

Nickel

A tug war between supply and demand growth

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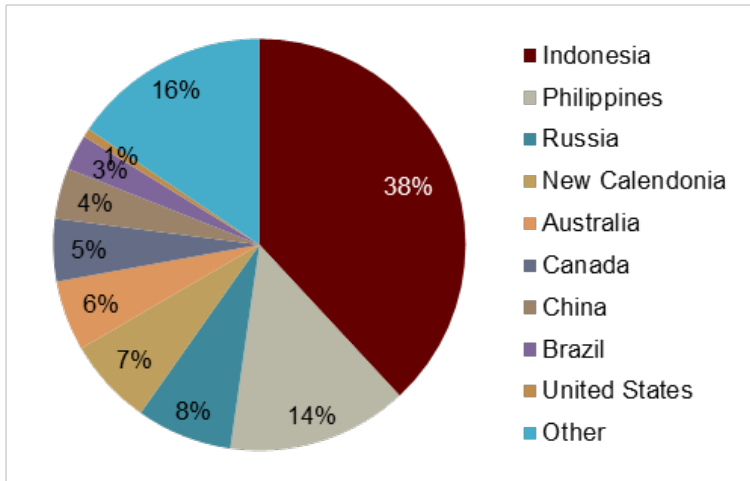
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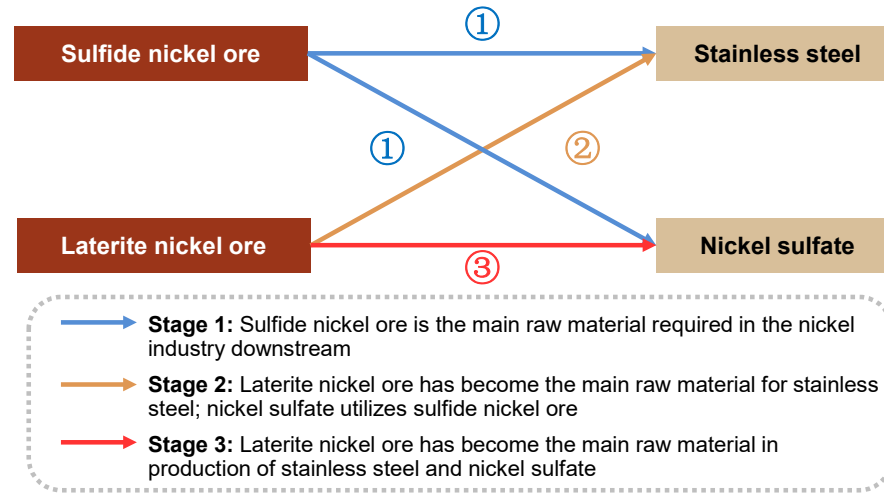
Recent demand and supply: rapid growth

- ◆ The nickel market has grown by c.70% from 2015 to 2022.
 - **Debottlenecking on production technology on laterite ore was the key for supply growth.**
 - ✓ Laterite ore overtook sulfide.
 - ✓ Indonesia is the largest nickel producing country, accounting for 38% of global production.
 - **Power lithium contributes most of incremental demand.** The main use of nickel is in the manufacture of stainless steel, accounting for nearly 70% of total demand. With the rapid development of EVs, the growth in use of Li-ion batteries has been a significant driver of nickel demand.

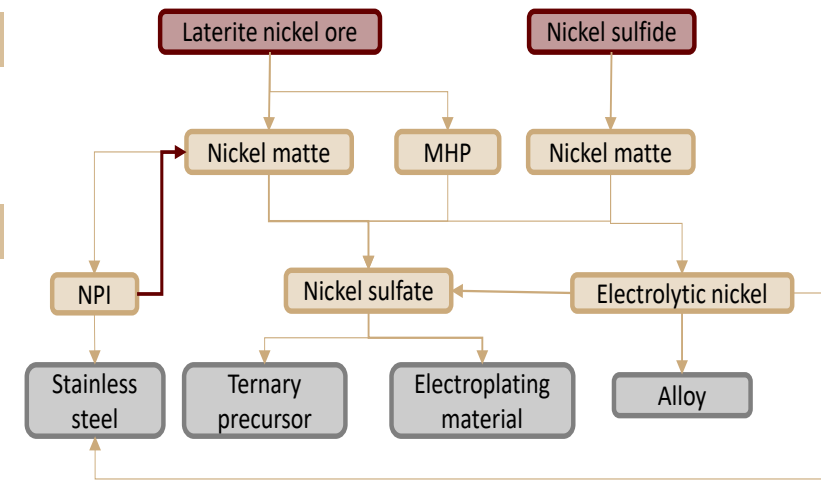
Global nickel production in 2021 by country



