



Live more,
Bank less

Stainless, nickel and battery: A paradigm shift

Eun Young LEE

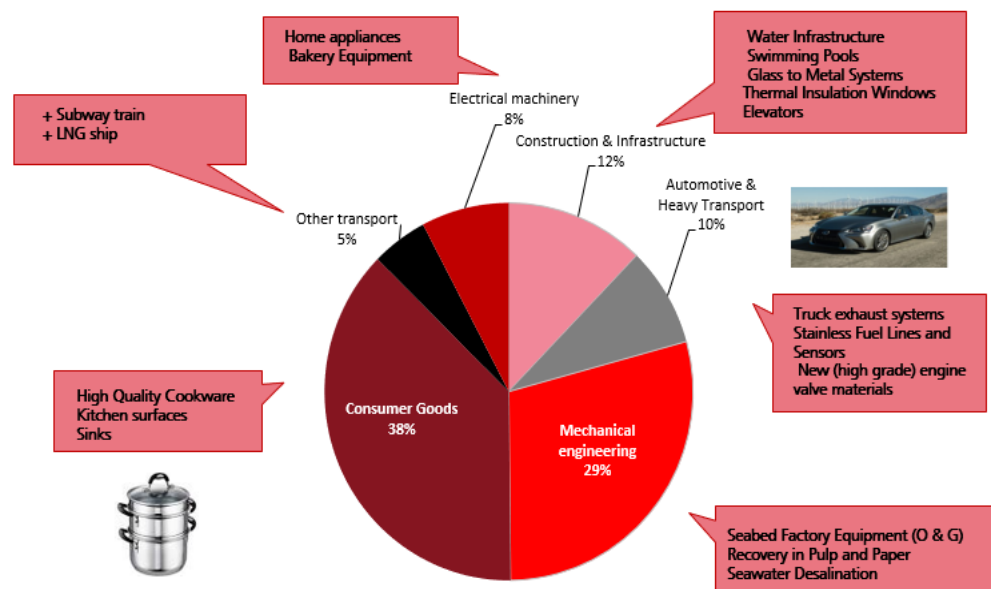
Oct 2020

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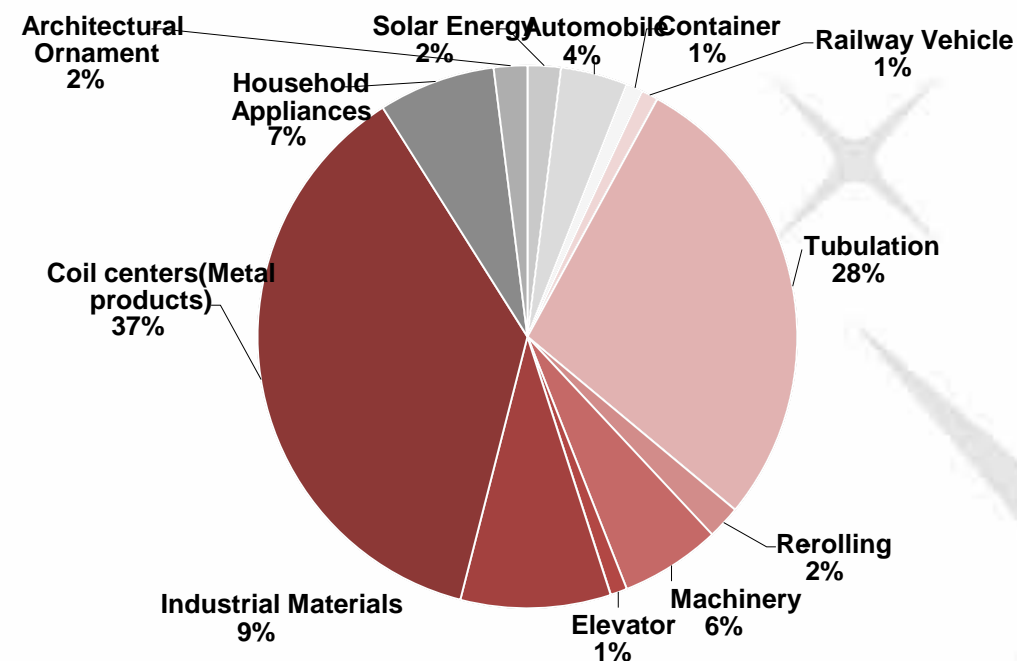
1. **Outlook for global stainless steel demand & supply**
2. Stainless steel based on NPI to dominate market
3. Indonesia - rising hub for nickel and stainless steel sectors
4. A paradigm shift in nickel and stainless steel market

Stainless steel: Increased consumption with urbanisation

Stainless steel (end-use)



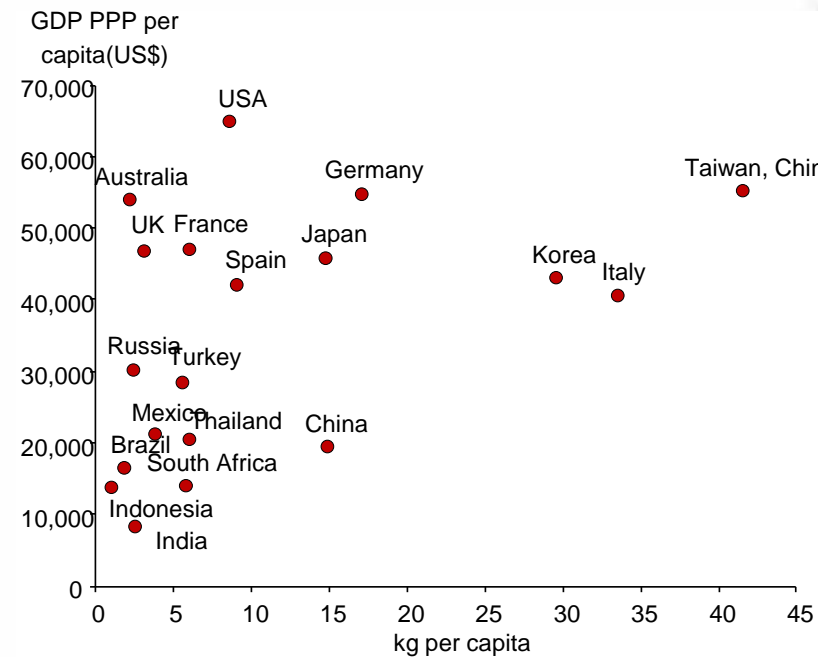
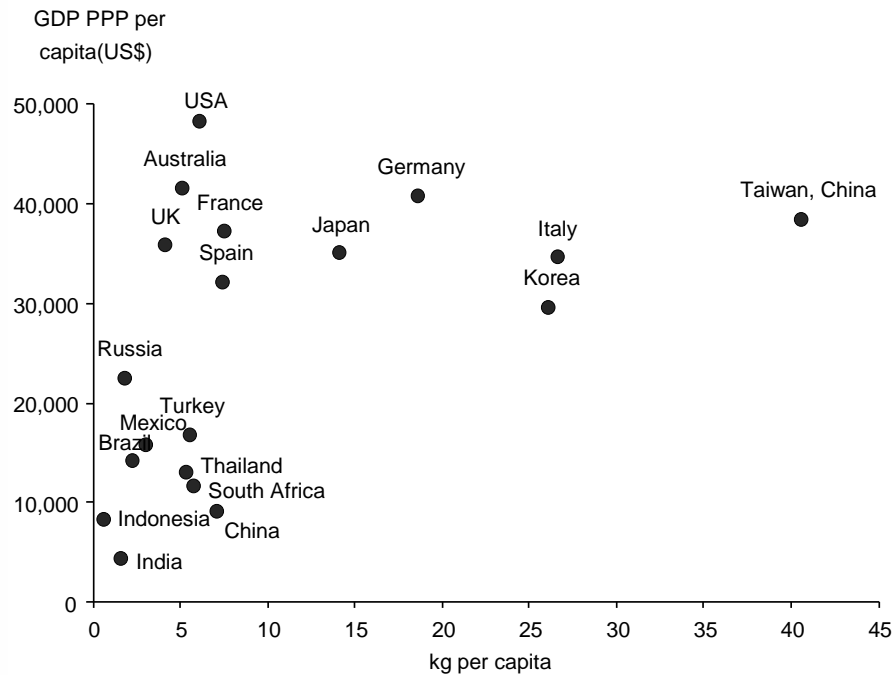
Stainless steel usage by sector (China)



Source: ISSF, Nickel Institute, Bao Steel, DBS Bank

Stainless steel consumption per capita jumped in line with income growth

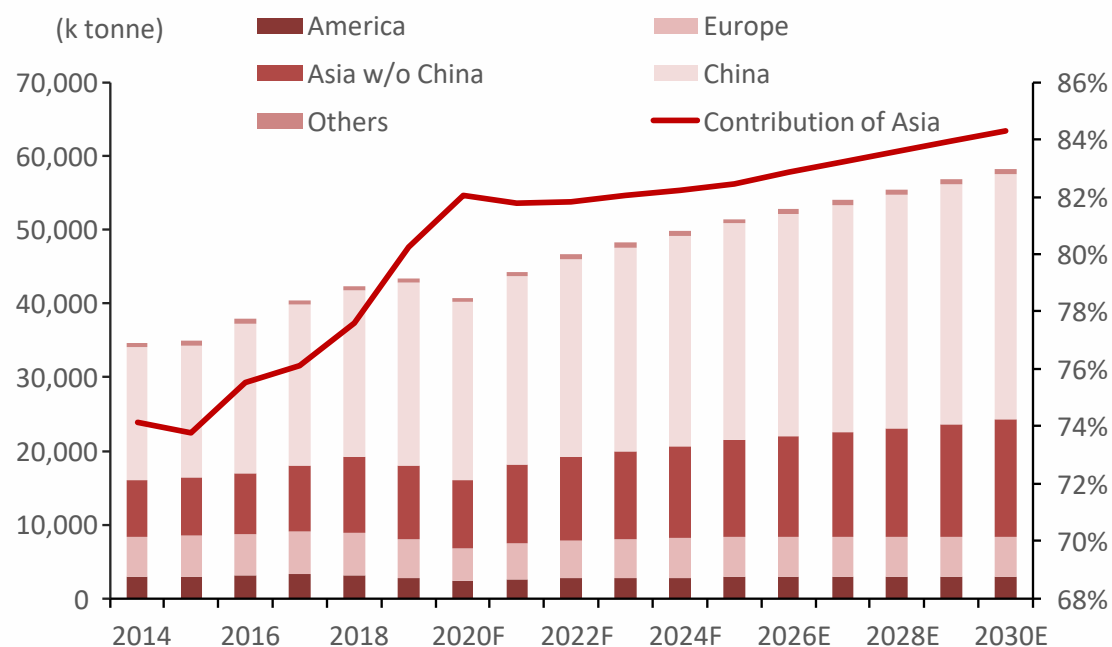
Stainless steel: Consumption vs. GDP per capita (2010 vs 2019)



Source: ISSF, Nickel Institute, DBS Bank

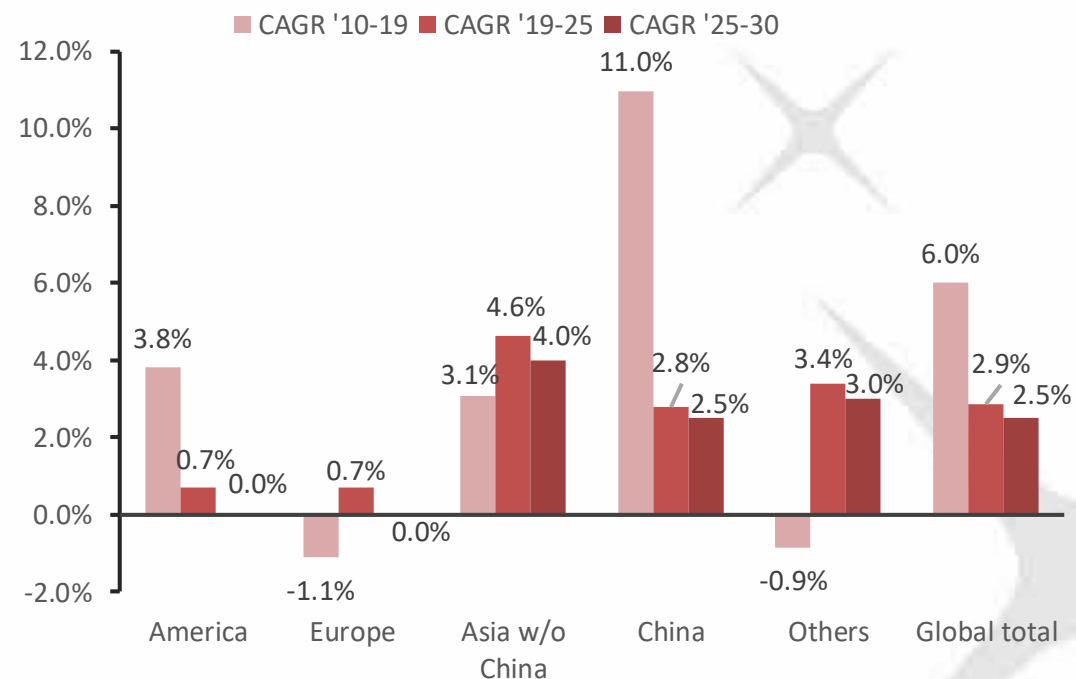
Stainless steel demand will grow but at a slower pace

