Global Aluminium Outlook: The Era of Energy-Constrained Scarcity

The global aluminium industry has entered a decade of structural realignment, transitioning from a cyclical industrial metal into an energy-constrained strategic asset. As of mid-2026, the market is defined by a fundamental collision between inelastic supply, anchored by China's 45 Mt production ceiling, and a structural demand surge driven by new use cases such as light weighting through EVs and RE focus.

- **The Structural Deficit - A New Market Regime:** Historical primary aluminium markets, defined by consistent surpluses, have been replaced by a regime of structural tightness. While Alcoa projects a steady long-term growth trajectory (2.3% CAGR for demand over 2025 - 2035), we assess both the demand and production projections critically and foresee a tight supply-demand fundamental in future.
- **The Supply Wall:** China, accounting for ~60% of production, reached its 45 Mt capacity cap in 2025, removing the industry's traditional "supply buffer". **The 2026 War Shock:** The military conflict in the Middle East, a region supplying 9% of global metal, triggered direct strikes on major smelters (EGA and Alba) and a blockade of the Strait of Hormuz. This, along with Iceland and Mozal smelter, removed ~3.3 Mt of output in 2026, pushing the global balance into a sizable deficit.
- **The Indonesia Factor - Capacity vs. Infrastructure Reality:** Indonesia has emerged as the "Next Frontier", targeting a massive 14.9 Mt nameplate capacity by 2030. However, a technical stress test reveals a severe **"Electron Gap". Energy Hunger:** Achieving the 14.9 Mt target would require ~ 24 GW of Power capacity, ~22% of Indonesia's total 2025 power capacity of 107.5 GW. **Production Verdict:** Due to these energy bottlenecks, actual production is forecast at a more realistic 3.4 - 3.5 Mt by 2030.
- **The Cost Curve Escalator - Permanent Upward Migration:** The industry cost curve has shifted from a weighted average world cash cost of ~$1,600/t in 2014 to $2,053/t in 2025. This upward shift is non-cyclical and driven by: **AI Power Competition:** Smelters are being outbid for baseload power by AI data centres willing to pay $100/MWh+ compared to the $40/MWh economic limit for aluminium. Every $10/MWh increase in electricity translates to a $125-$150/t increase in production costs. **Carbon Stratification:** The EU's Carbon Border Adjustment Mechanism (CBAM) acts as a permanent premium driver. High-carbon (coal-based) metal to face certificate costs of $150-$230/t by 2028. **Capex Intensity:** New Indonesian hubs and smelters elsewhere will have higher capex intensity.
- **Probable Price Trajectory:** Aluminium is undergoing a multi-year price reset. Prices are unlikely to retreat to historical sub-$2,500 levels. **Short-Term (2026-2027):** Elevated range of $3,000 - $3,800/t, driven by the Hormuz supply drought and acute physical backwardation. **Long-Term (2028-2030):** Structural equilibrium floor at $2,800 - $3,000/t. This "Incentive Price" is required to amortise high Indonesian capex and offset the rising marginal cost of compliant (green) electrons.
- **Investment Implication:** Aluminium prices have retreated from $3,850/t on 2nd June, 2026 and currently are at $3,594/t. US Non-farm payrolls added 172,000 jobs in May, well above the expectation of 85,000, which sparked Fed rate hike expectations. Markets are now pricing in roughly a 70% chance of a quarter-point rate increase in December, leading to the price retreat in Aluminium. We assess that although prices could correct from the elevated levels due to inflation concerns, they are likely to be supported by structural fundamental support from rising cost support and tight metal balance (discussed in the report). We maintain our **BUY** ratings on Hindalco (link) and NALCO (link) and maintain our Q4FY26 results target. Our Aluminium price assumptions remain unchanged at $3,295/t, $3,175/t and $3,025/t for FY26/27/28, respectively. **Key risks** to our BUY rating are a sharp decline in Aluminium price vis-à-vis our projections due to faster supply growth from Indonesia, or faster recovery from the Middle East disruption, and steeper fed rate hike in a higher-than-expected inflation scenario.

Our Non-Ferrous Coverage

Hindalco	BUY (TP: Rs 1,220)
NALCO	BUY (TP: Rs 440)

Aditya Welekar
Sr. Research Analyst
Email: aditya.welekar@axissecurities.in

Global Aluminium Supply and Demand Outlook

As per Alcoa, global aluminium consumption (primary + secondary) is projected to grow at 2.3% CAGR over CY25-35, with growth mainly driven by ex-China. Global primary aluminium production is expected to grow more slowly by 0.9% CAGR, whereas secondary production is expected to grow by 4.9% over CY25-35. The majority of the new Aluminium supply will be coming from Indonesia over CY25-35. Alcoa projects ~3.7 mt of metal coming from Indonesia. Majority 59% of the incremental supply, will be coal-based (mainly based out of Indonesia).

As per the Niti Ayog report, global aluminium consumption (primary + secondary) is projected to grow at 2.2% CAGR over CY25-35, while supply is projected to grow by 1.9% over the same period. It projects demand surpassing supply by 3 mt in CY30.

