Are you likely to consider buying a BEV? (% answer “Likely”, by region)



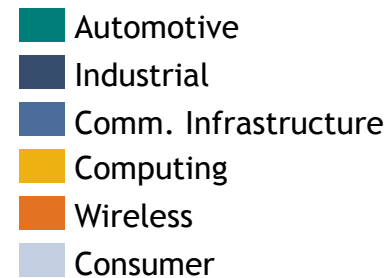
- US showing largest YoY improvement in sentiment on heels of EV details announced in stimulus packages proposed by Biden administration
- Chinese sentiment falls in tandem with removal of direct EV subsidies (though indirect subsidies, like no limited driving days, remain)

# Expectation is for shortage to ease late 2021 into 2022 as semiconductor producers focus on auto

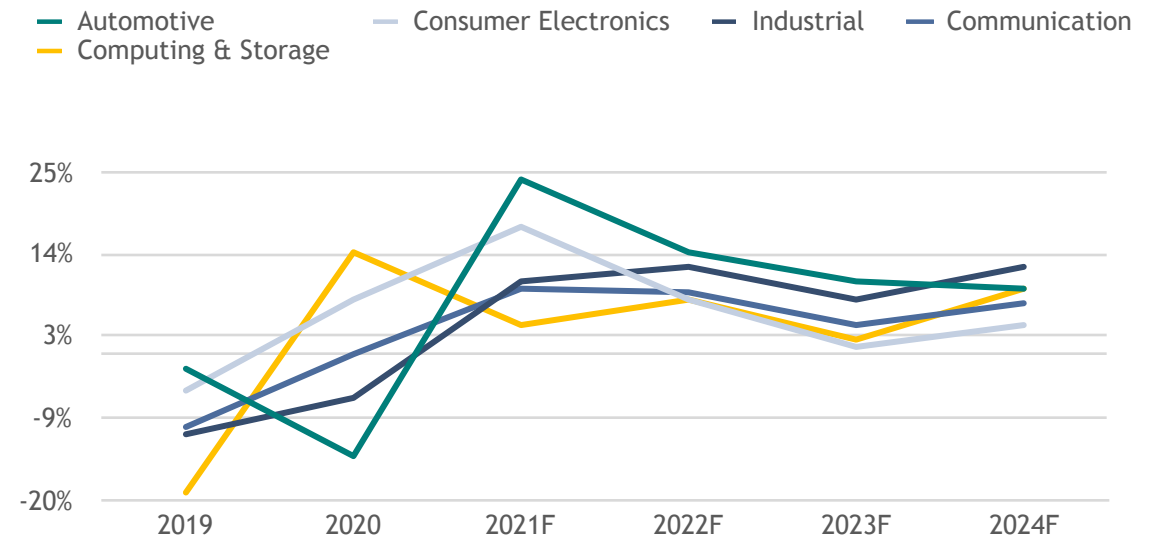


- Cause of shortage twofold and largely due to the impacts of COVID-19:
  1. A surge in consumer electronics due to working from home
  2. A decrease in automobile demand
- Semiconductor manufacturers forced to pivot and now struggling to meet resurgence in automobile demand.
- With that said, the auto industry accounts for less than 9% of total semiconductor demand leading analysts to believe that demand can be met by 2022 as manufacturers focus on automotive

## Chip Demand by Revenue

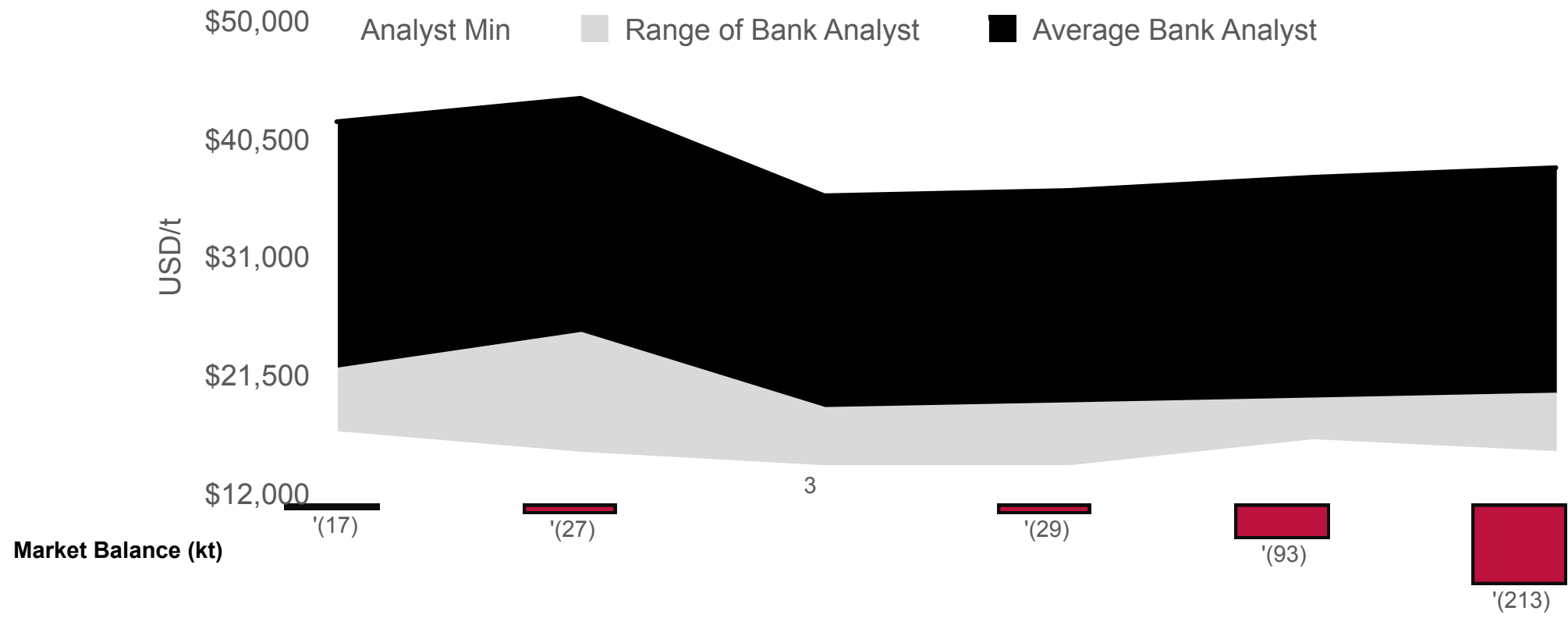


## Semiconductor Global Sales Growth





# Short-term deficit led by Class II; structural long-term deficit in Class I



USD \$/t	2022	2023	2024	2025	2026	2027	LT
Avg. Bank Analyst	\$19,801	\$18,815	\$17,022	\$17,065	\$17,743	\$18,119	\$16,257
Maximum	\$22,126	\$25,001	\$18,945	\$19,324	\$19,711	\$20,105	\$17,637
Minimum	\$17,081	\$15,427	\$14,340	\$14,340	\$16,442	\$15,479	\$13,682





Thank You.