Stainless steel consumption



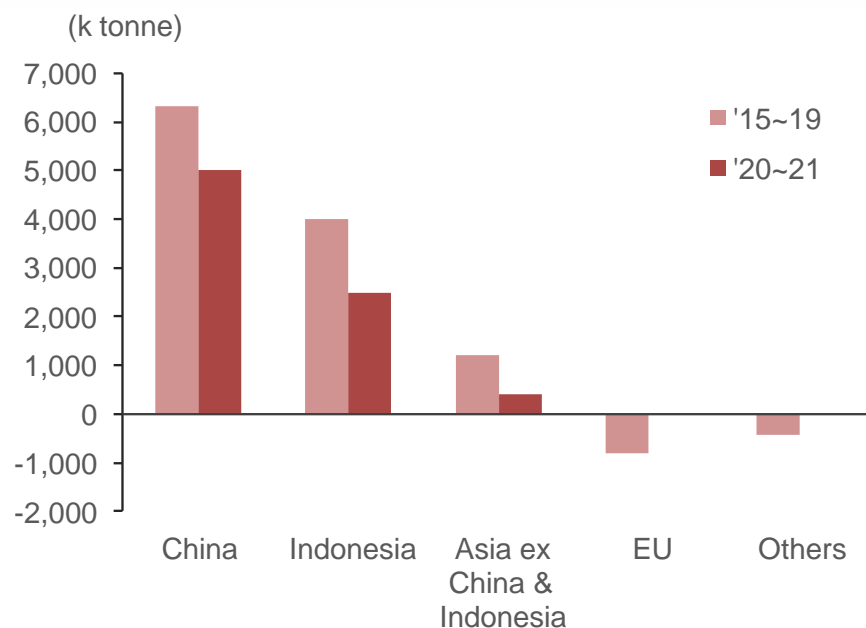
Source: ISSF, DBS Bank

Stainless steel consumption growth by region



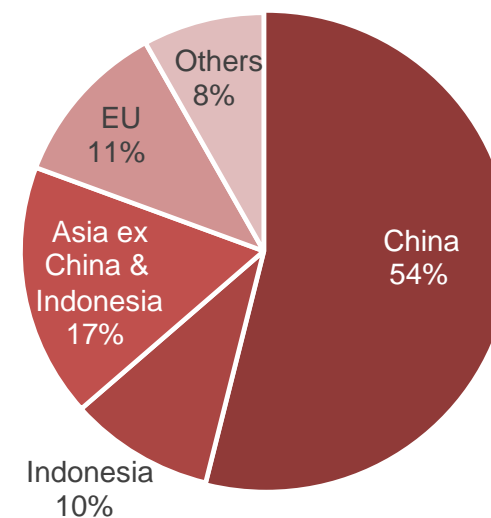
Strong capacity expansion in China and Indonesia

Stainless steel: Capacity growth 2021)



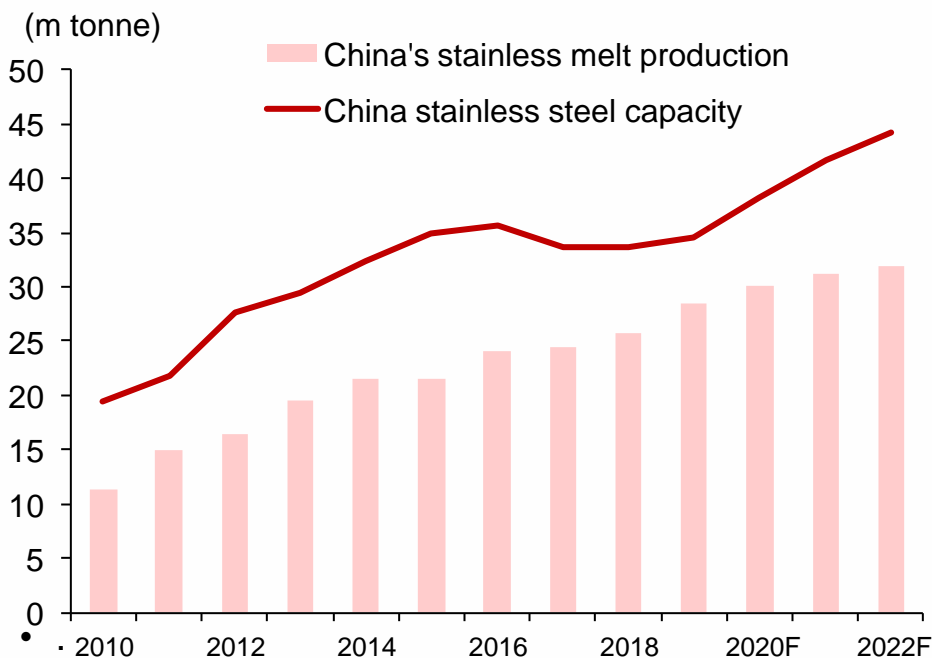
Source: ISSF, DBS Bank

Stainless steel: Capacity (by region,



China's strong capacity growth to overshadow sector outlook

China: Stainless capacity and production



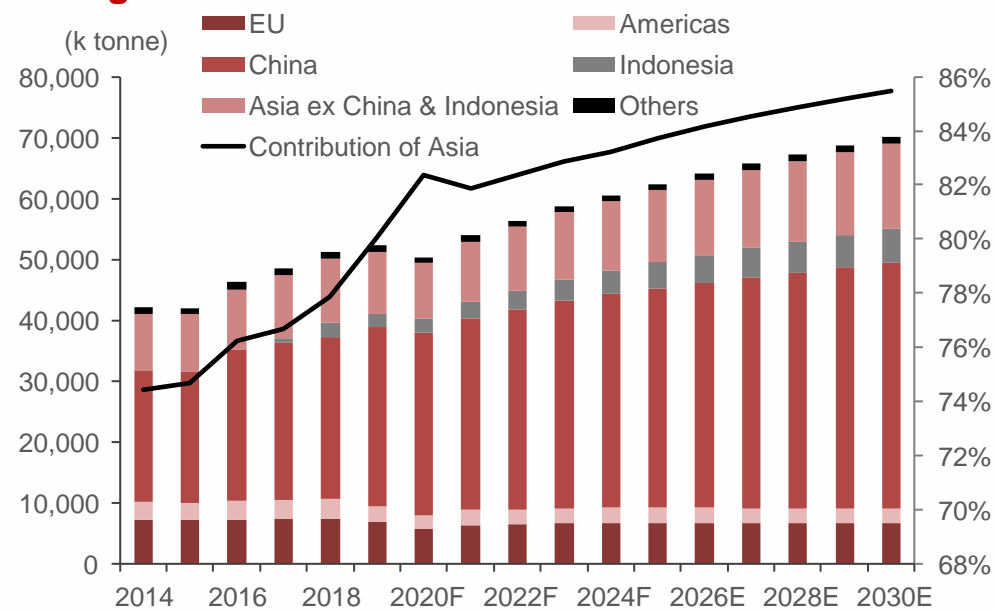
Source: SMM, DBS Bank

China: Cold-rolled STS capacity addition

Producer	New capacity in 2020 (k tonne)
Jiangsu Zhanshuo	500
Shandong Huaye Technology	500
Zhongshan Zhongsheng Phase II	200
Jurong Zhongsheng Phase II	400
Qinxi Seven Continuous Rolling	200
Chongqing Shunguo	300
Jiangsu Delong	750
Jiangsu Zhanshuo Phase I	300
Yongjin, Yangjiang, Guangdong	680
Liugang Zhongjin	600
Yangjiang Hongwang Phase II	300
Total	4,730
2020 total capacity estimates	24,530

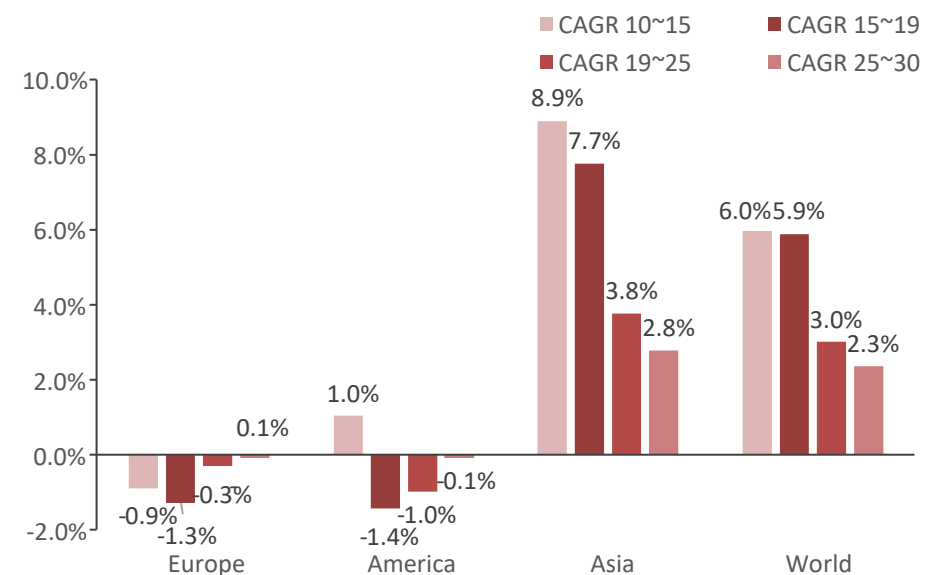
Global stainless steel production: Growth to continue

Stainless steel: Production forecasts by region

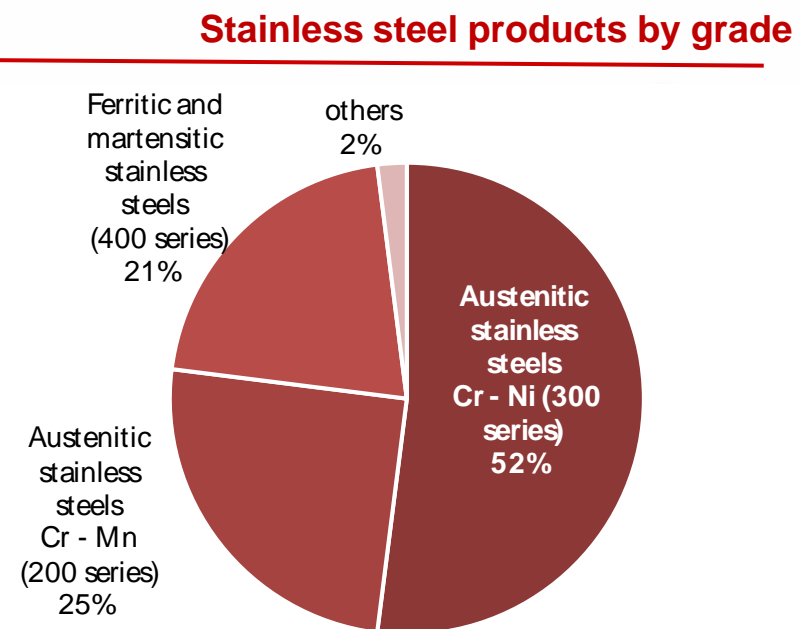
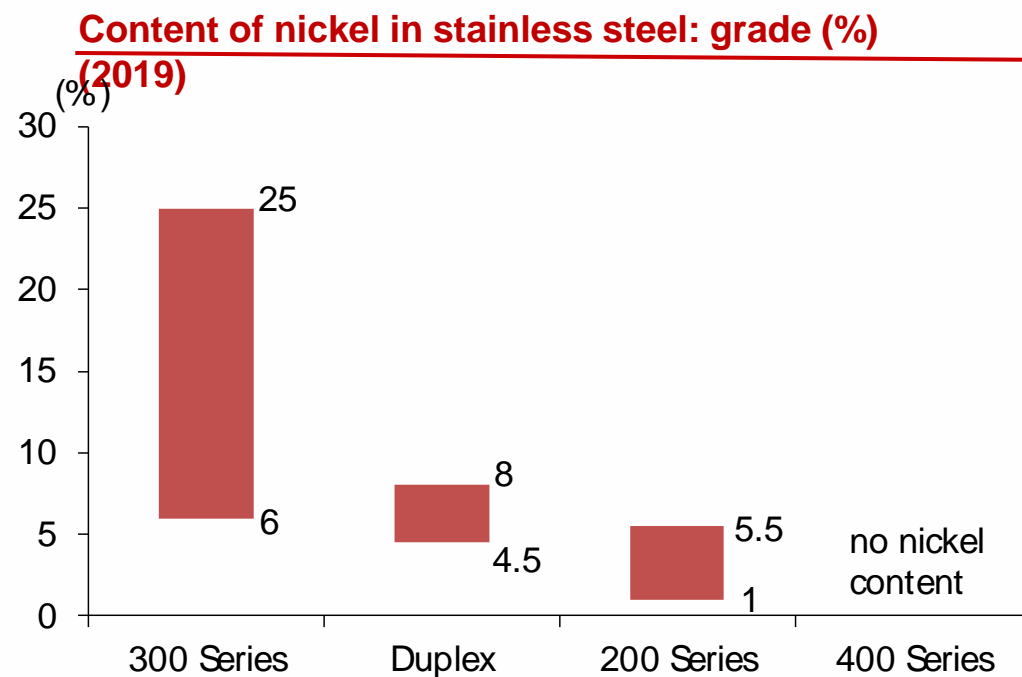