Exhibit 1: Global Total Aluminium Consumption, mmt

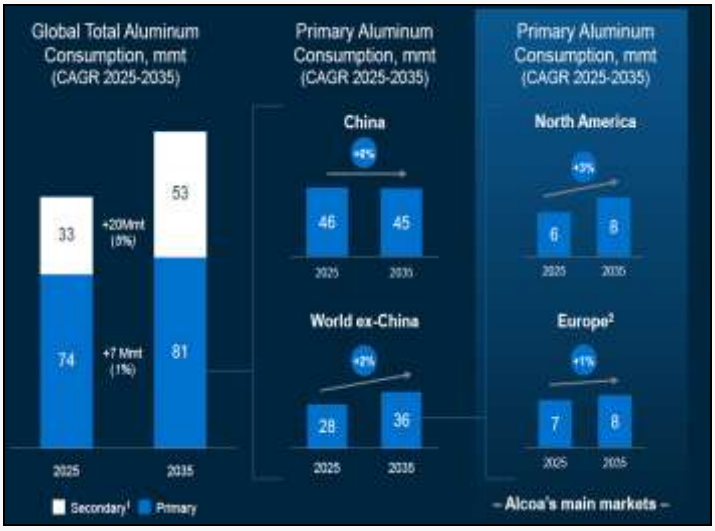


Exhibit 2: Global Primary Aluminium Production Net Growth by Region, mmt

Source: Alcoa Investor Day 2025

Exhibit 3: Global Aluminium Demand, Mn tonnes

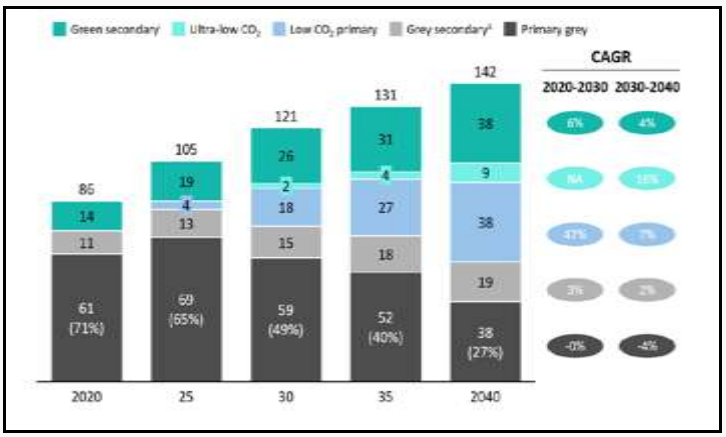


Exhibit 4: Global Aluminium Supply (Primary and Secondary), Mn tonnes

Source: Niti Aayog, Jan'2026

In **Exhibit 5** below, we assess global Aluminium supply and demand. In 2026, due to the supply disruptions in the Middle East, we anticipate a 1.2 MT deficit in primary aluminium. The market could turn into a narrow surplus as affected smelters come online in the next 12 months and as Indonesian smelters ramp up. However, the primary market is likely to remain tight, with surplus largely limited. Global Secondary metal supply and demand growth will outpace primary metal supply and demand in the coming decade.

Exhibit 5: Aluminium Global Supply and Demand

Region	2024 (A)	2025 (A)	2026 (F)	2027 (F)	2028 (F)	2029 (F)	2030 (F)	CAGR 2025 - 30
China	42.90	44.38	44.90	45.00	45.00	45.20	45.30	0.4%
GCC (Middle East)	**6.35**	**6.16**	**3.40**	**5.50**	**6.40**	**6.50**	**6.50**	**1.1%**
India	4.20	4.28	4.60	4.70	5.00	5.50	6.50	8.7%
Indonesia	**0.80**	**0.82**	**1.60**	**2.40**	**3.00**	**3.20**	**3.50**	**33.8%**
Russia	3.96	3.50	3.90	4.00	4.00	4.30	4.50	5.2%
Canada	3.34	3.27	3.50	3.50	3.50	3.50	3.50	1.4%
ROW (Rest of World)	11.46	11.45	11.40	11.60	12.00	12.00	12.00	0.9%
Global Primary Production	**73.01**	**73.84**	**73.30**	**76.70**	**78.90**	**80.20**	**81.80**	**2.1%**
Global Secondary Production	**28.40**	**31.50**	**33.90**	**35.50**	**37.00**	**38.80**	**40.60**	**5.2%**
China	12.80	13.40	14.50	15.60	16.80	18.00	19.50	7.8%
ROW	15.60	18.10	19.40	19.90	20.20	20.80	21.10	3.1%
Total Global Supply	**101.41**	**105.34**	**107.20**	**112.20**	**115.90**	**119.00**	**122.40**	**3.0%**

Region	2024 (A)	2025 (A)	2026 (F)	2027 (F)	2028 (F)	2029 (F)	2030 (F)	CAGR 2025 - 30
China	45.00	46.20	47.00	48.20	49.00	50.00	50.50	1.8%
Ex-China	27.70	28.10	27.50	28.30	29.40	31.00	31.50	2.3%
Global Primary Demand	**72.70**	**74.30**	**74.50**	**76.50**	**78.40**	**81.00**	**82.00**	**2.0%**
Primary Metal Balance Supply/(Deficit)	**0.31**	**-0.46**	**-1.20**	**0.20**	**0.50**	**-0.80**	**-0.20**	
Global Secondary Demand	**28.00**	**30.20**	**31.00**	**33.00**	**35.00**	**37.50**	**39.50**	**5.5%**
Total Global Demand	**100.70**	**104.50**	**105.50**	**109.50**	**113.40**	**118.50**	**121.50**	**3.1%**
Metal Balance Supply/(Deficit)	**0.71**	**0.84**	**1.70**	**2.70**	**2.50**	**0.50**	**0.90**	
World ex-China primary demand	27.70	28.10	27.50	28.30	29.40	31.00	31.50	2.3%

