# Assessment of Global and Domestic Metal Recycling & recovery market

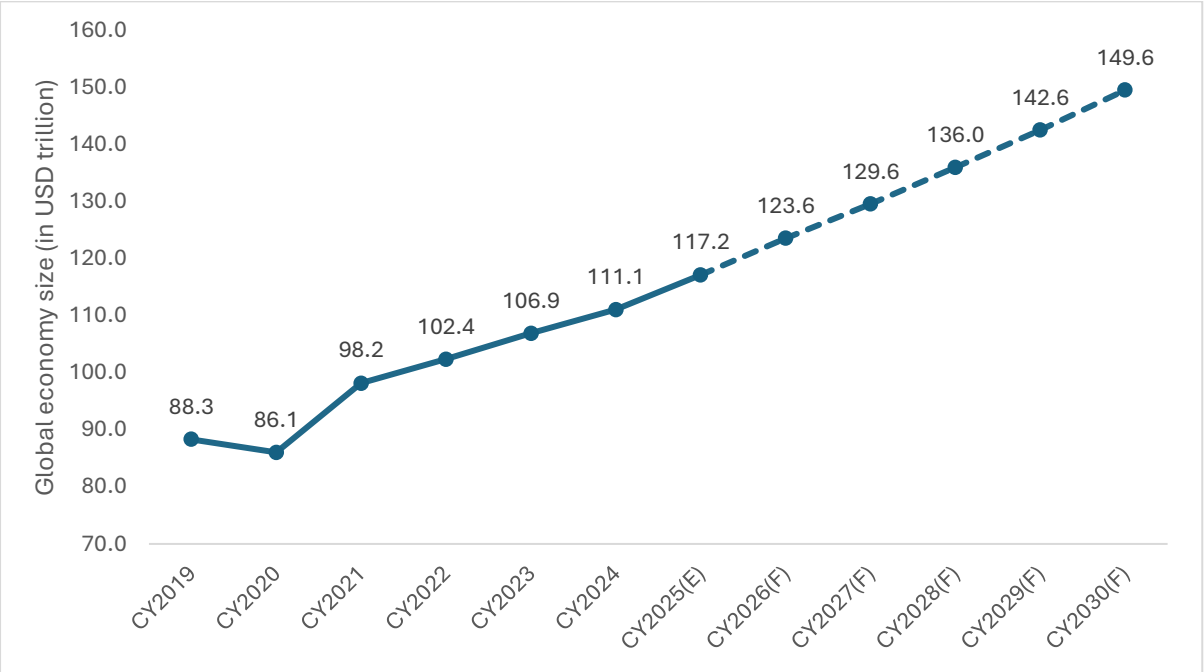
January 2026

Contents

## 1. Global macroeconomic overview

As per the International Monetary Fund (IMF), the size of global economy is projected to reach USD 117.2 trillion in CY2025 (in nominal terms) and continue to grow to USD 149.6 trillion in CY2030 (in nominal terms) at a CAGR of ~5%. Despite multiple Global challenges, economic activity at the global level has remained broadly resilient with growth in employment and steady income levels, favourable demand and supply developments, utilization of substantial savings accumulated during the pandemic and healthy household consumption supported major economies to maintain their growth.

**Chart 1: Global economy growth and prediction till CY2030 (in USD trillion- nominal terms)**




Source: IMF (WEO October 2025), ICRA Analytics
Note: E-Estimated for CY2025, F-Forecasted; data from CY2026-CY2030 are forecasted

As per the IMF, World Economic Outlook published in October 2025, the Global growth is anticipated to decrease from an estimated 3.3% in CY2024 to 3.2% in CY2025, subsequently rebounding to a modest 3.1% in CY2026 as inflation continues to ease, real incomes recover, and financial conditions gradually normalize.

The global economy has shown resilience to the trade policy shocks, in part because these shocks materialized on a smaller scale than expected at their onset; however, the drag from shifting policies is becoming visible in more recent data. The IMF continues to note that protectionist measures and policy uncertainty constrain growth by discouraging investment and complicating supply chains. This global slowdown has direct implications for the metal recycling and recovery market as slower growth in the automotive, construction, and manufacturing sectors leads to weaker demand for raw materials, including secondary metals such as aluminium, zinc, stainless steel, copper, and nickel. With industrial activity slowing, the volume of scrap generated also declines, thereby dampening demand for recycled inputs.

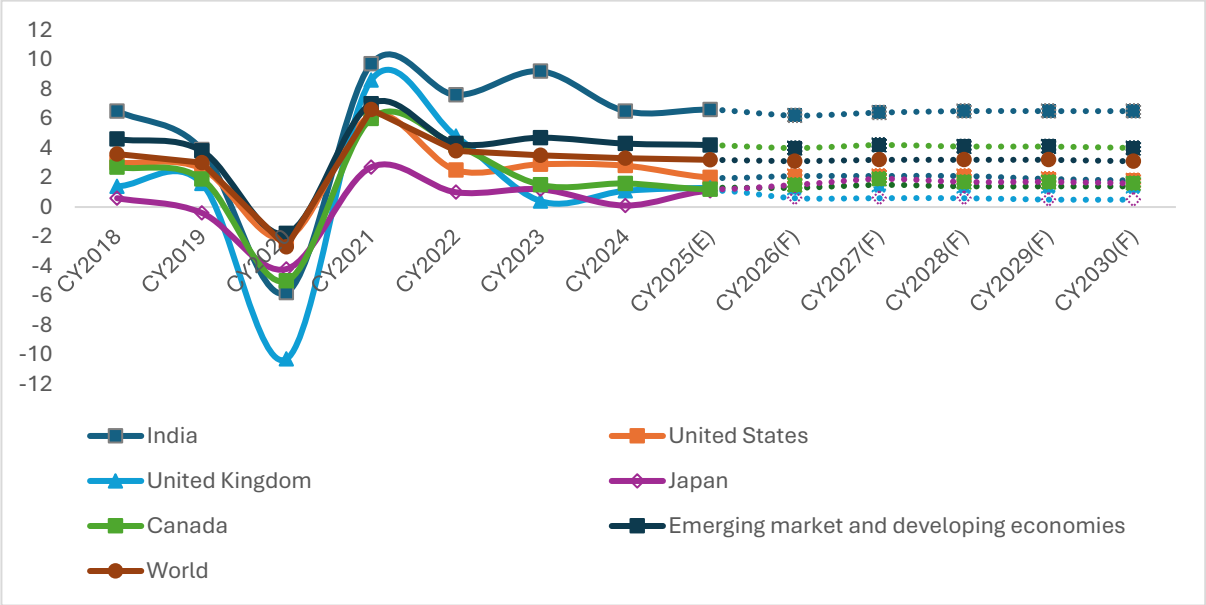
The global inflation rate is predicted to decrease from an annual average of 6.6% in CY2023 and 5.7% in CY2024. Inflation is expected to decline to 4.2% globally in 2025 and to 3.7% in 2026, with notable variation across regions above-target inflation in the United States (with risks tilted to the

upside) and subdued inflation in much of the rest of the world. As global inflation trends downward, the metal recycling and recovery markets industry stands to benefit in terms of cost structure, operating margins, and investment planning. While lower inflation may ease operating costs and support profitability, the overall sluggishness in demand will limit scrap generation and constrain end-user orders.

Tariff-related disruptions especially in U.S.–China and EU trade corridors have had pronounced effects on the metal recycling and recovery sectors. Tariff and trade restrictions have impeded the free flow of secondary raw materials; for example, China's import ban on foreign waste and the U.S. and EU export restrictions meant to retain valuable secondary material for domestic use. Such trade fragmentation is driving countries to build localized, self-sufficient recycling ecosystems, reducing reliance on external scrap exports/imports and forcing a structural shift from global integration to regional circularity. However, this shift may reduce efficiency and the specialization benefits historically gained from global trade.

### 1.1 Global Economies and Growth Trend:

**Chart 2: Real GDP growth rate (annual % change) of India and other economies**




Source: IMF, ICRA Analytics

Note: E- Estimated for CY2025, F-Forecasted; data from CY2026-2030 are forecasted, emerging market and developing economies includes India, China, Saudia Arabia, Mexico, Vietnam and other developing economies.

**Table 1: India v/s Other Economies (Real GDP, Y-o-Y % change)**

| Real GDP growth (Annual % change) | CY 2018 | CY 2019 | CY 2020 | CY 2021 | CY 2022 | CY 2023 | CY 2024 | CY 2025(E) | CY 2026(F) | CY 2027(F) | CY 2028(F) | CY 2029(F) | CY 2030(F) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **India** | 6.5 | 3.9 | (5.8) | 9.7 | 7.6 | 9.2 | 6.5 | 6.6 | 6.2 | 6.4 | 6.5 | 6.5 | 6.5 |
| **Advanced economies** | 2.3 | 1.9 | (3.9) | 6.0 | 3.0 | 1.7 | 1.8 | 1.6 | 1.6 | 1.7 | 1.7 | 1.6 | 1.5 |
| **United States** | 3.0 | 2.6 | (2.1) | 6.2 | 2.5 | 2.9 | 2.8 | 2.0 | 2.1 | 2.1 | 2.1 | 1.9 | 1.8 |
| **Euro Area** | 1.8 | 1.6 | (6.0) | 6.4 | 3.6 | 0.4 | 0.9 | 1.2 | 1.1 | 1.4 | 1.3 | 1.2 | 1.1 |
| **United Kingdom** | 1.4 | 1.6 | (10.3) | 8.6 | 4.8 | 0.4 | 1.1 | 1.3 | 1.3 | 1.5 | 1.4 | 1.4 | 1.4 |
| **Japan** | 0.6 | (0.4) | (4.2) | 2.7 | 1.0 | 1.2 | 0.1 | 1.1 | 0.6 | 0.6 | 0.6 | 0.5 | 0.5 |
| **Canada** | 2.7 | 1.9 | (5.0) | 6.0 | 4.2 | 1.5 | 1.6 | 1.2 | 1.5 | 1.9 | 1.7 | 1.7 | 1.6 |
| **Emerging market and developing economies** | 4.6 | 3.8 | (1.8) | 7.0 | 4.3 | 4.7 | 4.3 | 4.2 | 4.0 | 4.2 | 4.1 | 4.1 | 4.0 |
| **China** | 6.8 | 6.1 | 2.3 | 8.6 | 3.1 | 5.4 | 5.0 | 4.8 | 4.2 | 4.2 | 4.0 | 3.7 | 3.4 |
| **World** | 3.6 | 2.9 | (2.7) | 6.6 | 3.8 | 3.5 | 3.3 | 3.2 | 3.1 | 3.2 | 3.2 | 3.2 | 3.1 |

Source: IMF, ICRA Analytics

Note: E-Estimated for CY2025, F- Forecasted; data from CY2026-2030 are forecasted, Advanced Economies includes United States, Germany, France, Japan, United Kingdoms, Canada and other developed countries. Emerging market and developing economies includes India, China, Saudia Arabia, Mexico, Vietnam and other developing economies.

In CY2025, global growth is being driven by strong domestic demand, resilient labour markets, and sectoral expansion across major economies. India is propelled by infrastructure investment and rising consumption, while the U.S. benefits from innovation and easing monetary policy. The UK and Japan are seeing modest recoveries through trade and capital investment. Emerging markets are gaining momentum through commodity exports, improving supply chains, and neutral fiscal policies, despite facing structural and geopolitical challenges

The global real GDP growth was 3.3% in CY2024 and is anticipated to decrease to 3.2% in CY2025 and 3.1% in CY2026. The rapid increase in trade tensions and exceptionally high levels of policy uncertainty is anticipated to considerably affect global economic activity. The growth is projected to remain at 3.1% in CY2030, wherein growth would be driven mainly by easing of monetary policy and strong private consumption.

## 1. 2 Overview of Tariffs Introduced During the Trump Administration

### 1.2.1 Implications of tariffs introduced during the Trump administration on the global commodities, with a focus on metals

The tariffs introduced during the Trump administration represented a notable transformation in U.S. trade policy, particularly affecting global commodities. The administration's strategy was designed to safeguard domestic industries, redefine trade relationships, and tackle perceived unfair practices from international competitors.

Trump administration implemented tariffs of 25% on steel and 10% on aluminium imports, citing national security concerns as outlined in Section 232 of the Trade Expansion Act. The justification for these measures was to shield U.S. industries from what the administration deemed unfair trade practices, especially from nations like China, which were accused of inundating the market with subsidized metals. The administration contended that these tariffs were essential to maintain the viability of the domestic steel and aluminium sectors, which are crucial for national defence and infrastructure. By enforcing these tariffs, the U.S. sought to diminish its dependence

on foreign metals and promote domestic production, thereby generating jobs and fostering economic growth.

The Section 232 measures were expanded through 2025 (multiple proclamations and implementing actions). On June 4, 2025, the administration raised the ad valorem rates on covered steel and aluminium products (including many derivative articles) from earlier levels up to 50% for most countries (with limited exceptions such as a lower rate for the UK). The U.S. Commerce Department was also directed to add hundreds of derivative HTSUS product codes to the tariff scope during 2025.

**1. Evaluating the impact of tariffs on specific metals such as Aluminium, Zinc, Copper and Stainless-steel**

- **Impact of tariffs on Aluminium**
    - The aluminium industry has been significantly affected by the trade policies of the Trump administration. Initially subject to a 10% tariff under Section 232 in 2018, this duty was increased to 25% in early-2025 and then raised to 50% effective June 4, 2025, as part of a comprehensive strategy aimed at addressing global overcapacity, particularly from China. The United States is heavily dependent on foreign sources for its aluminium requirements, with more than 50% of total consumption satisfied through imports. This reliance is even more pronounced when it comes to specialized aluminium products, which are frequently not manufactured domestically at the necessary scale or quality.
    - As reported by the Aluminium Association, approximately two-thirds of U.S. primary aluminium imports originate from Canada, driven by the country's economical, hydro-powered smelting capabilities. As the primary supplier of aluminium to the United States, Canada is crucial in supporting sectors such as automotive, aerospace, defence, electronics, and packaging, where high-purity aluminium is critical. These industries depend on consistent material standards that domestic production alone cannot adequately fulfil. The previous 25% tariff had already raised costs for the production of military aircraft and lightweight armor, and the increase to a 50% tariff is anticipated to exert even more strain on the U.S. defence industrial base especially in light of escalating global security threats. Rising input costs are expected to be transferred to consumers, resulting in higher prices for aircraft, automobiles, and packaged beverages.

    - U.S. consumers also face rising competition due to global shortages. Analysts report that China’s strict 45-million-ton production cap and declining semis exports have removed up to 900,000 tons per year from the global market, while production outside China has fallen by 1.1 million tons annually.

- **Impact of tariffs on Zinc**
    - Despite the fact that zinc has not been explicitly targeted by Section 232 tariffs, it is facing significant indirect repercussions due to its essential function in the manufacturing of galvanized steel a vital component in the infrastructure, automotive, and construction sectors. The increased tariffs on steel are affecting the demand for galvanized products, which subsequently influences zinc consumption.
    - The International Lead and Zinc Study Group (ILZSG) reports that U.S. zinc demand reached 848,000 metric tons in 2024, accounting for approximately 6% of global

demand. Nevertheless, the nation remains largely reliant on imports, obtaining about 62% of its zinc requirements, mainly from Canada and Mexico, as per estimates from BNP Paribas. The implementation of tariffs on imports from these two countries has introduced an additional layer of strain on the zinc market.

- **Impact of tariffs on copper**
  - The copper sector is facing profound disruption following President Trump's July 30, 2025, Presidential Proclamation, which imposed a 50% Section 232 tariff on the copper input value of all imported semi-finished copper and intensive copper derivative products, effective August 1, 2025. This marks the strongest U.S. protectionist action ever taken in the copper value chain. The measure covers a broad range of HTSUS codes including pipes, wires, rods, sheets, tubes, cables, connectors, pipe fittings, and electrical components reflecting the administration's intent to rebuild domestic mid-stream copper processing capacity and reduce dependence on foreign suppliers for critical electrical and infrastructure materials. Crucially, the tariff does not apply to refined copper, anodes, cathodes, ores, concentrates, mattes, or copper scrap, meaning upstream producers remain unaffected while downstream manufacturers face substantial cost increases. Goods entered into U.S. Foreign Trade Zones on or after August 1 must be designated under "privileged foreign status," ensuring duties cannot be avoided through post-entry manipulation.
  - The 50% duty applies only to the copper content of covered products, while the remaining non-copper value is still subject to the wide-ranging IEEPA Reciprocal Tariffs or the IEEPA Fentanyl Tariffs (on Mexico, Canada, China). This makes the copper tariff additive, resulting in unusually high combined duty burdens particularly for electrical goods, HVAC components, renewable energy equipment, automotive wiring harnesses, and construction materials, where copper constitutes a significant share of costs. U.S. Customs and Border Protection (CBP) has issued strict guidance requiring precise copper-content declarations under new tariff headings 9903.78.01 and 9903.78.02, with penalties for misreporting including fines, loss of import privileges, and potential criminal liability. These provisions signal a compliance-heavy regime similar to Section 232 steel and aluminium enforcement.

- **Impact of tariffs on Steel**
  - On June 4, 2025, President Donald Trump enacted a comprehensive increase in Section 232 tariffs, raising import duties on steel products from 25% to 50%. This adjustment affects stainless steel, an essential high-performance alloy utilized across various U.S. industries, including medical devices, aerospace, construction, automotive, and energy infrastructure.
  - Despite the fact that the U.S. meets approximately 75% of its total steel demand domestically, it still heavily depends on imported specialty steel products, particularly high-grade stainless steel that is critical in sectors such as energy, construction, medical devices, food processing, and aerospace. Notably, 40% of U.S. imports consist of specialty items like steel pipes, tubes, and rolled materials necessary for demanding applications, including oil drilling and precision engineering.
  - According to the Council on Foreign Relations, the escalation of tariffs is anticipated to raise input costs, resulting in downstream impacts across sectors that heavily rely on steel. In 2018, the initial 25% steel tariff imposed by Trump resulted in an almost 2% increase in steel prices and an approximate 25% decline in import volumes. Industries

such as automobile manufacturing may experience a rise in vehicle production costs exceeding USD 2,000 per unit, considering that an average vehicle utilizes around half a ton of steel, which includes stainless grades for engine and exhaust components. Manufacturers like Caterpillar have previously transferred such increased costs to consumers, reporting over USD 100 million in expenses related to tariffs.

**2. To Examine how emerging markets especially India can leverage these shifts to strengthen their position in the global Metal Recycling & recovery market**

- **Recycled Metal Exclusions Can Pave the Way for Indian Suppliers:** While the emergency tariffs imposed by the U.S. focus on a range of materials, ReMA has verified that recycled aluminium and steel are not subject to Section 232 duties. Nevertheless, with Mexico, Brazil, South Korea, and Canada encountering 50% duties on multiple processed metal products, and China experiencing persistent trade limitations, the U.S. is expected to broaden its import sources. This scenario establishes India as a feasible, cost-effective supplier of stainless-steel scrap, aluminium alloys, zinc-based secondary products, and copper-based secondary products.

- **India's Green Steel and Low-Carbon Aluminium Drive ESG-Oriented Export Advantage:** As North American and European purchasers place greater emphasis on materials that exhibit low embodied carbon, India's initiative towards clean recycling encompassing green steel and low-carbon aluminium has the potential to enhance export readiness. Supported by governmental incentives and the demand from global Original Equipment Manufacturers (OEMs) and infrastructure initiatives, India can seize market opportunities by marketing its recycled metals as environmentally sustainable and traceable.

- **Fuelling India's Circular Economy Evolution with Zinc:**
  Zinc plays a vital role in India's circular economy, offering both industrial utility and environmental value. Its high recyclability, long lifespan, and cross-sector applications in construction, automotive, and agriculture make it central to resource efficiency. Zinc supports infrastructure through galvanization and enhances soil health when used in fertilizers, bridging technical and biological cycles. As India advances toward the UN Sustainable Development Goals, zinc's integration into multi-metal recycling loops and policy-backed circular initiatives positions it as a key driver of low-waste, resilient growth. India's zinc recycling efforts not only reduce environmental impact but also align with global ESG standards helping the country and other emerging markets capture a larger share of the green materials export market.

**1. 3 Geopolitical Tensions and Their Impact on Global Metal Prices**

Geopolitical tensions and structural changes in the market have transformed global base metal markets, with aluminium, zinc, copper, and steel each encountering unique yet interconnected pressures. Ongoing conflicts, including the Russia-Ukraine war and the Israel-Iran escalation, have created long-term instability in commodity markets, resulting in supply chain disruptions, risk-averse investor behaviour, and a reconfiguration of trade flows. These geopolitical events, along with trade policy uncertainty and regional production limitations, have rendered volatility a characteristic aspect of metal pricing.

- **Aluminium-**
  Aluminium prices experienced a decline earlier in 2025 due to rising concerns over a global economic slowdown and heightened tensions in the Middle East. The escalation of conflict between Israel and Iran temporarily lifted geopolitical risk premiums, pushing prices upward; however, the ceasefire agreement reached in late June 2025 eased regional tensions and removed much of the risk-driven support. Markets subsequently adjusted, resulting in a short-term bearish correction in both London Metal Exchange (LME) and Shanghai Futures Exchange (SHFE) aluminium prices, as noted by the Shanghai Metal Market (SMM).

  Compounding this volatility is a challenging supply environment. Chinese aluminium production rose by 5% year-on-year in May 2025, while exports recorded mixed trends. At the same time, Guinea one of the world's largest bauxite suppliers faces political and operational uncertainties that could disrupt raw material availability. In the United States, physical premiums fell by over 7%, driven by speculation of a potential easing of tariffs on Canadian aluminium. Tight LME inventories, were at their lowest levels since CY2022, further highlight a physically constrained market, particularly as Chinese demand especially from the rapidly expanding solar sector remains robust.

  However, as the year progressed, aluminium prices shifted into a more bullish phase. By November 2025, LME aluminium was trading in the USD 2,800–2,900 per tonne range, levels last seen during the post–Russia–Ukraine supply disruptions. A key driver of this resurgence has been investor sentiment: funds have accumulated record-long positions in LME aluminium futures, signalling growing confidence that the period of global oversupply is ending and that a structural deficit may emerge. Supply-side pressures also intensified, with disruptions in alumina-producing regions and tighter export flows pushing up input costs and adding to supply-risk premiums.

- **Zinc-**
  Zinc markets, which remained fragile through mid-2025 due to the Israel–Iran conflict and weak Chinese industrial demand, have seen intermittent volatility but no sustained recovery. Earlier in 2025, prices softened as investors adopted a risk-averse stance amid slowing factory output in China, limited progress in U.S.–China trade negotiations, and a narrowing global surplus of just 16,000 tons. Production cuts by major players such as Teck Resources and Nyrstar added some upward pressure, but geopolitical uncertainty and sluggish macroeconomic indicators kept sentiment muted.