Source: ISSF, DBS Bank

Stainless steel: Production growth by



Stainless steel grade and nickel content

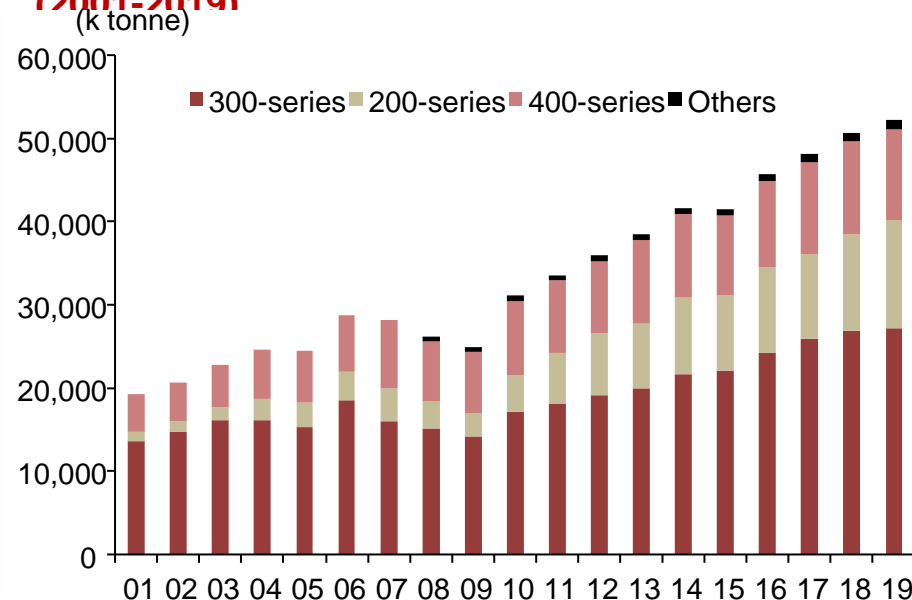


Source: ISSF, DBS Bank

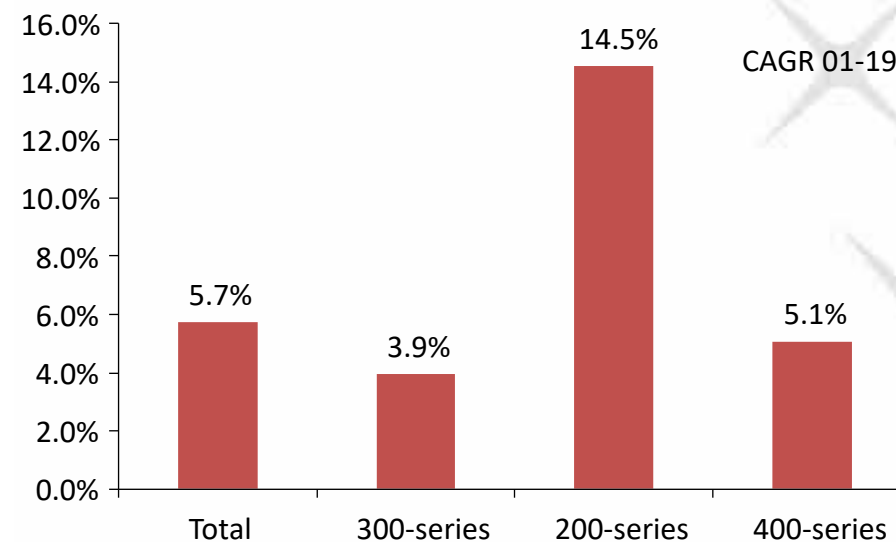
Decline of 300 series' contribution

Stainless steel production by grade

(2001-2019)



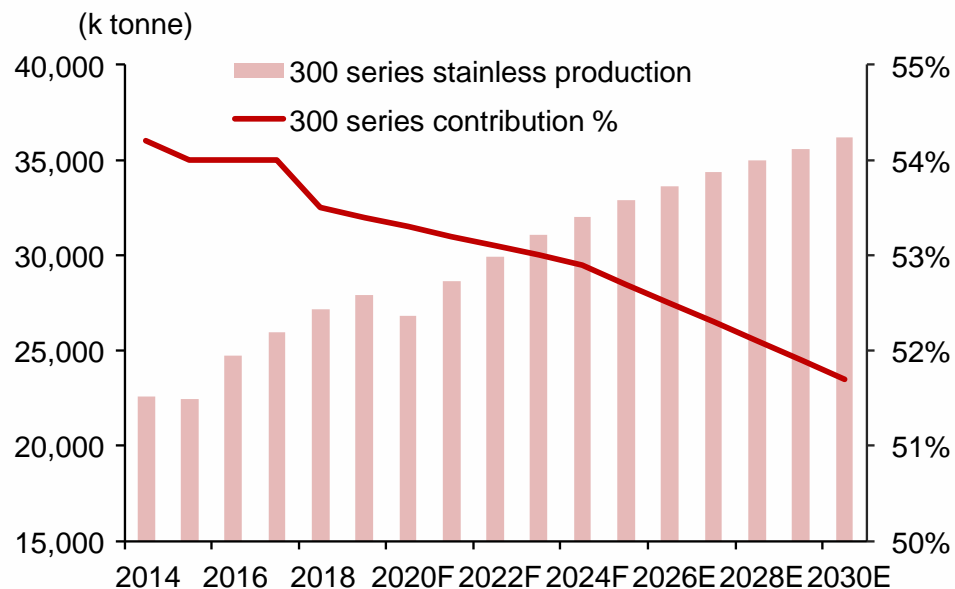
Stainless steel output CAGR by grade



Source: ISSF, DBS Bank

300 series stainless steel output continues to grow

Global: 300 series stainless steel output forecasts



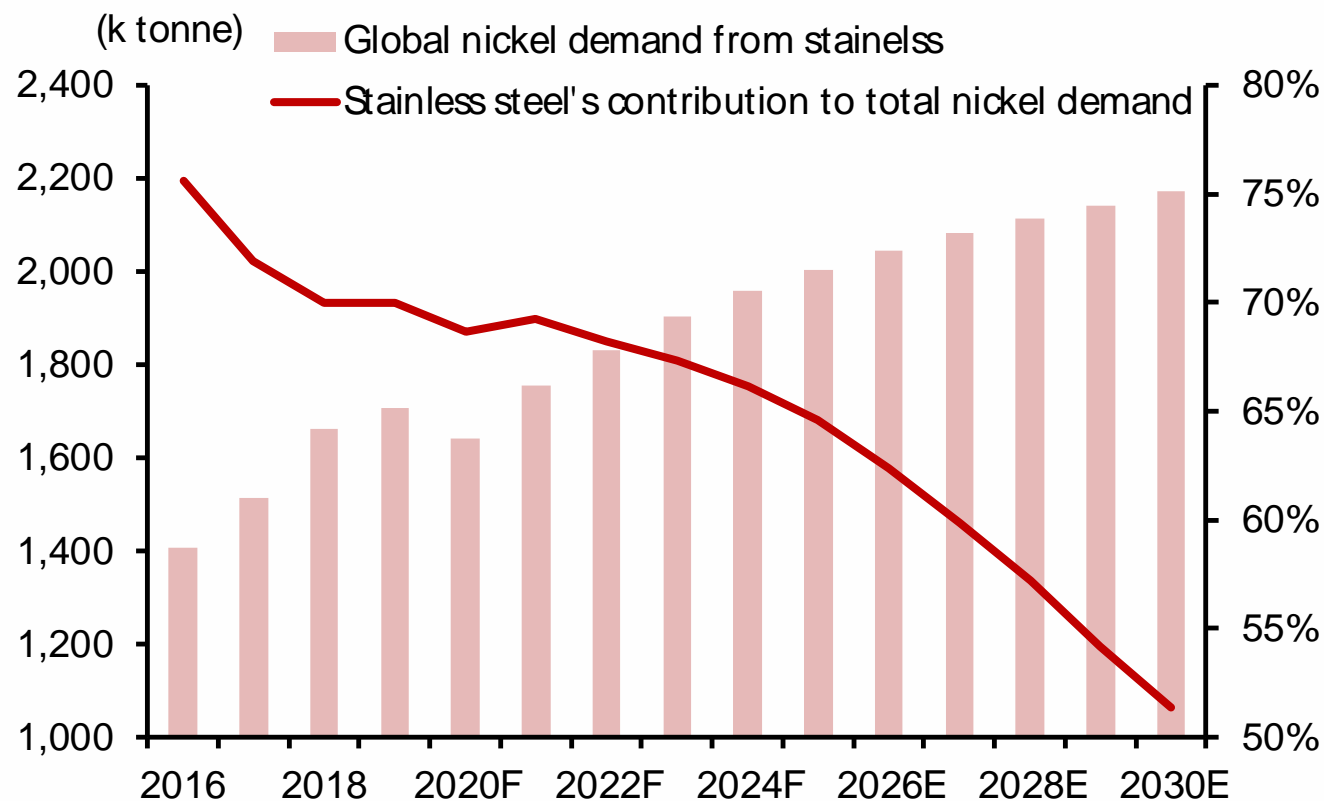
China: 300 series stainless output



Source: ISSF, DBS Bank

STS will remain the largest contributor to nickel demand

Global nickel demand from stainless steel



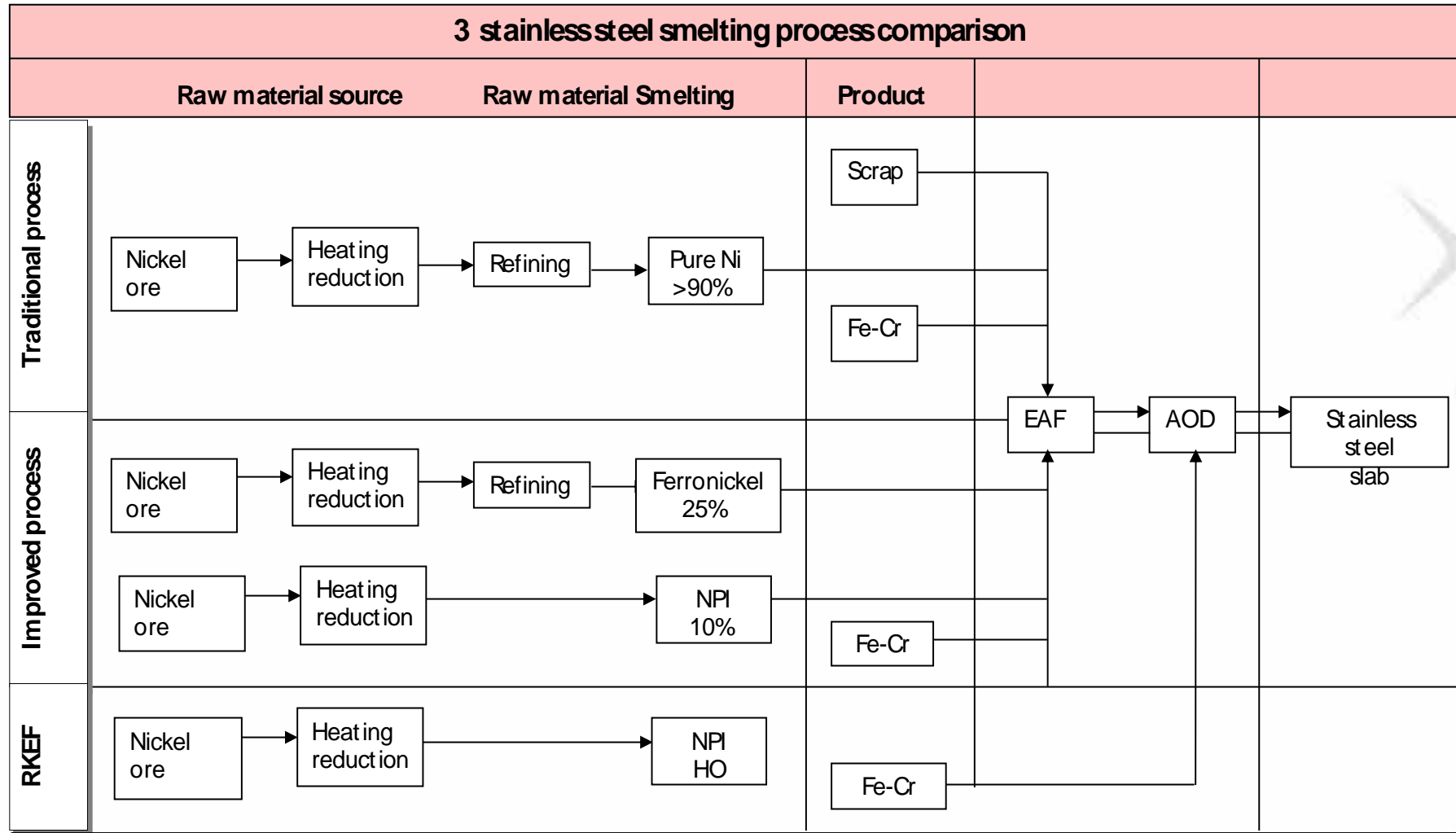
Source: ISSF, WBMS, DBS Bank

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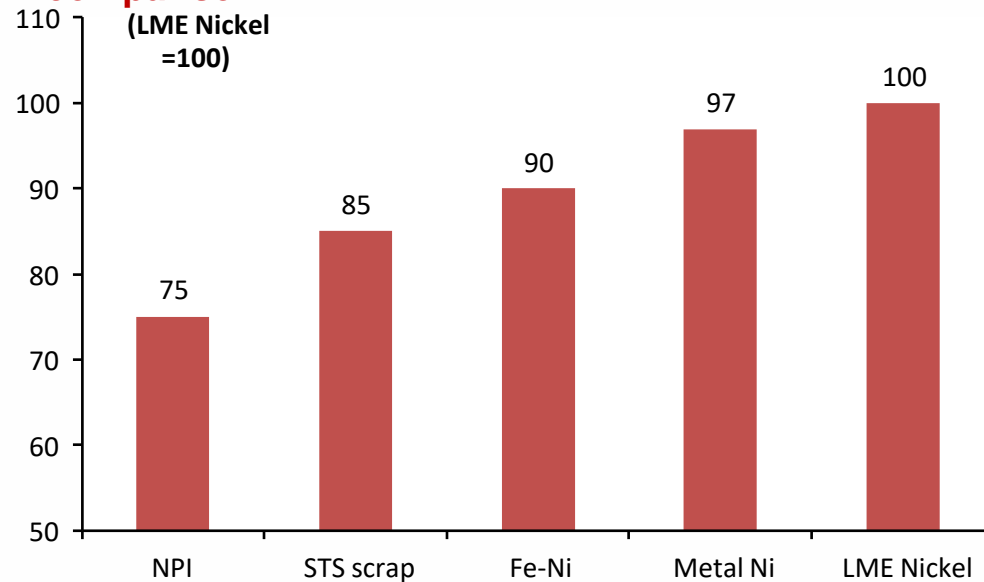
Nickel and stainless steel production process



