



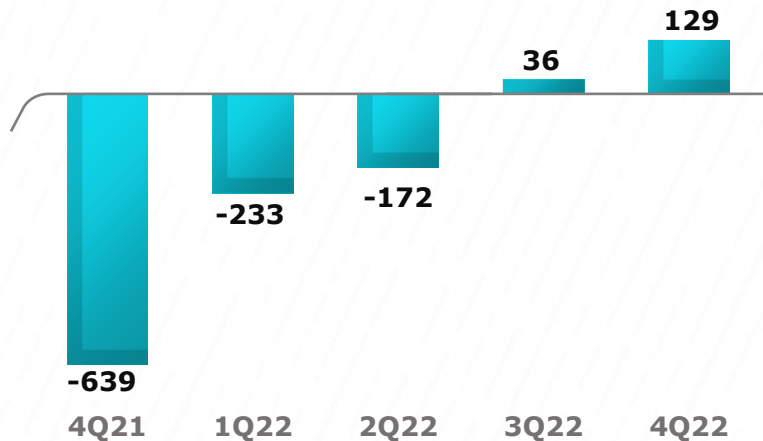
Aluminum Market Report

4Q22

ALUM

Global aluminum market in deficit in 2022, but lower consumption in 4Q22 leads to a surplus in the period

Global Balance¹ (kt) - Supply vs Demand



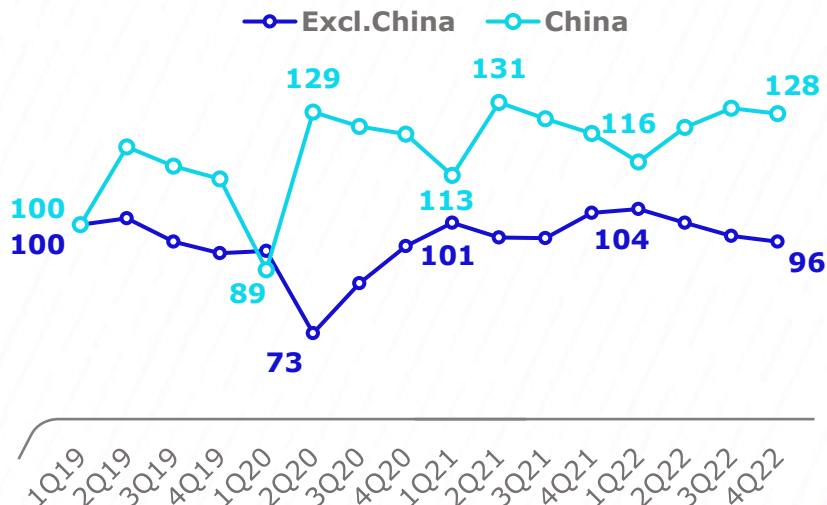
¹ Balance adjusted for net primary trade



Global market registered a deficit of -240 Kt in 2022.