Source: Industry, Axis Securities Research

Exhibit 6: Aluminium Total Supply Growth Rationale

Region	CAGR 2025 -30	Rationale for Production Growth Forecast
China	0.4%	China smelter cap 45 mtpa
GCC (Middle East)	1.1%	2026 impacted by war ~3.5-4 mt lost, recovery in 12-18 months. Growth driven by Alba potline 7 of 540 ktpa & Ma'aden debottlenecking
India	8.7%	Hindalco: 180 ktpa Aditya Aluminium Phase-I by FY28, 193 ktpa Phase-II by FY29. NALCO: 500 ktp by 2030, Vedanta: Dhenkanal, Odisha 1,000 kt
Indonesia*	33.8%	Many new smelters are coming
Russia	5.2%	Taishet (BEMO) Full Ramp-up: The long-term production growth to 4.5 Mt assumes the full operational ramp-up of the Taishet (BEMO II) smelter and the modernisation of older Siberian pots with inert anode technology. This allows for a projected CAGR of 2.9% for the Russian aluminium sector through 2030.
Canada	1.4%	2025 production is verified by USGS 2026, and Alcoa's 2025 Investor Presentations, which record Canadian output at 3.3 Mt. Rio Tinto's AP60 expansion in Quebec added 96 new pots, increasing capacity by 160,000 tonnes annually, specifically for the EV battery market
ROW (Rest of World)	0.9%	Vietnam, Finland
Primary Production	2.1%	
Secondary Production	5.2%	Global secondary Aluminium production volume was registered at 28.3 Mt in 2023 and projected to reach 40.6 Mt by 2030 with a CAGR of 5.3%, owing to the growing demand for recycled aluminium at a healthy pace during the last decade.
China	7.8%	China's secondary aluminium consumption increased from 12.7 MT in 2024 to 13.35 MT in 2025, a 5.1% YoY rise, led by a sharp increase in scrap usage and higher import volumes, reflecting a structural shift rather than short-term volatility. Under the 14th Five-Year Plan for the Circular Economy, China set a target to use more than 15 Mt of recycled aluminium by 2027.
ROW	3.1%	
Total Global Supply	**3.0%**	

Source: Industry, Axis Securities Research. * See Exhibit 8 for Indonesia smelter projects

Exhibit 7: China's Aluminium Demand, Expectations

Sector	2023	% YoY	% of Total	2024	% YoY	% of Total	2025E	% YoY	% of Total	2026E	% YoY	% of Total	2027E	% YoY	% of Total
Construction	11.8	-3.60%	29.00%	11.3	-4.20%	26.60%	10.5	-7.10%	23.80%	10.5	0.00%	23.50%	10.5	0.00%	23.00%
Transportation	8.35	12.40%	20.50%	9.46	13.20%	22.20%	11.1	17.30%	25.20%	11.82	6.50%	26.50%	12.66	7.20%	27.80%
Electronics	7.74	25.10%	19.00%	8.78	13.40%	20.60%	9.52	8.40%	21.60%	9.19	-3.40%	20.60%	9.16	-0.40%	20.10%
Machinery	3.13	1.00%	7.70%	3.16	1.00%	7.40%	3.19	1.00%	7.20%	3.22	1.00%	7.20%	3.29	2.00%	7.20%
Consumer Durables	3.53	1.00%	8.70%	3.57	1.00%	8.40%	3.6	0.80%	8.20%	3.65	1.50%	8.20%	3.67	0.50%	8.10%
Packaging	4.75	2.00%	11.70%	4.82	1.50%	11.30%	4.82	0.10%	11.00%	4.9	1.50%	11.00%	4.97	1.50%	10.90%
Others	1.45	0.00%	3.50%	1.45	0.00%	3.40%	1.3	-10.10%	3.00%	1.32	1.50%	3.00%	1.32	0.00%	2.90%
Total	**40.75**	**5.70%**	**100.00%**	**42.53**	**4.40%**	**100.00%**	**44.03**	**3.50%**	**100.00%**	**44.6**	**1.30%**	**100.00%**	**45.57**	**2.20%**	**100.00%**

Source: Bloomberg

Exhibit 8: Global Aluminium Smelter Commissioning Pipeline: 2026–2030

Country	Smelter / Project Name	Developer / JV	Location	2026	2027	2028	2029	2030	Power Source
Indonesia	Kaltara (KAI) Ph I	Adaro / Lygend	KIPI, N. Kalimantan	500	-	-	-	-	Captive Coal
Indonesia	Juwan (IWIP Ph I)	Tsingshan / Xinfa	Weda Bay, N. Maluku	250	-	-	-	-	Captive Coal
Indonesia	Taijing (IMIP Ph I)	Tsingshan / Xinfa	Morowali, Sulawesi	180	-	-	-	-	Captive Coal
Indonesia	Bintan Nanshan Ph I	Nanshan Group	Bintan, Riau Is.	250	-	-	-	-	Captive Coal
Indonesia	Xianfeng (IWIP Ph II)	Tsingshan / Xinfa	Weda Bay, N. Maluku	50	200	-	-	-	Captive Coal
Indonesia	Kayong Al (Harita)	Harita Group	W. Kalimantan	-	1,000	-	-	-	Gas/Coal
Indonesia	Adaro (KAI) Ph II	Adaro Minerals	KIPI, N. Kalimantan	-	500	-	-	-	Captive Coal
Indonesia	Inalum Mempawah	Inalum / MIND ID	W. Kalimantan	-	-	300	300	-	Coal/Hydro
Indonesia	Bintan Nanshan Ph II	Nanshan Group	Bintan, Riau Is.	-	-	250	-	-	Captive Coal
Indonesia	Adaro (KAI) Ph III	Adaro Minerals	KIPI, N. Kalimantan	-	-	-	500	-	Hydro
Malaysia	Bosal Malaysia	Bosal Group	Sarawak	-	-	-	-	1,000	Hydro/Coal
India	BALCO Expansion	Vedanta Aluminium	Korba, Chhattisgarh	435	-	-	-	-	Coal/RE
India	Aditya expansion T1	Hindalco Ind.	Sambalpur, Odisha	-	180	-	-	-	RE-RTC
India	Aditya expansion T2	Hindalco Ind.	Sambalpur, Odisha	-	-	193	-	-	RE-RTC
India	Dhenkanal Ph 1	Vedanta Aluminium	Dhenkanal, Odisha	-	-	-	1,000	-	Coal/RE
India	Angul Expansion	NALCO	Angul, Odisha	-	-	-	-	500	Captive Thermal
Angola	Huatong Angola Ph I	Hebei Huatong	Barra do Dande	120	-	-	-	-	Hydro/Gas
Angola	Huatong Angola Ph II	Hebei Huatong	Barra do Dande	-	-	-	-	120	Hydro/Gas
China	Relocation Projects	Yidian Holding	Inner Mongolia	240	-	-	-	-	Hydro/Wind
Canada	Arvida AP60	Rio Tinto	Jonquière, Québec	160	-	-	-	-	Hydroelectric
Vietnam	Dak Nong Ph I	THQ	Dak Nong province	150	-	-	-	-	Thermal/RE
Vietnam	Dak Nong Ph II	THQ	Dak Nong province	-	300	-	-	-	Thermal/RE
Vietnam	Duc Giang Smelter	Duc Giang Chem	Lam Dong province	-	-	-	-	500	Thermal/RE
USA	Inola Smelter	EGA / Century JV	Inola, Oklahoma	-	-	-	-	750	Clean Energy
Saudi	Ma'aden Expansion	Ma'aden / Alcoa	Ras Al Khair	-	-	700	-	-	Solar/Gas
Finland	Greentop Project	Arctial Consortium	Kokkola, Finland	-	-	-	550	-	Hydro/RE
Nigeria	GCL Nigeria Base	GCL Group	Abuja/Abasi	-	-	-	-	1,000	LNG (Gas)
Total				**2,335**	**2,180**	**1,443**	**2,350**	**3,870**	