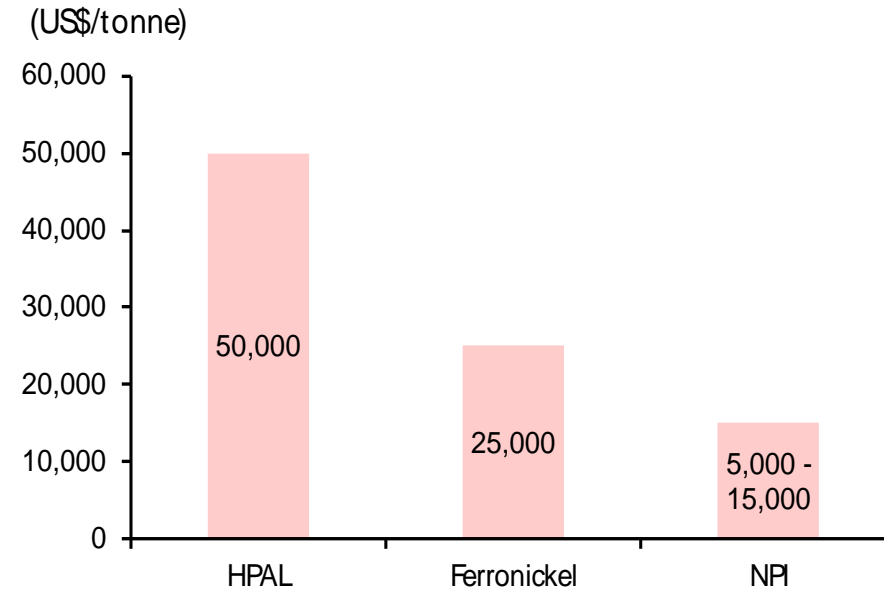
Source: INSG, ISSF, DBS Bank

NPI's cost competitiveness over others for stainless steel production

Stainless steel production cost comparison



Nickel smelting projects: Capex

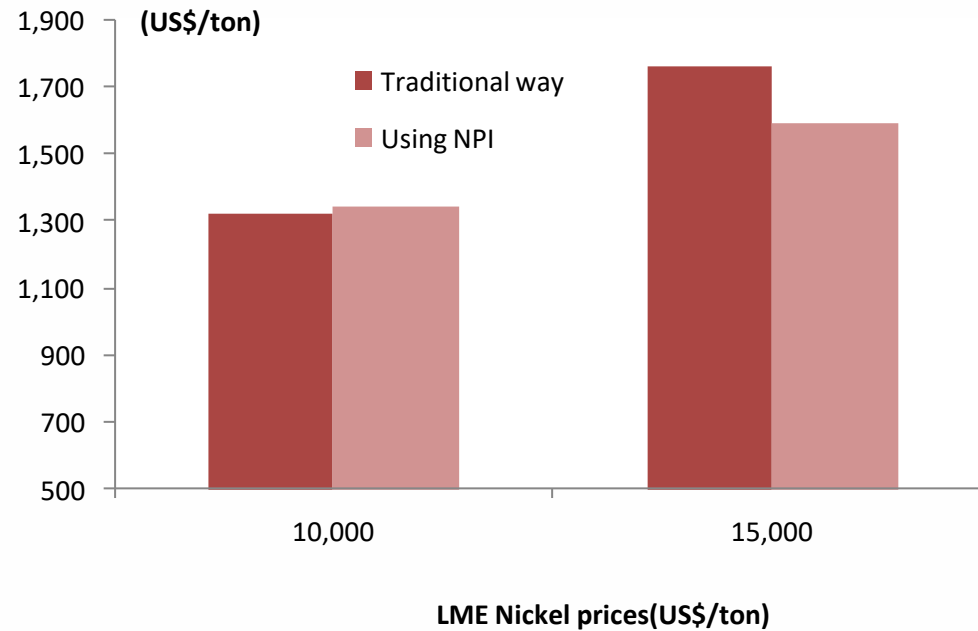


* Based on LME nickel price of US\$20,000/ton

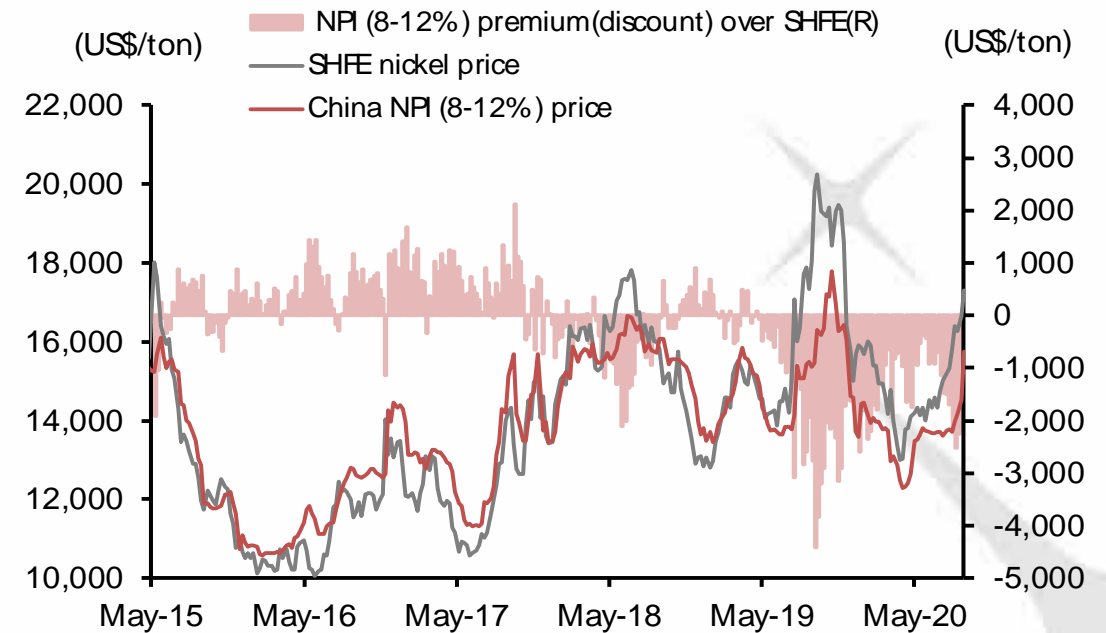
Source: INSG, ISSF, DBS Bank

NPI's cost advantage magnifies when nickel prices rise

Stainless steel: Raw material cost vs. LME nickel prices



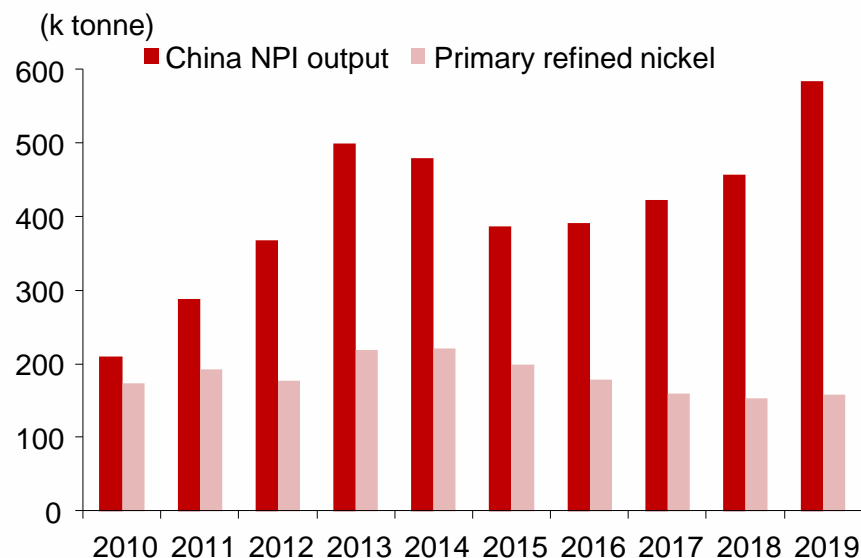
SHFE nickel prices vs. NPI prices



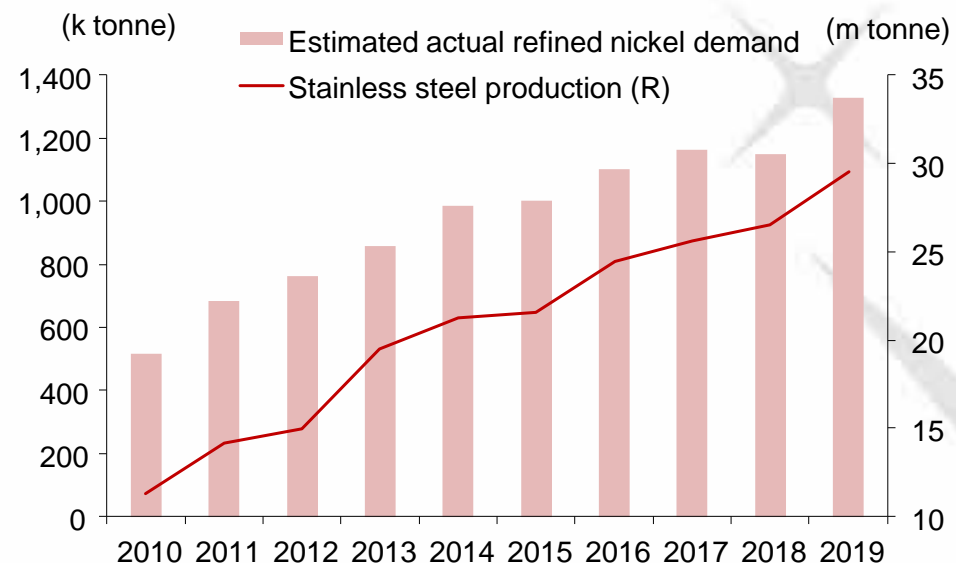
Source: INSG, ISSF, DBS Bank

China's surging NPI output, fast replacing pure nickel

China: NPI output (Ni content)
output



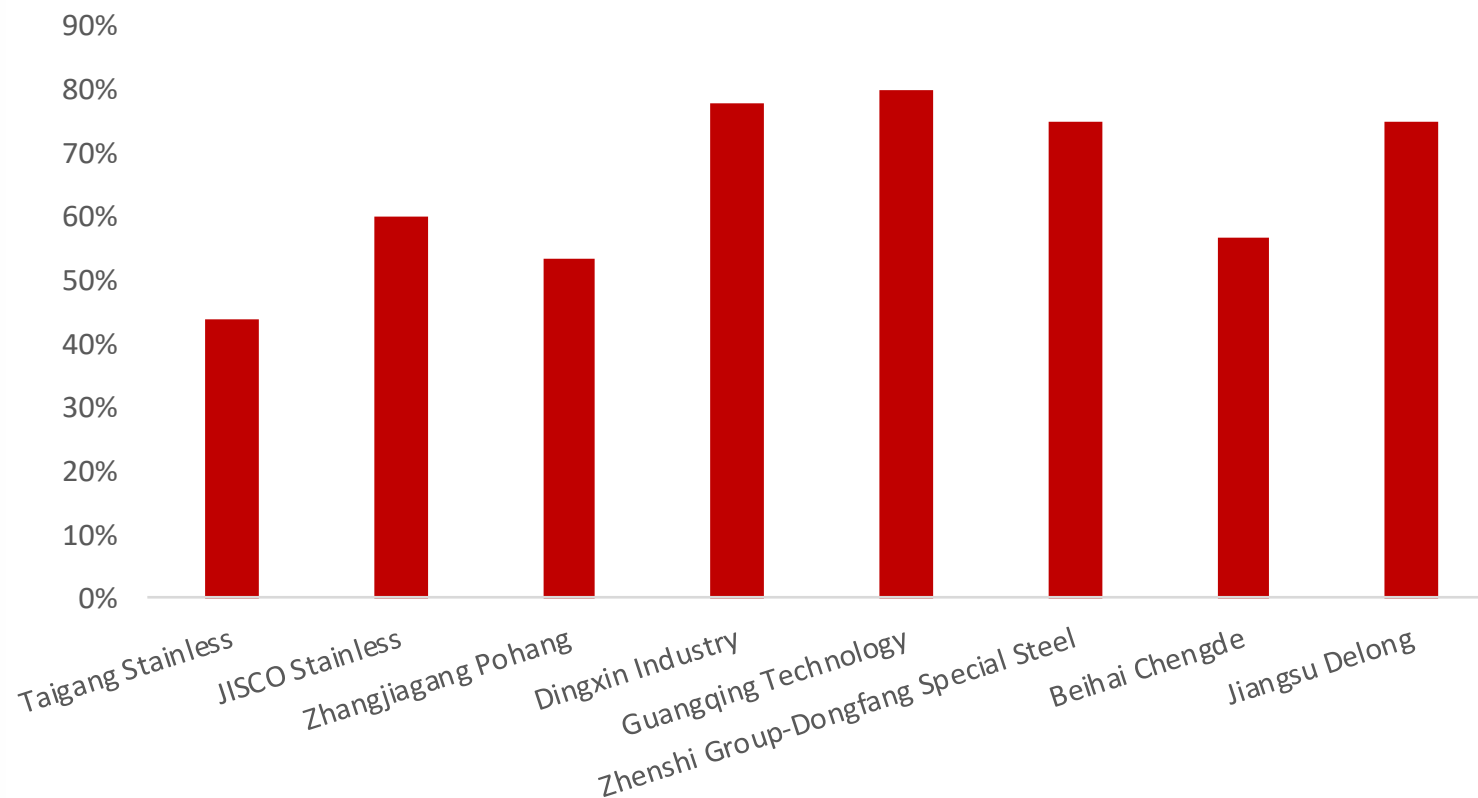
China: Refined nickel demand and stainless