Primary Aluminum Demand

1Q19 = 100



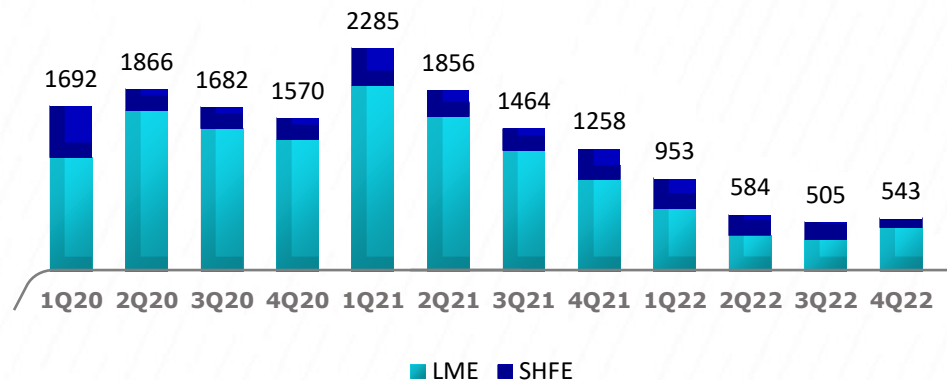
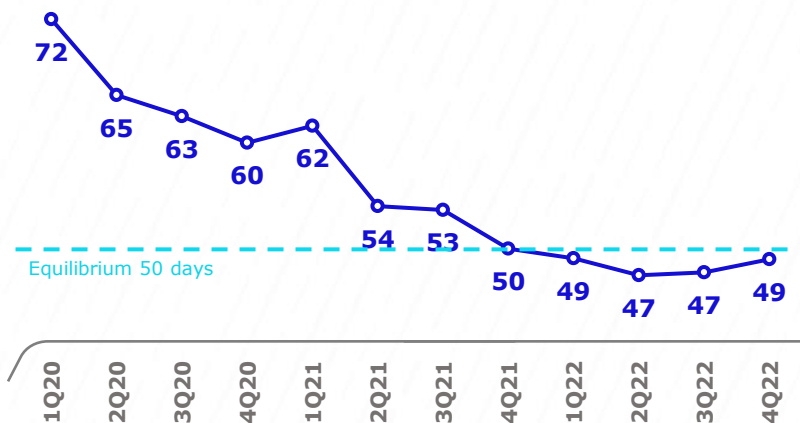
Primary aluminum consumption slows in 4Q22 in China and other countries. Zero Covid policy, inflationary pressures and high interest rates impacted consumption

Physical market remains tight, with stocks at low levels despite recent volatility

Increase in inventory days in 4Q22 due to reduced demand. Still, physical market remains tight and sensitive to relevant supply fluctuations

Inventories of LME and SHFE (kt) warehouses increased 8% compared to the previous quarter, but are 57% lower than 4Q21

Global stocks in days of consumption



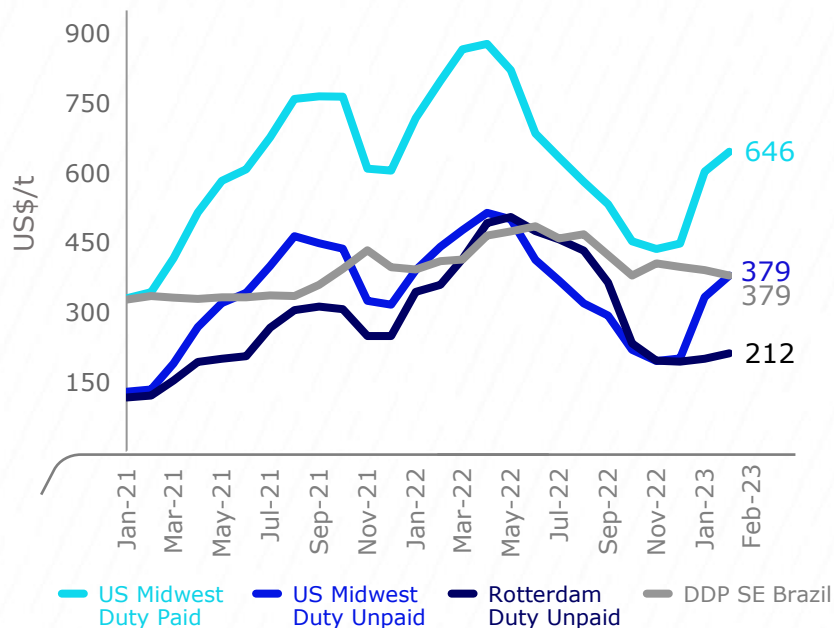
Russian metal flowing to LME Asian warehouses: LME reinforces that it does not identify any distortion in the market and comments that there are also Russian metal withdrawals from stocks, which indicates consumption, especially in Asia, where acceptance is greater.