  By late 2025, however, short-term trading momentum briefly improved following a ceasefire announcement between Israel and Iran. This development, combined with a weaker U.S. dollar, triggered a small rally in zinc futures. In September 2025, zinc prices once again faced downward pressure, declining more sharply than other industrial metals after reports showed China's zinc output in August reached its highest monthly level since early 2024. The surge in supply reinforced the market's structural weakness, offsetting the temporary bullish impact of the ceasefire.

- **Copper-**
  Copper prices, which had declined earlier in 2025 following Israeli airstrikes on Iranian nuclear sites and Iran's retaliatory drone attacks, have since rebounded sharply as

geopolitical conditions shifted and market fundamentals strengthened. The mid-year conflict spike had heightened global economic uncertainty, triggering risk-averse behaviour across financial and commodity markets. LME and SHFE copper fell around 0.9% during that period, while the COMEX–LME premium widened to USD 946 per ton in June 2025 reflecting supply-chain dislocation and rising geopolitical risk premiums. Concerns over a potential expansion of U.S. tariffs on strategic imports further weighed on investor sentiment.

By late 2025, however, copper entered a decisive bullish phase. Prices surged to multi-month highs amid renewed U.S.–China trade tensions, mixed but stabilizing economic indicators from China, and intensifying expectations of long-term supply tightness. In October 2025, LME copper rose 0.80% to around USD 10,691 per ton as markets reacted to President Trump's comments on possible export restrictions on aircraft parts to China, even as both sides prepared for fresh trade talks. China's reaffirmation of its 5% growth target, despite uneven data, provided additional support.

The rally accelerated through November, driven by structural forces. Indian and global copper prices hit record highs, fuelled by strong demand from the green energy transition including solar, EVs, and grid modernization along with significant supply disruptions in major mining regions and renewed Chinese stimulus.

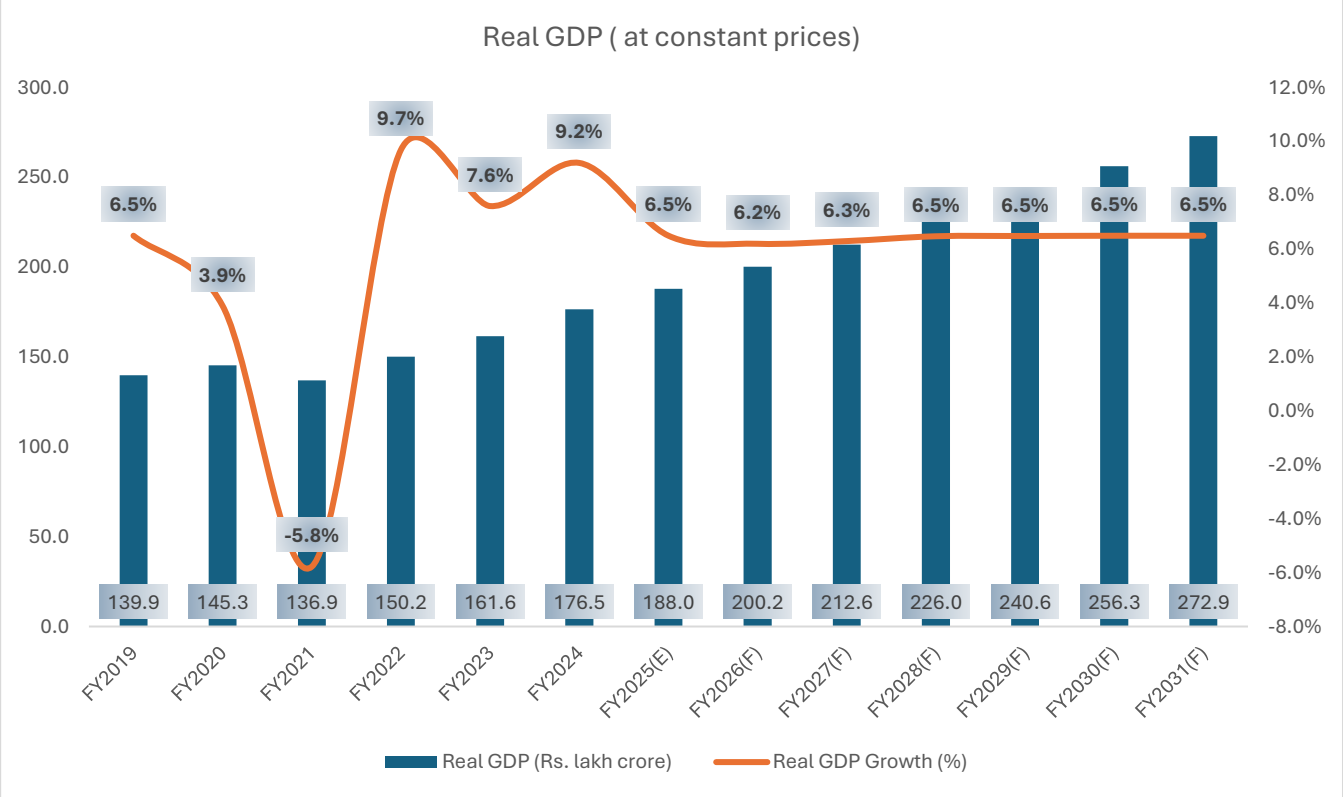
- **Steel-**
  Despite the easing of the initial Russia-Ukraine price shock, steel markets in 2025 remain highly sensitive to geopolitical tensions, with US–China trade frictions, rising protectionism and shifting tariff policies weighing on sentiment. Worldsteel's October 2025 outlook notes that although global steel demand is set to rebound modestly in 2026 supported by recovering demand in Europe and strong growth in India, Saudi Arabia, Egypt and Vietnam high production costs, weak Chinese consumption and escalating trade disputes continue to suppress prices. China's downturn, compounded by local government financial stress and export-related tensions with the US, has pushed HRC prices lower, while production cuts by CISA mills underscore deteriorating margins. These pressures, combined with geopolitical instability across key regions, keep steel markets fragile and highly reactive to any further escalation in global trade or regional conflicts.

## 2. Domestic Economic overview

### 2.1 Trend in GDP growth in India and its Outlook

India's real Gross Domestic Product (GDP) for FY2025 is projected to grow by 6.5%, according to the Provisional Estimates (PE) released by the National Statistical Office (NSO), Ministry of Statistics and Programme Implementation (MoSPI) in May 2025. This represents a slight upward revision from the initial estimate of 6.4% published in January 2025. GDP to now reach a level of Rs 188 trillion (lakh crore). India's real GDP registered 9.2% growth in FY2024 as against 7.6% in FY2023, making FY2024 the 3rd year of real GDP growth of 7.0% or above. Growth was majorly driven by robust domestic demand, vibrant demographic landscape, ongoing economic reforms, India is establishing its growing impact on global trade, investment, and innovation, coupled with Government's focus on infrastructural and economic development supported this upward trend in the country's growth rate. Furthermore, International Monetary Fund (IMF) expects India to continue being the fastest growing economy in the world, whereby it expects India's output to grow by 6.5% from FY2028 to FY2031.

**Chart: Historical trend and projection of Real GDP of India (Rs lakh crore)- Base year (2011-12)**




Source: RBI, IMF, ICRA Analytics
Note: F-Forecasted; E- Estimated
Data from FY2026-2031F are forecasted from IMF
FY2025(E) is the provisional Estimates released by the National Statistical Office (NSO)

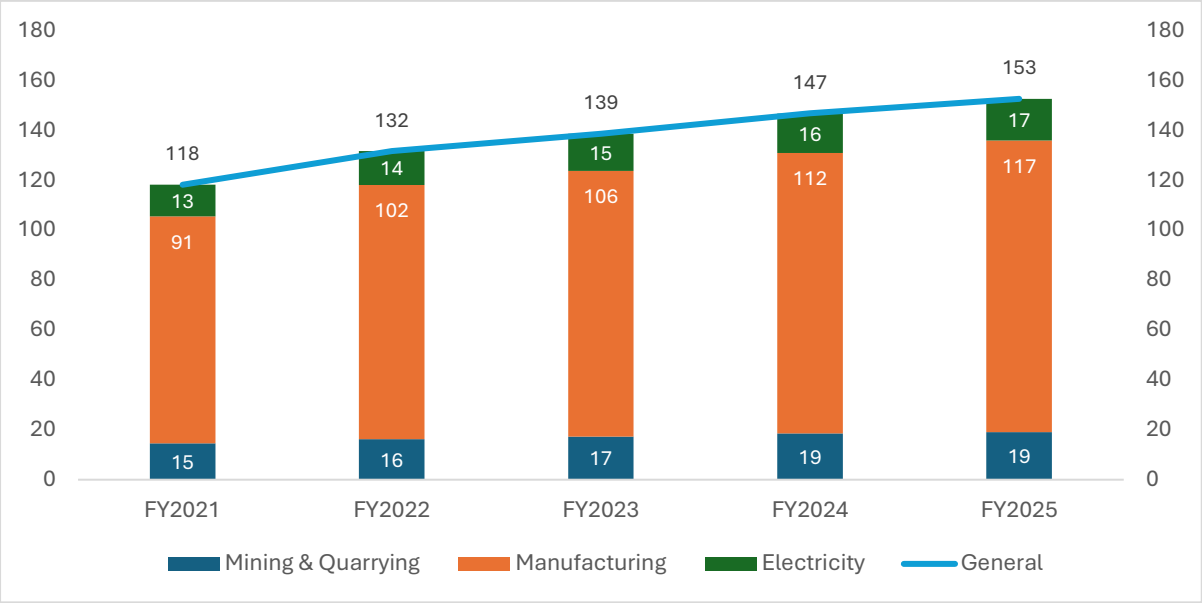
### 2.3 Performance of key macroeconomic indicators

#### 2.3.1 Trends in Industrial growth

Aided by strong corporate profits on the back of reduced input cost pressures and government support in promotion of manufacturing in India through various schemes such as Make in India,

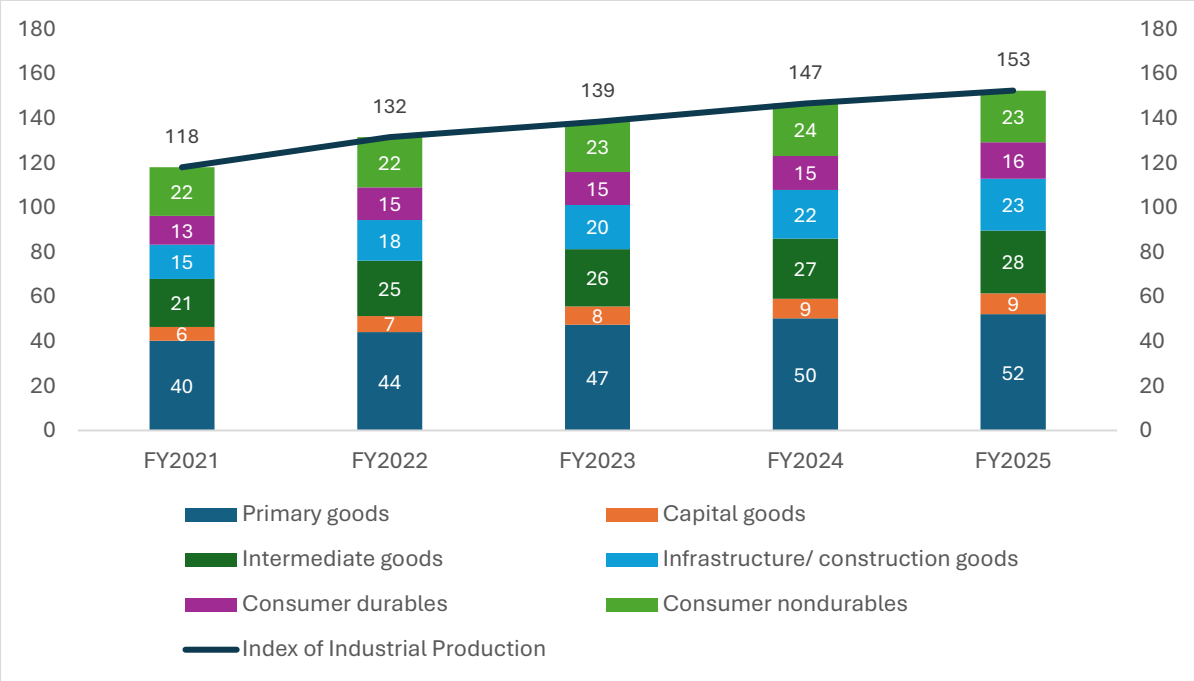
Startup India, Digital India, etc, led to healthy growth in Index of Industrial Production (IIP). Industrial output reported expansion of 4.0% in FY2025 as compared to 5.9% in the preceding year (i.e. FY2024). Led by electrical equipment, transport equipment, furniture and basic metals, 17 of 23 industry groups recorded y-o-y expansion in the manufacturing space. Moreover, while considering user-based classification all categories reported year over year growth. Going forward, India's manufacturing sector is expected to reach USD 1 trillion by FY2025-26, mainly led by investments in automobile, textiles and electronics industries.

**Chart: Movement in Index of Industrial Production and its Components**




Source: PIB, RBI, ICRA Analytics

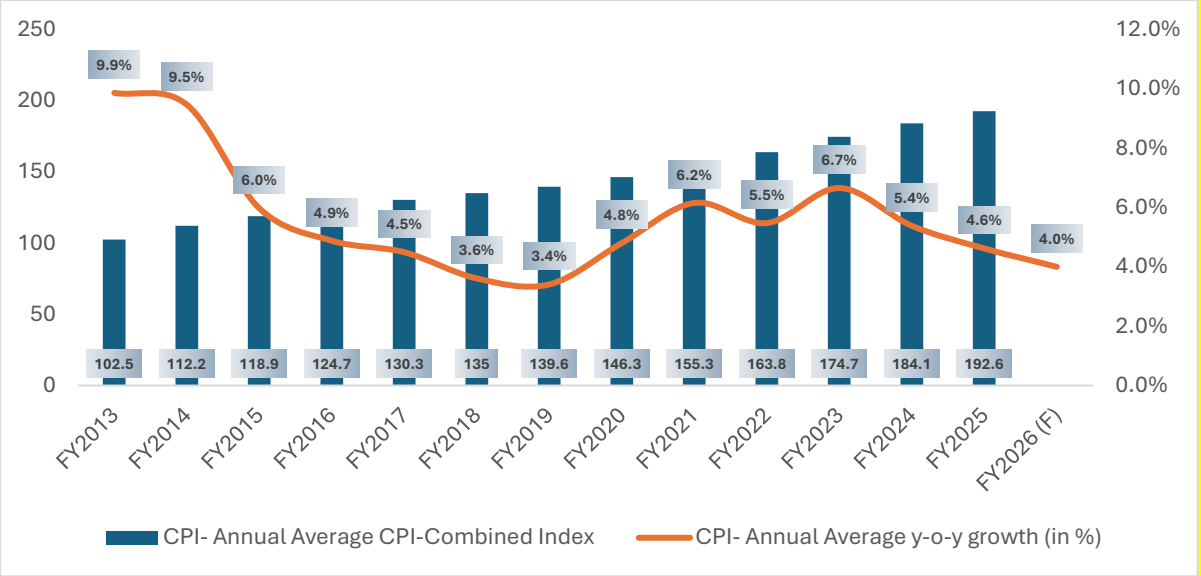
**Chart: Index of Industrial Production - Use-Based Classification**




Source: RBI, ICRA Analytics

### 2.3.2 Review of inflation in India

**Chart: CPI trend over the past ten years, FY2016-FY2025**

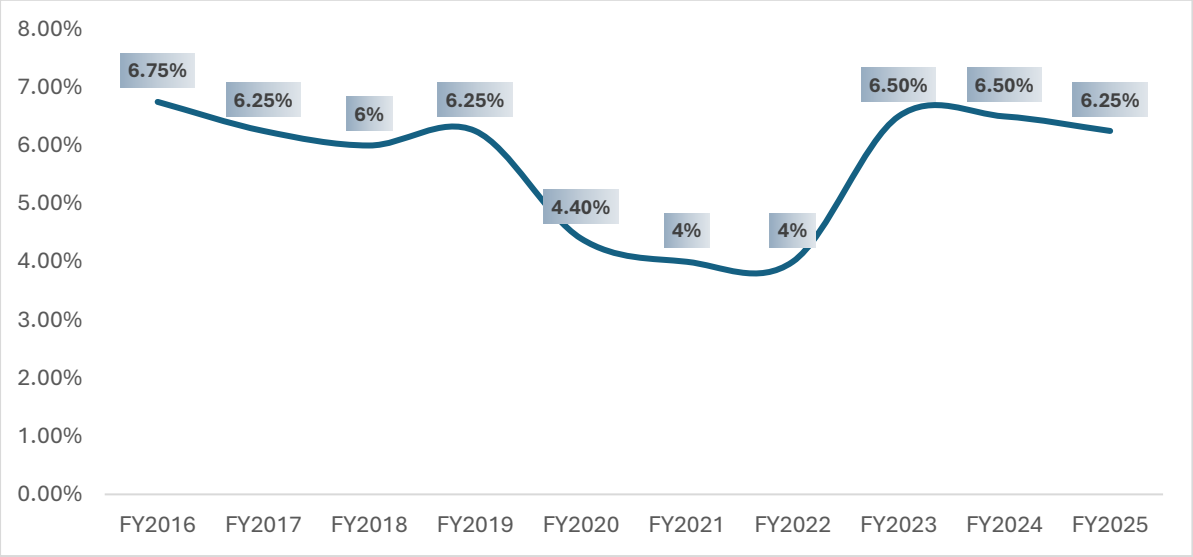



Source: RBI, MOSPI, ICRA Analytics

Retail inflation in India, as indicated by the Consumer Price Index (CPI), which represents the cost of daily goods and services, retail inflation in India has followed a steady downward path over the past three financial years, falling from 6.7% FY2023 to 5.4% during FY2024, and further to 4.6% during FY2025. This consistent moderation highlights the combined impact of the Reserve Bank of India's calibrated monetary policy and the Government of India's focused interventions to ease supply-side constraints and stabilise prices of essential commodities. The declining trend has helped ease cost-of-living pressures and fostered a more stable environment for economic growth.

### 2.3.3 Interest rate movement in India

**Chart: Repo rate movement in India (on year, in percentage)**




Source: CMIE, ICRA Analytics

**Table: Recent Repo Rate Maintained by the Reserve Bank of India**

| Date | Repo Rate |
|---|---|
| **RBI Repo Rate on 5-Dec-2025** | 5.25% |
| **RBI Repo Rate on 1-Oct-2025** | 5.50% |
| **RBI Repo Rate on 6-Aug-2025** | 5.50% |
| **RBI Repo Rate on 6-Jun-2025** | 5.50% |
| **RBI Repo Rate on 9-Apr-2025** | 6.00% |
| **RBI Repo Rate on 7-Feb-2025** | 6.25% |
| **RBI Repo Rate on 6-Dec-2024** | 6.50% |
| **RBI Repo Rate on 9-Oct-2024** | 6.50% |
| **RBI Repo Rate on 8-Aug-2024** | 6.50% |
| **RBI Repo Rate on 7-Jun-2024** | 6.50% |
| **RBI Repo Rate on 5-Apr-2024** | 6.50% |
| **RBI Repo Rate on 7-Feb-2024** | 6.25% |
| **RBI Repo Rate on 9-April-2023** | 6.00% |

Source: RBI, ICRA Analytics

In 2025, the RBI's Monetary Policy Committee, chaired by Governor Sanjay Malhotra, concluded the year with a 25-bps cut on December 5, reducing the repo rate to 5.25% while maintaining a "neutral" stance and signalling the end of the easing cycle. This decision came amid historically low inflation and strong growth, with the FY2026 CPI forecast sharply lowered to 2.0% and GDP growth upgraded to 7.3%, alongside significant downward revisions in quarterly inflation estimates. Earlier, on October 1, the MPC kept the repo rate unchanged at 5.50%, citing continued disinflationary trends and improved growth prospects, revising inflation to 2.6% and growth to 6.8%. On August 6, the committee again held the rate at 5.50%, pausing to assess the impact of previous cuts while projecting inflation at 3.1% and growth at 6.5%. The cycle began on June 6 with a 50-bps cut, lowering the repo rate from 6.0% to 5.50% and shifting the stance from "accommodative" to "neutral," indicating a possible end to the easing phase.

The Monetary Policy Report for April 2025, released alongside the 54th session of the Monetary Policy Committee, outlines a balanced approach adopted by the Reserve Bank of India (RBI) to support economic growth while maintaining price stability. The decision to lower the policy repo rate by 25 basis points to 6% is based on easing inflation particularly in food prices and a gradual recovery in economic activity. With GDP growth expected at 6.5% for FY2026 and inflation projected to remain within the 4% target range, the report reflects cautious optimism amid global uncertainty.

On the external front, robust services exports and strong remittance inflows have cushioned the merchandise trade deficit, helping keep the current account deficit at sustainable levels. In addition, improved system liquidity, reduced short-term borrowing costs, and stable foreign exchange reserves underscore the resilience of India's financial system. The RBI reaffirmed its commitment to closely monitoring evolving conditions and taking timely and calibrated measures to ensure macroeconomic and financial stability.