Evolution of nickel supply and demand structure



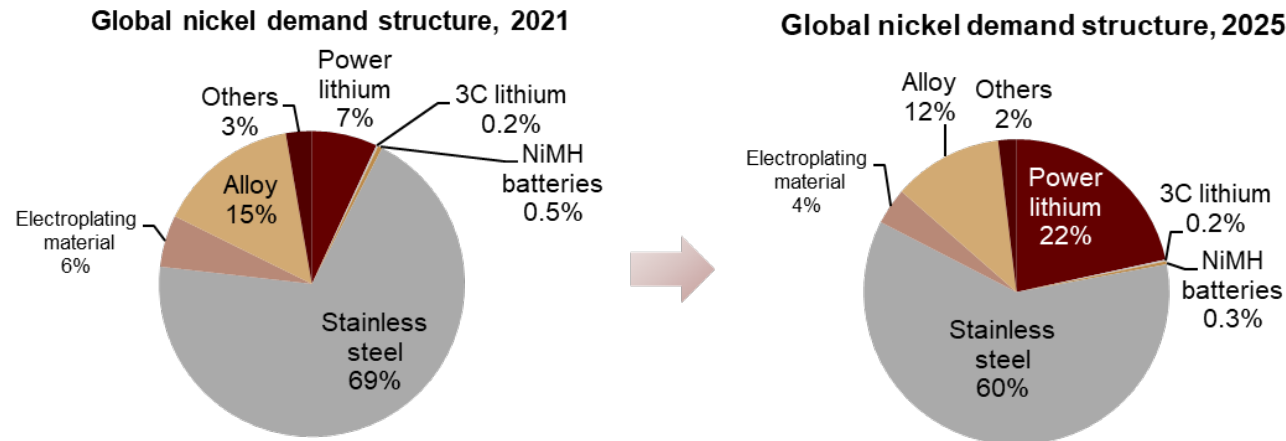
A value chain analysis of nickel industry



◆ Nickel consumption will increase to c.4mn metal tonnes in 2025.

- **Battery use:** With the increasing popularity of NMC types in battery for EVs, we expect the CAGR for nickel used in batteries may reach 45.5% over 2021–2025.
- **Stainless steel:** The demand for nickel should increase steadily, and we estimate CAGR may be 5–6% in 2021–2025.
- **We expect the CAGR for nickel demand over 2021-2025 to be 9.3%.**

| Forecast nickel demand | | | | | | | | |
|-------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| '000 tonnes | 2018 | 2019 | 2020 | 2021 | 2022E | 2023E | 2024E | 2025E |
| Li-ion power battery | 50 | 66 | 86 | 194 | 342 | 514 | 698 | 868 |
| Domestic | 22 | 29 | 31 | 67 | 97 | 124 | 152 | 202 |
| Overseas | 28 | 38 | 55 | 127 | 245 | 390 | 545 | 666 |
| Stainless steel | 1,517 | 1,640 | 1,675 | 1,916 | 2,111 | 2,219 | 2,317 | 2,377 |
| Electroplating material | 154 | 152 | 152 | 152 | 152 | 152 | 152 | 152 |
| Alloy | 354 | 373 | 394 | 414 | 431 | 439 | 448 | 457 |
| Others | 98 | 95 | 93 | 94 | 95 | 95 | 95 | 96 |
| Total | 2,173 | 2,327 | 2,401 | 2,769 | 3,131 | 3,419 | 3,710 | 3,950 |
| YoY | 6.3% | 7.1% | 3.2% | 15.3% | 13.0% | 9.2% | 8.5% | 6.5% |