LME Aluminum remains sensitive to macroeconomic developments, especially in China

LME Aluminum boosted in early 2023, reflecting China's reopening expectations. However, uncertainties about global demand continue to bring volatility to the price

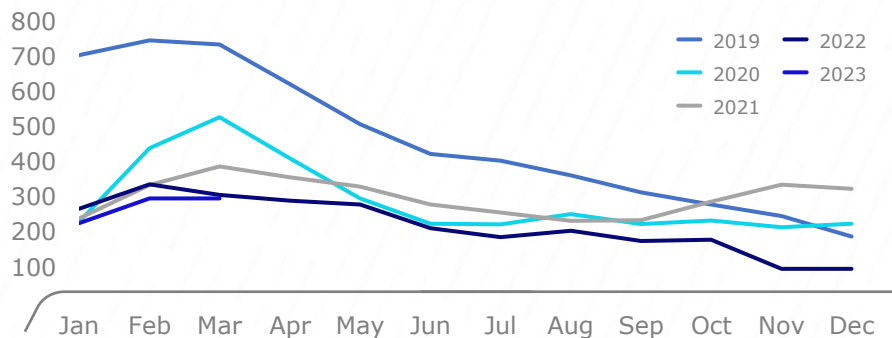


Tight physical market and positive sentiment leverage US Midwest premium. Other regional premiums remained relatively stable

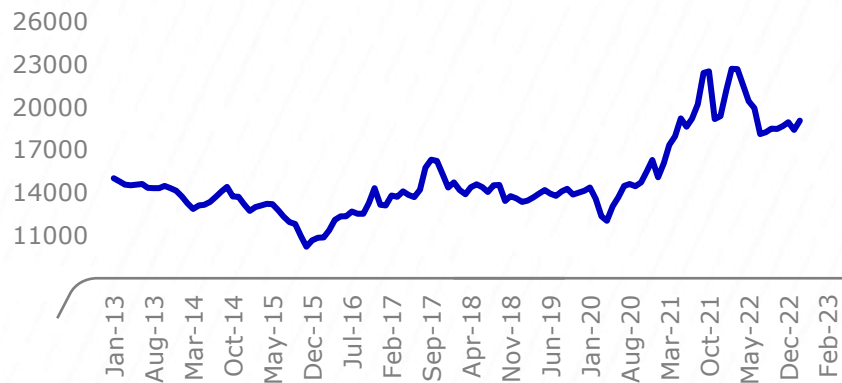


China: market in deficit for 3 years with low stock levels, despite the reduced consumption

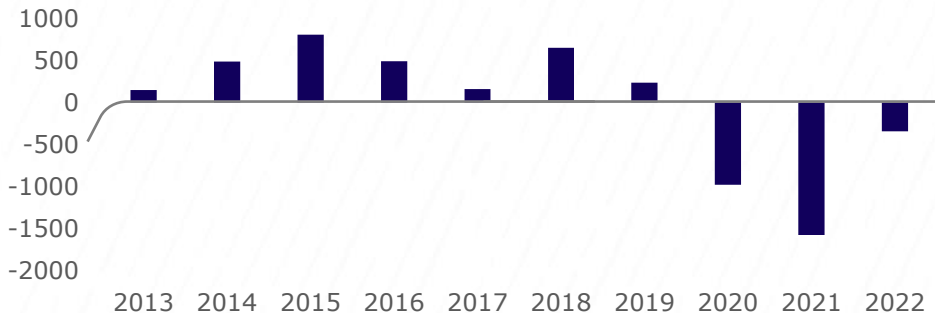
Stocks in China - SHFE Warehouse - kt



Aluminum price in China (SHFE) - RMB/t



China: Primary Aluminum (Exports - Imports) - kt



Seasonal increase in inventories in early 2023 due to Chinese New Year, with accumulation below previous year levels



China's third consecutive year as net importer of primary aluminum



Aluminum price in China supported by the slowest pace of supply growth in recent years, resumption of post-pandemic demand and recent closures related to the energy crisis

Aluminum supply remains under pressure from energy crises in Europe and China

Europe: smelter capacity cuts reached 1.2 Mtpa

- Fall in natural gas price, but still above the historical average. In addition, high prices of other raw materials offer little incentive for restarts. Smelters would also compete with other industries to access energy at a competitive cost.
- Experts do not expect a big wave of restarts in Europe in 2023. Some smaller ones may occur, such as the Dunkirk smelter in France, which is restarting 60 ktpa, supported by the extension of the government subsidy to electro-intensive industries.