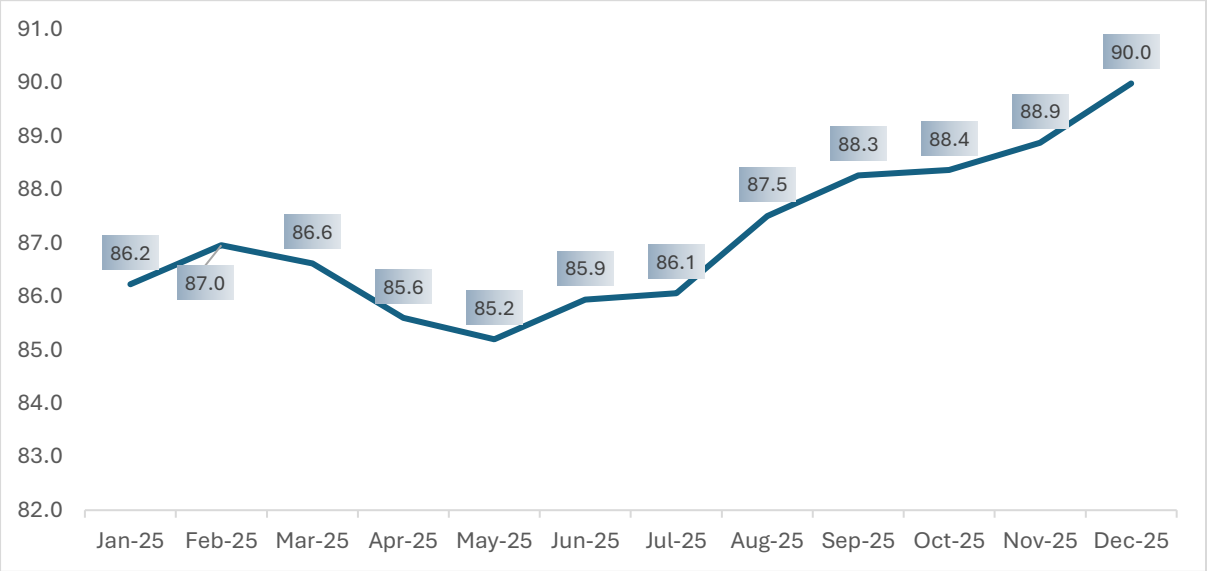
- India's monetary policy over the past decade has been marked by gradual rate reductions prior to the pandemic, aimed at spurring growth while controlling inflation. The RBI then implemented significant rate cuts during the COVID-19 pandemic to support the economy.

- Subsequently, the RBI raised rates in 2022 to address rising inflation and stabilize the rupee. Rates remained largely unchanged during 2023 and 2024.
- The RBI's repo rate ended 2024 at 6.25%, down from 6.50% at the end of 2023 and from 7.50% a decade ago. The average repo rate over the past ten years stood at 5.85%.

As of December 2025, the RBI has cut the repo rate to 5.25%, while the reverse repo rate remains at 3.35%. This decision came after three earlier rate cuts in February, April, and June 2025 totalling 100 basis points, bringing the repo rate down from 6.50% to 5.50%, followed by the December cut. The policy stance continues to be neutral, with the MPC unanimously voting to maintain a data-dependent approach.

**Conclusion:** Despite the improving inflation outlook, the RBI remains cautious. It flags downside risks to growth from uncertainty about global trade post-protectionist measures, protracted geopolitical tensions and global financial market volatility. These very factors also pose upside risks to inflation, reinforcing the need for a balanced, watchful approach. As per RBI, the Reserve Bank will undertake liquidity management operations in sync with the monetary policy stance and keep system liquidity adequate to meet the needs of the productive sectors of the economy.

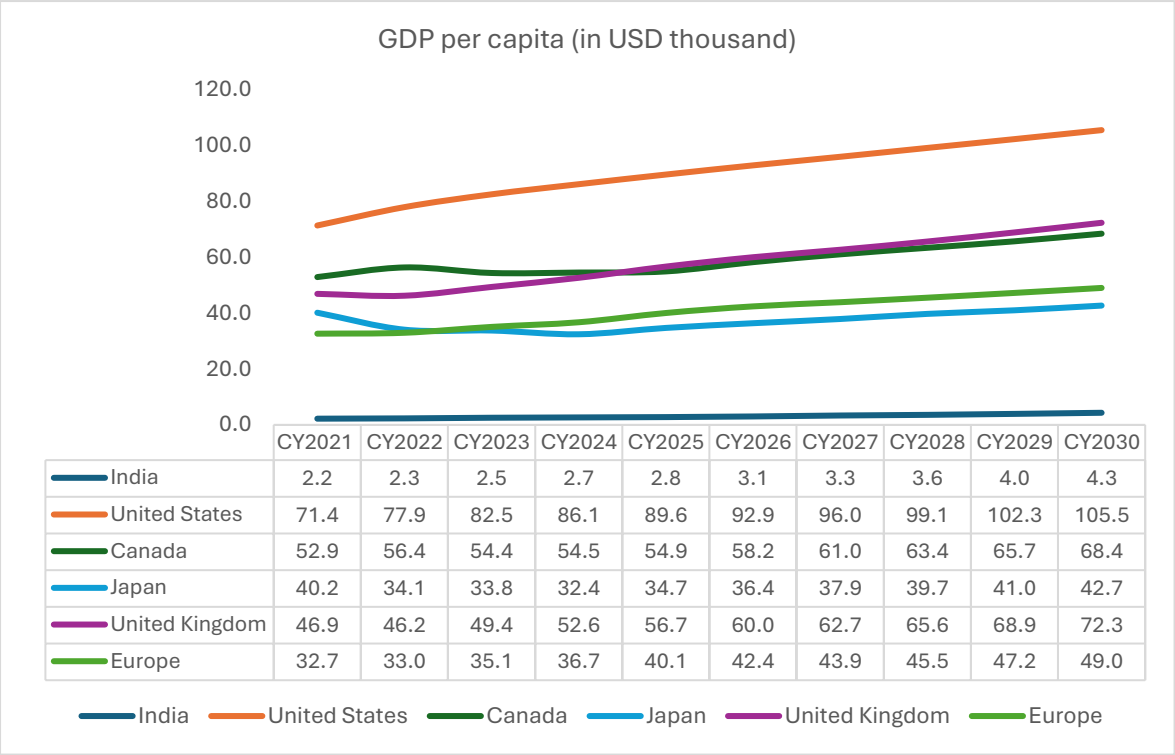
### 2.3.4 Exchange rate movement in India




Source: X-rates, ICRA Analytics

Over the past year (January to December 2025), the USD/INR exchange rate exhibited a steady depreciation trend, shaped by global monetary tightening, geopolitical uncertainties, and fluctuating foreign investment flows. The year closed at its weakest point in December, marking a cumulative depreciation of nearly 4.4% from January levels. This trend underscores the influence of global monetary conditions, geopolitical risks, and capital flow volatility on India's currency performance.

### 2.3.5 Trends in GDP per capita of India vs other major economies




| | CY2021 | CY2022 | CY2023 | CY2024 | CY2025 | CY2026 | CY2027 | CY2028 | CY2029 | CY2030 |
|---|---|---|---|---|---|---|---|---|---|---|
| India | 2.2 | 2.3 | 2.5 | 2.7 | 2.8 | 3.1 | 3.3 | 3.6 | 4.0 | 4.3 |
| United States | 71.4 | 77.9 | 82.5 | 86.1 | 89.6 | 92.9 | 96.0 | 99.1 | 102.3 | 105.5 |
| Canada | 52.9 | 56.4 | 54.4 | 54.5 | 54.9 | 58.2 | 61.0 | 63.4 | 65.7 | 68.4 |
| Japan | 40.2 | 34.1 | 33.8 | 32.4 | 34.7 | 36.4 | 37.9 | 39.7 | 41.0 | 42.7 |
| United Kingdom | 46.9 | 46.2 | 49.4 | 52.6 | 56.7 | 60.0 | 62.7 | 65.6 | 68.9 | 72.3 |
| Europe | 32.7 | 33.0 | 35.1 | 36.7 | 40.1 | 42.4 | 43.9 | 45.5 | 47.2 | 49.0 |

Source: IMF, ICRA Analytics
Note: The data provided for India is for the fiscal year, mapped to the calendar year as FY(t/t+1) = CY(t). Eg: CY2021 is FY2022 for India

India's GDP per capita has shown a steady and sustained upward trajectory from USD2.3k in FY2022 to USD2.8k in FY2025, marking an overall increase of ~20%. This growth reflects India's economic resilience, supported by strong domestic consumption and ongoing structural transformation. Key contributors to this progress include rapid expansion in the digital economy, technology-enabled services, and extensive government-led infrastructure development particularly in transportation, energy, and urban sectors which have collectively enhanced productivity and income levels.

### 2.4 Key Government Schemes for End-User Industries

The Indian government has introduced a range of impactful schemes and policies targeting key end-use sectors such as automotive, infrastructure, and electric vehicles (EVs), all of which are major consumers of recycled metals. These initiatives not only support growth within these industries but also align with the nation's broader vision of promoting a circular economy and reducing dependency on imported raw materials. These schemes concern the wider aspect of the Indian economy and its development wherein the metal recycling sector is directly or indirectly impacted by it.

- **PM E-DRIVE (Electric Drive Revolution in Innovative Vehicle Enhancement) Scheme:** The PM E-DRIVE (Electric Drive Revolution in Innovative Vehicle Enhancement) Scheme was launched by the Ministry of Heavy Industries, Government of India, through Gazette notification S.O. 4259(E) on September 29, 2024, and is being implemented from October 1, 2024, to March 31, 2026. Subsuming the earlier EMPS-2024 benefits for the April–September 2024 period, the effective duration of the scheme spans two years. With an overall outlay of Rs10,900 crore, PM E-DRIVE aims to accelerate the adoption of electric

vehicles across various categories, including e-two-wheelers, e-three-wheelers, e-buses, e-ambulances, and electric trucks, with a strong emphasis on commercial and public transport applications. The scheme introduces first-of-its-kind direct incentives for electric trucks, providing buyers with Rs I5,000 per kWh of battery capacity, capped at Rs 9.6 lakh per truck, with a dedicated Rs 500 crore allocation for 5,600 e-trucks of which 1,100 are earmarked for Delhi-NCR to tackle air pollution. As of July 2025, significant progress has been made: 12 lakh e-two-wheelers have been supported against a target of 24.5 lakh, 1.6 lakh e-three-wheelers against a 2-lakh target, and 10,400 e-buses have been sanctioned for deployment across key cities such as Bengaluru, Delhi, Hyderabad, Ahmedabad, and Surat. The scheme also mandates a phased manufacturing programme (PMP) to encourage domestic sourcing, minimizing import dependency. It integrates closely with the government's broader objectives of electrifying public transport, reducing emissions, and creating a circular economy through support for local EV manufacturing, vehicle recycling, and component reuse.

- **Production Linked Incentive (PLI) Schemes:** The Production Linked Incentive (PLI) Scheme, launched in 2020, is a landmark initiative by the Government of India to bolster domestic manufacturing, reduce import dependency, and enhance global competitiveness across 14 strategically chosen sectors. With a total outlay of INR 1.97 lakh crore (over USD 26 billion), the scheme provides direct financial incentives linked to incremental production, sales, and investments. In the Union Budget 2025–26, allocations for several key sectors under PLI were significantly enhanced, including electronics and IT hardware (INR 9,000 crore), automobiles and auto components (INR 2,818.85 crore), and textiles (INR 1,148 crore) underscoring the government's continued push to scale up indigenous manufacturing. As of August 2024, actual investments worth Rs 1.46 lakh crore have already been realized. These investments have led to Rs 12.5 lakh crore in production output, Rs 4 lakh crore in exports, and the creation of around 9.5 lakh jobs, expected to rise to 12 lakhs in the near future. The scheme has catalyzed transformative growth in sectors such as mobile phone manufacturing, pharmaceuticals, solar PV modules, and drones. It also aligns with broader policy reforms, including liberalized FDI policies, which have resulted in a 69% increase in FDI equity inflows into manufacturing between 2014 and 2024. Collectively, the PLI schemes are not only reshaping India's industrial landscape but also reinforcing its vision of Atmanirbhar Bharat by fostering technological innovation, employment generation, and global supply chain integration.

- **Vehicle Scrappage Policy (2021):** Introduced to eliminate old and environmentally harmful vehicles, the Vehicle Scrappage Policy fosters a circular economy in the auto sector. Vehicles that fail automated fitness tests after 15 to 20 years (depending on type) must be scrapped, and owners are incentivized through tax relief and purchase discounts. This generates a consistent stream of end-of-life vehicles (ELVs), which are a valuable source of recyclable metals like steel, aluminium, and copper. The policy supports the creation of Registered Vehicle Scrapping Facilities (RVSFs) and Automated Testing Stations (ATSs), facilitating a structured and efficient vehicle dismantling and recycling infrastructure in the country. As of January 2025, 84 RVSFs are operational, with 22 facilities transitioned from the informal sector, reflecting progress in formalizing the scrappage ecosystem. The scheme has been reinforced by the End-of-Life Vehicles (Management) Rules, 2024 and Environment Protection (End-of-Life Vehicles) Rules,

2025, introducing Extended Producer Responsibility (EPR) targets for OEMs, beginning FY 2025–26.

- **Smart Cities Mission and AMRUT**: The Smart Cities Mission (SCM), launched on June 25, 2015, is a flagship urban transformation initiative by the Government of India aimed at enhancing the quality of life in 100 selected cities through smart and sustainable infrastructure and governance solutions. Anchored on principles of economic growth, inclusivity, and environmental sustainability, the mission follows both area-based development and pan-city approaches, focusing on efficient service delivery across housing, transport, education, healthcare, and recreation. The Union Government allocated a total of Rs 47,652 crore, of which 99.44% has already been disbursed to the participating cities as of March 31, 2025. Supplemented by funding from state governments, urban local bodies, and public-private partnerships, the total investment under the mission has reached Rs 1.64 lakh crore. As of May 9, 2025, the mission has achieved the completion of 7,555 out of 8,067 projects (94%), while the remaining 512 projects worth Rs 13,043 crore are in advanced stages of implementation. Notable achievements include the establishment of Integrated Command and Control Centres in all 100 cities leveraging AI and IoT technologies, the creation of smart roads, classrooms, health centres, and initiatives like Cycles4Change and Streets4People that promote inclusivity and open public spaces. The Smart Cities Mission is playing a pivotal role in redefining urban governance, infrastructure, and livability, with its holistic outcomes serving as blueprints for future urban development across India.

- **PM Gati Shakti National Master Plan:** The PM Gati Shakti National Master Plan (NMP), launched on October 13, 2021, is a transformative initiative aimed at streamlining multimodal infrastructure development across India. With an ambitious outlay of Rs 100 lakh crore, the scheme unifies planning and implementation across 44 Central Ministries and 36 States/UTs, leveraging a dynamic GIS platform developed by BISAG-N. The plan covers seven core sectors railways, roads, ports, waterways, airports, mass transport, and logistics infrastructure to facilitate holistic and synchronized infrastructure growth. As of October 2024, over 1,614 data layers have been integrated into the portal, allowing real-time mapping, gap identification, and optimization of project alignments. Notably, 208 high-value projects worth Rs 15.39 lakh crore have been assessed under Gati Shakti principles. The platform has significantly improved the quality and speed of infrastructure project execution by reducing approval delays, minimizing ecological disruption, and cutting costs through better design integration. With enhanced interoperability among ministries and datasets such as eDAR and toll data, the scheme is steadily transforming India's infrastructure ecosystem and boosting investor confidence while supporting the broader vision of Aatmanirbhar Bharat.

- **Atal Mission for Rejuvenation and Urban Transformation (AMRUT):** The Atal Mission for Rejuvenation and Urban Transformation (AMRUT) was launched on June 25, 2015, with the objective of improving urban infrastructure and enhancing the quality of life in cities, particularly by ensuring universal access to basic services like water supply, sewerage, non-motorized transport, and green spaces. The Mission initially covered 500 cities (later revised to 485, following the merger of 15 cities) and operated as a centrally sponsored scheme, with funds allocated based on urban population and the number of statutory towns in each state. Over the past decade, Rs 2.73 lakh crore worth of projects have been sanctioned under AMRUT and AMRUT 2.0, out of which projects worth Rs 1.12 lakh crore

have been completed, and Rs 72,656 crore has been spent. Key outcomes include the provision of 2.03 crore tap connections, 1.50 crore sewer connections, installation of 99 lakh LED streetlights leading to annual savings of 666 crore kWh of power and a reduction of 46 lakh tonnes of $CO_2$ emissions, and the raising of Rs 4,984 crore by 13 Urban Local Bodies (ULBs) through municipal bonds for infrastructure financing. Furthermore, State Annual Action Plans (SAAPs) valued at Rs 77,640 crore were approved, with committed Central Assistance of Rs 35,990 crore. The Mission's integrated focus on water security, pollution reduction, and green space development has significantly upgraded urban service delivery, especially for the urban poor, and encouraged cities to incorporate smart features in planning and execution. AMRUT continues to drive India's urban transformation, complementing the Smart Cities Mission and laying the foundation for more sustainable and inclusive urban growth.

### 2.4.1 Government Policies Supporting Circular Economy and Metal Recycling

To promote sustainable industrial development and reduce reliance on imported raw materials, the Government of India has implemented a range of policies aimed at embedding circular economy principles particularly in the metal recycling sector. These initiatives encompass areas such as scrap handling, vehicle dismantling, battery recycling, and taxation reforms. They aim to formalize the recycling industry, boost material recovery efficiency, and foster the integration of recycled inputs across major industrial segments. Collectively, these measures establish a foundational policy ecosystem that positions metal recycling as a key driver of resource efficiency, environmental responsibility, and manufacturing competitiveness.

- **Non-Ferrous Metal Scrap Recycling Framework (2020**): Launched by the Ministry of Mines, this framework addresses rising demand for non-ferrous metals such as aluminium, copper, and zinc, while reducing environmental impact and import dependency. It outlines a national-level plan for structured collection, segregation, and scientific recycling of non-ferrous scrap. The policy promotes the establishment of authorized recycling centers with modern infrastructure, enforcing adherence to environmental and occupational safety norms. It also mandates robust scrap tracking systems, improved traceability, and implementation of quality assurance protocols to increase recovery efficiency and metal purity. Additionally, it includes awareness and capacity-building programs to help integrate informal recyclers into the formal recycling network. On May 7, 2025, Union Minister G. Kishan Reddy launched the Non-Ferrous Metal Recycling Stakeholders' Portal (https://nfmrecycling.jnarddc.gov.in), developed under this framework to centralize data, facilitate stakeholder registration, and support evidence-based policy interventions

- **Scrap Recycling Policy (2019):** The Scrap Recycling Policy (2019), introduced by the Ministry of Steel, aims to formalize India's scrap ecosystem by promoting a circular economy in the steel sector and reducing dependency on imported raw materials. It supports the objectives of the National Steel Policy 2017 by facilitating the establishment of Collection, Dismantling, and Scrap Processing Centres for scientific and environmentally sound recycling of ferrous and non-ferrous scrap. The policy promotes the 6Rs Reduce, Reuse, Recycle, Recover, Redesign, and Remanufacture while encouraging shared responsibility among stakeholders including aggregators, dismantlers, recyclers, OEMs, and government agencies. It mandates Extended Producer Responsibility (EPR) for vehicle manufacturers, requiring incentives for scrapping End-of-Life Vehicles (ELVs) and ensuring issuance of Certificates of Destruction (CoD). Emphasis

is placed on environmentally sound practices through adherence to rules such as the Hazardous & Other Wastes (Management) Rules, 2016, and ensuring depollution and safe disposal of toxic components. The policy helps reduce greenhouse gas emissions and resource consumption, contributing to India's sustainability goals while boosting domestic metal availability and enabling steel production targets of 300 MTPA by 2030 with a significant share from the scrap-based Electric Arc Furnace (EAF) and Induction Furnace (IF) routes.

- **Vehicle Scrappage Policy (2021):** The Vehicle Scrappage Policy, launched in October 2021 by the Ministry of Road Transport and Highways (MoRTH), is a key initiative aimed at reducing vehicular pollution, enhancing road safety, and promoting a circular economy by encouraging the scientific scrapping of old and unfit vehicles. Under this policy, vehicle owners are incentivized through motor vehicle tax concessions of up to 25% for private vehicles and 15% for commercial vehicles, along with registration fee waivers upon purchase of a new vehicle against a Certificate of Deposit (CoD). To ensure environmentally sound dismantling, the policy mandates scrapping to be carried out at Registered Vehicle Scrapping Facilities (RVSFs) adhering to CPCB guidelines and AIS-129 standards. As of January 2025, 84 RVSFs are operational across India, including 22 transitioned from the informal sector, marking significant progress in formalizing the scrappage value chain. The policy has been further institutionalized through the End-of-Life Vehicles (Management) Rules, 2024 and Environment Protection (End-of-Life Vehicles) Rules, 2025, which introduce Extended Producer Responsibility (EPR) targets for OEMs starting FY 2025–26, making them accountable for the retrieval and recycling of ELVs.

- **Battery Waste Management Rules (2022):** The Battery Waste Management Rules, 2022, enforced at the national level by the Government of India, provide a comprehensive regulatory framework for the environmentally sound collection, recycling, and management of all types of batteries including automotive, portable, industrial, and electric vehicle (EV) batteries. Central to the rules is the principle of Extended Producer Responsibility (EPR), which mandates producers to register with the Central Pollution Control Board (CPCB) and take responsibility for the collection and recycling/refurbishing of waste batteries through progressively increasing targets. For EV batteries, producers must ensure 70% collection by 2027–28, with material recovery targets rising from 70% in FY2024–25 to 90% by FY2026–27, measured as a percentage of dry weight. Additionally, producers are obligated to incorporate a minimum of 5% domestically recycled materials in new batteries by FY2027–28, increasing to 20% by FY2030–31, to stimulate the domestic recycling ecosystem and reduce import dependency. The rules prohibit sending batteries to landfills or incineration, enforce minimum material recovery rates of 90% for EV and portable batteries and 60% for automotive and industrial batteries by FY2026–27, and mandate online registration, tracking, and detailed labelling. Non-compliance by producers or recyclers results in environmental compensation penalties, calculated based on waste handling and processing costs, and could also lead to registration cancellation or imprisonment under Section 15 of the Environment (Protection) Act, 1986. These measures are expected to build a circular economy around battery materials, reduce environmental risks, and strengthen India's e-mobility and energy storage sectors.

- **Extended Producer Responsibility (EPR) Guidelines:** The Extended Producer Responsibility (EPR) Guidelines, reinforced under the Hazardous and Other Wastes (Management and Transboundary Movement) Second Amendment Rules, 2024 effective from April 1, 2026, to form a foundational element of India's circular economy strategy. These guidelines mandate that producers, particularly in metal-intensive sectors like electronics, automotive, and packaging, are legally responsible for the post-consumer phase of products made from non-ferrous metals such as aluminium, copper, and zinc. The updated EPR framework, notified by the Ministry of Environment, Forest and Climate Change (MoEFCC) on July 1, 2025, requires all stakeholders producers, manufacturers, recyclers, refurbishes and collection agents to register on a centralized CPCB portal and meet specific annual recycling targets. Producers must fulfill obligations starting at 10% in FY2026–27 and rising to 75% by FY2032–2033, either through in-house recycling or by purchasing tradable EPR certificates from registered recyclers. Additionally, manufacturers are obligated to use a minimum of 5% domestically recycled content from FY2028–2029, increasing to 25% by FY2033–FY2034, with exemptions allowed under technical or statutory limitations. The rules promote reuse by offering refurbishing credits for certain products, allowing temporary deferral of EPR obligations. Non-compliance attracts environmental compensation penalties as per Rule 60, along with possible registration suspension, and prosecution under the Environment (Protection) Act, 1986.