Source: WBMS, SMM, DBS Bank

China's high ratio for stainless production based on NPI

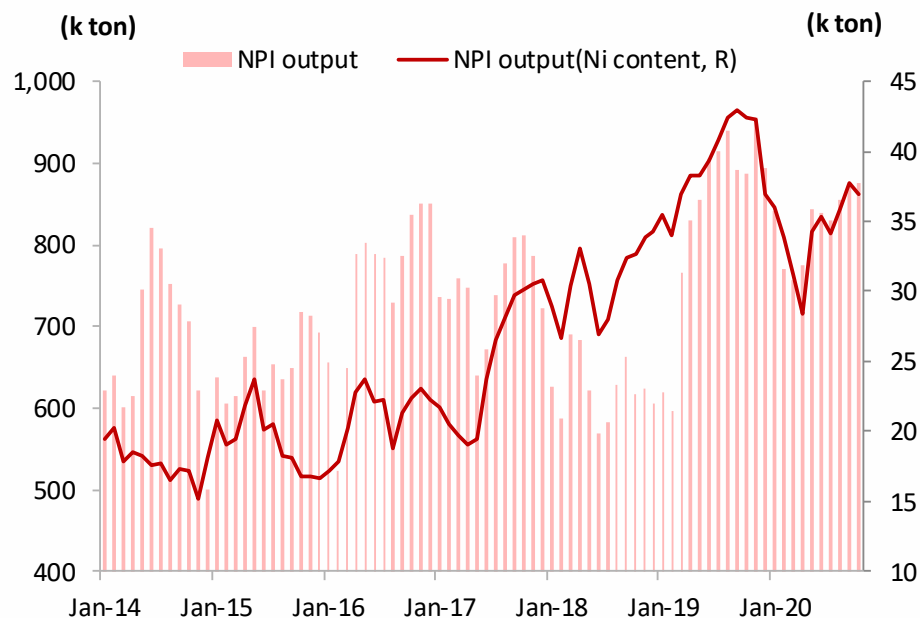
Ratio of 300 series stainless steel production based on high-grade NPI by Chinese player



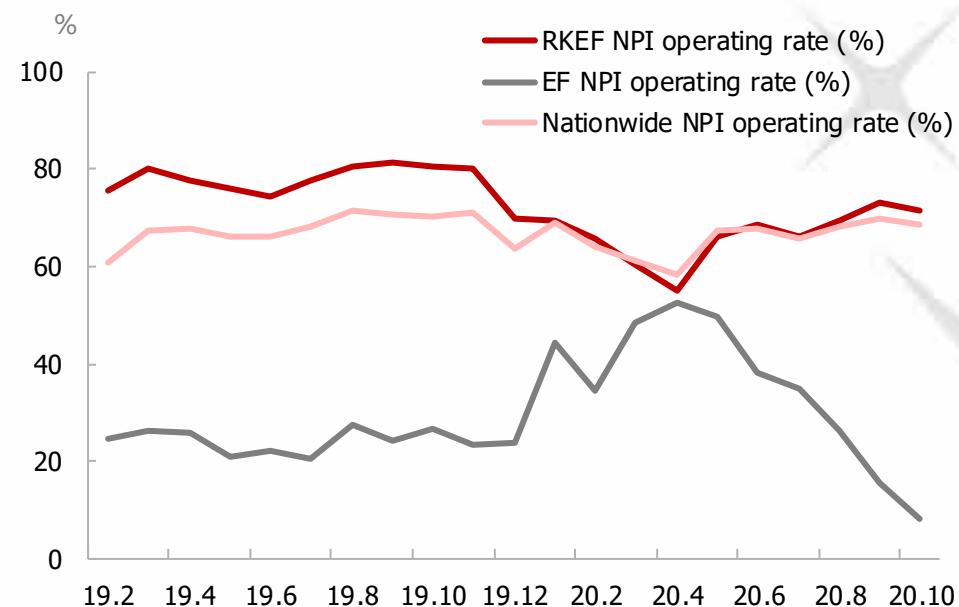
Source: SMM, DBS Bank

China's NPI production to focus on high-grade NPI from RKEF

China: NPI output



China: NPI operating rate



Source: WBMS, SMM, DBS Bank

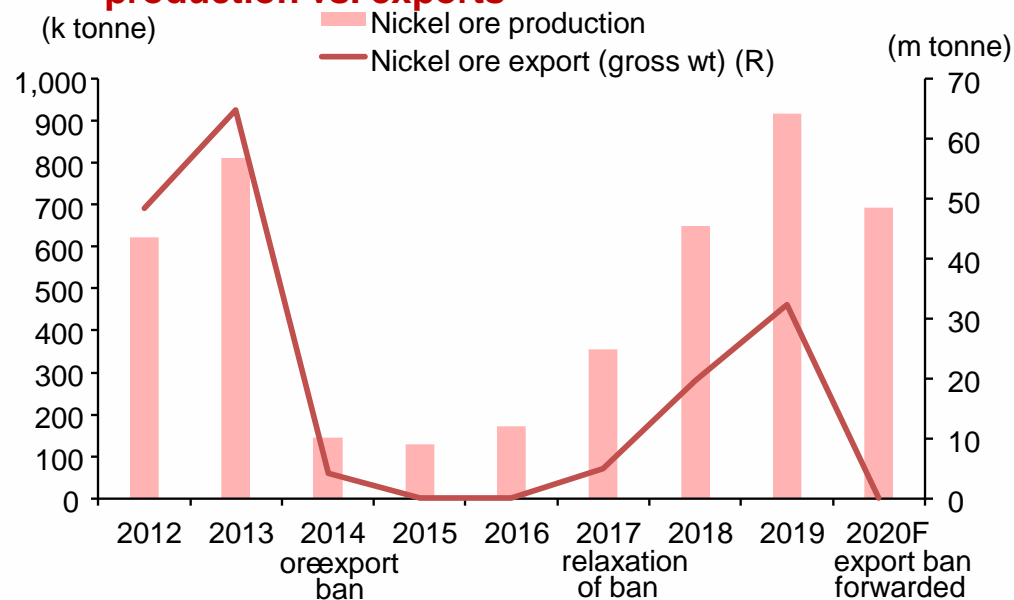
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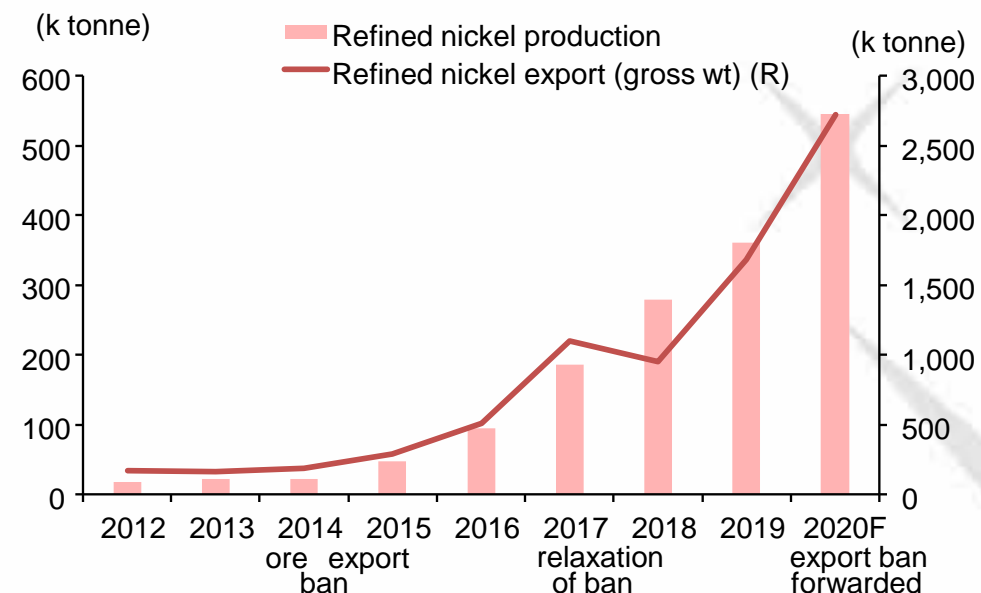
Indonesia's export ban on nickel ore spurs downstream sector growth

Indonesia: Nickel ore production vs. exports

production vs. exports



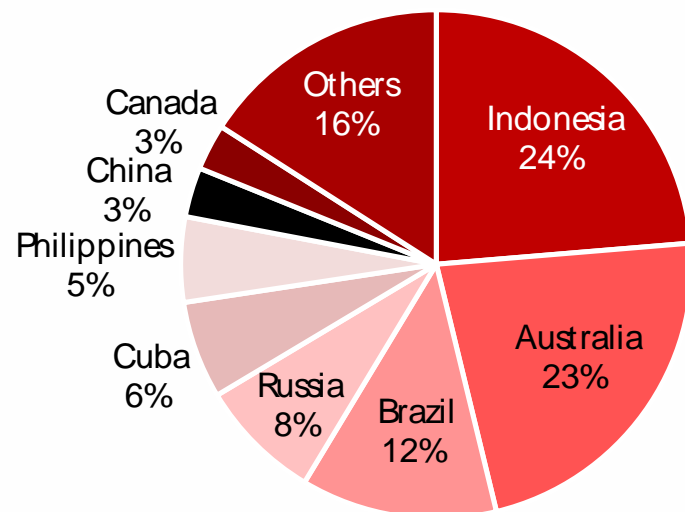
Indonesia: Refined nickel



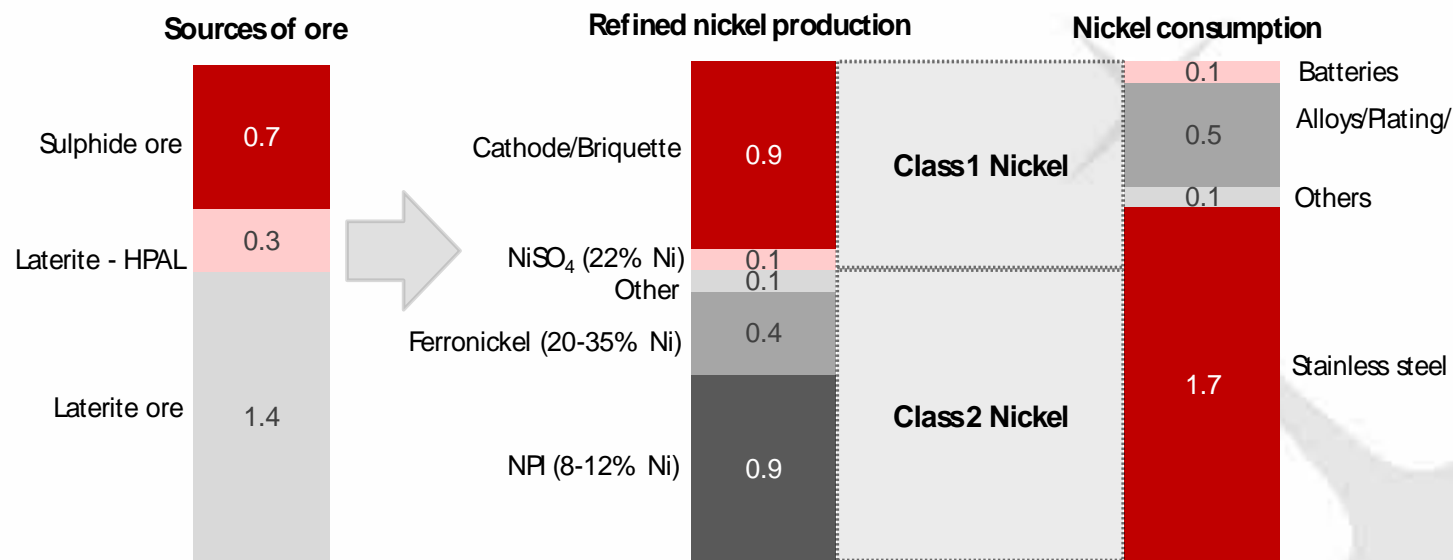
Source: WBMS, DBS Bank

Indonesia's key advantages - abundant laterite reserves

Nickel reserves by country (2019)