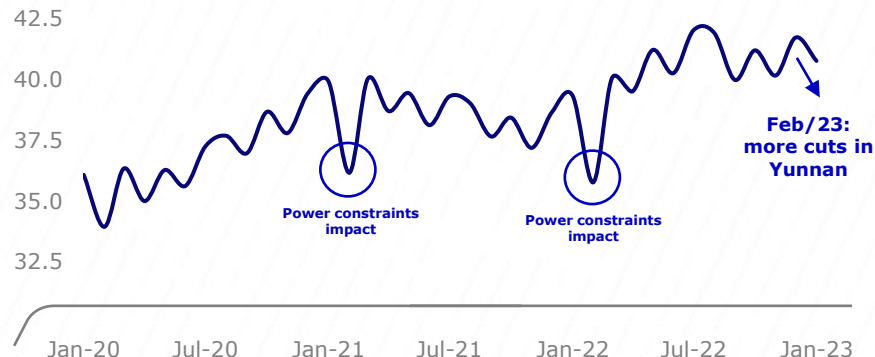
Energy crisis in China: more than 2.5 Mtpa of smelters' capacity have been affected so far

- On February/23, further cuts in the Yunnan region were announced (650 ktpa). The region accounts for 12% of the country's production and its energy matrix is composed of ~73% hydroelectric source

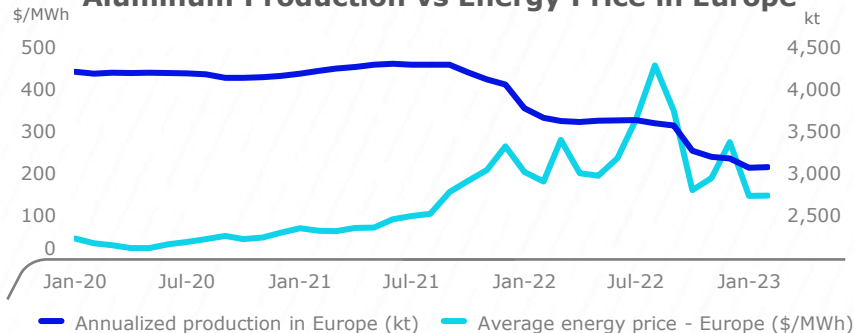
China's aluminum exports retreated for the fourth consecutive month in December. Despite this, in 2022, the increase was 17%, totaling 6.6 Mt.

- Depending on the pace of recovery in domestic demand, exports may continue to fall in the coming months

Annualized production in China (Mt)