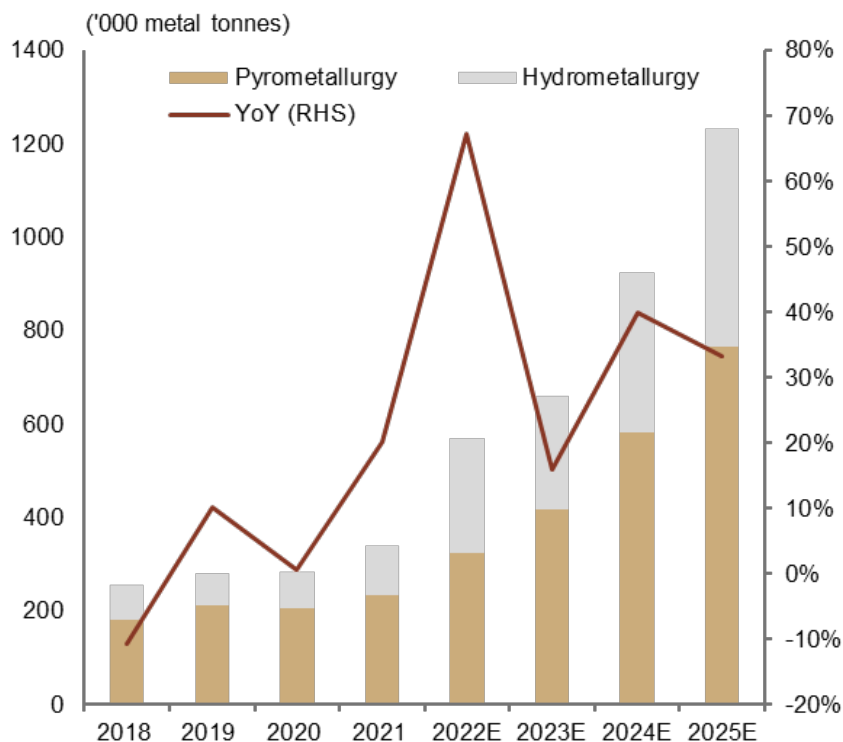


Supply outlook: Indonesia taking the lead

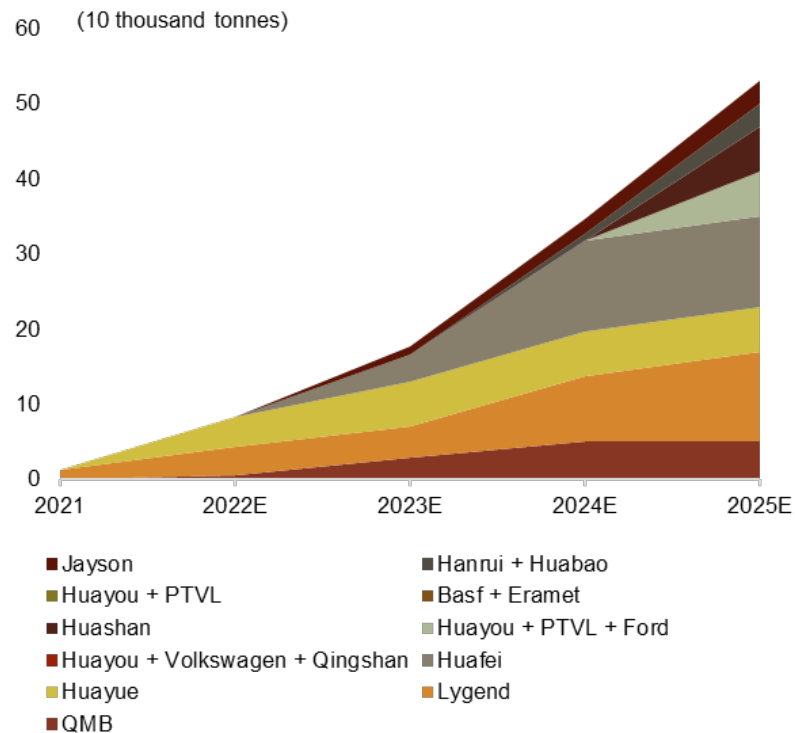
◆ Nickel supply will increase to 4mn metal tonnes in 2025.