- **GST Reforms for Scrap Metal Recycling:** The Government has implemented several reforms under the Goods and Services Tax (GST) regime to address long-standing issues affecting the scrap metal recycling sector. The 54th GST Council Meeting introduced major reforms to the taxation framework for metal scrap, aimed at streamlining compliance and improving traceability in the recycling sector. Effective from 10th October 2024, the Reverse Charge Mechanism (RCM) now applies to purchases of metal scrap from unregistered suppliers. Under RCM, registered buyers must pay 18% GST on such transactions and issue self-invoices, thereby bringing informal sector dealings under formal tax compliance. Additionally, for purchases from registered suppliers, a 2% TDS is now applicable when the contract value exceeds Rs 2.5 lakh. Buyers are required to register for TDS, file returns, and issue certificates, while sellers can claim the TDS as credit. These changes impact all stakeholders, buyers, registered recyclers, and informal suppliers, by enforcing better documentation and improving revenue accountability. The reforms aim to curb tax evasion, promote formalization, and make the organized recycling industry more competitive. By establishing a clear and predictable tax regime, these GST amendments support the long-term growth and sustainability of India's metal recycling ecosystem

- **National Resource Efficiency Policy (NREP), 2019:** The Draft National Resource Efficiency Policy (NREP), introduced by the Ministry of Environment, Forest and Climate Change in 2019, outlines a strategic vision for environmentally sustainable and equitable economic growth in India. It aims to ensure long-term resource security, a healthy environment including air, water, and land and the restoration of ecosystems rich in biodiversity. The policy is anchored in key principles such as reducing primary resource consumption to sustainable levels aligned with the Sustainable Development Goals and planetary boundaries; generating higher economic value with less material input through resource-efficient and circular economy approaches; minimizing waste across all sectors; enhancing material security; and fostering the creation of green jobs and

business models that contribute meaningfully to environmental protection and ecological restoration.

### 2.5 Impact of Tariffs on India's Aluminium, Zinc, Copper, and Stainless-Steel Imports

India is expected to face limited direct consequences from the United States' 2025 move to raise import duties on steel and aluminium to 50%. However, the decision has disrupted global trade flows, increasing India's exposure to inexpensive metal imports from Asian countries such as China, South Korea, and Vietnam. India's proposed 12% safeguard duty on steel imports provides partial protection against the surge of cheap Chinese steel but remains below industry expectations.

In FY2025, India exported approximately USD 4.56 billion worth of iron, steel, and aluminium products to the U.S., including USD 587.5 million in iron and steel, USD 3.1 billion in articles of iron or steel, and USD 860 million in aluminium and related articles. The U.S. tariff regime has triggered major concerns for India's export community, particularly the Engineering Export Promotion Council (EEPC), representing over 10,000 MSME exporters. EEPC estimates that India could face a USD 7.5-USD 8 billion loss in FY26, with potential job cuts if the duty persists.

India exported USD 20 billion in engineering goods to the U.S. in 2024–25, comprising USD 5 billion in steel/aluminium, USD 2.6 billion from the auto sector, and USD 12.5 billion in other engineering goods. Steel and aluminium exports are expected to shrink by about 20%, auto exports by USD 0.5 billion, while the USD 12.5 billion "other engineering goods" segment may contract up to 50%, as U.S. buyers pivot to lower-tariff markets like Vietnam, Indonesia, and the EU.

Front-loaded shipments ahead of the tariff deadline temporarily boosted exports. From April–July 2025, engineering exports to the U.S. rose 12.6% to USD 6.95 billion, with July alone posting a 19.2% jump to USD 1.81 billion. Industrial machinery (+17%), electrical machinery (+19%), non-ferrous metals (+27%), and iron and steel (+12%) led the surge, while auto components fell 1%, signaling early stress.

Post-tariff trends show softening. In September 2025, exports dipped 9.4% year-on-year to USD 1.45 billion, though steel and aluminium exports remained strong due to tariff parity with competing suppliers. For April–September 2025, engineering exports to the U.S. still grew 8% to USD 10.04 billion, reflecting delayed tariff pass-through on existing orders.

Overall, India's engineering exports grew 5.35% year-on-year to USD 59.36 billion in April–September 2025, accounting for 27–28% of total merchandise exports. While the broader sector remained resilient, supported by strong demand from ASEAN, Latin America, Sub-Saharan Africa, and North-East Asia, reliance on the U.S. market continues to represent a significant risk.

**Aluminium:** With the US effectively limiting market access for many Asian exporters, India may witness increased inflows of aluminium. This development could reposition India as an important player in regional aluminium trade. Countries like China, which already influence global pricing, may redirect more volumes toward India. The Aluminium Association of India (AAI) has highlighted the need for strategic responses, noting that higher US tariffs may reshape the global aluminium landscape. Domestic producers, who are navigating challenges from competitively priced imports, may need to enhance efficiency and explore value-added opportunities to maintain growth momentum.

**Zinc:** India is a major importer of zinc concentrates, essential for galvanization across infrastructure, automotive, and construction sectors. With global trade diversions caused by US tariffs, excess zinc supply in Asian markets may result in temporary price reductions, potentially disrupting market stability.

**Copper:** Copper plays a vital role in India's infrastructure, energy transition, and building sectors. Given India's significant dependency on refined copper imports, trade redirection from the US could lead to increased competition and price fluctuations domestically. While downstream sectors such as electrical cable and wire manufacturing may gain from lower input costs, Indian copper refiners might see their profitability shrink under pressure from rising imports.

**Stainless Steel:** The Indian steel sector is particularly susceptible to trade diversion, especially from China, Indonesia, and South Korea. According to Nikunj Saraf, Vice President at Choice Wealth, the primary concern lies in the renewed risk of Chinese steel dumping in India due to the US market restrictions. Chinese exports to India could rebound to previous levels, nearing one million tonnes, placing downward pressure on domestic prices and compressing margins for Indian producers.

### 3. Global Metal Recycling & Recovery Market

Metal recycling involves reprocessing scrap metal into useful products to conserve natural resources, reduce energy consumption, and minimize greenhouse gas emissions. The process includes collecting and treating waste metal to produce new materials, which can then be used to manufacture items like bars, ropes, ingots, billets and poles. Recycled metals find applications across various industries, including construction, packaging, automotive, industrial machinery, and shipbuilding. With increasing government support, corporate ESG commitments, and global decarbonization goals, the metal recycling and recovery market is poised for long-term growth and strategic importance in sustainable resource management.

The growth of the global metal recycling & recovery market is being driven by the surge in construction activities across regions like Europe and Asia-Pacific. Rapid urbanization and industrialization are accelerating economic development, which in turn increases demand for metal recycling. Moreover, metal recycling not only supports job creation but also strengthens national economies for example, the U.S. recycling industry employs over a million people and generates approximately USD 236.0 billion annually.

Urbanization and industrial growth are among the primary drivers of the market, as manufacturers increasingly use recycled metals to produce goods without compromising quality. Government regulations further support this trend. For instance, the U.S. recycling industry adds USD116.8 billion to the national economy.

According to Tata Steel MD and CEO T V Narendran, the recycling industry is poised to surpass traditional mining in economic value by 2050. This shift underscores a long-term transition from resource extraction to resource recovery, particularly in urban settings. The emergence of “urban mining” the process of recovering valuable and critical minerals from discarded electronic devices is expected to play a pivotal role in addressing India’s resource scarcity while supporting its fast-growing consumption of electronics and infrastructure materials.

Tata Steel’s own investment into recycling through its Industrial By-products Management Division (IBMD), which has already achieved a turnover of ₹10,000 crore, reflects the strategic importance of this sector. Industry players are increasingly designing metals like steel and aluminium for recyclability, ensuring quality output from secondary production processes. This not only supports circular economy goals but also aligns with decarbonization targets, especially in energy-intensive sectors such as steel and aluminium.

Parallel to developments in the steel sector, the aluminium recycling industry in India is also witnessing accelerated growth with the industry poised to become bigger than its mining sector in the near future. The ability to produce high-quality aluminium from scrap, with significantly lower energy inputs compared to primary extraction, is making secondary production an attractive and scalable alternative. The growing adoption of electric vehicles, renewable energy systems, and lightweight materials in automotive and construction sectors is further fueling demand for recycled metals.

Despite these advancements, challenges such as poorly organized scrap metal collection and limited scrap zones may hinder market growth. Nevertheless, the increasing construction of buildings and the resulting waste disposal in landfills are expected to create promising opportunities for the metal recycling & recovery market industry.

### 3.1 Key Processes Forming Metal Recycling & Recovery


**Collection:** Scrap metals are collected either through drop-offs by individuals or by recycling facilities themselves. Upon arrival, the metals are weighed to determine payout and processing needs. Residential items like tin cans and cast-iron pans are also transported by trucks and weighed before processing.

**Sorting:** After weighing, the scrap is sorted to remove non-metal materials and debris. Equipment such as the DE-STONER is used to separate light materials like plastic. Metals are further sorted by type such as copper or steel and classified as ferrous or non-ferrous using machines like crossbelt magnetic separators.

**Processing:** Before melting, scrap metals are reduced to smaller, manageable pieces through hydraulic equipment, shredders, or torches. These smaller pieces are then sent to a foundry for further processing.

**Melting:** Metals are melted in furnaces specific to their type- steel, aluminium, tin, etc. This melting process is more energy-efficient compared to extracting and refining raw materials.

**Filtration & Purification:** Impurities in the molten metal either rise to the surface for removal or are eliminated through electrolysis, depending on the metal being processed.

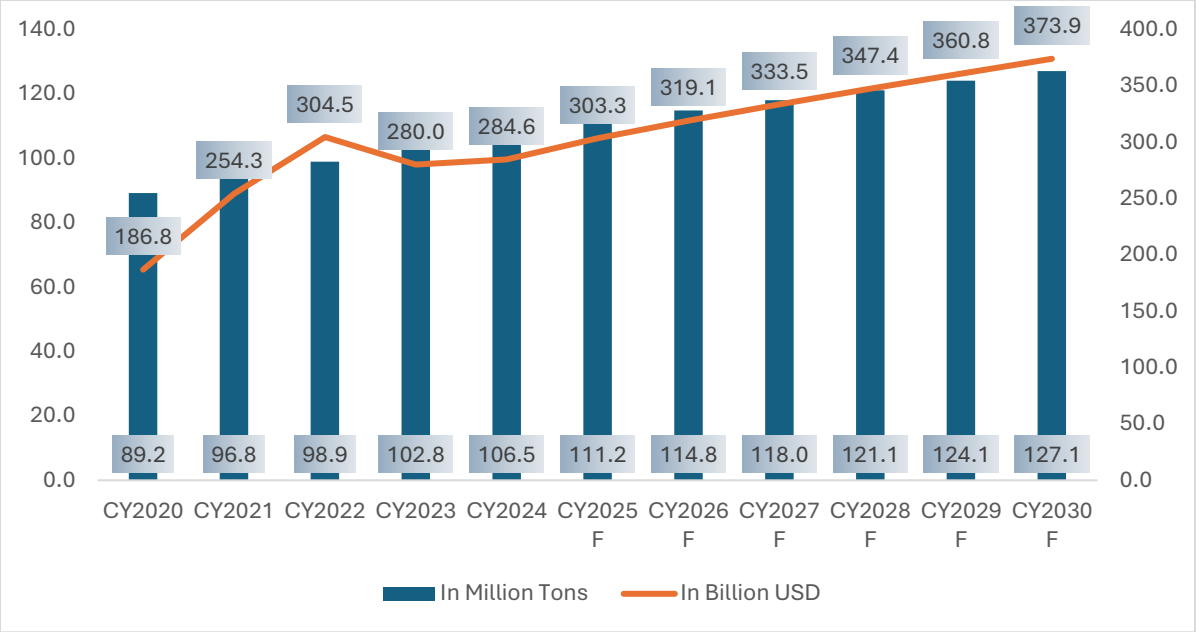
**Solidifying:** Once purified, the molten metal is poured into molds through a process known as casting, allowing it to cool and solidify into standardized shapes such as ingots, rods, sheets, or blocks. Depending on the desired end-use, various casting methods may be used such as continuous casting for sheets and billets, or ingot casting for larger blocks. This step ensures the recycled metal is ready for downstream manufacturing application.

**Shipping:** Once solidified, the recycled metal is shipped to manufacturers where it is used to create new products such as food cans or cookware starting its life cycle again.

### 3.2 Global Demand Projections (CY2020 to CY2030F)

#### 3.2.1 Aluminium

**Chart: Global Aluminium Market Forecast: Sales Volume (in Million Tons) and Volume (in Billion USD)**




Source: IMARC, ICRA Analytics

The global aluminium market reached a value of USD284.6 billion and a volume of 106.5 million tons in CY2024, recording a CAGR of 11.1% in value and 4.5% in volume from CY2020 to CY2024.

The market's growth is largely driven by a strong shift toward sustainability and the implementation of advanced technologies within the industry. Leading producers are increasingly focused on developing low-carbon aluminium and innovative recycling methods to minimize environmental impact. Companies like CMR Green Technologies Limited are a critical enabler of the global aluminium industry's decarbonisation imperative due to its nature of business.

- This shift is influenced by tightening environmental regulations and rising consumer preference for eco-friendly materials. While the focus on low-carbon aluminium and recycling solutions is intensifying due to regulatory pressures and growing environmental awareness, the increasing usage of aluminium is also supported by its inherent advantages such as being lightweight, corrosion-resistant, highly durable, and an excellent conductor of heat and electricity. These properties make aluminium a preferred material across sectors, including automotive (especially EVs), aerospace, construction, electronics, and packaging. For example, in January 2024, Alcoa Corporation began supplying low-carbon aluminium to Nexan S.A, produced using ELYSIS technology, which enables aluminium production without direct greenhouse gas emissions and generates oxygen as a byproduct. In a similar move, Rio Tinto Group announced plans to power 90% of its Gladstone aluminium operations using renewable energy from Edify Energy Pty Ltd 600MW solar and 2,400MWh battery projects. Construction is set to begin in late 2025

and finish by 2028. These initiatives are expected to greatly improve the sustainability credentials of global aluminium production.

Looking ahead, the global aluminium market is projected to reach a value of USD 373.9 billion and a volume of 127.1 million tons by CY2030, indicating a CAGR of 4.3% in value and 2.7% in volume over the period CY2025 to CY2030.

The growing demand from the transportation sector is expected to drive aluminium market growth in the coming years. Due to its lightweight and high-strength characteristics, aluminium is a vital material in the manufacturing of electric vehicles (EVs), ICE automobiles and aircraft. The rapid expansion of the global EV market, supported by government incentives and strict emissions regulations, is likely to boost aluminium use in automotive applications. Additionally, Boeing's projection of a 67% increase in the global freighter fleet from 2,375 aircraft in 2024 to 3,975 by 2044 highlights aluminium's increasing importance in aviation. These developments are expected to sustain long-term demand and strengthen aluminium's position as a key material in next-generation transportation technologies. Beyond transportation, aluminium usage is also increasing in the building and construction (B&C) sector, where it offers improved performance, design flexibility, and reduced maintenance costs over the lifecycle compared to conventional materials. Additionally, the metal packaging segment is witnessing robust growth as industries shift away from plastic and glass, driven by circular economy goals and rising sustainability concerns. Compared to mild steel, aluminium has a lower density approximately one-third which significantly reduces weight in structural applications. Although aluminium is costlier than steel, its higher strength-to-weight ratio, corrosion resistance, and recyclability often lead to lower lifetime costs and superior environmental performance. These trends are expected to fuel long-term demand across multiple sectors.

**Price Trends:**

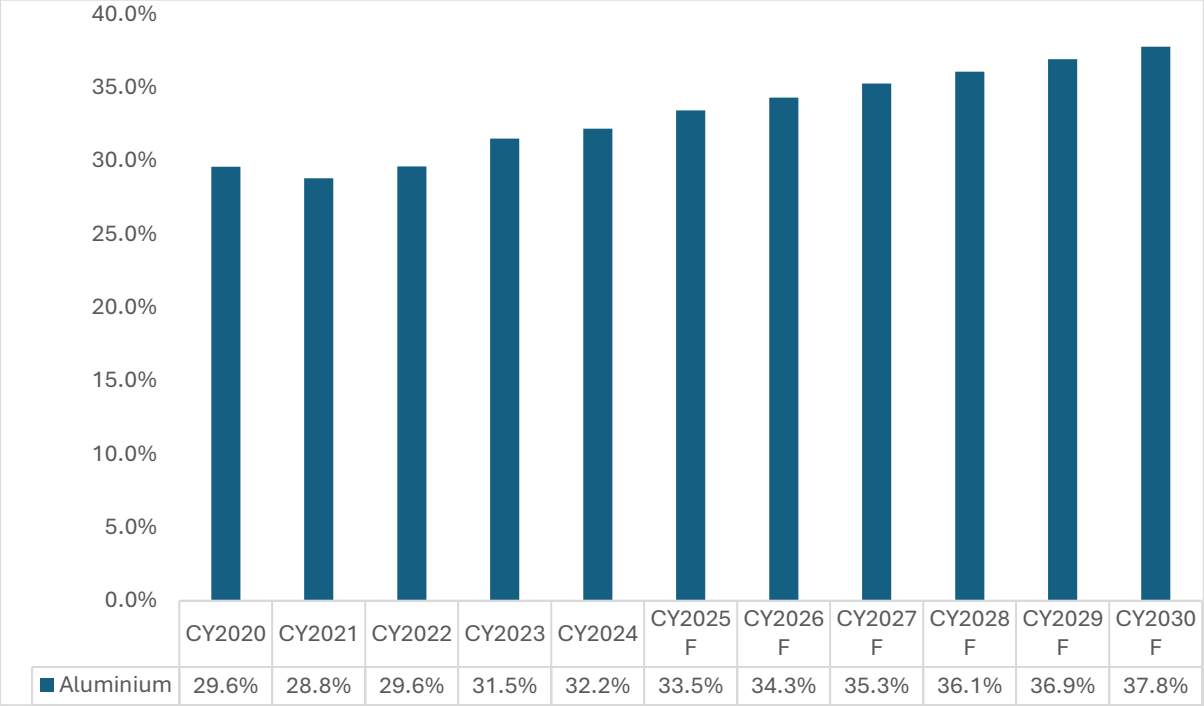
**Supply Chain Disruptions:** The aluminium industry continued to face severe disruptions in the global supply chain. The aftermath of the COVID-19 pandemic led to widespread logistical challenges, including port congestion, container shortages, and delays in the transportation of raw materials. In parallel, several mining operations were either halted or operating at reduced capacity due to labor shortages, health restrictions, and rising operational costs. These bottlenecks not only delayed raw material deliveries but also increased lead times and costs across the entire value chain, affecting both upstream (bauxite mining and alumina refining) and downstream (rolling and extrusion) operations.

**Geopolitical Factors:** The outbreak of the Russia-Ukraine war had a profound impact on global commodity markets, including aluminium. Russia is one of the prominent suppliers of aluminium, as well as its key inputs, including bauxite and alumina. The conflict, along with sanctions and trade restrictions, disrupted these supply chains, reducing the availability of raw materials in global markets. Simultaneously, the war triggered an energy crisis across Europe, as Russia significantly reduced its natural gas supplies. This led to skyrocketing energy costs, making aluminium smelting economically unviable for several European producers. Many smelters either reduced output or shut down entirely, further tightening the supply and fueling price increases. The uncertainty created by the conflict also impacted investor sentiment and procurement strategies, with many buyers seeking alternative supply sources often at higher costs.

**Energy Cost Increase:** Aluminium production is extremely energy-intensive, relying heavily on electricity and natural gas. The global surge in energy prices significantly increased smelting costs, particularly in regions dependent on fossil fuel-based power. This was further exacerbated by the Russia-Ukraine war, which triggered an acute energy crisis in Europe as Russian natural gas supplies were curtailed. The resulting spike in energy costs rendered aluminium smelting economically unsustainable for many European producers, leading to widespread output reductions and smelter shutdowns. These supply-side constraints contributed to a tighter global aluminium market and drove prices sharply higher.

### 3.3 Share of Recycled/Recovered Aluminium in Total Demand

**Chart: Global Metal Recycling and Recovery Market: Share of Recycled/Recovered Aluminium in Total Demand, (in %), CY2020-CY2030F**

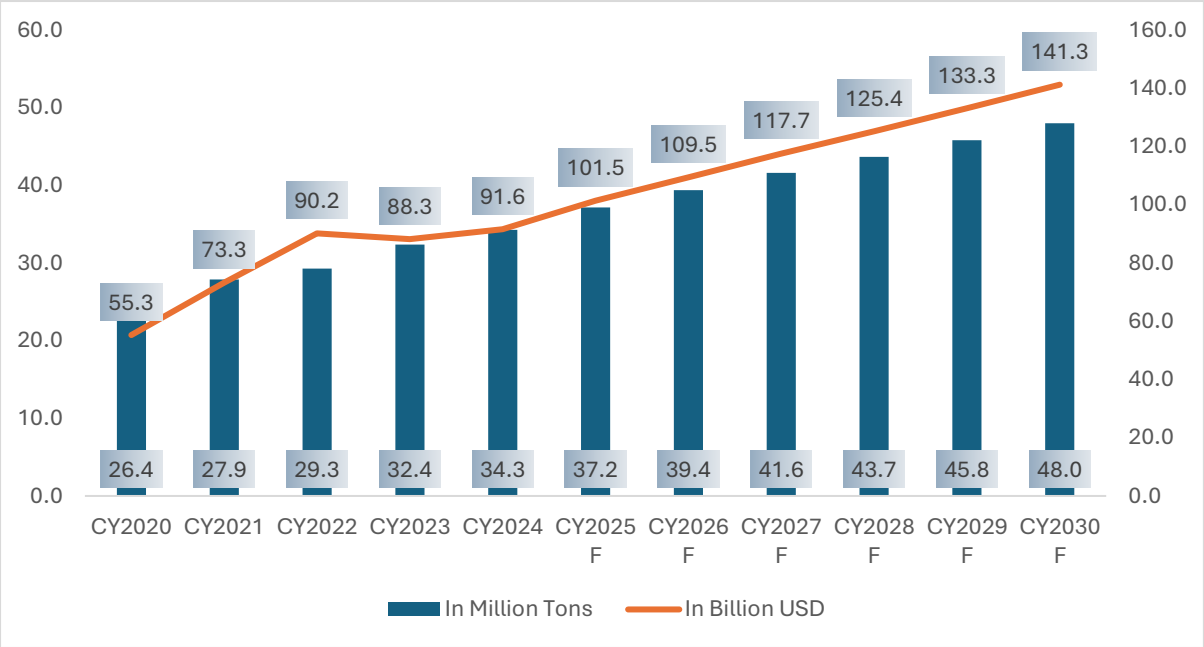



| | CY2020 | CY2021 | CY2022 | CY2023 | CY2024 | CY2025F | CY2026F | CY2027F | CY2028F | CY2029F | CY2030F |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Aluminium | 29.6% | 28.8% | 29.6% | 31.5% | 32.2% | 33.5% | 34.3% | 35.3% | 36.1% | 36.9% | 37.8% |

Source: IMARC, ICRA Analytics

### 3.3.1 Recycled Aluminium

**Chart: Global Recycled Aluminium Market Forecast: Sales Volume (in Million Tons) and Sales Value (in Billion USD)**




Source: IMARC, ICRA Analytics

The global recycled aluminium market reached a value of USD 91.6 billion and a volume of 34.3 million tons in CY2024, registering a CAGR of 13.5% in value and 6.8% in volume between CY2020 and CY2024.