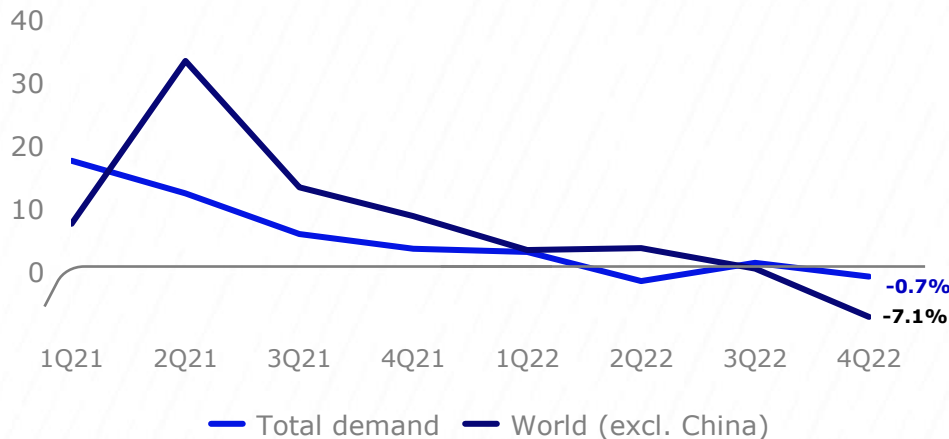


Aluminum Production vs Energy Price in Europe

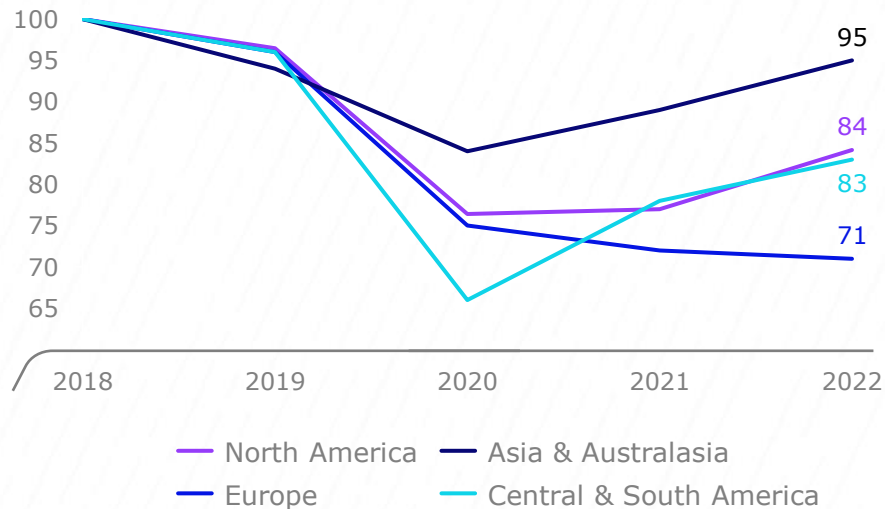


Primary aluminum demand reduction in 4Q22 compared to previous year, pulled by Europe

Growth in primary aluminum demand (% yoy)



Light vehicle production (2018 = 100)



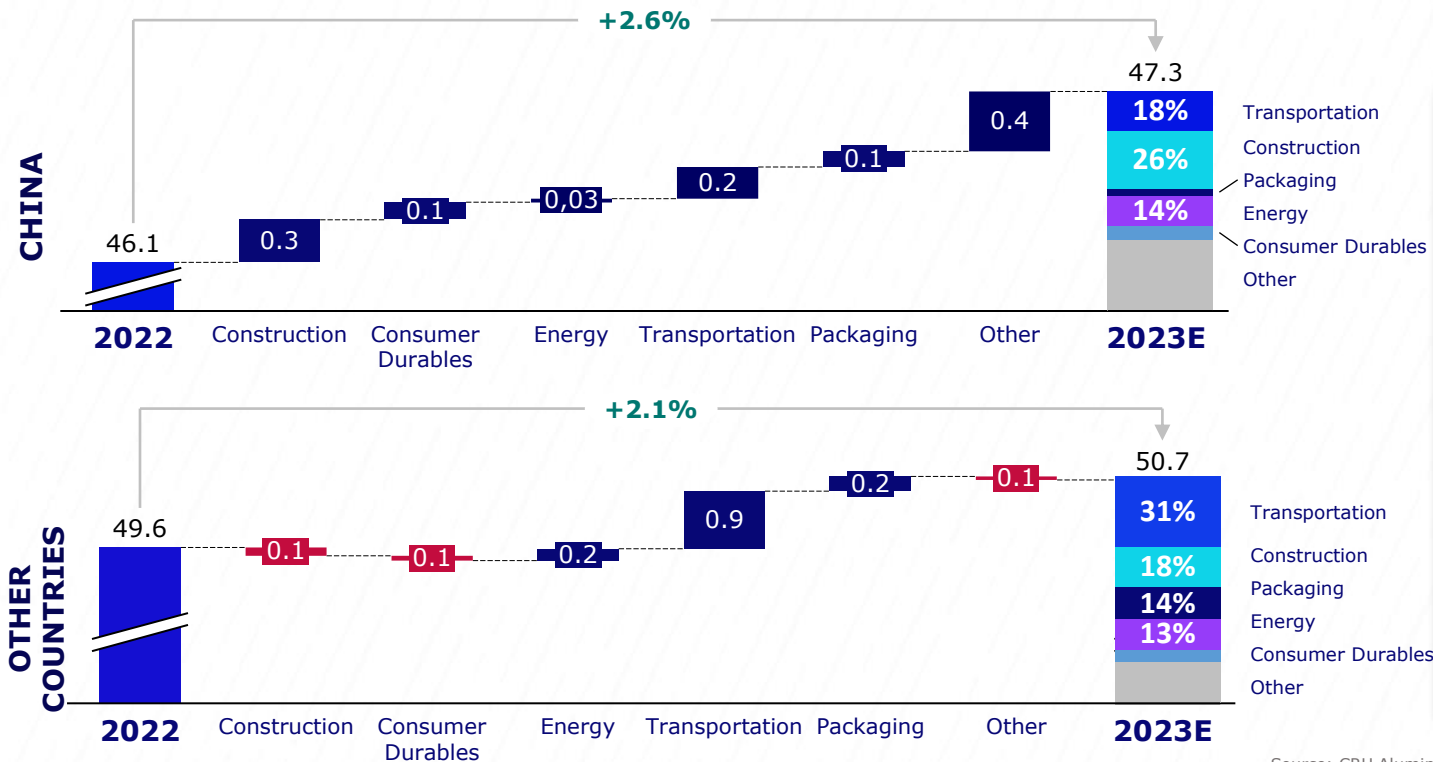
Macroeconomic factors and uncertainties about future growth put pressure on global aluminum demand