Source: Industry, Axis Securities Research

Indonesia's Aluminium Expansion: Growth Outlook and Market Risks

Capacity Projections & Raw Material Demand

- **Smelting Capacity Surge:** Indonesia's primary aluminium smelting capacity is projected to rise from 0.75 Mtpa in 2024 to 3.13 Mtpa by 2028. This marks a critical structural shift for a nation that historically relied on imports between 2018 and 2024.
- **The Pipeline vs. Reality:** While the total project pipeline aims to scale capacity from the current 1.1-1.2 Mtpa to an ambitious 14.9 Mtpa upon full completion, achieving this target by 2030 appears highly improbable. Fastmarkets projects a more conservative, realistic base-case output of 3.4 Mtpa by 2030.
- **Upstream Alumina & Bauxite Pressures:** According to PT Inalum, pipeline projects are set to expand domestic alumina capacity from 12 Mtpa to 29.8 Mtpa. This surge will drive annual bauxite demand from 36 Mt to 94 Mt, placing severe pressure on Indonesia's finite bauxite reserves.

Key Risks and Sector Challenges

- **Overcapacity and Price Suppression:** The aggressive capacity expansion raises fears of a supply glut, mirroring Indonesia's recent experience with Nickel. A resulting market surplus could depress LME aluminium prices, potentially jeopardising the financial viability of Chinese-funded projects.
- **Proposed Moratorium:** In response to these market risks, state miner PT Inalum has urged the Indonesian government to impose a moratorium on licensing new alumina and aluminium facilities.
- **Environmental & Infrastructure Bottlenecks:** Greenfield smelter developments face severe environmental headwinds, primarily due to deforestation risks. Additionally, because these smelters will rely predominantly on coal-fired power, project developers face complex logistical and infrastructure challenges.
- **Strategic Bottlenecks - The "Electron Gap":** Achieving 14.9 Mt of output requires 24 GW of power capacity. As of 2025, Indonesia's power capacity stands at 107.5 GW, which implies 14.9 Mt smelters will consume ~22% of Indonesia's 2025 national electricity capacity.
- **Capex Intensity:** Greenfield aluminium smelters in Indonesia cost $1,800-$2,000/t of capacity (~37% higher than the Chinese domestic model of ~$1,400/t). Due to this higher capital intensity and localised operating costs, these projects necessitate a permanent LME aluminium price floor of $2,000/t to achieve a full capital payback.

Exhibit 9: Stress Testing the Indonesia Case

Indonesia Metric	2020	2024	2025	2026E	2028E	2030E
Bauxite Production (Mt)	21.9	16.8	12	15	45	94
Coal Production (Mt)	564	836	756	721	700	685
Alumina Refining Capacity (Mtpa)	1	9	12	14.2	22.5	29.8
Power Generation for Smelting (GW)	0.4	1	2.5	3.5	9.5	18.5
Aluminium Smelter Capacity (Mtpa)	0.28	0.75	0.82	1.6	3.13	14.9
Primary Aluminium Production (Mt)	0.25	0.80	0.82	1.6	3.00	3.50

Source: Industry, Axis Securities Research

Alumina Prices Remain Subdued Despite Uncertainty from Guinea

Global bauxite reserves of 29 Bt are concentrated in Guinea, Australia, and Vietnam. Guinea has emerged as the systemically vital node for China's smelting network.