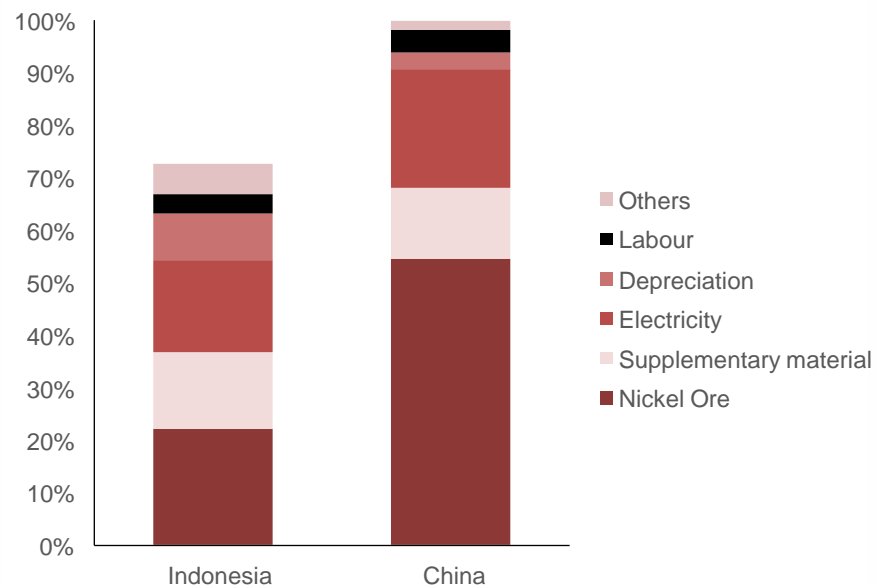
Nickel sector value chain



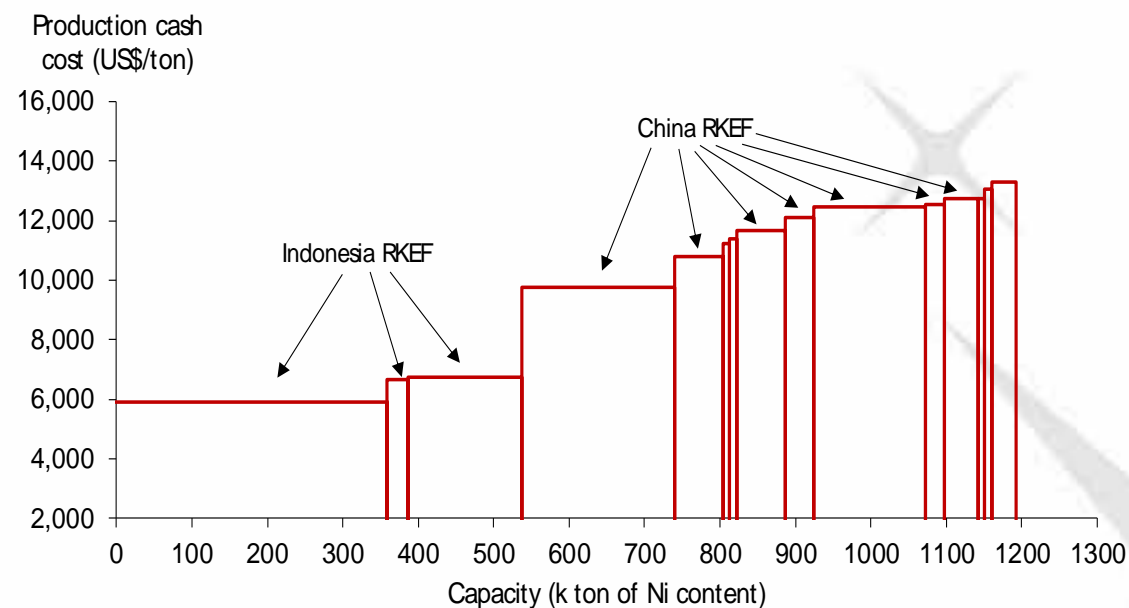
Source: Bloomberg Finance L.P., POSRI, DBS Bank

Indonesia's cost advantage over China for NPI

NPI cost breakdown (Indonesia vs. China)



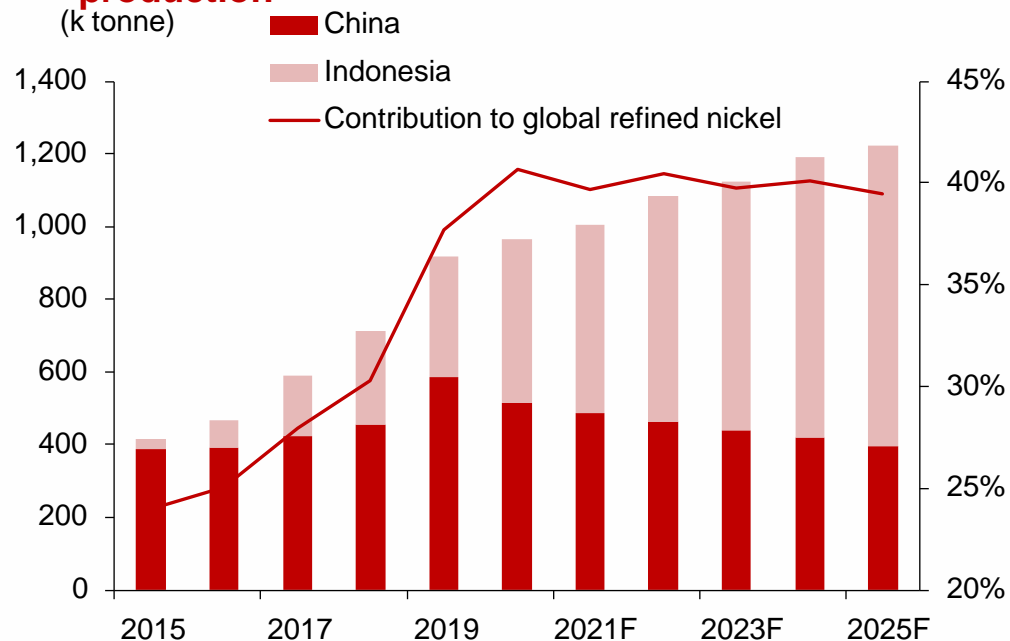
NPI cost curve: China and Indonesia



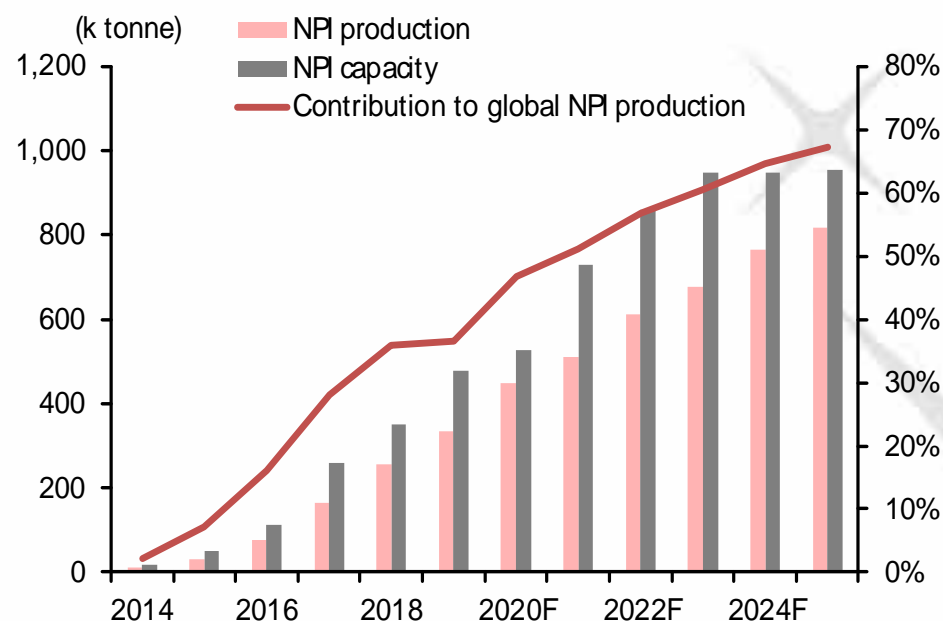
Source: Bloomberg Finance L.P., POSRI, DBS Bank

Indonesia, rising as the largest NPI supplier after ore export ban

Global NPI production: Forecasts by region production



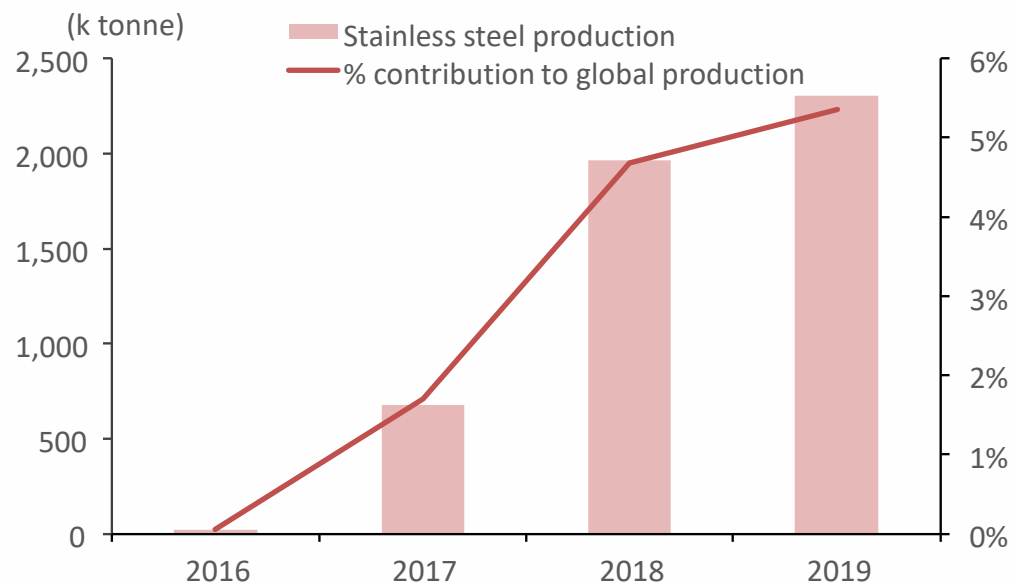
Indonesia: NPI capacity and



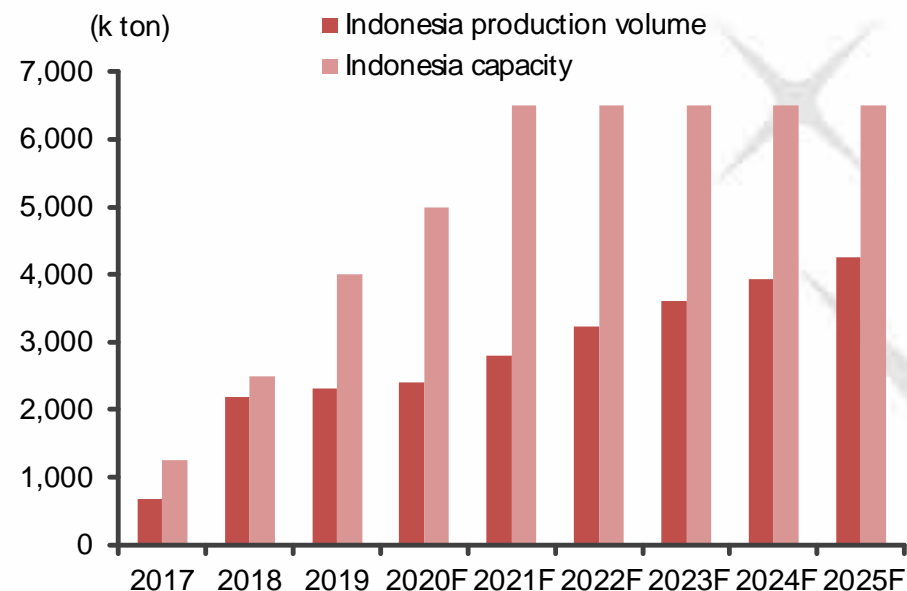
Source: WBMS, SMM, DBS Bank

Indonesia, rising as dark horse for stainless steel supply

Indonesia: Stainless steel production and production



Indonesia: Stainless steel capacity and



Source: WBMS, SMM, DBS Bank

Indonesia: Capacity expansion (NPI/ferronickel)

Company	Project	Location & Details	Products	Capacity	Capex (US\$m)	Timeline	Remarks
Tsingshan, Eramet	Tsingshan-Eramet Weda Bay project	4 RKEF lines in Weda Bay in the province of North Maluku	NPI	30k tonnes of nickel content in NPI		Started production in May 2020	To expand to 117k tonnes p.a.
Tsingshan		8 RKEF lines at Morowali Industrial Park	NPI	78k tonnes of nickel content in NPI		2020	
PT Perkasa Metal		RKEF in Halmahera Island, 2 rotary kilns (4.6x100m), 2 ore-smelting electric furnace (42MVA)	10-14% ferronickel from 1.8-3% laterite ore	20k tonnes of nickel content in ferronickel		Commission in 2021	
Aneka Tambang, Ocean Energy Nickel International	Antam Niterra Haltim (East Halmahera)	8 production lines of NPI blast furnaces	NPI	30k tonnes of nickel content in NPI	320	2023	Construction reached 97.75% as of 2019. First two lines operational in 2021 and full operations from 2023.
CNI (Ceria Nugraha Indotama)			Ferronickel	50.6k tonnes	1,020	2021	
PT Virtue Dragon Nickel Industry	Konawe Virtue Dragon	RKEF in Konawe, Sulawesi Stage 1: 15 lines of electric furnaces (33MVA)	NPI	180k tonnes of nickel content in NPI		Commission in 2023	66k tonnes p.a. of nickel in NPI expected in stage 1, to rise to 180k tonnes p.a. in stage 2
TISCO		8 RKEF production lines (43MVA), followed up with stainless steel smelting facility in Sulawesi	NPI	65k tonnes of nickel content in NPI			
Aneka Tambang	Sorong Smelter	Smelter in Sorong, West Papua	Ferronickel	40k tonnes of nickel, 500k tonnes of stainless steel	1,000	2022	Production of 3m tonnes of nickel in Gag Island, West Papua to supply the smelter
Hengshun Zhongsheng, PT Bumi Morowali Utama		RKEF in Morowali	NPI	32k tonnes of nickel content in NPI			
PT Huadi Nickel-Alloy Indonesia	Bantaeng smelter	8 furnace lines JV between Shanghai Huadi Industrial Co and PT Duta Nikel Sulawesi	Ferronickel	200k tonnes of ferronickel* *nickel content unknown	458	2021	Construction of four lines started since early 2020 Electricity to be provided by PLN (state power company) in April 2021 for operation
PT Wanatiara Persada		Ferronickel smelter in Obi Island	Ferronickel	39k tonnes	600	2020	
PT Macika Mada Madana, PTPP	Macika	2 x 33MVA RKEF in Konawe, Sulawesi	NPI	13.2k tonnes		2021	

Indonesia's key advantages vs. risks

Advantages

- **Abundant reserves of high-grade laterite ores.** Indonesia has the largest nickel reserves with 21m tonnes of laterite ore, accounting for 24% of global nickel reserves in 2019. Its average grade of c.1.6% is higher than laterite ore grades in Brazil and the Philippines of <1.3%.
- **Cost competitiveness.** Lower fuel, electricity and labour costs in Indonesia allow manufacturers to produce at a cheaper cost. Also, the reduced transportation costs for shipping of ore help to reduce cost.
- **Favourable policy developments.** Indonesia's Omnibus Law will (i) liberalise Indonesia's foreign direct investment, (ii) ease labour laws, and (iii) simplify business licensing and permits.