Recovery in Automotive sector: except for Europe, other regions showed growth in 2022

Transport segment is the most representative in countries excl. China (31% of total aluminum demand)

Expected demand growth in all sectors in China in 2023. In other countries, Transportation sector stands out

Downstream Aluminum products demand (kt)



Expected Chinese demand revitalization after the reopening post-Covid

Recession in Europe/USA tends to be milder than previously forecasted, but still pressuring some consumer sectors

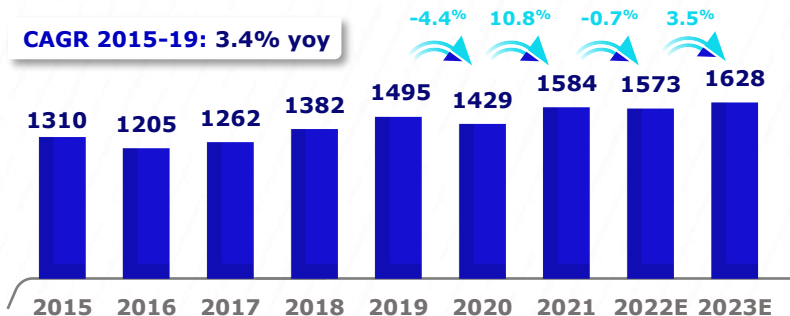
Positive impacts of decarbonization trend in the short term, mainly in automotive (electric vehicles) and energy segments (infrastructure for electrification and solar panels)

Brazil: cooling consumption in 2022, however, it is worth noting that 2021 was a year of strong growth

- ✓ Growth in **consumer durables** segment in the 3Q22, but there is still a demand correction compared to the high baseline of 2021
- ✓ **Self-construction** sector remained contracted versus 3Q22 and 4Q21 due to the end of emergency aid payments and increased inflation
- ✓ **Packaging (excl. cans)** stayed resilient in relation to 3Q22. In comparison with 4Q21, demand growth was relevant, especially for flexible packaging
- ✓ **Aluminum cable** market showed growth in relation to 3Q22. Compared to 4Q21, consumption has declined
- ✓ **Total vehicle production** dropped 8% vs. 3Q22. However, compared to 4Q21, production rose 3% (Anfavea)
- ✓ **Increase in imports** compared to 3Q22, but volumes are still below the levels observed in 4Q21
- ✓ **Domestic premium** followed international premiums' downward trend, but in lower intensity

Aluminum consumption in Brazil (kt)

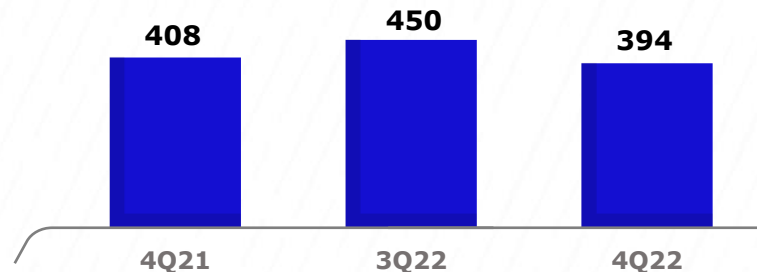
[ABAL Yearbook (data 2015-2021) and CRU Market Outlook Jan 2023 (data 2022E and 2023E)]