Bauxite Dynamics and Pricing Impacts

- **Guinea's Export Policy:** Guinea's export policy is identified as the critical variable driving the bauxite market. **Supply and Price Trends:** In Q1CY26, CIF China bauxite prices actually declined due to an increase in bauxite supply from Guinea. **Freight Support:** While supply increased, elevated global freight costs provided some baseline support to bauxite pricing.
- **Recently China Spot Alumina Prices Increased:** Recent reports indicate that Guinea, the world's biggest bauxite producer, is taking steps to control bauxite exports in Jun'26. As a result, China's domestic spot alumina price (SHFE Alumina) rose to $391/mt. This localised strength is further driven by factors such as **Refining Capacity Curtailments:** As per Alcoa, China's domestic supply was significantly constrained in Q1CY26, with ~4 Mmtpa of Chinese refining capacities curtailed due to policy-related disruptions and other factors. **Tight Regional Market Balance:** Market forecast data for 2026 indicates that China's domestic Metallurgical Alumina (SGA) surplus is restricted, sitting at just 0.3 Mt.
- **Global Alumina Prices Remained Subdued:** In contrast to China, global prices remained weak, with the Platts Alumina FOB Australia index dropping to $308/t, moving sideways at low levels. This global stagnation is due to: **Massive Global Oversupply:** The market outside of China is heavily oversupplied. For 2026, the "World ex China" SGA surplus is estimated at a significant 2.7 Mt (Norsk Hydro Q1CY26 presentation), contributing to a total global surplus of 3.0 Mt. **Demand Destruction from Conflict:** Alumina demand has been put at risk due to the ongoing Middle East conflict, which continues to depress global alumina prices. **Supply Expansions:** Global markets face ongoing pressure from refining capacity expansions and production ramp-ups taking place across India, Indonesia, and China. **Rerouted Cargoes:** The global market pressure is further exacerbated by logistical shifts, particularly Middle East alumina cargoes being rerouted due to regional conflict

Exhibit 10: Guinea Emerges as a Major Bauxite Player

Country	Alumina Prod (2025) Kt	Bauxite Prod (2025) MnT	Bauxite Reserves (BnT)	Share of World Total (%)
Guinea	360	150	7.40	25.5%
Australia	17,000	97	3.70	12.8%
Vietnam	1,500	3.8	3.10	10.7%
Indonesia	1,500	10	2.90	10.0%
Jamaica	1,500	6.2	2.00	6.9%
Brazil	11,000	33	1.70	5.9%
China	93,000	87	0.71	2.5%
India	8,200	25	0.65	2.2%
Russia	2,900	5.7	0.65	2.2%
Saudi Arabia	1,900	5.7	0.18	0.6%
Kazakhstan	1,500	4.8	0.16	0.6%
Turkey	310	3.8	0.07	0.2%
United States	710	0	0.02	0.1%
Other countries	1,300	8	5.30	18.3%
World total (rounded)	**1,50,000**	**440**	**29.00**	**100.0%**

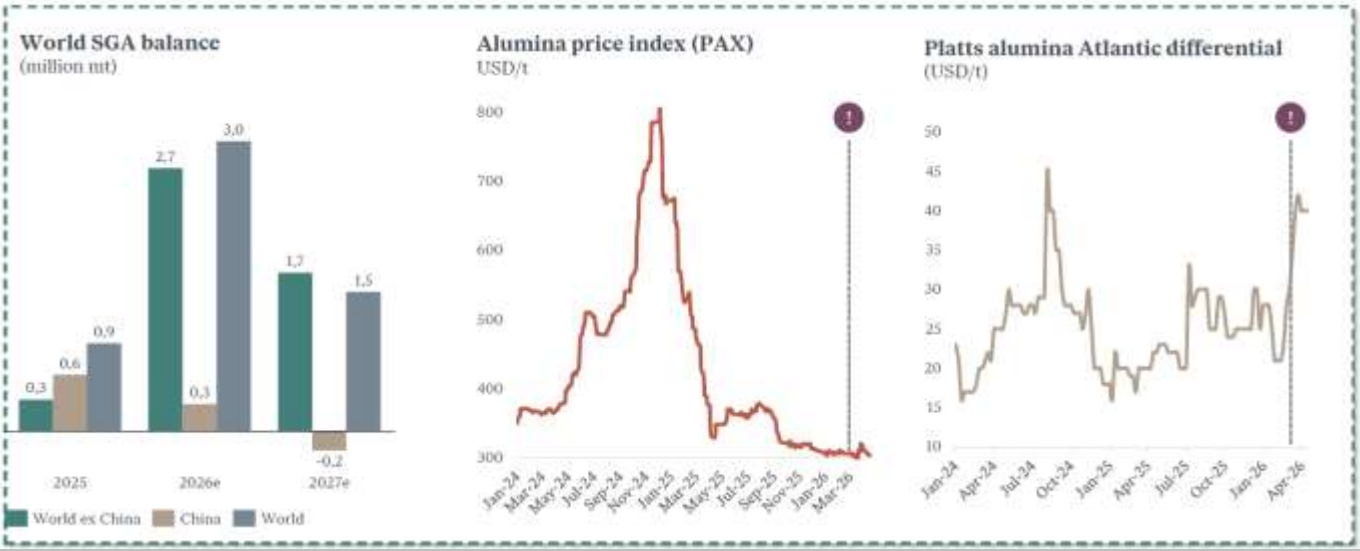
Source: U.S. Geological Survey, Mineral Commodity Summaries, February 2026

Exhibit 11: Global Bauxite trade flows

Producer	2025 Output (MT)	Primary Destination	Dest. Share	Market Position
Guinea	150	China	69%	Largest Exporter
Australia	97	China / India	33%	Stable High-Grade
China	87	Domestic	100%	Plateauing Reserves
Brazil	33	US / Europe	45%	Integrated Sourcing
India	25	Domestic	90%	Expanding Refining
Indonesia	10	Domestic	100%	Export Ban Policy

Source: Industry

Exhibit 12: Alumina Prices Rangebound at Lower Levels



Source: Norsk Hydro

Exhibit 13: LME Aluminium Prices ($/t)