The global aluminium recycling industry is highly fragmented, with thousands of small and mid-sized recyclers operating across regions. These medium and small sized players may incur lower capital expenditure to set up manufacturing facilities as compared with large sized players. This sometimes results in faster break-even period for these players as price differential between large and small players is typically minimal. This, however, results in a low bargaining power of a majority of recyclers, especially the small-scale recyclers.

The global recycled aluminium market is being propelled by its strong alignment with global sustainability goals and carbon reduction initiatives. Aluminium is endlessly recyclable without any loss in quality, making it an ideal material for sustainable industrial use. Moreover, 100% of aluminium can be recycled, reducing the need for extracting finite bauxite resources. Beyond energy and cost efficiency, aluminium recycling helps mitigate environmental damage by eliminating the need for bauxite mining, which often causes deforestation and habitat loss. It also reduces industrial water usage and minimizes hazardous waste like red mud. Moreover, recycling curbs air pollutants such as sulphur dioxide ($SO_2$) and nitrogen oxides ($NO_x$), improving local air quality and public health outcomes. Recycling aluminium consumes only 5% of the energy required for primary production, making it a key solution in lowering industrial emissions. While primary aluminium production emits ~2.9 $tCO_2$ per ton even under the best available technology, recycled aluminium has up to 5 times lower emissions. This significant energy efficiency advantage is expected to boost adoption across sectors such as construction. Additionally, secondary aluminium production has approximately 90% lower capital expenditure (capex) intensity compared to primary production, making it the most cost-effective pathway to

decarbonizing the industry. As industries increasingly prioritize sustainable sourcing and circular economy practices, the demand for recycled aluminium is projected to surge. While switching to greener energy sources (like hydro or natural gas) for primary aluminium smelting is an option, it comes at a 15–20% higher capex intensity compared to coal-based plants, further reinforcing the cost and climate case for recycled aluminium. Major investments, such as Hydro Aluminium Iberia S.A. U's EUR 180 million recycling plant in Torija, Spain, further reflect industry commitment to expanding capacity and reducing reliance on primary aluminium.

The environmental and economic advantages of aluminium recycling further reinforce its role in driving sustainable industrial practices. Recycling just one tonne of aluminium can save up to 8 tonnes of bauxite, 14,000 kWh of energy, and approximately 40 barrels of oil, significantly reducing the demand for virgin resource extraction. In fact, secondary aluminium production requires only 5% of the energy used in primary production, resulting in lower carbon emissions a critical factor in meeting global climate targets. Additionally, recycling aluminium avoids the ecological impacts of mining and refining, including land degradation and water pollution, while conserving up to 95% of the water required compared to producing primary aluminium. The process also supports a circular economy by enabling infinite recyclability without quality loss, thereby extending the material's lifecycle and reducing landfill waste. Beyond environmental benefits, aluminium recycling offers a cost-effective, low-capex pathway for industries to reduce their carbon footprint, while simultaneously generating employment in the recycling and materials recovery sectors. As global industries pivot toward sustainable sourcing and decarbonization, the strategic advantages of aluminium recycling make it an indispensable component of the green transition.

Looking ahead, the global recycled aluminium market is anticipated to reach a value of USD 141.3 billion and a volume of 48.0 million tons by CY2030, with a CAGR of 6.8% and 5.2%, respectively, from CY2025 to CY2030.

The shift toward electric vehicles (EVs) zis expected to further drive the use of recycled aluminium in automotive applications. Leading manufacturers like General Motors and Volkswagen are setting ambitious EV production targets, increasing the need for lightweight and sustainable materials. Currently, EVs account for around 18% of global car sales (as of 2024), and this penetration is expected to grow to over 40-45% by 2030, driven by strong policy support, improving charging infrastructure, and declining battery costs. OEMs are investing heavily in electrification Ford has committed over USD 50 billion towards EV development through 2026, Volkswagen aims for 80% of its European sales to be EVs by 2030, and General Motors plans to phase out internal combustion engine (ICE) vehicles by 2035.

Recycled aluminium is now widely used in battery housings and structural components, aided by advancements in alloy design and processing techniques that meet EV-specific performance requirements. Aluminium's light weight improves vehicle energy efficiency, enabling greater driving range and reducing battery size and cost. Research shows that a 10% weight reduction can lead to an improvement of up to 6–8% in EV range This makes aluminium a key enabler for achieving vehicle performance and efficiency targets in electric models. Moreover, EVs consume nearly 3 times more aluminium than ICE vehicles largely due to their need for lightweight structures, battery housings, and motor components. Countries with high recycling rates such as Italy underscore the market's positive trajectory, supported by effective collection systems, active consumer participation, and strong regulatory frameworks. For instance, in 2022, 73.6% of aluminium packaging in Italy was recycled, and with energy recovery, the total recovery rate

reached ~78%. The growing collaboration between manufacturers and recyclers to establish closed-loop systems is expected to further accelerate market expansion in the coming years.

**Price Trends:**

**High Aluminium Prices:** Primary aluminium prices in 2022 reached multi-year highs due to global supply disruptions and energy crises. This rise in prices made recycled aluminium comparatively more profitable, incentivizing scrap collection and secondary smelting. Many manufacturers turned to recycled sources to reduce costs, driving a sharp market expansion that year.

**Energy Crisis:** During the Russia-Ukraine war, European smelters faced soaring electricity costs, resulting in widespread curtailments of primary aluminium production. This created a supply gap in the market, which was partly filled by recycled aluminium, whose production requires significantly less energy. The shift contributed to an exceptional rise in demand during 2022.

**Economic Slowdown and Inventory Correction:** Despite strong fundamentals, the market faced a slight dip due to macroeconomic headwinds. Inflation, rising interest rates, and a slowdown in construction and automotive sectors (especially in Europe and North America) dampened demand. Moreover, overstocking in 2022, as buyers rushed to secure material amid price volatility, led to inventory corrections in 2023. These factors collectively resulted in a temporary decline in recycled aluminium market revenues, followed by an expected recovery in later years.

**Impact of China's Curbs on Primary Aluminium**

China's aluminium sector, long the backbone of global supply, is now approaching a critical structural threshold. As of 2024, the nation produced approximately 44 million metric tons of aluminium, nearing its 45-million-ton annual cap imposed by the government in 2017. This ceiling established to curb overcapacity and address environmental concerns has now become a binding constraint. With smelters running at 98.2% capacity in Q1 2025, China's ability to increase primary aluminium production is significantly limited. This constraint comes at a time when global aluminium demand continues to rise across industries like automotive, aerospace, renewable energy, and construction.

China's dominance in aluminium built over two decades through state-driven investments, preferential energy pricing, and strong downstream integration accounts for roughly 60% of global primary aluminium output. However, the country now faces sustainability-related limitations. As part of its decarbonization strategy, the government is shifting aluminium production from coal-heavy areas to cleaner energy regions like Yunnan and Inner Mongolia. While this supports long-term environmental goals, it does not raise total output due to the ongoing production cap, further tightening global supply.

Adding to this supply pressure, China eliminated the 13% export tax rebate on aluminium products in December 2024, leading to an 11% drop in exports in early 2025. Since Chinese aluminium exports fulfil nearly 15% of global demand, this policy shift significantly impacts global availability. With domestic production capped and exports declining, international consumers are increasingly turning to recycled (secondary) aluminium to close the supply gap.

Recycled aluminium is now central to restoring balance in the global aluminium market. Recognizing its importance, China has launched a national recycling campaign aiming to produce over 15 million metric tons of recycled aluminium annually by 2027. This approach not

only helps sidestep production limits but also reduces dependency on imported bauxite and alumina, while promoting industrial circularity.

Globally, momentum is building around recycled aluminium. Western economies like the U.S. and EU are heavily investing in recycling infrastructure, aiming to offset high energy costs and reduce reliance on China. Closed-loop systems are expanding in sectors like automotive and packaging, and regions such as Southeast Asia and Latin America are ramping up scrap collection and processing capacity to meet rising demand for low-carbon aluminium.

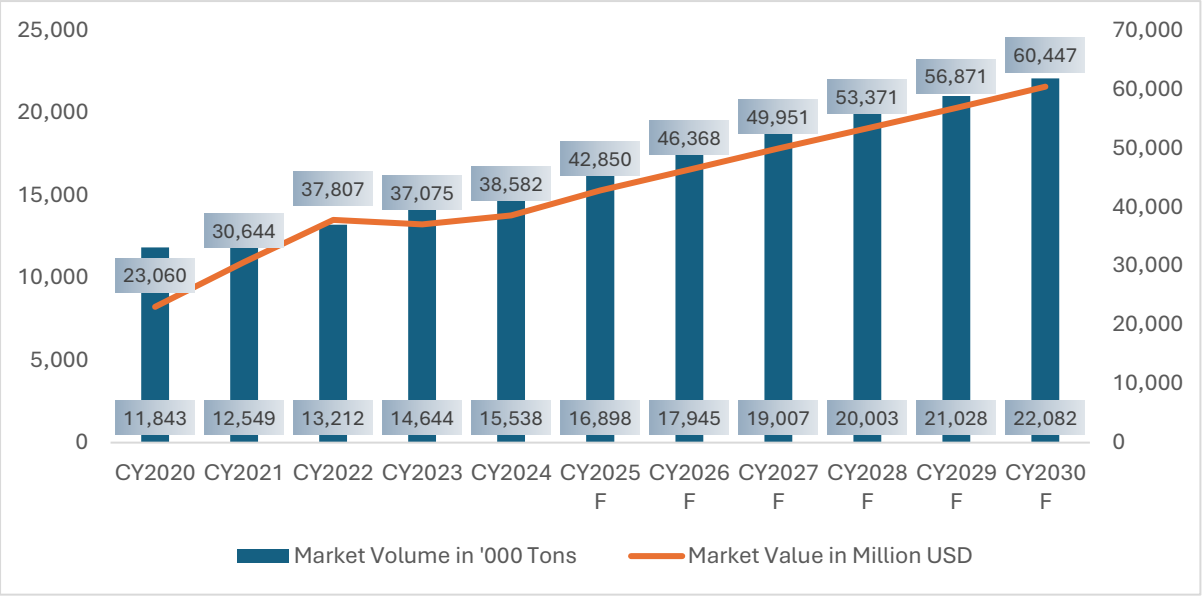
Simultaneously, Western nations are exploring ways to revive dormant smelting operations including 1 million tons of idle capacity in the U.S. and nearly half of Europe's capacity, which was shut down during the 2022 energy crisis. While power costs remain a hurdle, market conditions are improving. Notably, Century Aluminum Company has secured USD 500 million in U.S. federal funding to build the country's first new smelter in over four decades, and companies like Rio Tinto Group are evaluating low-carbon projects in Finland and India, leveraging renewables and advanced smelting technologies.

However, the growing reliance on recycled aluminium brings new challenges. Scrap availability varies widely across regions, and many developing countries face difficulties in scaling efficient collection systems. Additionally, scrap quality inconsistencies present technical obstacles for high-performance applications. These pressures are encouraging innovation in sorting technologies and prompting countries to build more organized global trade networks for recyclable materials.

### 3.3.2 Split of Recycled Aluminium

| Cast | CY2020 | CY2021 | CY2022 | CY2023 | CY2024 | CY2025 F | CY2026 F | CY2027 F | CY2028 F | CY2029 F | CY2030 F |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Market Volume in '000 Tons** | 11,843 | 12,549 | 13,212 | 14,644 | 15,538 | 16,898 | 17,945 | 19,007 | 20,003 | 21,028 | 22,082 |
| **Market Value in Million USD** | 23,060 | 30,644 | 37,807 | 37,075 | 38,582 | 42,850 | 46,368 | 49,951 | 53,371 | 56,871 | 60,447 |
| **Rolled** | | | | | | | | | | | |
| **Market Volume in '000 Tons** | 6,547 | 6,974 | 7,383 | 8,229 | 8,781 | 9,596 | 10,241 | 10,904 | 11,536 | 12,192 | 12,874 |
| **Market Value in Million USD** | 15,318 | 20,448 | 25,346 | 24,975 | 26,119 | 29,121 | 31,641 | 34,228 | 36,730 | 39,314 | 41,978 |
| **Extrusion** | | | | | | | | | | | |
| **Market Volume in '000 Tons** | 5,518 | 5,753 | 5,960 | 6,503 | 6,791 | 7,259 | 7,578 | 7,891 | 8,165 | 8,441 | 8,717 |
| **Market Value in Million USD** | 11,834 | 15,480 | 18,802 | 18,154 | 18,604 | 20,311 | 21,609 | 22,890 | 24,052 | 25,208 | 26,356 |
| **Others** | | | | | | | | | | | |
| **Market Volume in '000 Tons** | 2,492 | 2,624 | 2,745 | 3,024 | 3,190 | 3,446 | 3,636 | 3,828 | 4,003 | 4,183 | 4,367 |
| **Market Value in Million USD** | 5,088 | 6,725 | 8,254 | 8,053 | 8,340 | 9,199 | 9,888 | 10,582 | 11,234 | 11,895 | 12,565 |

### 3.3.2.1 Cast Aluminium:

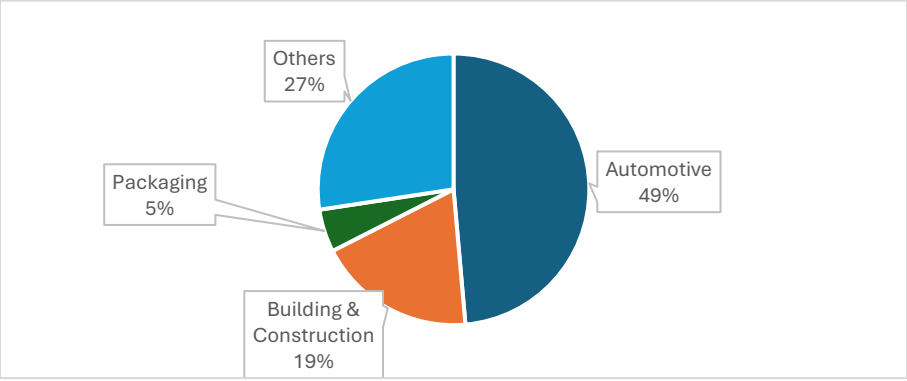



Source: IMARC, ICRA Analytics

Cast aluminium is a form of aluminium produced by melting and pouring the metal into moulds, typically used for creating complex-shaped components.

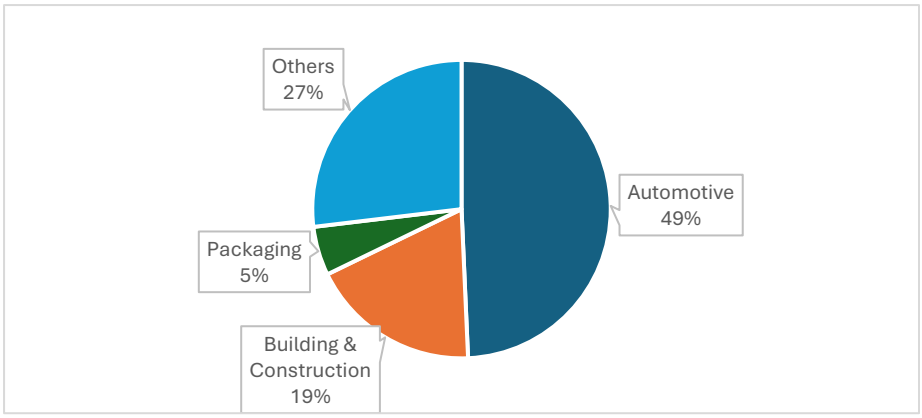
**Market segregation by end-user segment (in % terms)**

**Cast Aluminium in CY2020**



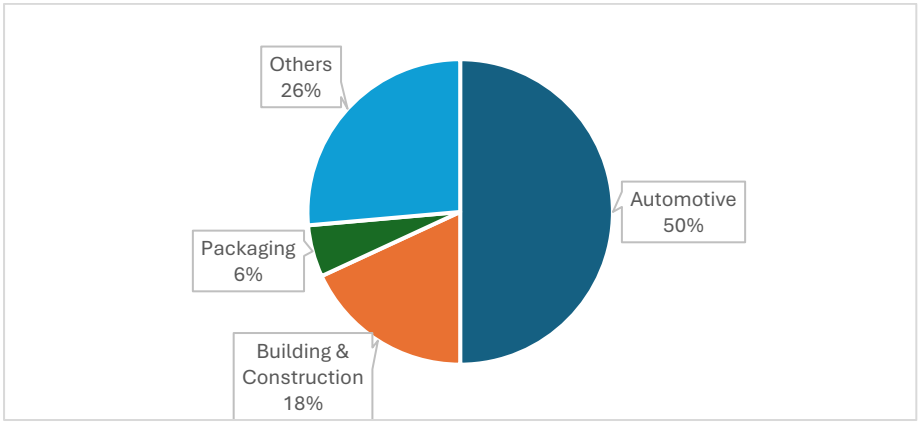

Source: IMARC, ICRA Analytics

**Cast Aluminium in CY2024**




Source: IMARC, ICRA Analytics

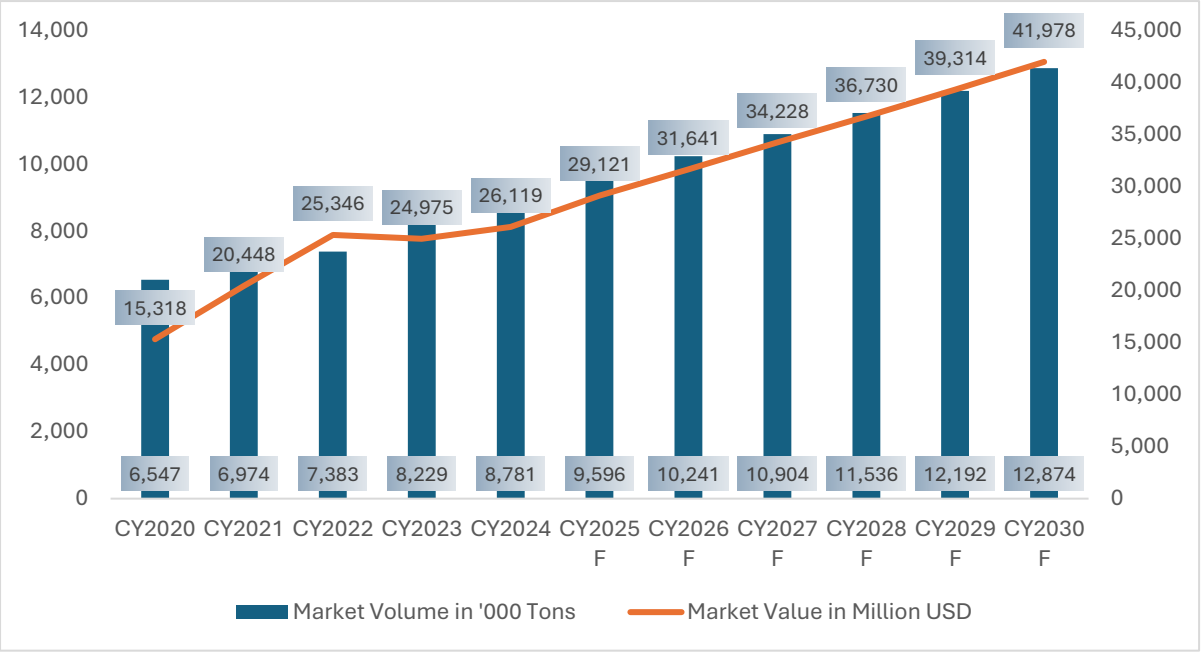
**Cast Aluminium in CY2030F**




Source: IMARC, ICRA Analytics

Recycled cast aluminium remains the dominant form of secondary aluminium globally, accounting for approximately 45.3% of total recycled aluminium demand in CY2024, largely driven by its extensive use in the automotive sector. Its excellent fluidity and machinability make it ideal for casting engine blocks, transmission housings, cylinder heads, and other complex components key in reducing vehicle weight to meet tightening emission regulations. The shift toward electric vehicles (EVs), which have higher aluminium content than traditional vehicles, has further bolstered demand. According to the Federal Reserve Bank of St. Louis, 15.5 million lightweight vehicles were sold globally in 2023, reflecting growing consumer demand for fuel-efficient transport solutions. This trend, along with the use of post-consumer scrap to produce low-carbon aluminium, is driving innovation. For instance, in April 2024, Norsk Hydro launched a new recycling unit at its Årdal plant in Norway, enabling the facility to process 25,000 metric tons of post-consumer scrap annually and deliver Reduxa 3.0 aluminium, which has a carbon footprint 80% below the global average. “The demand for low-carbon aluminium is increasing, particularly in the automotive industry,” says Eivind Kallevik, executive vice president at Hydro. “Thanks to the cutting-edge technology and know-how utilized by our team in Årdal, customers can reduce the carbon footprint in their value chain and get closer to achieving their climate targets.”