Brazil DDP SE Premium (US\$/t)

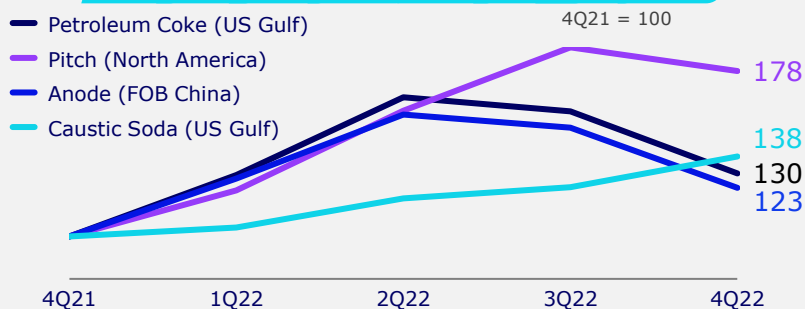
[S&P Global Platts]

P1020: standard ingot, sow and T-bars

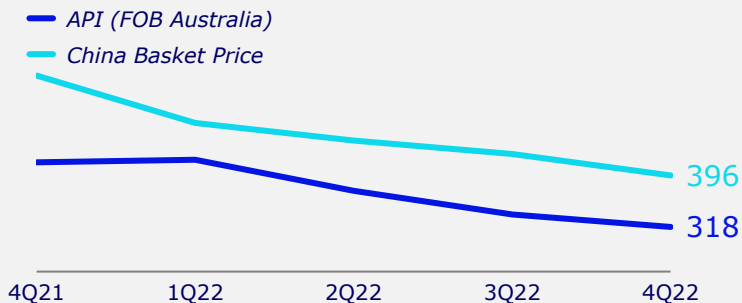


Most raw materials prices remain above 4Q21 levels

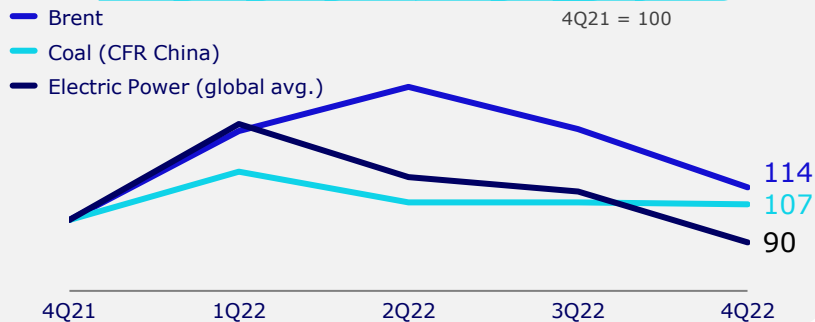
Price Index - Carbon Products and Caustic Soda



Alumina Prices - US\$/t



Price Index - Power Prices



According to CRU, about **54%** of alumina production in China and **42%** in other countries had costs above international prices in 4Q22

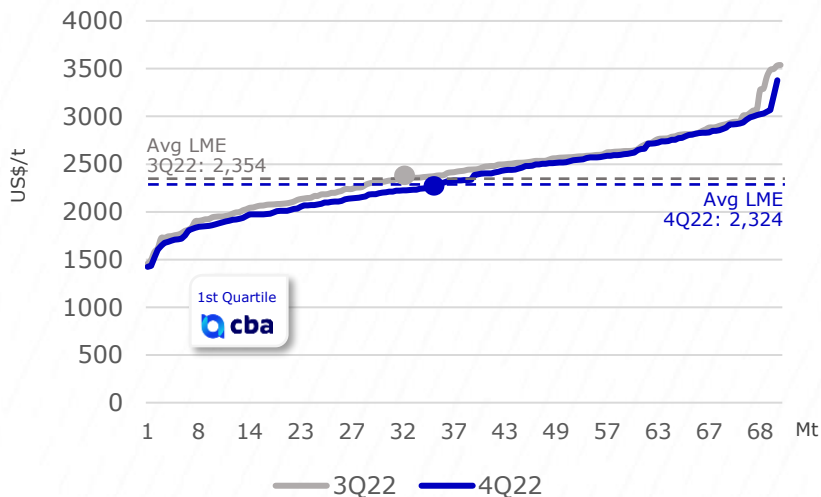
Continued **cost pressure** and **low margins** resulted in further refinery cuts, leading to **price recovery** in early 2023 (API on 2/23 was \$371/t, an increase of 17%)