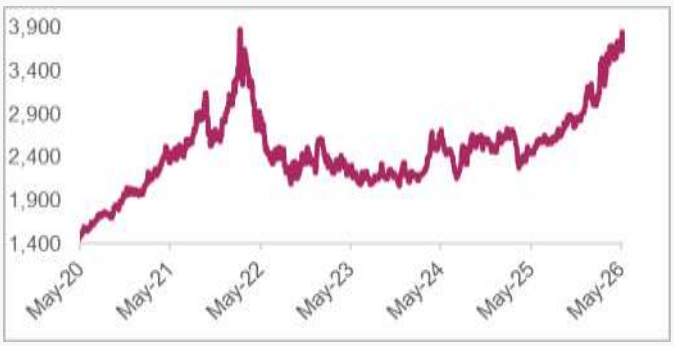
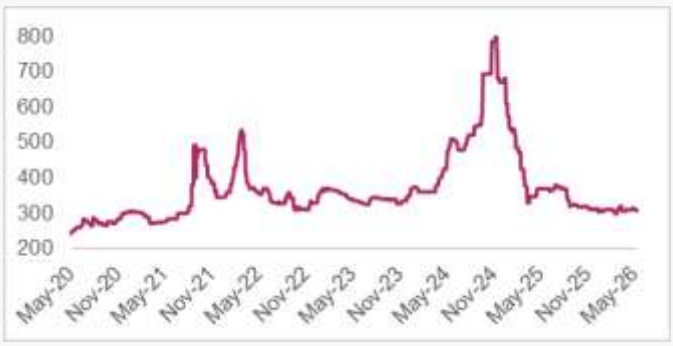


Exhibit 14: Alumina Prices ($/t)



Source: Refinitiv

The Aluminium Cost Curve Could Move Upwards

The weighted average world cash cost (C1) has moved from ~$1,600/t in 2014 to $2,053/t in 2025.

- **Cost Comparison 2025 vs. 2014:** Costs have increased substantially across the entire curve between 2014 and 2025. This rise is not merely inflationary but driven by higher energy tariffs and a geographic shift toward more capital-intensive production hubs.

Exhibit 15: Aluminium Cost Curve Analysis

Quartile	2014 Avg Cost	2025 Avg Cost	2030E Avg Cost	Rationale
1st Quartile	$1,350	$1,750	$1,900	• Insulated by captive hydro/low-carbon power; cost lift driven primarily by marginal alumina/bauxite inflationary pressure.
2nd Quartile	$1,550	$2,050	$2,300	• Uplifted by high-CAPEX Indonesian entrants ($2,000/t), setting a higher floor for new capacity; moderate grid power cost escalation.
3rd Quartile	$1,850	$2,350	$2,750	• Hit by rising grid costs and "Electron Competition" from AI data centres ($115/MWh vs $40/MWh viability limit); adds $125–$150/t to production.
4th Quartile	$2,250	$2,850	$3,300+	• Heavily impacted by full CBAM phase-in for coal-based producers; adds $150–$230/t in mandatory carbon certificates to delivered costs.

Source: Industry

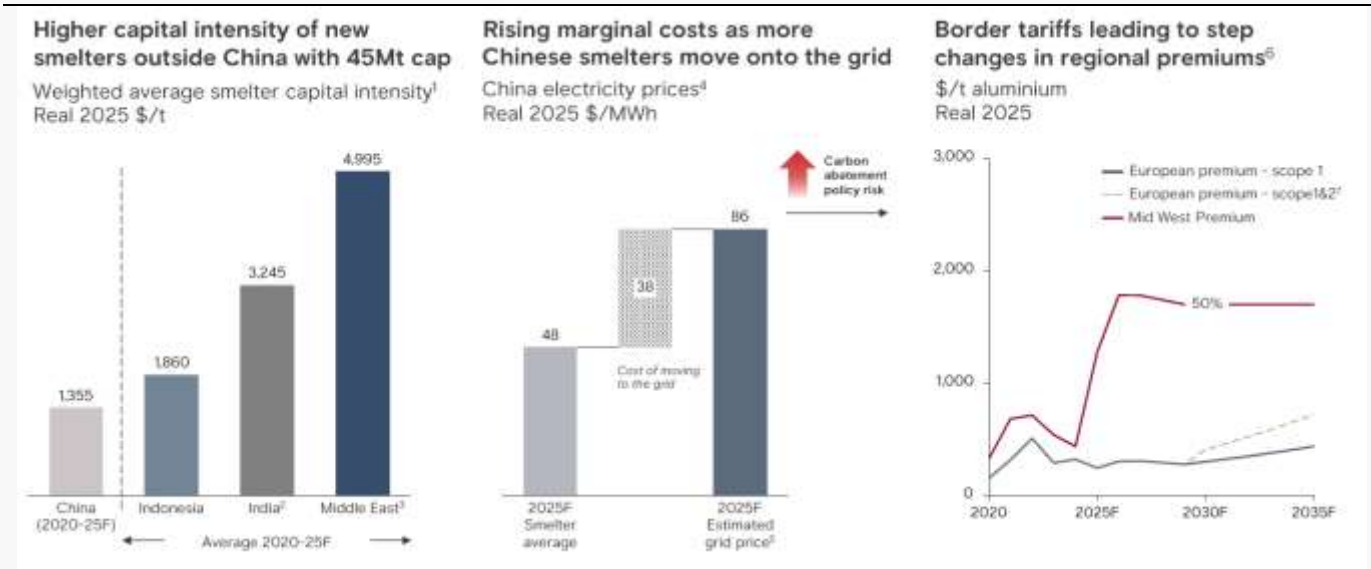
- **2014 Analysis (Exhibit 18):** The 1st quartile boundary sat at approximately $1,600/t. Smelters like Norsk Hydro were producing at roughly $1,400/t, while marginal producers in the 4th quartile operated at $2,250/t.
- **2025 Analysis (Exhibit 19):** The industry's centre has moved significantly. The weighted average has surged past $2,000/t. Integrated leaders like Hindalco remain in the 1st quartile with costs in the $1,500–$1,720/t range, but they now face a much steeper "right tail" where high-cost marginal producers are approaching $3,000/t.
- **Higher carbon pricing**, energy displacement, and capital repayment requirements will move the cost curve further upwards, which will support the Aluminium prices at higher prices. Even after the Middle East smelters restart and as Indonesia ramps up gradually, the spot Aluminium prices could retreat but eventually settle at higher prices.
- **The AI Displacement Factor:** Aluminium is now an "energy-constrained asset". Smelters historically contracted power at $40/MWh, but they are now being outbid by AI data centres willing to pay $115/MWh. Research indicates that every $10/MWh variation in electricity price translates to a ~$125-$150/t increase in production costs.
- **The CBAM Layer:** Starting in 2026, the EU's Carbon Border Adjustment Mechanism (CBAM) definitive phase has begun. Carbon certificates for coal-based metal (predominantly the 4th quartile) are projected to add between $150 and $230/t to delivered costs by 2028-2030.
- **CBAM acts primarily as a driver for regional premium inflation** rather than a uniform increase in the global cash cost of production (C1) for all producers. However, there is a critical nuance regarding European domestic smelters versus global exporters. Exhibit 16 provides the breakdown of how CBAM impacts cost and pricing.
- **Conclusion:** The aluminium industry has entered a phase where supply is price inelastic. Costs will continue to move upward as the global supply response remains slow and capital-intensive, and as electricity becomes the "gatekeeper" for primary production. **Even after the Middle East smelters restart and as Indonesia ramps up gradually, the spot Aluminium prices could retreat but eventually settle at higher prices.**