Risks

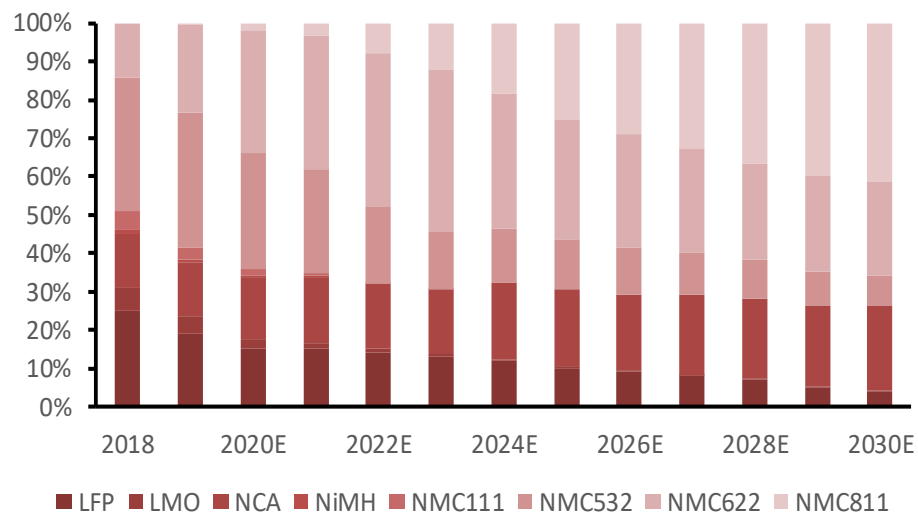
- **Project delays from weak execution capabilities.** Indonesia's structural constraints and lack of execution capabilities may delay projects and lead to capex overruns. (e.g. ANTM's East Halmahera ferronickel project).
- **Potential threats to local miners.** The nickel ore export ban may hurt local mining companies that have yet to venture into smelting due to lower nickel ore prices. In July, domestic smelters were buying 1.8% nickel ore for US\$27/wmt CIF, much lower than US\$43-46/wmt CIF (1.65% nickel ore) in the international market.
- **Anti-dumping.** Countries may impose anti-dumping duties on Indonesia's products to protect domestic markets.
- **Lack of battery manufacturing capacity and R&D.**

Content

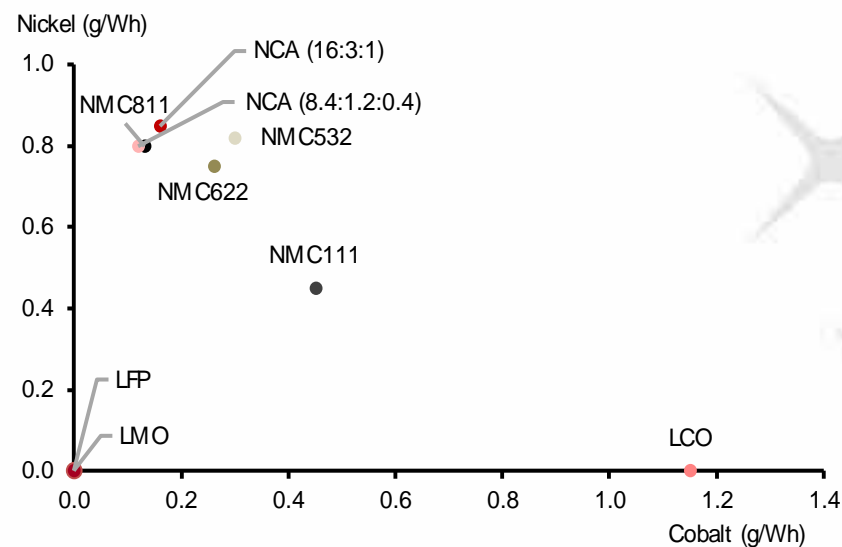
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Why is nickel important for EVs?

Battery chemistry forecasts



Nickel & cobalt content (by cathode chemistry)

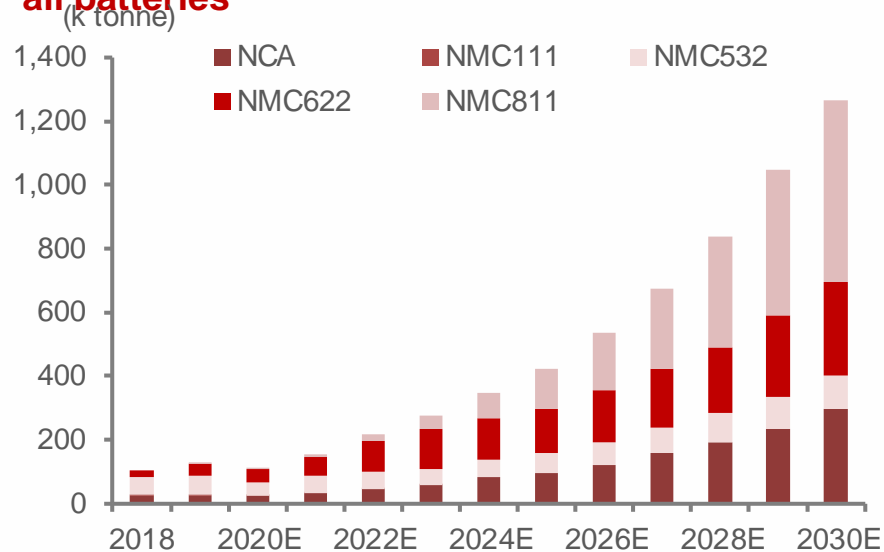


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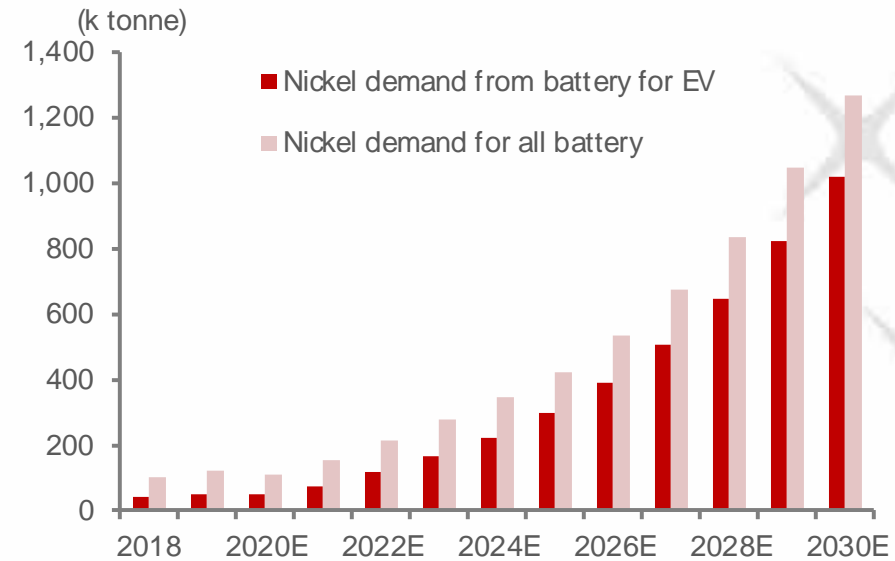
Source: IEA, Battery Institute, Bloomberg Finance L.P., DBS Bank

Nickel demand from battery to grow rapidly

Nickel demand forecasts (by cathode chemistry)
all batteries



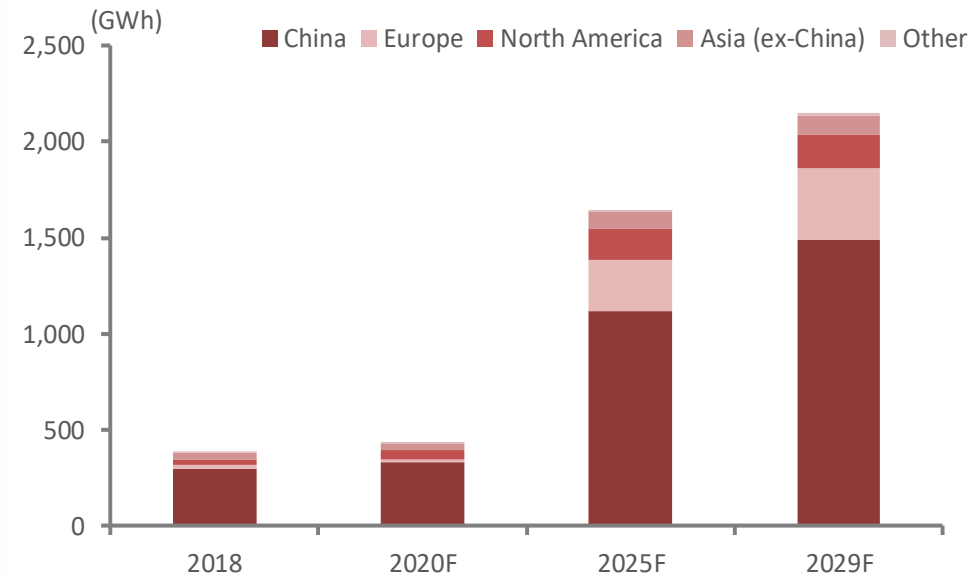
Nickel demand from EV battery vs.



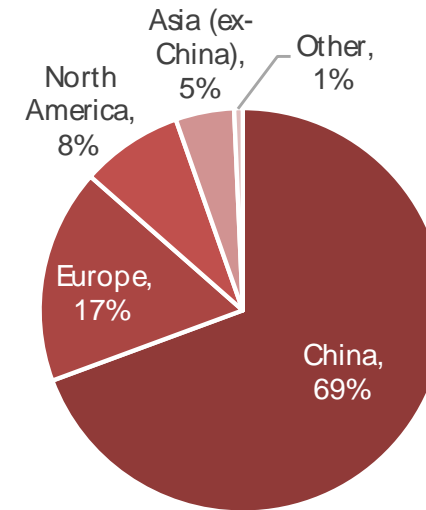
Source: WBMS, INSG, DBS Bank

Strong growth in battery manufacturing capacity

Battery manufacturing capacity forecasts



Battery capacity by region (2029)



Source: IEA, Benchmark Minerals, DBS Bank

Nickel market deficit from 2021 onwards

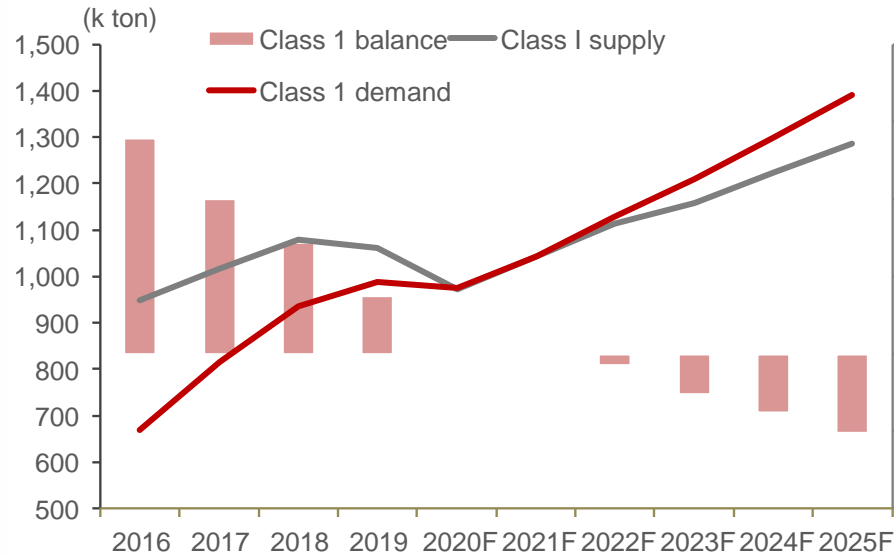
Nickel demand, supply and price forecasts