- **New supply is mainly from Indonesia.** The planned projects in Indonesia could contribute 0.2mn metal tonnes of new capacity in 2022E, and about 0.9mn metal tonnes in 2025, giving Indonesia a total capacity of 1.2mt by then.

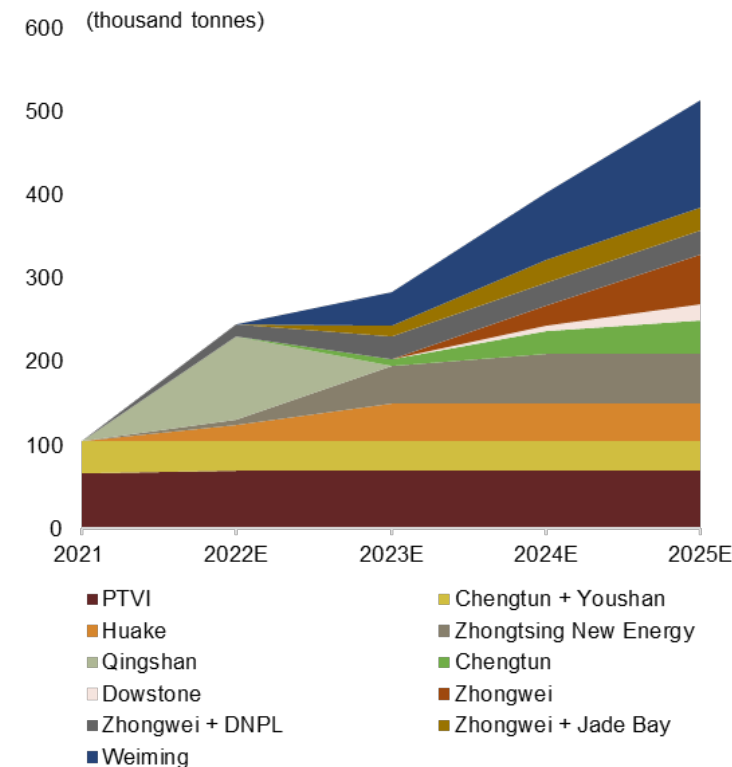
Production capacity in Indonesia
continues to rise



Nickel production of new hydrometallurgy
projects in Indonesia



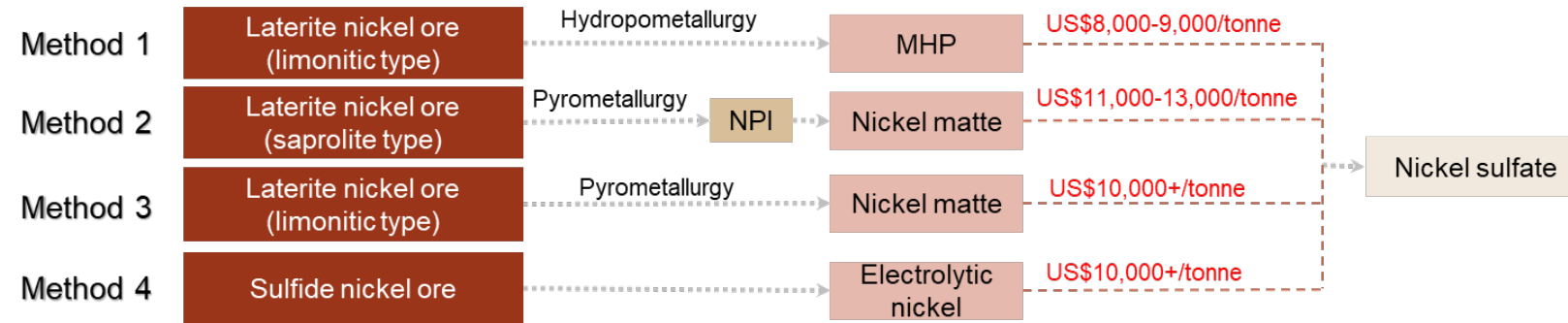
Nickel production of new pyrometallurgy
projects in Indonesia