### 3.3.2.2 Rolled Aluminium:

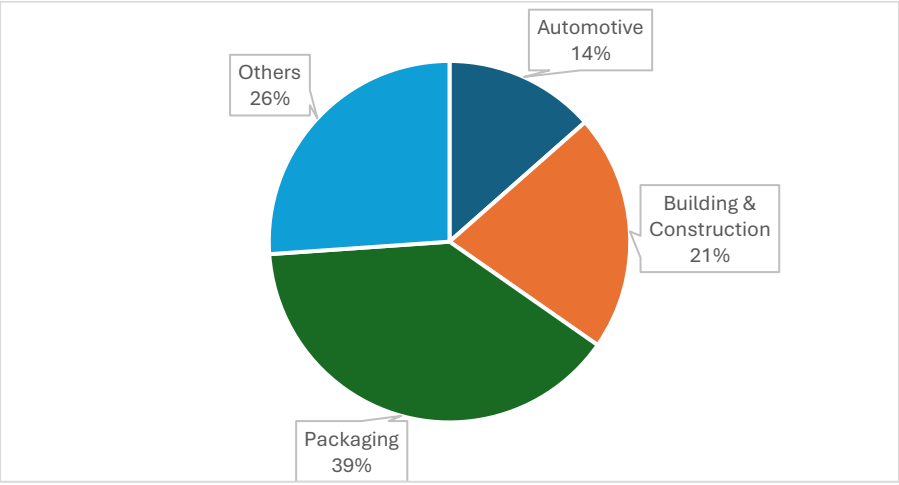



Source: IMARC, ICRA Analytics

Rolled aluminium is made by compressing recycled aluminium ingots or slabs between rollers to produce sheets, plates, or foils of varying thicknesses. Known for its excellent surface finish, lightweight properties, and recyclability, rolled aluminium finds wide application in packaging, automotive panels, and construction. It offers superior formability and is especially suited for thin-gauge or flat-surface applications.

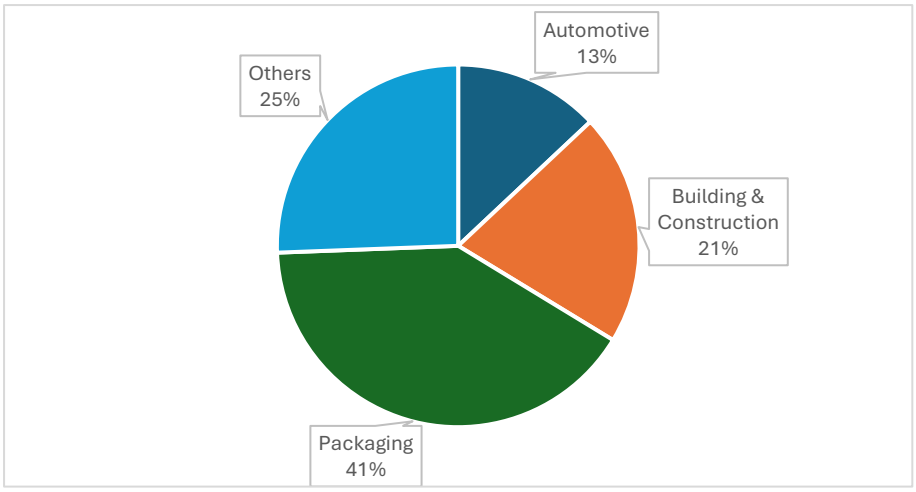
**Market segregation by end-user segment (in % terms)**

**Rolled Aluminium in CY2020**



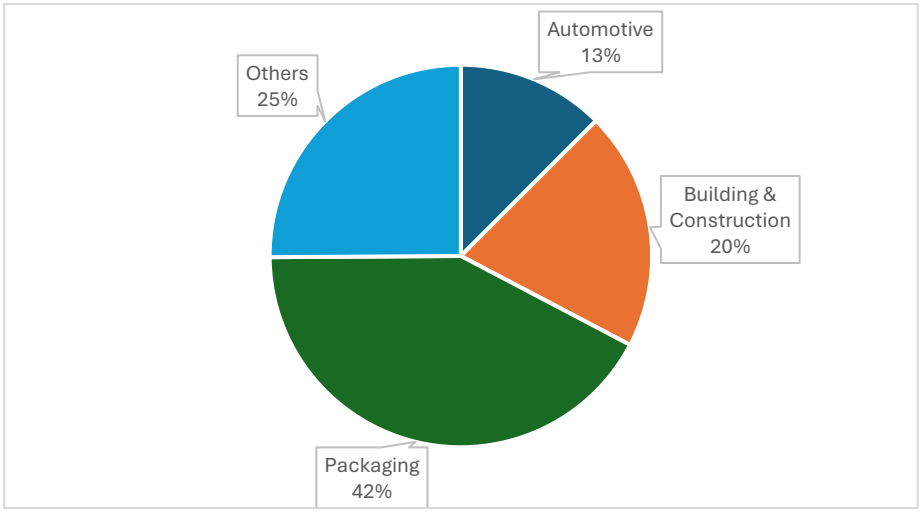

Source: IMARC, ICRA Analytics

**Rolled Aluminium in CY2024**




Source: IMARC, ICRA Analytics

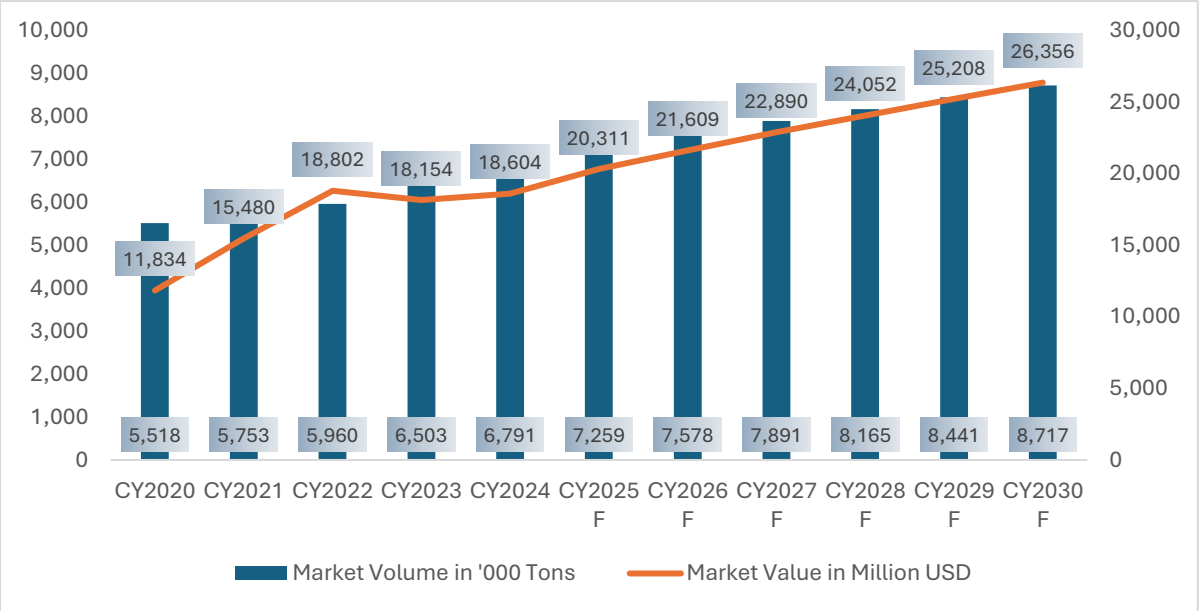
**Rolled Aluminium in CY2030F**




Source: IMARC, ICRA Analytics

In CY2024, recycled rolled aluminium accounted for 28.5% of global secondary aluminium consumption, driven by strong demand for sustainable materials. In the packaging industry, aluminium foils derived from recycled content are extensively used in pharmaceuticals, food packaging, and beverage cans, thanks to aluminium's barrier properties and hygiene. To support this growth, companies are investing in high-speed rolling mills and closed-loop recycling systems. On July 17, 2024, Novelis announced a USD 90 million investment to double its used beverage can (UBC) recycling capacity at its Latchford, UK facility. The expansion adding 85 kilotonnes per year aims to support the UK's future deposit return scheme and reduce annual $CO_2e$ emissions by over 350,000 tonnes. This move reflects Novelis' broader strategy to achieve full circularity and offer high-recycled, low-carbon aluminium solutions across Europe.

### 3.3.2.3 Extruded Aluminium:

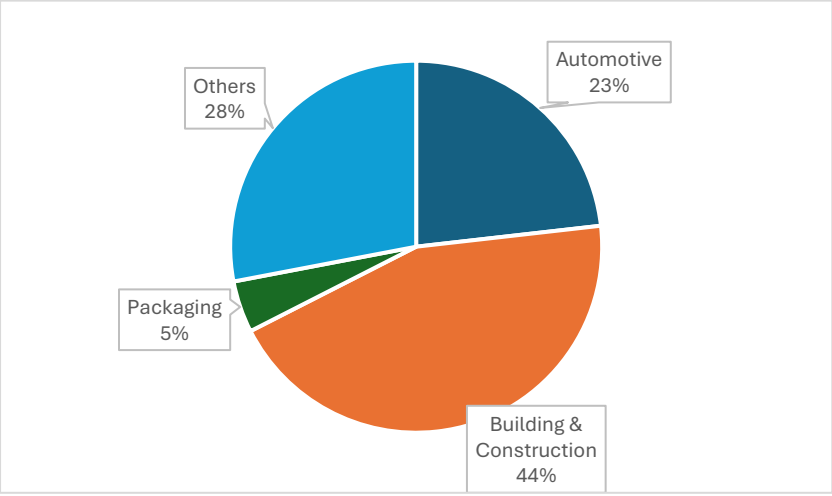



Source: IMARC, ICRA Analytics

Extruded aluminium is made by forcing recycled aluminium billets through a die to create uniform profiles like tubes, rods, and frames, commonly used in construction and industrial sectors.

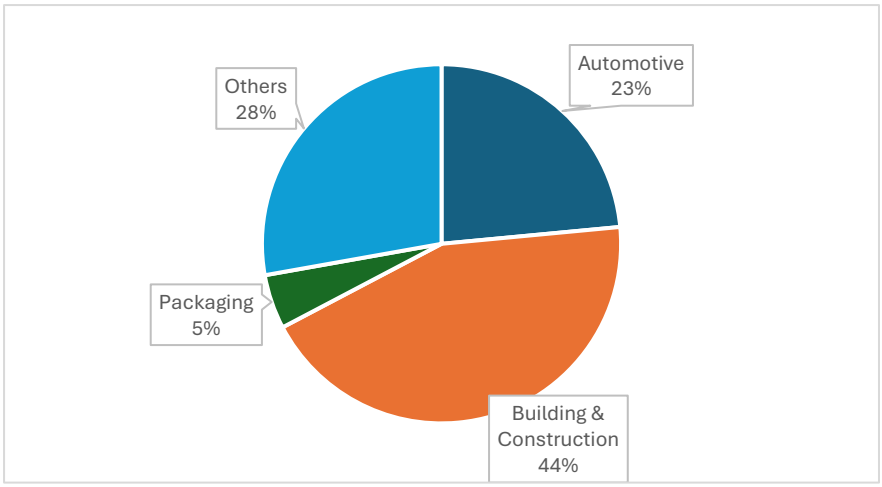
**Market segregation by end-user segment (in % terms)**

**Extruded Aluminium in CY2020**



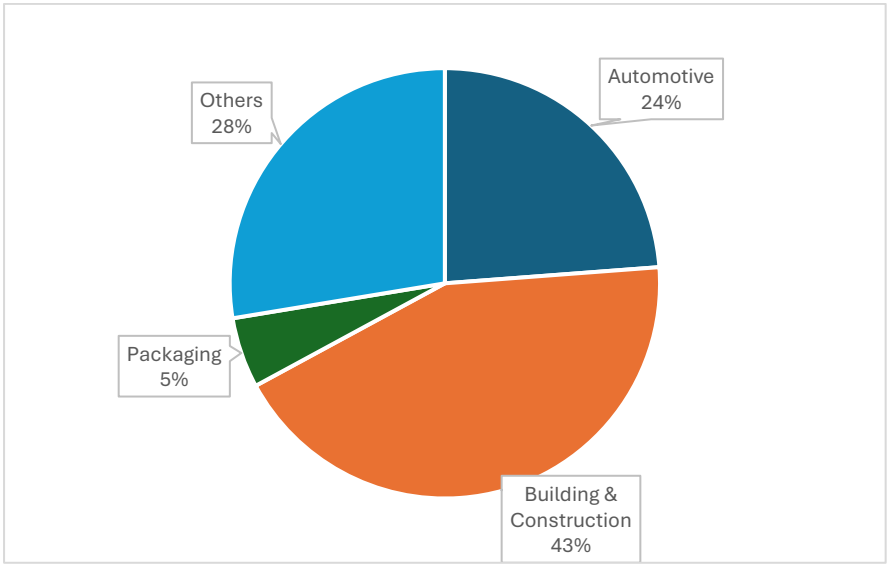

Source: IMARC, ICRA Analytics

**Extruded Aluminium in CY2024**




Source: IMARC, ICRA Analytics

**Extruded Aluminium in CY2030F**




Source: IMARC, ICRA Analytics

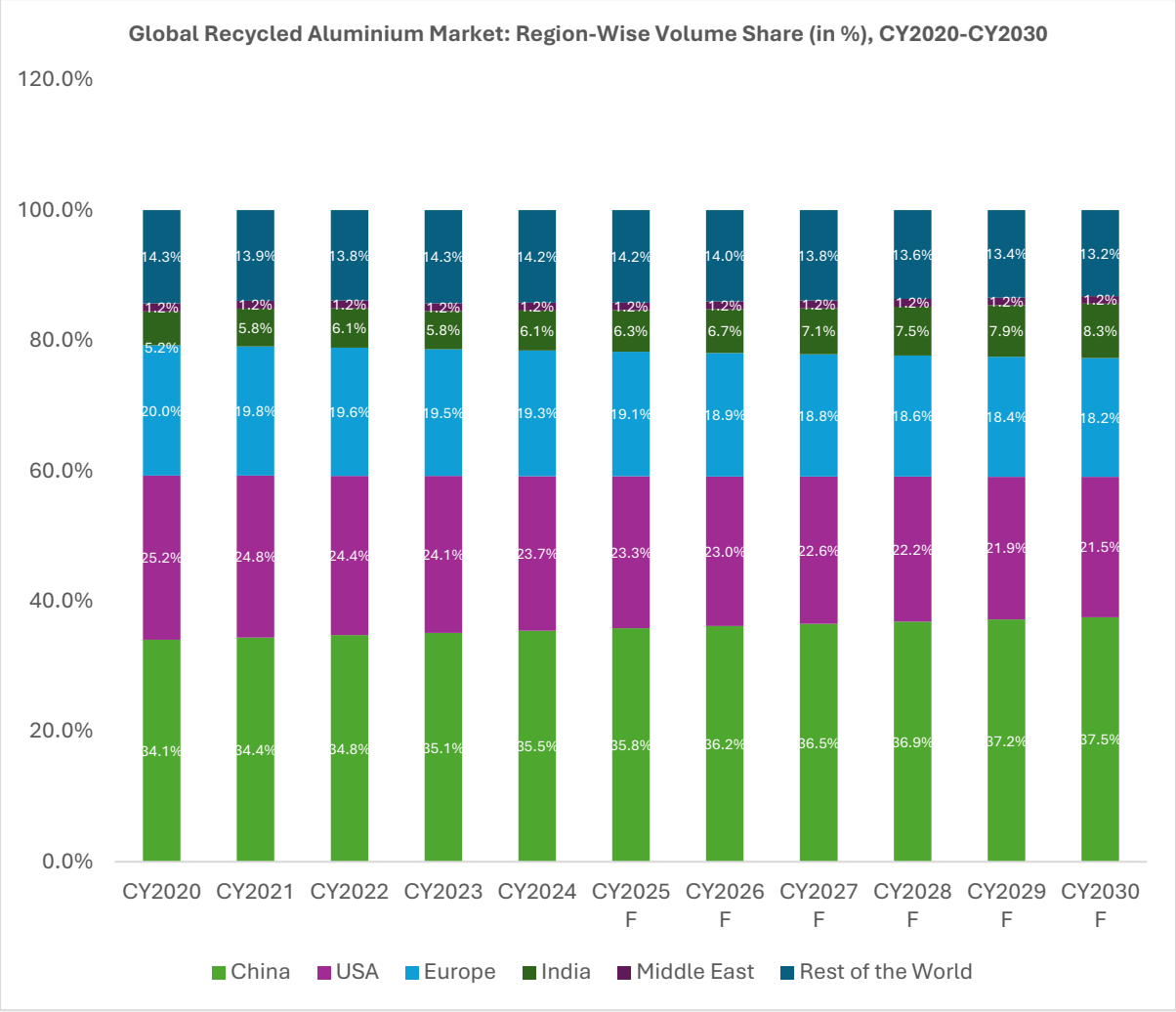
In CY2024, recycled extruded aluminium made up 20.3% of global secondary aluminium demand, with widespread use in the building and construction (B&C) industry for window and door frames, curtain walls, and structural systems. Its strength, corrosion resistance, and design flexibility make it ideal for load-bearing applications. Earlier in the year 2024, deep-tech entrepreneur Eric Donsky launched Atomic13 a joint venture with a major North American scrap firm to commercialize the Shear Assisted Processing and Extrusion (ShAPE) technology developed at the U.S. DOE's Pacific Northwest National Laboratory. ShAPE refines aluminium's grain structure using shear and axial forces, enabling the use of 100% post-consumer scrap to produce low-carbon, high-performance extrusions. Atomic13 is targeting the B&C market. Moreover, in October 2024, India's Nupur Recyclers Ltd. announced its entry into aluminium extrusion through its subsidiary Nupur Extrusion, investing over USD 2.1 million to set up a plant in Haryana with a target capacity of 5,000–6,000 tons by FY 2025–2026. NRL has already ordered two extrusion presses and plans to supply products like solar panel components and construction materials, reinforcing its sustainability focus and market expansion.

### 3. 4 Region-wise demand for recycled & recovered metals from key geographies

| Shares in % | CY2020 | CY2021 | CY2022 | CY2023 | CY2024 | CY2025 F | CY2026 F | CY2027 F | CY2028 F | CY2029 F | CY2030 F |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **China** | 34.1% | 34.4% | 34.8% | 35.1% | 35.5% | 35.8% | 36.2% | 36.5% | 36.9% | 37.2% | 37.5% |
| **USA** | 25.2% | 24.8% | 24.4% | 24.1% | 23.7% | 23.3% | 23.0% | 22.6% | 22.2% | 21.9% | 21.5% |
| **Europe** | 20.0% | 19.8% | 19.6% | 19.5% | 19.3% | 19.1% | 18.9% | 18.8% | 18.6% | 18.4% | 18.2% |
| **India** | 5.2% | 5.8% | 6.1% | 5.8% | 6.1% | 6.3% | 6.7% | 7.1% | 7.5% | 7.9% | 8.3% |
| **Middle East** | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% | 1.2% |
| **Rest of the World** | 14.3% | 13.9% | 13.8% | 14.3% | 14.2% | 14.2% | 14.0% | 13.8% | 13.6% | 13.4% | 13.2% |

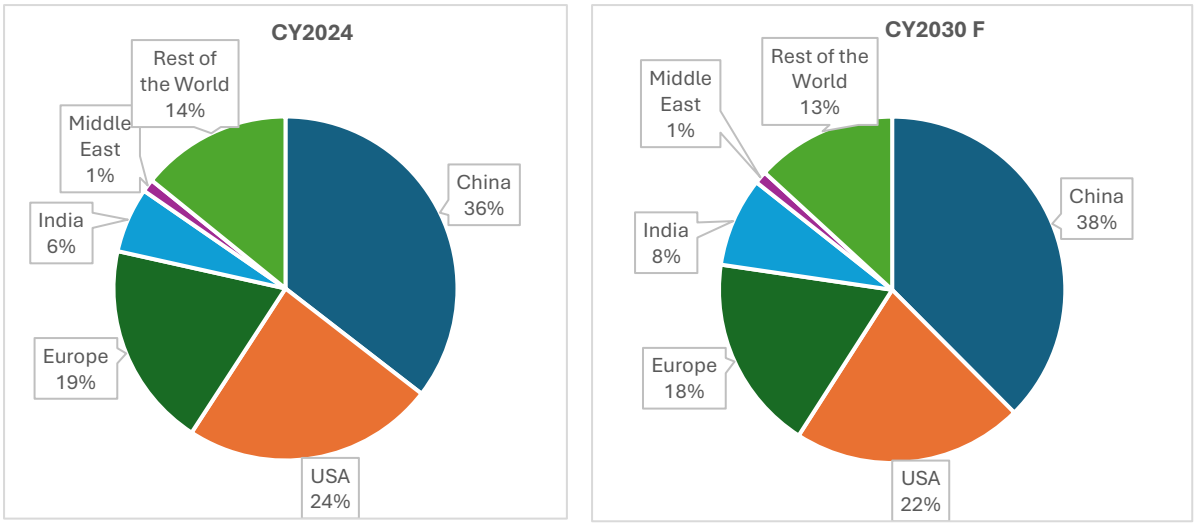
Source: IMARC Group, ICRA Analytics

### Region-wise share of volume, CY2020- CY2030F



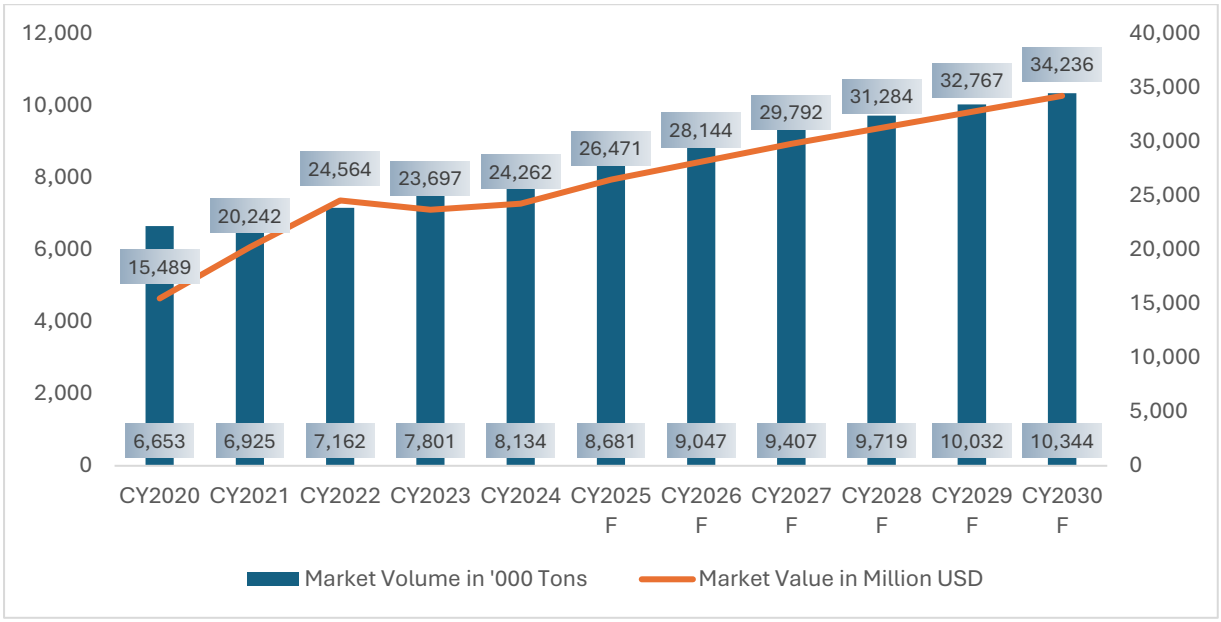

Source: IMARC Group, ICRA Analytics

**Region-wise share of volume in CY2024 and CY2030F**




Source: IMARC Group, ICRA Analytics

### 3.4.1 United States of America




Source: IMARC Group, ICRA Analytics

The United States remains one of the world's largest consumers of recycled and recovered metals, with an increasing emphasis on sustainability and circular economy practices. This shift reflects a broader commitment to reducing industrial carbon footprints and conserving natural resources. Among the most prominent recycled materials is aluminium, which has become a critical component in the U.S. strategy to transition toward greener manufacturing.