(k tonne)	2018	2019	2020F	2021F	2022F	2023F	2024F	2025F
Nickel mine production	2,396	2,593	2,359	2,703	2,853	3,068	3,117	3,103
y-o-y %	10.5%	8.2%	-9.0%	14.6%	5.5%	7.6%	1.6%	-0.5%
Refined nickel production	2,252	2,410	2,372	2,518	2,678	2,779	2,908	3,003
y-o-y %	9.1%	7.0%	-1.6%	6.2%	6.4%	3.8%	4.7%	3.3%
Refined nickel consumption	2,349	2,437	2,370	2,534	2,683	2,827	2,963	3,093
y-o-y %	11.8%	3.7%	-2.8%	6.9%	5.9%	5.4%	4.8%	4.4%
Balance	(97)	(27)	2	(16)	(5)	(48)	(55)	(90)
Class I	143	74	(1)	0	(15)	(52)	(75)	(103)
Class II	(240)	(101)	2	(17)	10	4	20	13
Stock	222	191	235	210	190	180	170	170
Market balance	(286)	(58)	46	(41)	(25)	(58)	(65)	(90)
LME nickel price (US\$/ton)	13,122	13,936	13,200	14,300	14,800	15,400	15,900	16,700
y-o-y % / q-o-q %	26.0%	6.2%	-5.3%	8.3%	3.5%	4.1%	3.2%	5.0%

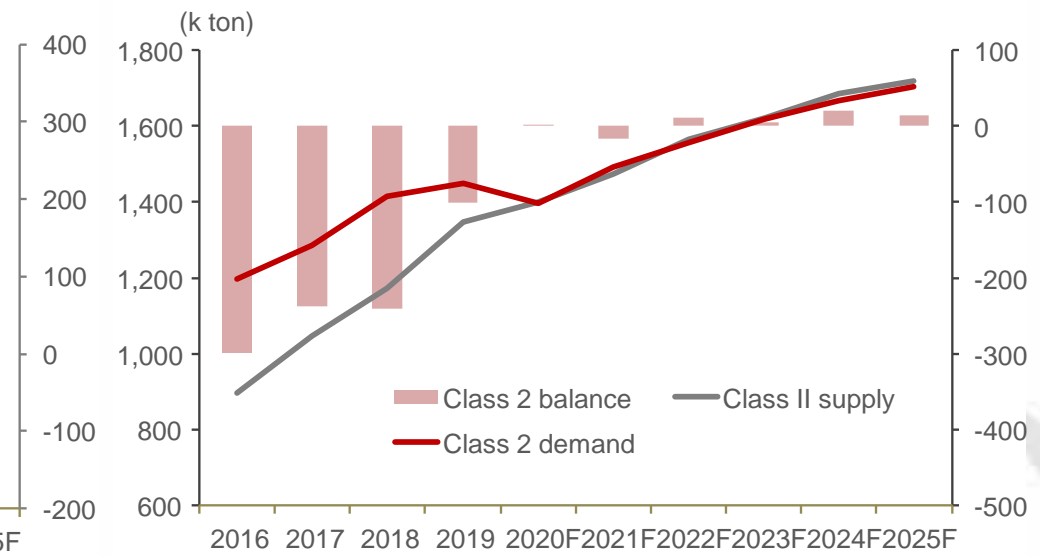
Source: WBMS, Bloomberg Finance L.P., DBS Bank

Class I nickel deficit vs. Class II nickel balanced/oversupplied

Class I nickel: Market forecasts



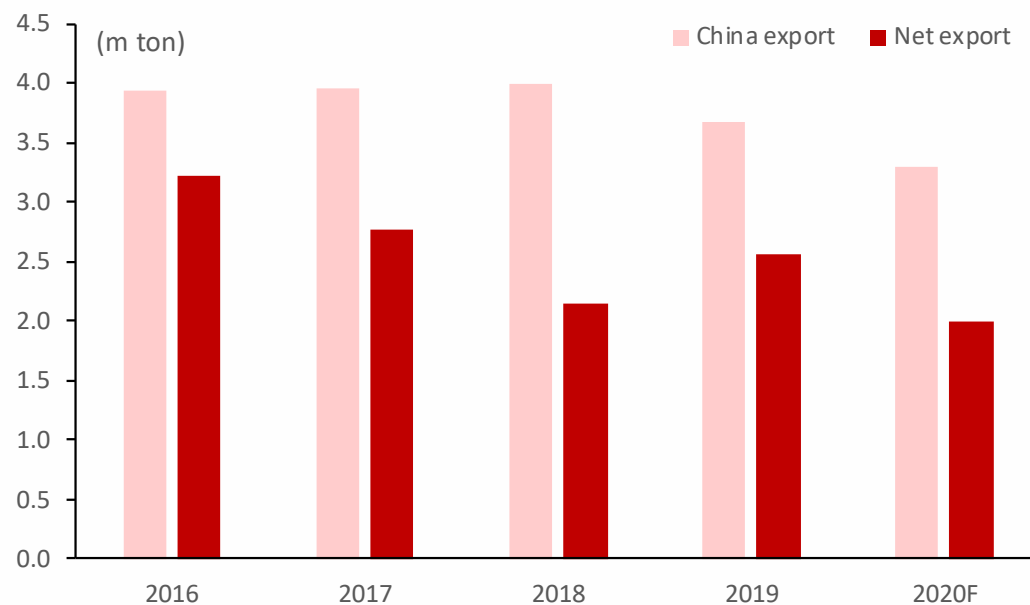
Class II nickel: Market forecasts



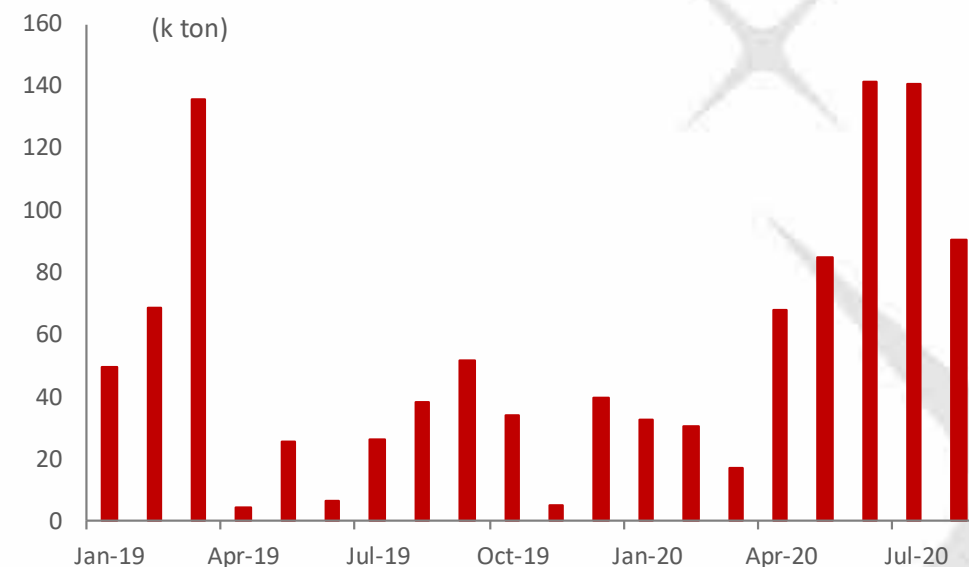
Source: Company, Bloomberg Finance L.P., DBS Bank

China's stainless exports to decline as imports from Indonesia grow

**China: Stainless steel export
Indonesia**



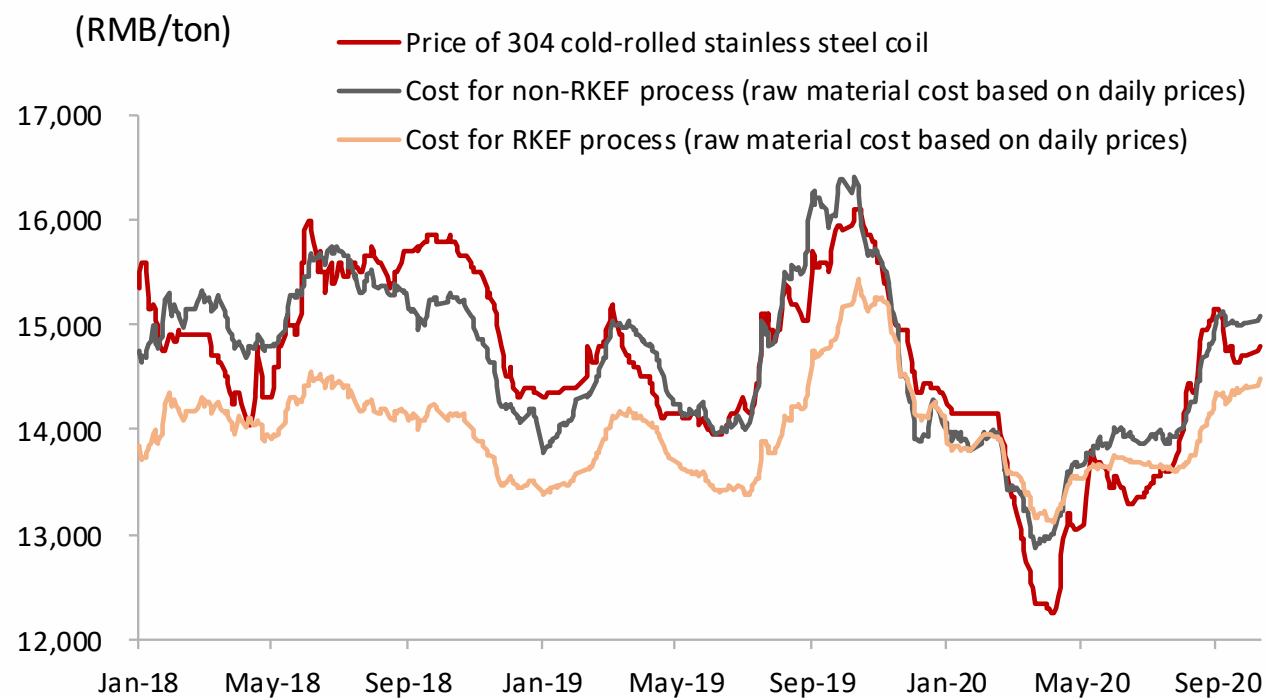
**China: Stainless steel import from
Indonesia**



Source: WBMS, SMM, DBS Bank

Anaemic profitability for stainless steel makers

China: 304 cold-rolled stainless steel prices and raw material cost



Source: SMM, DBS Bank

Increasing trade conflicts

Countries/Regions initiating anti-dumping, anti-subsidy probes	Date of determination	Product	Countries/Regions investigated
The United States	13/07/2018	Stainless steel flanges	China
The United States	25/07/2018	Stainless steel sinks	China
The United States	02/11/2018	Refillable stainless steel kegs	China
The United States		Welded stainless steel pressure pipe	China
Turkey	31/12/2018	Welded stainless steel pipes and tubes	China
The European Union	04/03/2019	Welded stainless steel pipes and tubes	China
The European Union	06/03/2018	Seamless pipes and tubes of stainless steel	China
The European Union	12/08/2019	Hot-rolled stainless steel sheet	China, Taiwan, Indonesia
Australia	03/07/2019	Stainless steel sinks	China
Mexico	05/04/2019	Stainless cold-rolled steel sheet	Mainland China, Taiwan
Brazil	25/07/2019	Welded austenitic stainless steel pipes	Mainland China, Taiwan
Colombia	30/08/2019	Stainless steel sinks	China
Vietnam	06/07/2019	Stainless steel products	Mainland China, Taiwan, Malaysia, Indonesia
India	04/07/2017	Stainless hot-, cold-rolled steel sheet	China
India		Flat-rolled stainless steel products	Mainland China, Korea, EU, Japan, Taiwan, Indonesia, EU, Thailand, South Africa, UAE, Hong Kong, Singapore, Mexico, Vietnam, Malaysia
India	31/07/2019	Welded stainless steel pipes and tubes	China, Vietnam
Malaysia	07/02/2018	Stainless cold-rolled steel sheet	Mainland China, Taiwan, Thailand, South Korea
Taiwan, China	12/07/2019	Cold-rolled stainless steel	Mainland China

Source: WBMS, SMM, DBS Bank

Conclusion

- Stainless steel demand will grow but the growth will decelerate particularly in China.
- Stainless steel capacity is poised to grow strongly following strong capacity expansion in China and Indonesia, drawing concerns on oversupply.
- Stainless steel production method is shifting to the integrated line of NPI and stainless steel based on RKEF posing challenges to conventional stainless makers to lose cost competitiveness.
- Indonesia is a rising hub for NPI and stainless steel supply after the government banned nickel ore export.
- Cost competitiveness in Indonesia for NPI and stainless steel is superior to Chinese makers which attracts Chinese makers to shift its production facilities to Indonesia from China.
- Nickel demand in EV battery will grow rapidly to account for 30% of total nickel demand in 2030 from 5% currently, a driver of nickel price rise and high premium for battery-grade nickel.
- Higher nickel prices would provide significant challenges to stainless steel makers, especially conventional stainless steel makers without nickel smelting line, amid potential oversupply of stainless steel market.



Traditional stainless steel makers are focusing on high-grade products and the niche markets

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are likely to survive, while the producers producing common grade are likely to phase out.

Disclaimer

DBS Bank Ltd recommendations are based on an Absolute Total Return* Rating system, defined as follows:

STRONG BUY (>20% total return over the next 3 months, with identifiable share price catalysts within this time frame)

BUY (>15% total return over the next 12 months for small caps, >10% for large caps)

HOLD (-10% to +15% total return over the next 12 months for small caps, -10% to +10% for large caps)

FULLY VALUED (negative total return i.e., > -10% over the next 12 months)

SELL (negative total return of > -20% over the next 3 months, with identifiable share price catalysts within this time frame)

* Share price appreciation + dividends

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Sources for all charts and tables are DBS Bank unless otherwise specified.

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