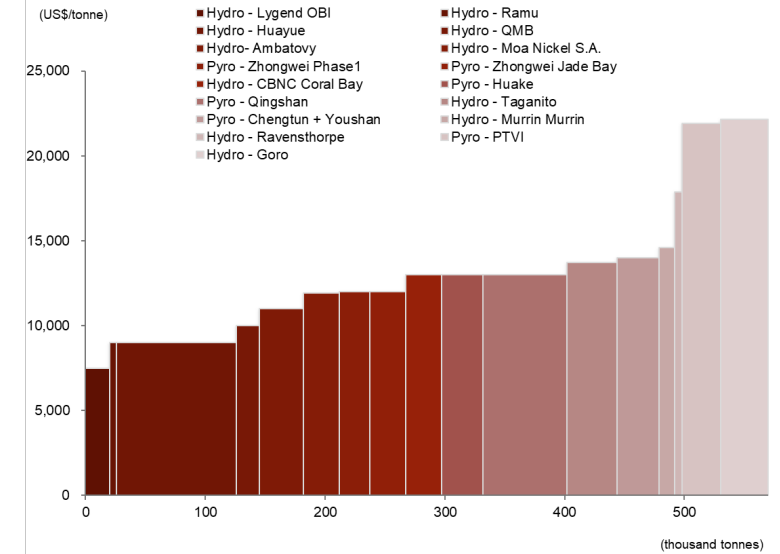
Cost outlook: laterite leading to cost reduction

- ◆ Production cost of nickel sulfate may be reduced systematically
- ◆ Cost curve would be a key determinant of nickel price
 - Most of new projects expected are on the left side of the cost curve
 - With the surplus in the long term, nickel price is likely to be determined by marginal costs.