Smelter margins strongly constrained, being below half of the values observed in 4Q21

Slight variation in industry average cost compared to the previous quarter, continuing at high levels

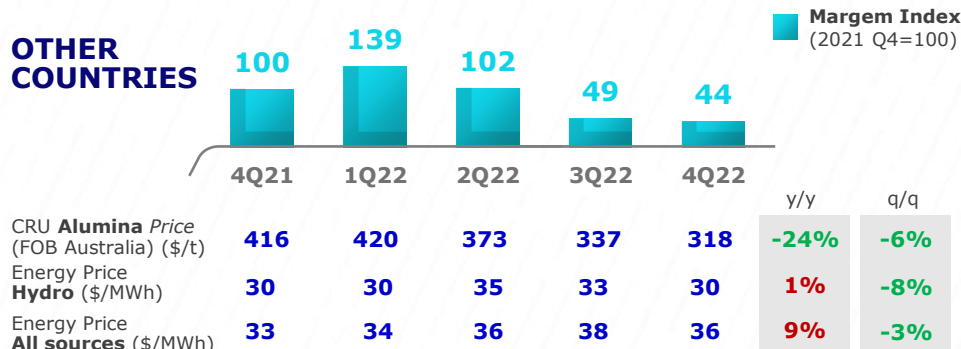
Liquid Metal Cost Curve - 4Q22

CRU Liquid Metal Cost (US\$/t)

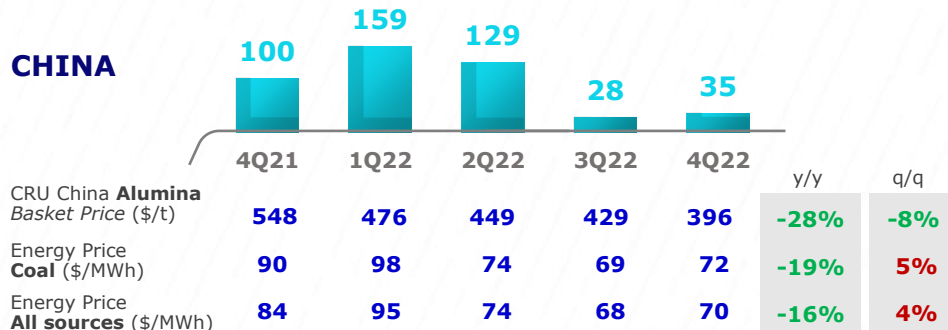


Sharp margins retraction due to falling aluminum prices. China's energy prices rise again from 3Q22

OTHER COUNTRIES





CHINA



Key Takeaways

 **Global market ends 2022 in deficit**, with stocks below the equilibrium level.
In 4Q22, it records surplus due to demand slowdown

 **Demand recovery in China** is an important price driver in the short term.
Uncertainties about the speed of resumption lead to LME volatility

 **Supply increase in China still faces challenges due to energy restrictions**. Country remains net importer of primary aluminum and has reduced aluminum exports in the last four months

 **Smelter costs still high and margins remain under pressure**,
impacted by the 16% drop in Aluminum LME in 4Q22 vs 4Q21

 **US Midwest premium resumes growth**, reflecting tight physical market and improved sentiment. Other regional premiums remain stable

 **Brazil: demand at a healthy level**, despite retraction in 2022. It is noteworthy that consumption in 2021 was historically high, with double-digit growth