Exhibit 16: CBAM Impact

Category	Impact of CBAM	Logic
European Premiums	High Increase	CBAM costs are added directly to duty-paid premiums (Rotterdam/Midwest).
LME Benchmark Price	Moderate Support	Does not move 1:1 with CBAM but stays supported by the rising marginal cost of compliant supply.
EU Production Cost	Actual Increase	Loss of free allowances makes local smelting significantly more expensive.
Ex-EU Production Cost	No Direct Change	Smelting costs remain the same; only the "cost to serve" Europe rises.

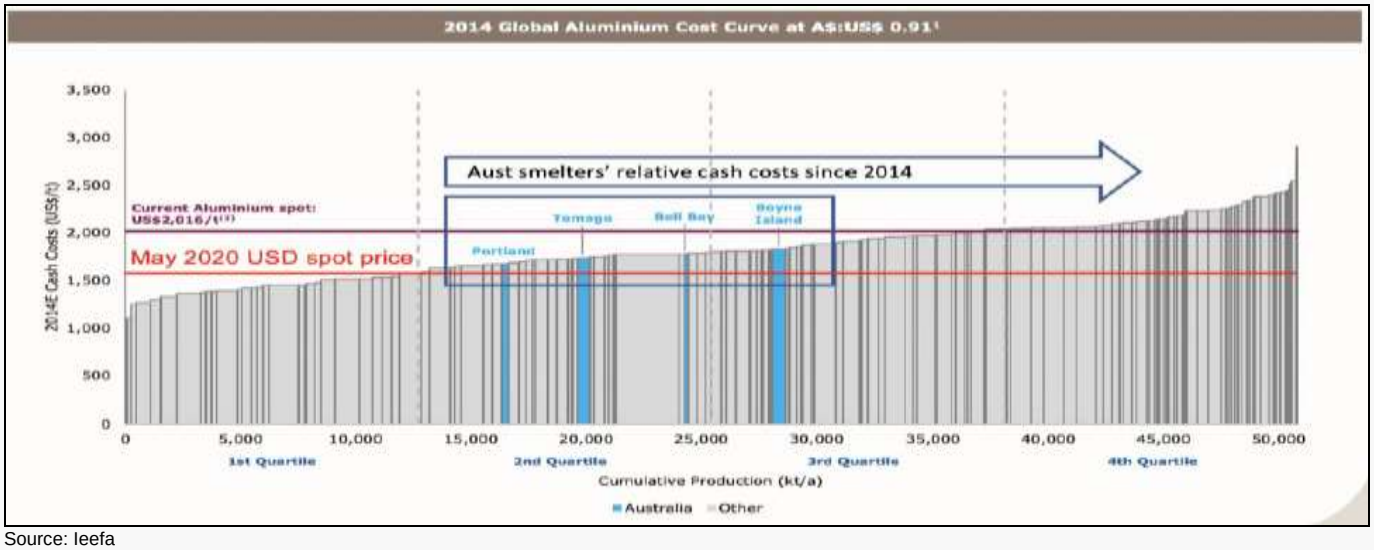
Source: Industry

Exhibit 17: Alumina Prices Rangebound at Lower Levels



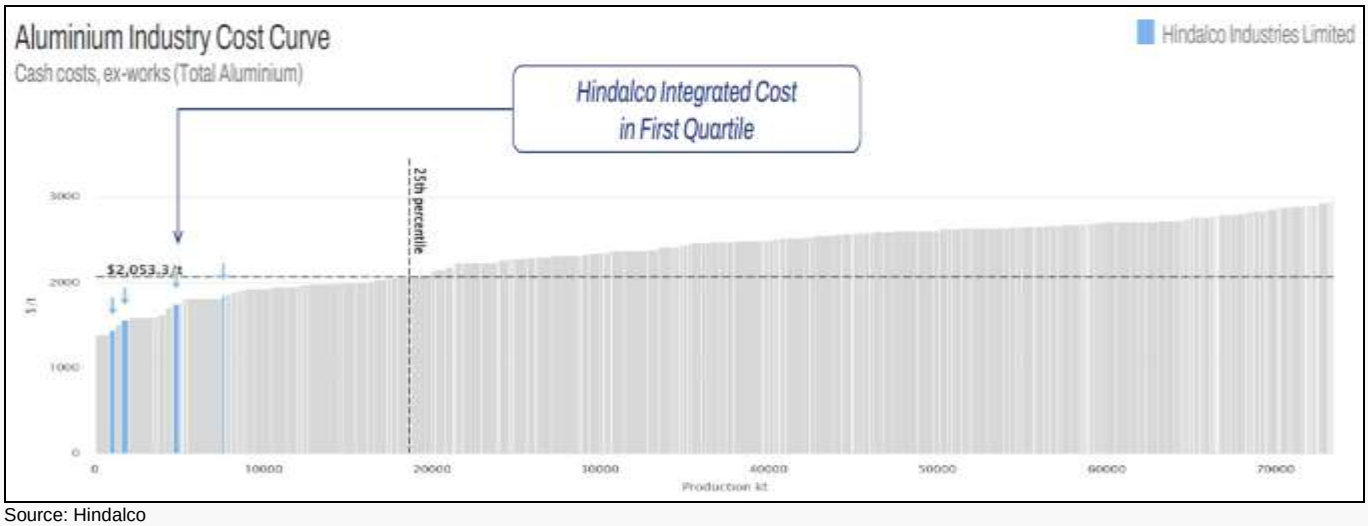
Source: Rio Tinto

Exhibit 18: 2014 Global Aluminium Cost Curve



Source: Ieefa

Exhibit 19: 2025 Global Aluminium Cost Curve



Source: Hindalco

Exhibit 20: 2024 Global Bauxite Cost Curve – Guinea: Higher Cost than Australia

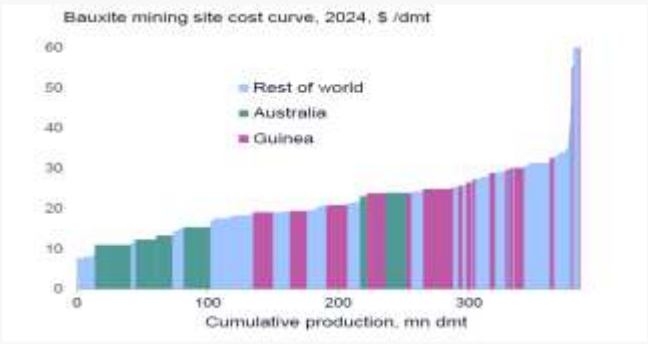
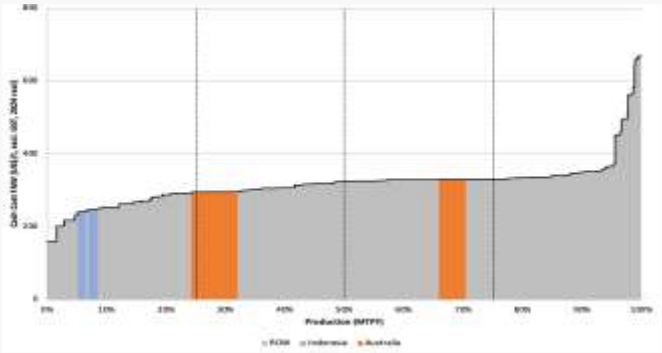


Exhibit 21: World Alumina Production Cost Curve 2024



Source: Australian Aluminium Council

Bauxite Cost Curve Insights:

- **Australia Advantage:** Australian mines maintain a higher extraction efficiency (3.8:1) compared to Guinea (4.2:1), resulting in lower per-unit extraction costs despite Guinea's reserve dominance.
- **China Exposure:** China holds only 2.45% of global reserves but produces ~60% of global aluminium, relying on Guinea for 69-80% of its imports.

Exhibit 22: Company-wise EBITDA/t

Company	Metric	2015	2020	2025
LME	**$/t**	**1495**	**1916**	**2827**
Hindalco	EBITDA/t ($/t)	$420	$569	$1,572
	COP ($/t)	$1,550	$1,709	$1,850
	Power Source	Coal	Coal	Coal/RE
	Integration	High	High	High