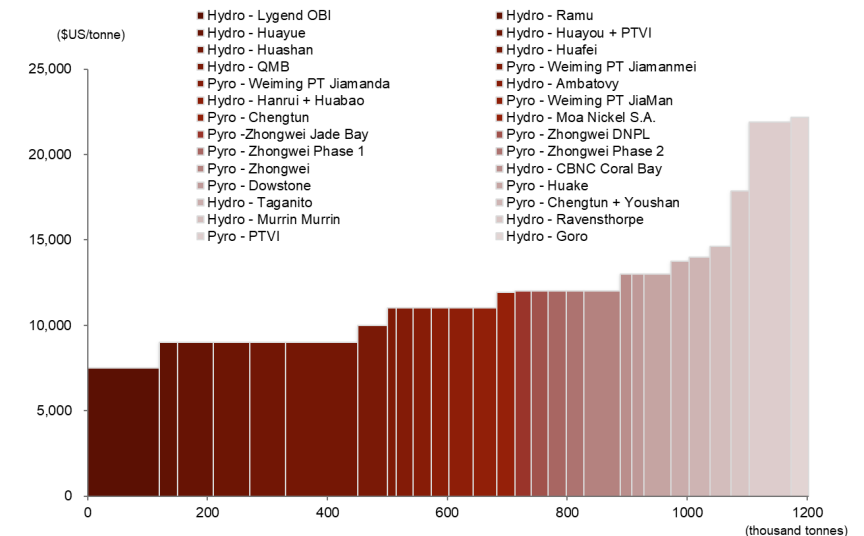
Production cost under different methods



Cost curve in 2022



Cost curve in 2025

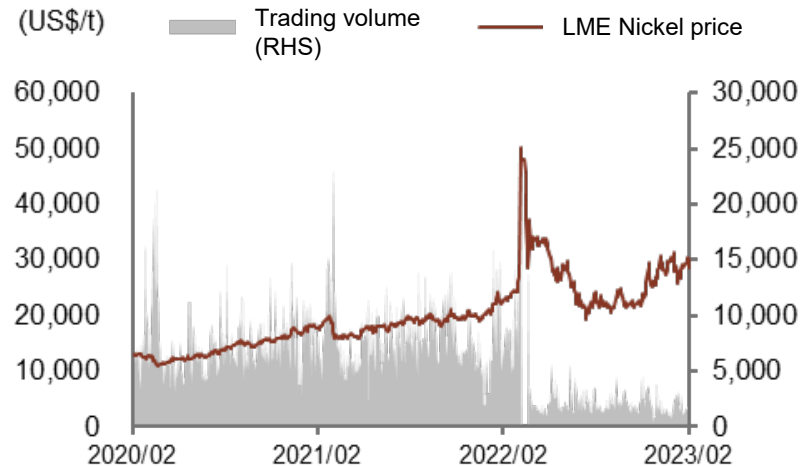


Note: assume cobalt price of US\$25/pound when calculate cost under hydrometallurgy method
Source: CNKI, corporate filings, Wood Meckenzie, CRU, Mysteel, CICC Research

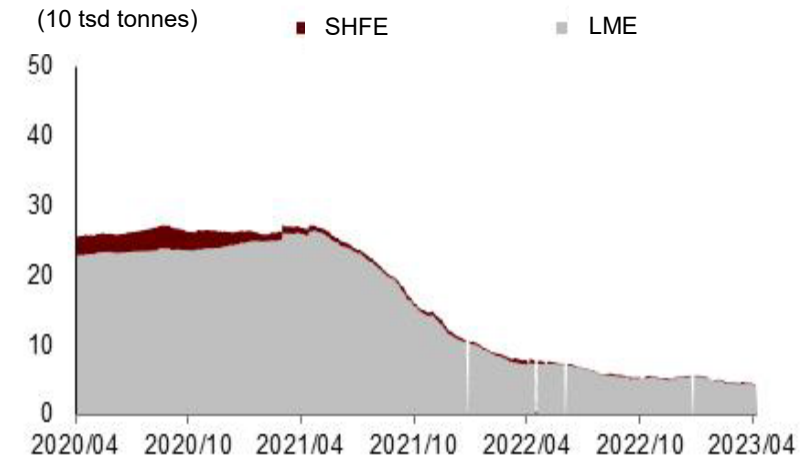
◆ S&D fundamentals vs sentiment

- Spot price of nickel products is affected only by supply and demand, while futures price is affected by supply and demand and market sentiment simultaneously.
 - S&D side: The revolution of laterite would alleviate the supply shortage and reduce production cost, leading to a fall in spot price of NPI and nickel sulfate.
 - Market side: Due to geopolitics, energy crisis, low inventory and other policy-related factors, market is bullish on the nickel futures, resulting in a high futures price.

Trading volume of LME Nickel has decreased significantly since March



Nickel inventory at LME and SHFE remains historical low



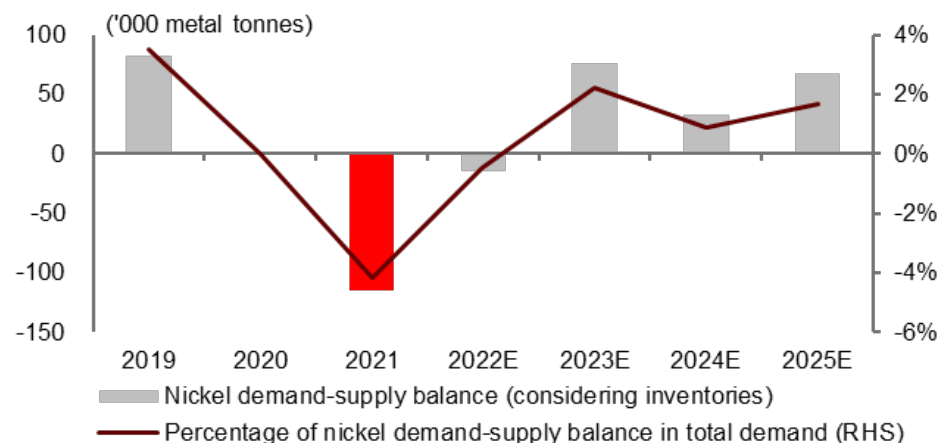
Source: CAAM, CICC Research

◆ Long-term supply/demand balance: a slight surplus

- **Long-term nickel price to be set by marginal costs.** The planned incremental capacity from Indonesia would significantly relieve supply bottleneck in nickel sulfate in the next 3 years. Marginal cost in the NPI and stainless steel would set the equilibrium price at US\$15,000-16,000/tonne.