In 2023, the United States recovered approximately 3.3 million metric tons of aluminium from scrap, with 55% originating from new (manufacturing) scrap and 45% from old (post-consumer) scrap. This recovery met about 38% of apparent U.S. aluminium consumption, showcasing the scale and maturity of the country's scrap collection and recycling infrastructure. This marks a significant structural shift in domestic supply chains, reflecting not only cost advantages but also growing environmental imperatives among manufacturers and policymakers.

Demand for recycled aluminium remains strong across multiple sectors particularly in automotive, construction, packaging, and electrical applications where lightweight, low-emission materials are increasingly prioritized. Companies are drawn to aluminium's excellent recyclability, with the recycling process requiring only about 5% of the energy needed for primary production and emitting substantially less $CO_2$ per tonne. As energy prices fluctuate and primary smelting faces capacity and environmental constraints, recycled aluminium is increasingly viewed as a strategic resource, driving both private sector investment in scrap processing technologies and public support for circular economy initiatives.

In 2024, United States of America's recycled aluminium markets reached values of USD 24,262 million growing at CAGRs of 11.9% during CY2020 to CY2024. Looking forward, the USA's recycled aluminium is projected to reach USD 34,236 million by CY2030 expanding at CAGR of 5.3% during CY2025 to CY2030.

In CY2024, United States of America's recycled aluminium market reached volumes of 8,134 thousand tons growing at CAGR of 5.2% during CY2020–CY2024. Looking forward, the USA's recycled aluminium is projected to reach 10,344 thousand tons by CY2030 expanding at CAGR of 3.6%, during CY2025 to CY2030

**3.4.2 Europe**

The recycled and recovered metals market in Europe is experiencing a critical transformation, driven by regulatory goals, technological investments, and industrial decarbonization priorities especially within the aluminium segments. The European Union aims to recycle 70% of all metal waste by 2030, a target that is catalyzing the development of advanced recycling infrastructure and the promotion of circular economy practices across member states. The recycled aluminium market in Europe is rapidly advancing, driven by strong regulatory momentum and major technological investments. Projects like RecAL, coordinated by the Austrian Institute of Technology and supported by Horizon Europe, are developing advanced alloy separation technologies, AI-powered sorting systems, and cleaner melting processes to optimize recycling output. Leading companies are also scaling capacity: Speira GmbH invested €6.4 million in a new furnace in Hamburg in 2024, increasing capacity by 7,500 tons annually while reducing energy usage by 15%. Similarly, Hydro's €180 million facility under construction in Torija, Spain will boost the continent's ability to retain and process post-consumer scrap, minimizing export dependency and emissions. The implementation of the Carbon Border Adjustment Mechanism (CBAM), which imposes a carbon cost on imported goods such as aluminium, further incentivizes the local sourcing of low carbon, recycled metal and strengthens demand for domestic recyclers who can offer greener inputs.

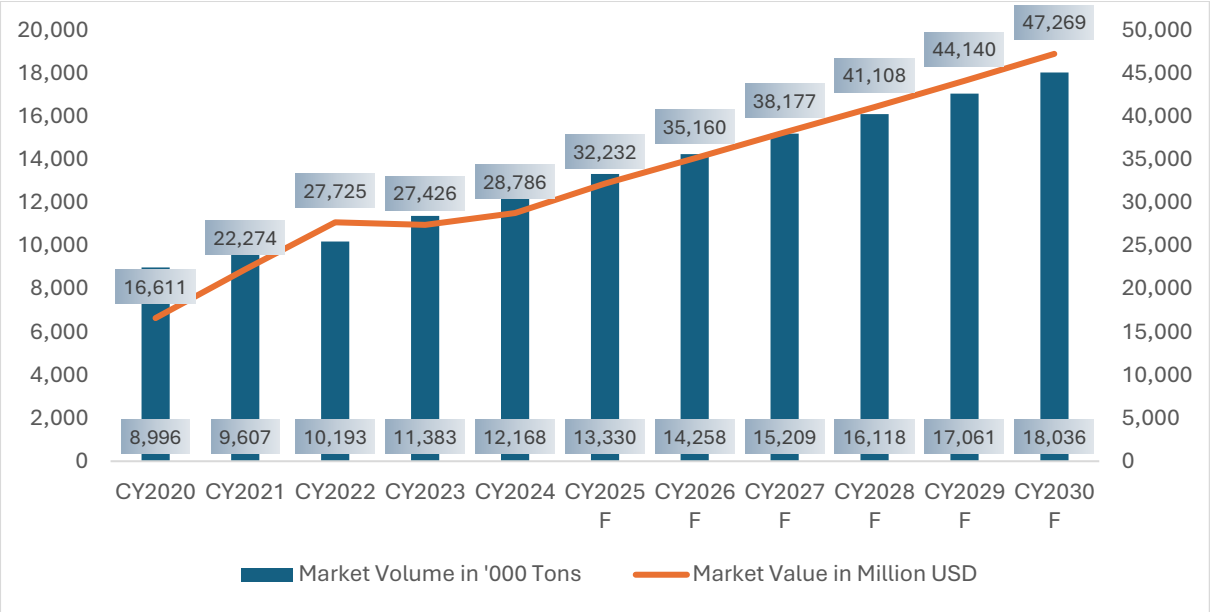
The longstanding presence of recycled inputs especially in sectors such as automotive and beverage packaging demonstrates that the use of recycled metal has historically been driven by scrap availability and cost efficiency. However, recent trends indicate a growing shift from opportunistic recycling to strategic integration, particularly as OEMs increasingly push for higher post-consumer recycled content to meet both regulatory and corporate sustainability goals. Advanced closed-loop recycling models, already adopted by leading OEMs and packaging firms, are helping secure stable, high-quality secondary metal streams while reducing dependency on virgin raw materials. With Europe recording an 81% recycling efficiency rate the highest globally, the region stands out as a leader in aligning industrial practice with environmental goals. As the EU accelerates its transition toward greener industry models, coordinated policy support,

investment in recycling infrastructure, and robust demand creation mechanisms will be pivotal in driving long-term growth of the recycled metals market.

In 2024, Europe's recycled aluminium markets reached values of USD 19,062 million growing at CAGRs of 12.5% during CY2020 to CY2024. Looking forward, Europe's recycled aluminium is projected to reach USD 27,914 million by CY2030 expanding at CAGR of 5.9% during CY2025–CY2030.

In CY2024, Europe's recycled aluminium market reached volumes of 6,620 thousand tons growing at CAGR of 5.8% during CY2020–CY2024. Looking forward, Europe's recycled aluminium is projected to reach 8,766 thousand tons by CY2030 expanding at CAGR of 4.3%, during CY2025–CY2030.

### 3.4.3 China




Source: IMARC Group, ICRA Analytics

China is the world's largest producer and consumer of metals, and its demand for recycled and recovered metals has grown steadily in recent years, driven by tightening environmental regulations, urban mining efforts, and industrial decarbonization goals. The shift away from heavy reliance on primary metal production due to its high energy intensity and environmental toll is encouraging the adoption of recycled materials across key sectors such as construction, automotive, electrical, and packaging. China's "dual carbon" policy goals (carbon peaking by 2030 and neutrality by 2060) are reshaping supply chains, making recycled metals an essential part of the nation's green transition.

Recycled aluminium, in particular, has seen significant momentum. As of 2023, China produced over 11 million metric tons of secondary aluminium, accounting for roughly 25–30% of its total aluminium output. In China, domestic aluminium scrap accounted for 89% of the total raw materials used in secondary aluminium, meaning that production has become significantly more independent of imports and external volatility. This demand is largely fuelled by industries seeking lightweight, low-emission materials especially the automotive and transportation sector, where electric vehicles are driving growth. China's scrap import restrictions have also accelerated domestic aluminium recycling infrastructure development, with more emphasis now placed on improving collection, sorting, and processing capabilities. Government-

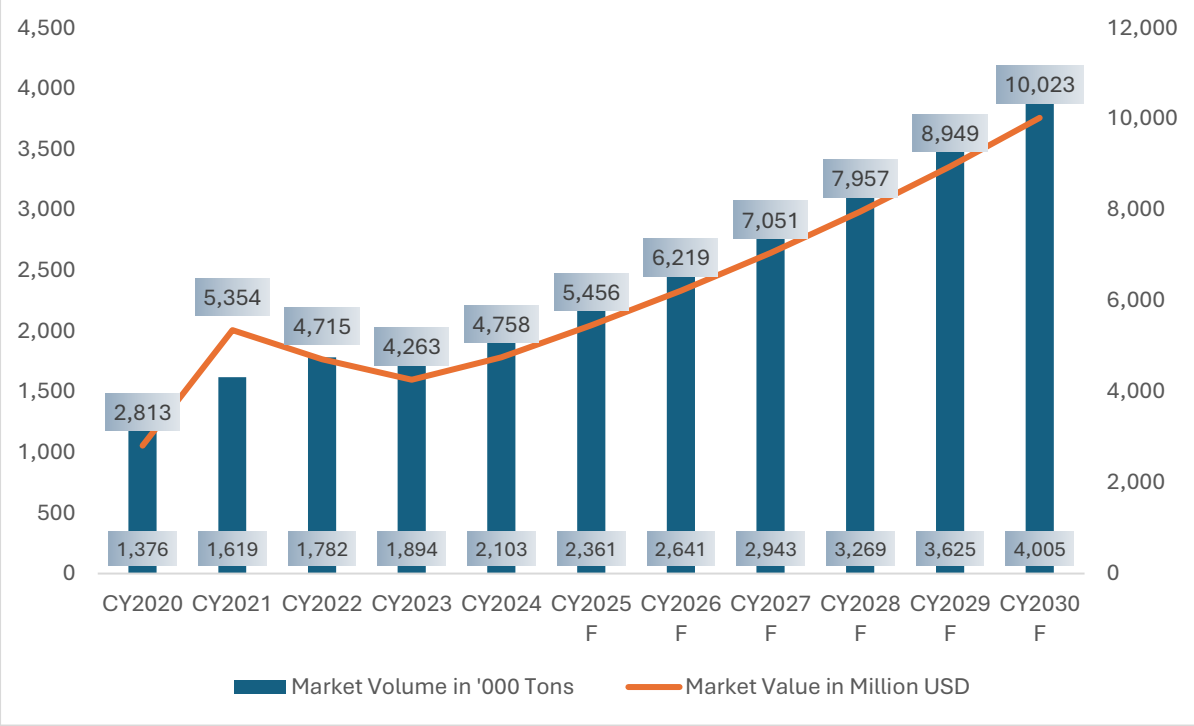
supported pilot programs for scrap recycling and circular economy zones are creating a more integrated value chain for secondary aluminium.

Looking ahead, OEMs in China are under increasing pressure to incorporate post-consumer recycled (PCR) content in their products, aligning with both global supply chain expectations and domestic policy reforms. Additionally, initiatives like the "Green Factory" certification program and tighter emission limits on primary smelters are pushing manufacturers toward sustainable alternatives. With an abundant urban scrap base and rising aluminium consumption in downstream manufacturing, China's demand for recycled aluminium is poised for long-term growth, supported by regulatory incentives, green finance mechanisms, and emerging technologies in scrap recovery and smelting efficiency.

In CY2024, China's recycled aluminium markets reached values of USD 28,786 million growing at CAGRs of 14.7% during CY2020 to CY2024. Looking forward, China's recycled aluminium is projected to reach USD 47,269 million by CY2030 expanding at CAGR of 8.0% during CY2025–CY2030.

In CY2024, China's recycled aluminium market reached volumes of 12,168 thousand tons growing at CAGR of 7.8% during CY2020–CY2024. Looking forward, China's recycled aluminium is projected to reach 18,036 thousand tons by CY2030 expanding at CAGR of 6.2%, during CY2025–CY2030.

### 3.4.4 India




Source: IMARC Group, ICRA Analytics

India’s demand for recycled and recovered metals is growing rapidly, fuelled by accelerating industrialization, urban infrastructure expansion, and a national push toward sustainable development. The domestic recycling ecosystem is still largely informal but evolving fast, with an estimated 1.5 million workers contributing to various stages of the value chain from scrap collection to processing. Although the organized segment remains nascent, it holds significant potential to boost circular economy efforts. Non-ferrous metals, including aluminium, account

for nearly 30% of the scrap market, reflecting their essential role in key industries. However, constrained by fragmented logistics, inadequate collection mechanisms, and limited technological integration, India remains heavily reliant on imports approximately 85–90% of its aluminium scrap is sourced from abroad, underscoring the need to develop self-sufficient domestic recycling infrastructure.

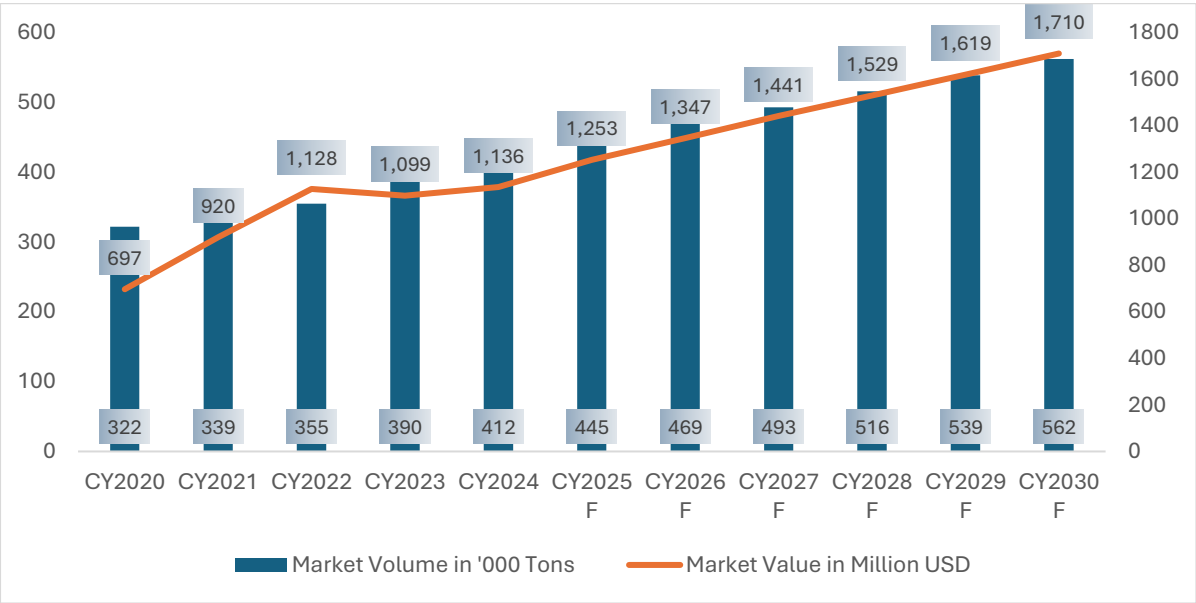
Recycled aluminium plays a crucial role in meeting India's overall aluminium demand, currently fulfilling about ~40% of the country's 5.3 million tonnes per year. Consumption of secondary aluminium rose approximately 1.7 million tonnes in 2023 and is projected to reach 2.4–2.5 million tonnes by 2028. The automotive sector drives nearly 40% of this demand, with construction, packaging, electrical, and consumer durables contributing significantly. The energy used in secondary aluminium production is just 5% of what's needed for primary aluminium, making it an attractive low-carbon alternative.

Thus, to support this transition, the Indian government has launched initiatives like Extended Producer Responsibility (EPR), the National Resource Efficiency Policy (NREP), and the vehicle scrappage policy. These aim to formalize recycling practices and strengthen local capacity.

In CY2024, India's recycled aluminium markets reached values of USD 4,758 million growing at CAGRs of 14.0% during CY2020 to CY2024. Looking forward, India's recycled aluminium is projected to reach USD 10,023 million by CY2030 expanding at CAGR of 12.9% during CY2025–CY2030.

In CY2024, India's recycled aluminium market reached volumes of 2,103 thousand tons growing at CAGR of 11.2% during CY2020–CY2024. Looking forward, India's recycled aluminium is projected to reach 4,005 thousand tons by CY2030 expanding at CAGR of 11.2%, during CY2025–CY2030.

### 3.4.5 Middle East




Source: IMARC Group, ICRA Analytics

The Middle East recycled and recovered metals market is being increasingly driven by national sustainability goals, industrial diversification, and infrastructure investments focused on

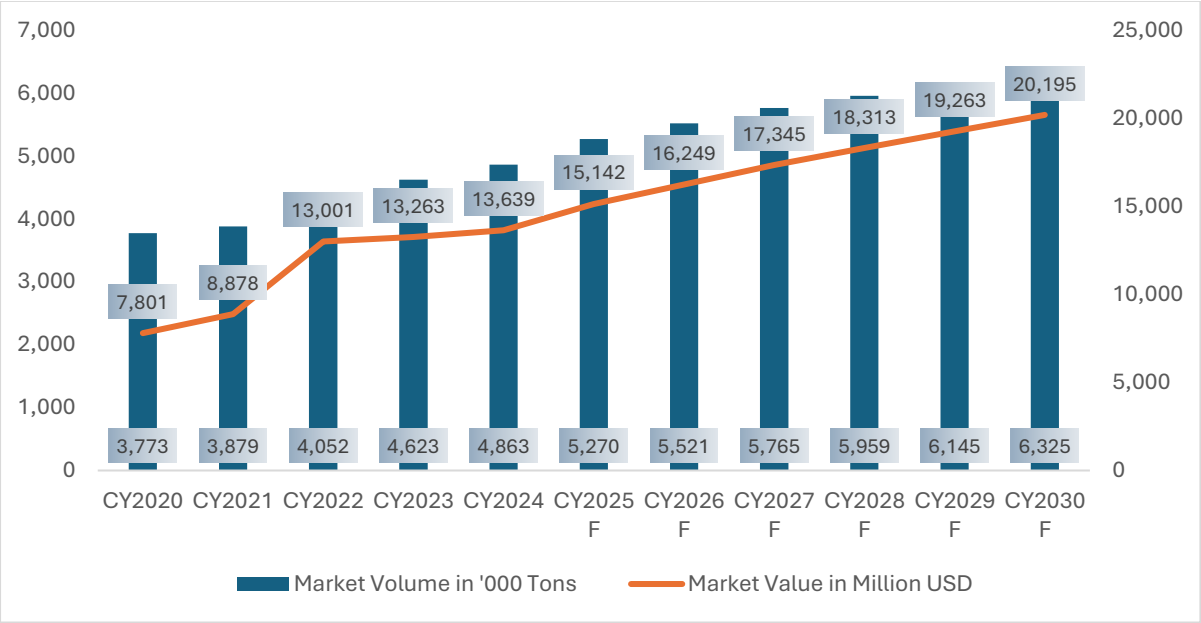
aluminium, zinc, and stainless steel. The United Arab Emirates (UAE) is at the forefront of this transition.

In the aluminium segment, demand for low-carbon inputs has prompted major investments across the region. Emirates Global Aluminium (EGA), the largest industrial company in the UAE outside oil and gas, is constructing the country's largest aluminium recycling facility. In Kuwait, sustainability efforts are also gaining traction. ReAs Gulf Cooperation Council (GCC) countries push toward green industrial policies, supported by circular economy frameworks and international trade linkages, the Middle East is poised to become a growing hub for sustainable metal recycling across aluminium, stainless steel, and others.

In CY2024, Middle East's recycled aluminium markets reached values of USD 1,136 million growing at CAGRs of 13.0% during CY2020–CY2024. Looking forward, Middle East's recycled aluminium markets are projected to reach USD 1,710 million by CY2030, expanding at CAGR of 6.4% during CY2025–CY2030.

In CY2024, Middle East's recycled aluminium markets reached volumes of 412 thousand tons, growing at CAGR of 6.4%, during CY2020–CY2024. Looking forward, Middle East's recycled aluminium markets are projected to reach 562 thousand Tons by CY2030, expanding at CAGR of 4.8% during CY2025–CY2030.

### 3.4.6 Rest of the world




Source: IMARC Group, ICRA Analytics

In the rest of the world, particularly in Southeast Asia, Latin America, and Oceania the demand for recycled and recovered metals is steadily gaining traction, driven by economic modernization, infrastructure growth, and global sustainability pressures. Countries like Brazil, Vietnam, Indonesia, and Australia are increasingly adopting circular economy frameworks to reduce their dependency on primary raw materials and align with global ESG standards. Rapid urbanization in Latin America and parts of Southeast Asia has led to increased scrap generation, while export restrictions on primary metals are prompting a greater emphasis on domestic recycling initiatives.

Recycled aluminium is emerging as a key material in these regions due to its energy efficiency, cost-effectiveness, and compatibility with industries such as automotive, packaging, construction, and electrical. In Latin America, Brazil stands out as a major consumer and recycler of aluminium, with a well-established can-to-can recycling model that reports aluminium can recycling rates above 95%. In Southeast Asia, aluminium recycling is gaining momentum as governments begin investing in infrastructure and policy support to shift away from imported scrap toward locally recovered material. However, challenges persist due to limited sorting and smelting capabilities and a lack of formalized collection networks.

Looking ahead, global OEMs are expanding their manufacturing footprint in these emerging regions. They are pushing for greater use of post-consumer recycled (PCR) aluminium to meet international green material standards. The proliferation of lightweight electric vehicles and solar energy infrastructure is expected to drive demand for secondary aluminium. While current recycling rates and capacities vary widely across countries, multilateral support, foreign investment in green industries, and growing awareness of environmental responsibility are expected to accelerate the use of recycled aluminium across these developing economies. This transition is not only environmentally strategic but also crucial for securing long-term, resilient supply chains.

In CY2024, rest of the world's recycled aluminium markets reached values of USD 13,639 million growing at CAGRs of 15.0% during CY2020–CY2024. Looking forward, Rest of the world's recycled aluminium markets are projected to reach USD 20,195 million by CY2030, expanding at CAGR of 5.9% during CY2025–CY2030.