Vedanta	EBITDA/t ($/t)	$96	$565	$1,268
	COP ($/t)	$1,527	$1,387	$1,674
	Power Source	Coal	Coal	Coal
	Integration	Mod	Mod	High
Alcoa	EBITDA/t ($/t)	$450	$520	$1,200
	COP ($/t)	$1,600	$1,450	$1,950
	Power Source	Hydro	Hydro/RE	86% RE
	Integration	High	High	High
Norsk Hydro	EBITDA/t ($/t)	$380	$460	$1,300
	COP ($/t)	$1,680	$1,550	$1,900
	Power Source	Hydro	Hydro	Hydro
	Integration	Mod	Mod	Mod

Source: Company reports

Exhibit 23: LME Aluminium Price driver

Year	Primary Metal Balance (Mt)	LME Annual Avg ($/t)	Primary Price Driver
2020 (A)	2.8mt Surplus	$1,702	• Pandemic-induced demand collapse; prices hit 30-year relative lows.
2021 (A)	-1.6mt Deficit	$2,475	• Rapid post-COVID recovery; energy cost spikes and shipping congestion.
2022 (A)	1mt slight Surplus	$2,707	• Ukraine conflict shock; prices peaked near $4,000 in Q1 before normalizing.
2023 (A)	0.5mt slight Surplus	$2,250 – $2,300	• High interest rates and sustained weakness in China's property sector.
2024 (A)	Balanced	$2,500 – $2,600	• Narrowing surplus; China's 45 Mt capacity cap begins to restrict supply flexibility.
2025 (A)	-0.3mt Deficit	$2,650 – $2,800	• European smelter electricity halts; global exchange inventories fall below 5-year averages.
2026 (F)	**-1.2-2mt Deficit**	$3,500 – $3,800	• **War Shock:** Strait of Hormuz blockade and damage to 50% of GCC smelting capacity.

Source: Industry, Axis Securities research

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Registered Office Address – Axis Securities Limited, Unit No.002, Building- A, Agastya Corporate Park, Piramal Realty, Kamani Junction, Kurla (W), Mumbai – 400070.

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