◆ High growth on both supply and demand = price volatility

| Nickel demand-supply balance | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|
| ('000 metal tonnes) | 2019 | 2020 | 2021 | 2022E | 2023E | 2024E | 2025E |
| Total supply of nickel | 2,408 | 2,400 | 2,653 | 3,109 | 3,485 | 3,729 | 3,997 |
| YoY | 10.0% | -0.3% | 10.5% | 17.2% | 12.1% | 7.0% | 7.2% |
| Total demand of nickel | 2,327 | 2,401 | 2,768 | 3,123 | 3,409 | 3,697 | 3,930 |
| YoY | 7.1% | 3.2% | 15.3% | 12.8% | 9.2% | 8.4% | 6.3% |
| Nickel demand-supply balance (considering inventories) | 82 | -1 | -115 | -14 | 76 | 33 | 67 |



Source: ISSF, Mysteel, Wood Mackenzie, CRU, CICC Research

Appendix: key projects in Indonesia

Overview of global hydrometallurgy nickel projects in operation or in construction

| Country | Company/Project | Capacity | Notes |
|------------------|--------------------------------|----------------------------------|--|
| Indonesia | Lygend | 120,000t nickel + 14,250t cobalt | Phase 1 started operation 2022 (about 37,000t) Phase 2 is expected to commence in 4Q22 (about 18,000t) Phase 3 is expected to commence in 4Q23 (about 65,000t) |
| | Huayue | 60,000t nickel + 7,800t cobalt | Started trial production by end-2021 |
| | QMB | 50,000t nickel + 4,000t cobalt | Started trial production in Jan 2023 |
| | Huafei | 120,000t nickel + 15,000t cobalt | Expect to start in 2023 |
| | Huashan | 120,000t nickel + 15,000t cobalt | Construction progress to be determined |
| | Huayou + Qingshan + Volkswagen | 120,000t nickel | Signed memorandums in 2022 |
| | Huayou + PTVI + Ford | 120,000t nickel | Signed a framework cooperation agreement in 2023 |
| | Huayou + PTVI | 60,000t nickel | Signed a framework cooperation agreement in 2022 |
| | Hanrui + Huabao | 60,000t nickel | Reached a memorandum in 2022 |
| | Basf + Eramet | 42,000t nickel + 5,000t cobalt | Subject to final investment decision |
| Cuba | Moa | 35,000t nickel | |
| Turkey | Gordes | 10,000t nickel | |
| Madagascar | Ambatovy | 60,000t nickel | |
| Australia | Murrin Murrin | 50,000t nickel | |
| | Ravensthorpe | 50,000t nickel | |
| Phillipine | Coral Bay | 24,000t nickel | |
| | Taganito | 36,000t nickel | |
| Papua New Guinea | Ramu | 33,000t nickel | |
| New Caledonia | Goro | 60,000t nickel | |

Overview of Indonesia pyrometallurgy nickel projects in operation or in construction

| Location | Company/Project | Capacity | Notes |
|--------------|----------------------------|-----------------|--|
| Sulawesi | Zhongtsing New Energy | 60,000t nickel | Phase 1 with 30,000t of nickel started construction |
| | Qingshan | 60,000t nickel | Started operation in 2021 |
| | PTVI | 70,000t nickel | Started operation in 1978 |
| North Maluku | Chengtun + Youshan | 34,000t nickel | Started production in 2020, but not started nickel matte production yet |
| | Zhongwei | 120,000t nickel | Construction progress to be determined |
| | Zhongwei + DNPL + Jade Bay | 55,000t nickel | Phase 1 with 27,500t started operation in 1Q23, the remaining is expected to start in 2Q23 |
| | Huake | 45,000t nickel | Started operation in 2022 |
| | Weiming | 130,000t nickel | Phase 1 with 40,000t is expected to start in 2023 Phase 2 with 40,000t is expected to start in 2024 Phase 3 is expected to start in 2025 |
| | Chengtun | 40,000t nickel | Expect to start in 4Q23 |
| | Dowstone | 20,000t nickel | Construction progress to be determined |



Thank You



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