In CY2024, rest of the world's recycled aluminium markets reached volumes of 4,863 thousand tons, growing at CAGR of 6.6%, during CY2020–CY2024. Looking forward, Rest of the world's recycled aluminium markets are projected to reach 6,325 thousand Tons by CY2030, expanding at CAGR of 3.7% during CY2025–CY2030.

## 3.5 Overview of Supply Landscape

### 3.5.1 Import-Reliant Nations & Secondary Metal Preference

**Table: Global Metal Recycling Market: Import-Reliant Nations & Secondary Metal Preference, in CY2024**

| Importing Countries (in Tons) | Aluminium Imported (Waste and Scrap) | Aluminium Imported (Waste and Scrap) % |
|---|---|---|
| **China** | 24,62,553 | 20.7% |
| **India** | 17,40,887 | 14.6% |
| **Germany** | 10,46,603 | 8.8% |
| **Republic of Korea** | 9,39,798 | 7.9% |
| **Belgium** | 2,30,237 | 1.9% |
| **United States of America** | 6,73,229 | 5.6% |
| **Thailand** | 7,89,856 | 6.6% |
| **Other Countries** | 40,40,281 | 33.9% |
| **Total** | **1,19,23,444** | **100.0%** |

Source: IMARC, ICRA Analytics

- The global scrap metal supply is a critical component of the circular economy, with demand increasing across import-reliant nations. Scrap is broadly classified into old scrap (from end-of-life products like vehicles, appliances, and buildings) and new scrap (generated during metal processing and manufacturing). With the rise in industrial activity, particularly in Asia

and Africa, and increased consumption of metal-rich products, the global volume of scrap is growing steadily.

- The future outlook for scrap availability is optimistic, driven by increasing global consumption of metal-intensive products, rapid urbanization, and the growing emphasis on circular economy practices. As more vehicles, buildings, and appliances reach the end of their life, the volume of old scrap entering the recycling stream is expected to rise significantly particularly in emerging economies across Asia and Africa. At the same time, regulatory support for recycling and advances in scrap collection and processing (e.g., automation, sensor-based sorting, and urban mining) are expected to improve recovery rates.

- Scrap availability also varies by industry. The construction and demolition sector is a key source of steel and aluminium scrap, while the automotive industry provides both old and new scrap from vehicle dismantling and production waste. Electronics and appliances are emerging as vital sources of e-waste, rich in precious and base metals, while manufacturing sectors, especially in aerospace and electronics, contribute high-quality new scrap. These industry-specific sources are shaping regional recycling dynamics and encouraging nations to improve domestic scrap collection and processing capacities.

- Import-reliant nations are increasingly prioritizing the use of secondary metals over primary ones due to supply chain vulnerabilities, cost-effectiveness, and environmental concerns. Countries with limited access to domestic mineral resources, such as Japan and several EU nations, have established robust recycling infrastructure to ensure a steady supply of raw materials. This preference is further reinforced by circular economy policies and carbon reduction commitments, positioning secondary metals as a strategic alternative to primary extraction.

### 3.5.2 Global Recycling Rates – Country Comparison

**Table: Global Metal Recycling Market: Global Recycling Rates – Country Comparison (with Focus on India), CY2024**

| Countries | Aluminium |
|---|---|
| **Global** | 32.0% |
| **India** | 40.0% |
| **China** | 30.0% |
| **Germany** | 58.0% |
| **United States of America** | 43.0% |

Source: IMARC, ICRA Analytics

India has shown steady progress in aluminium recycling over the past decade, driven by growing environmental awareness, rising industrial demand, and supportive policy initiatives. While India currently performs better than some emerging economies, it still lags behind more developed nations with mature recycling infrastructures. Looking ahead, the emphasis on circular economy practices, energy savings, and reduced carbon emissions is expected to further accelerate aluminium recycling both in India and globally. This signals a clear shift in the supply landscape, where recycled aluminium is increasingly gaining ground over primary aluminium due to its cost and environmental advantages. Continued investment in collection infrastructure and recycling technology will be key to sustaining this momentum and bridging the gap with global leaders.

### 3.6 End-User Industry Demand Trends (CY2020 to CY2030F)

Globally, demand for recycled metals particularly aluminium and stainless steel is being increasingly influenced by circular economy regulations, ESG commitments, and industrial decarbonization goals across sectors such as automotive, packaging, and construction.

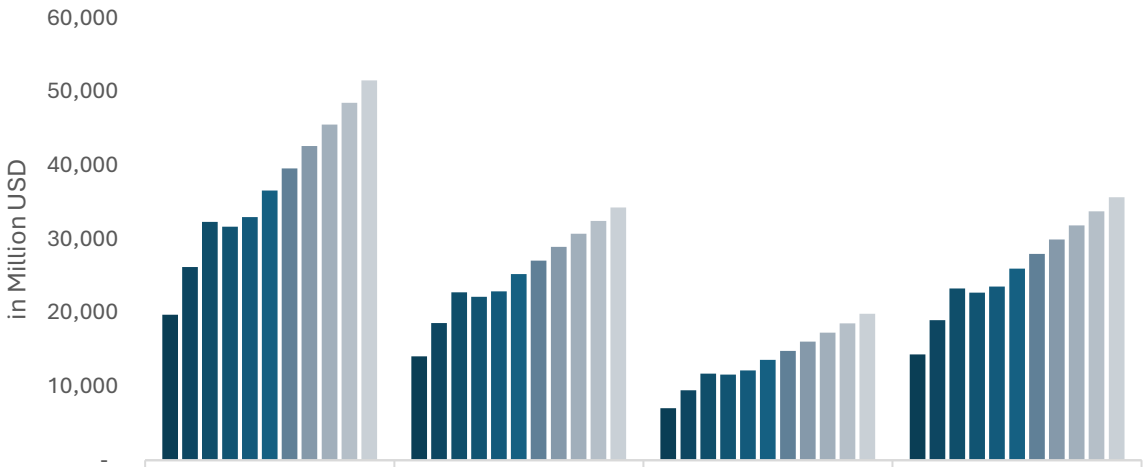
In the automotive sector, global OEMs are progressively increasing the share of recycled metals in vehicle manufacturing to meet circular economy goals and minimize lifecycle emissions. For example, in 2023, the BMW Group announced plans to use up to 50% secondary raw materials including aluminium and stainless steel in future models. At its Landshut foundry in Germany, BMW recycled over 73,000 metric tons of aluminium in 2022 to produce 3.3 million cast components. Companies like Novelis are also scaling their closed-loop recycling systems, focusing on recovering aluminium from production scrap and end-of-life vehicles (ELVs) a crucial move as aluminium plays a growing role in lightweighting electric vehicles. Recycled aluminium has long catered to sub-segments such as the automotive and beverage can industries, primarily due to the consistent and accessible availability of scrap sources like ELVs and UBCs (used beverage cans). These industries have historically benefited from robust closed loop recycling systems, enabling recovered aluminium to re-enter the same manufacturing chain with minimal loss of quality or performance. As the volume and quality of scrap generated from other sectors such as electronics, industrial machinery, and building infrastructure continue to rise, recycling is expected to serve a broader range of end-use applications increasingly.

In the packaging industry, aluminium's excellent recyclability and energy efficiency have made it a top choice for sustainable packaging. In 2023, South American aluminium beverage cans had an average recycled content of 85.8%, according to Novelis, underscoring the region's strong collection and processing infrastructure. On a global scale, beverage brands are increasingly shifting toward low-carbon, 100% recyclable cans.

In the construction sector, architects and developers are specifying recycled metals to comply with green building certifications like LEED. For instance, in 2022, the Deputy Managing Director of BNP Paribas Real Estate shared that recycled aluminium façade panels were used in Frankfurt's Senckenberg Tower as part of its material reuse strategy. Aluminium's retained strength through multiple recycling cycles and stainless steel's durability and corrosion resistance make them ideal for use in façades, structural components, roofing, and HVAC systems.

### 3.6.1 Global Recycled Aluminium Market

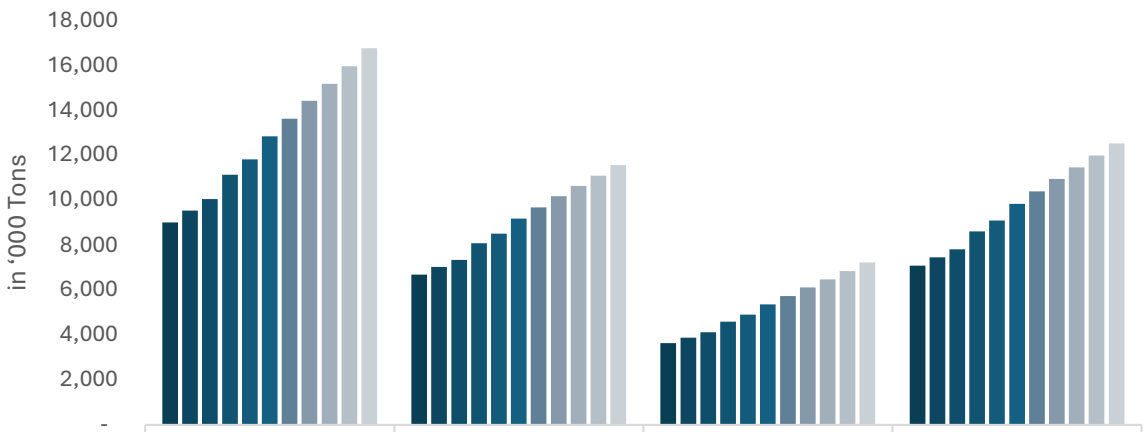
**Chart: Global Recycled Aluminium Market: End-User Industry Wise Sales Value (in Million USD), CY2020-CY2030F**




| | Automotive | Building & Construction | Packaging | Others |
|---|---|---|---|---|
| CY2020 | 19,742 | 14,102 | 7,078 | 14,378 |
| CY2021 | 26,224 | 18,599 | 9,472 | 19,002 |
| CY2022 | 32,343 | 22,777 | 11,770 | 23,318 |
| CY2023 | 31,709 | 22,174 | 11,626 | 22,748 |
| CY2024 | 32,992 | 22,911 | 12,189 | 23,553 |
| CY2025 F | 36,614 | 25,242 | 13,621 | 26,004 |
| CY2026 F | 39,596 | 27,100 | 14,833 | 27,978 |
| CY2027 F | 42,631 | 28,968 | 16,082 | 29,970 |
| CY2028 F | 45,527 | 30,716 | 17,297 | 31,847 |
| CY2029 F | 48,493 | 32,486 | 18,555 | 33,754 |
| CY2030 F | 51,523 | 34,276 | 19,857 | 35,690 |

Source: IMARC, ICRA Analytics

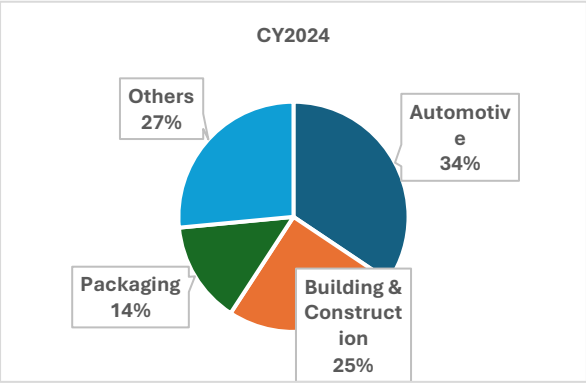
**Chart: Global Recycled Aluminium Market: End-User Industry Wise Sales Volume (in '000 Tons), CY2020-CY2030F**

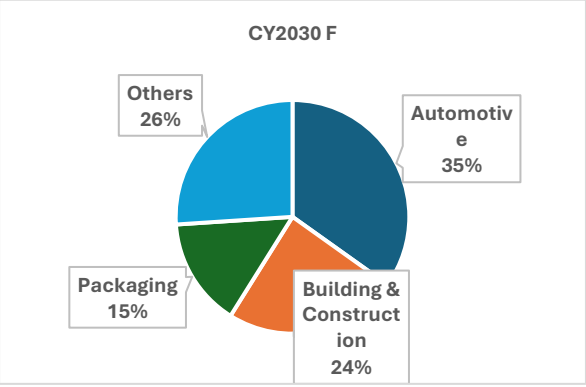



| | Automotive | Building & Construction | Packaging | Others |
|---|---|---|---|---|
| CY2020 | 9,002 | 6,679 | 3,643 | 7,075 |
| CY2021 | 9,536 | 7,024 | 3,885 | 7,456 |
| CY2022 | 10,036 | 7,339 | 4,116 | 7,808 |
| CY2023 | 11,122 | 8,075 | 4,592 | 8,610 |
| CY2024 | 11,799 | 8,506 | 4,905 | 9,090 |
| CY2025 F | 12,827 | 9,178 | 5,365 | 9,830 |
| CY2026 F | 13,616 | 9,672 | 5,731 | 10,382 |
| CY2027 F | 14,418 | 10,167 | 6,107 | 10,938 |
| CY2028 F | 15,170 | 10,620 | 6,466 | 11,451 |
| CY2029 F | 15,945 | 11,082 | 6,841 | 11,977 |
| CY2030 F | 16,743 | 11,553 | 7,229 | 12,514 |

Source: IMARC, ICRA Analytics

**Recycled aluminium usage across industries**




Source: IMARC, ICRA Analytics

In CY2024, the global recycled aluminium market by end-user industry reached values of USD 32,992 million in automotive, USD 22,911 million in building & construction, USD 12,189 million in packaging, and USD 23,553 million in other applications, with respective CAGRs of 13.7%, 12.9%, 14.6%, and 13.1% during CY2020–CY2024.

The growing demand for lightweight and fuel-efficient vehicles is expected to drive the use of recycled aluminium in the automotive industry. Automakers are increasingly adopting aluminium for body structures, engine components, and wheels to reduce overall vehicle weight, meet emission regulations, and improve energy efficiency. With electric vehicle (EV) production expanding rapidly, the need for sustainable and cost-effective materials like recycled aluminium is becoming more critical to manufacturers' green strategies. Aluminium is approximately 60% lighter than steel, enabling vehicle weight reductions of up to 30%, which directly enhances fuel economy and driving range particularly vital in EVs. On average, a traditional internal combustion engine (ICE) vehicle contains around 180–200 kg of aluminium, while EVs incorporate 250–400 kg depending on design and model. As global EV production is projected to exceed 20 million units by 2025 (according to the International Energy Agency), demand for recycled aluminium produced with 95% less energy compared to primary aluminium is becoming essential to automotive OEMs seeking to reduce lifecycle emissions, cut manufacturing costs, and align with global sustainability targets.

Looking ahead, the global recycled aluminium market is expected to grow to USD 51,523 million in automotive, USD 34,276 million in building & construction, USD 19,857 million in packaging, and USD 35,690 million in other applications by CY2030, reflecting CAGRs of 7.1%, 6.3%, 7.8%, and 6.5%, respectively, during CY2025–CY2030.

Increasing environmental regulations and consumer interest in eco-friendly packaging are projected to accelerate the use of recycled aluminium in the food and beverage sector. With its light weight, non-toxicity, and infinite recyclability, aluminium remains a key material for beverage cans, foils, and containers.

In CY2024, the global recycled aluminium market by end-user industry reached volumes of 11,799 thousand tons in automotive, 8,506 thousand tons in building & construction, 4,905 thousand tons in packaging, and 9,090 thousand tons in other applications, growing at CAGRs of 7.0%, 6.2%, 7.7%, and 6.5%, respectively, during CY2020–CY2024.

Rapid urban growth and government incentives for green construction projects continue to propel recycled aluminium usage in modern architecture and public infrastructure. Green building certifications are internationally recognized systems that evaluate buildings based on environmental and energy efficiency standards. Many governments encourage or require such certifications through incentives or regulations. Circular economy policies further promote the use of recycled materials in construction. For instance, in India, the government actively supports green building initiatives by offering subsidies, tax rebates, and reduced duties on eco-friendly materials. Additionally, the Ministry of New and Renewable Energy (MNRE) provides financial assistance for projects that meet specific environmental criteria, encouraging developers to adopt sustainable practices and integrate recycled materials into their construction processes.

Looking forward, the global recycled aluminium market is projected to reach 16,743 thousand tons in automotive, 11,553 thousand tons in building & construction, 7,229 thousand tons in packaging, and 12,514 thousand tons in other applications by CY2030, growing at CAGRs of 5.5%, 4.7%, 6.2%, and 5.0%, respectively, during CY2025–CY2030.

The increasing demand for sustainable materials in the electronics and appliance industries is also expected to boost recycled aluminium consumption across various consumer goods applications.

### 3.7 Key Success Factors in the Global Metal Recycling Market

**❖ Strong Collection and Supply Network**

Efficient scrap metal sourcing through organized collection systems, partnerships with scrap dealers, and buyback programs is crucial. Companies with direct access to industrial and consumer waste streams enjoy better margins and supply reliability. Long-term success depends on securing consistent sources of ferrous and non-ferrous scrap while navigating fragmented markets, input cost volatility, and international trade regulations.

**❖ Advanced Sorting and Processing Technologies**

Utilizing technologies such as sensor-based sorting, AI-driven material recovery, and automated shredding enhances operational efficiency and metal recovery rates, thereby improving profitability. Integrating digital tools across the value chain from logistics to processing and customer service streamlines operations and boosts both productivity and customer satisfaction.

**❖ Compliance with Environmental Regulations**

Adhering to national and international environmental standards (such as Basel Convention, EU WEEE directives, or local air and waste regulations) is essential for long-term licensing and operations. In addition, evolving regulatory frameworks, such as the EU's Carbon Border Adjustment Mechanism (CBAM), aim to reduce global carbon emissions by placing a fair price on the carbon content of imported, carbon-intensive goods and incentivizing cleaner industrial production. Similarly, the UK's requirement for net-zero commitments in public procurement is raising compliance expectations. These regulatory shifts are compelling metal recyclers to adopt cleaner technologies and provide transparent, verifiable emissions data across their value chains to maintain access to global markets and government contracts.

**❖ Integrated Business Models**

Vertical integration, encompassing everything from scrap collection to secondary smelting, offers improved cost control, product quality, and competitive pricing. Establishing strong partnerships from local entrepreneurs to global manufacturers helps build a resilient and efficient recycling ecosystem.

**❖ Environmental, Social, and Governance (ESG) Alignment**

Industry leaders are positioning recycled metals as essential low-carbon inputs for applications such as green steel, electric vehicles (EVs), and sustainable construction. Strong ESG performance increasingly influences access to capital and buyer decisions. Companies recognized as green and sustainable producers benefit from ESG-driven procurement, particularly from OEMs in the U.S. and Europe. Moreover, many aluminium consumers have set ambitious Scope 3 emission reduction targets, aimed at cutting greenhouse gas emissions across their entire value chain not just within their operations. These places increasing pressure on upstream suppliers, including metal recyclers, to decarbonize their processes and align with buyers' sustainability goals. Meeting these expectations is becoming essential for ensuring long-term supplier viability, securing contracts, and maintaining competitiveness in a decarbonizing market.

### 3.7.1 India-Specific Success Factors

❖ **Formalization of the Informal Sector:** India's scrap ecosystem is heavily reliant on informal collectors and aggregators. Successful companies are those that create structured procurement models by onboarding these players through incentives, digital payments, and training. Players must build strong reverse logistics, tap into end-of-life vehicle (ELV) policies, and partner with OEMs and bulk waste generators.

❖ **Policy Alignment and Government Schemes**: Success hinges on alignment with government initiatives like the Vehicle Scrappage Policy, Metal Recycling Policy, and environmental norms set by the Central Pollution Control Board (CPCB). Access to SEZs or clusters like MMR (Mumbai Metropolitan Region) helps bypass logistics bottlenecks.

❖ **Localization of Processing Facilities**: Establishing facilities near industrial corridors such as Pune, NCR, Chennai, and Gujarat ensures lower logistics costs and direct access to manufacturing scrap. Proximity to ports (for imports and exports), steel plants, and auto hubs further strengthens supply chain efficiency and turnaround time.

❖ **Collaboration with OEMs and Urban Local Bodies (ULBs):** Partnerships with automobile manufacturers for end-of life vehicle (ELV) recycling and tie-ups with municipal bodies for collecting urban scrap (e-waste, appliances, construction debris) provide steady material inflow. These collaborations also help companies fulfil Extended Producer Responsibility (EPR) mandates, opening doors to long-term contracts.

❖ **Investment in Low-Carbon Metal Production:** Indian recyclers who invest in green steel, low-emission aluminium, and other decarbonized secondary metals are better positioned to meet export demand, especially from Europe and North America. Tracking carbon footprint, applying for carbon credits, and using renewable energy in operations enhance global competitiveness.

❖ **OEM Approvals and Customer Stickiness:** Securing approvals from original equipment manufacturers (OEMs) is crucial in India, particularly in the automotive, appliance, and infrastructure sectors. OEM relationships are often long-term and difficult to replace due to stringent quality, traceability, and compliance requirements. Once qualified, metal recyclers benefit from sticky customer relationships, ensuring recurring demand and price stability. Building strong technical and service alignment with OEMs also enhances trust and collaboration.

### 3.8 Threats and challenges in the global metal recycling and recovery market

**High Capital and Technology Costs:** Establishing advanced recycling facilities such as hydrometallurgical or pyrometallurgical plants requires significant upfront investment, creating entry barriers, particularly for smaller firms in developing economies. Specialized equipment and automation technologies demand high financial and technical resources, often limiting expansion and modernization efforts.

**Price Volatility & Competition from Virgin Metals:** Recyclers margins are highly susceptible to metal price fluctuations, influenced by factors such as global demand, mining output, geopolitical tensions, and supply chain disruptions. When primary metal prices fall, virgin extraction becomes more economical, reducing the market competitiveness of recycled metals.

**Inadequate Infrastructure and Collection Systems:** Many countries lack robust collection, transportation, and sorting infrastructure, leading to the underutilization and contamination of

recyclable scrap. E-waste and heavy-metal waste streams often go unregulated or mismanaged due to infrastructure limitations, especially in low- and middle-income regions.

**Quality and Purity Limitations:** Scrap variability and contamination increase the complexity and cost of maintaining material purity during recovery processes.

**Environmental and Health Risks:** Informal recycling operations, particularly in low-regulation areas, pose serious health threats due to toxic metal exposure. Even formal processes, like pyrometallurgy, can emit harmful pollutants if emission controls are inadequate.

**Technological Complexity and Rapid Evolution:** Recycling technologies must constantly evolve to manage diverse and complex waste streams, requiring frequent upgrades and innovation investments (e.g., AI, automation, sensor-based sorting). This technological evolution imposes high time and cost burdens on recyclers.

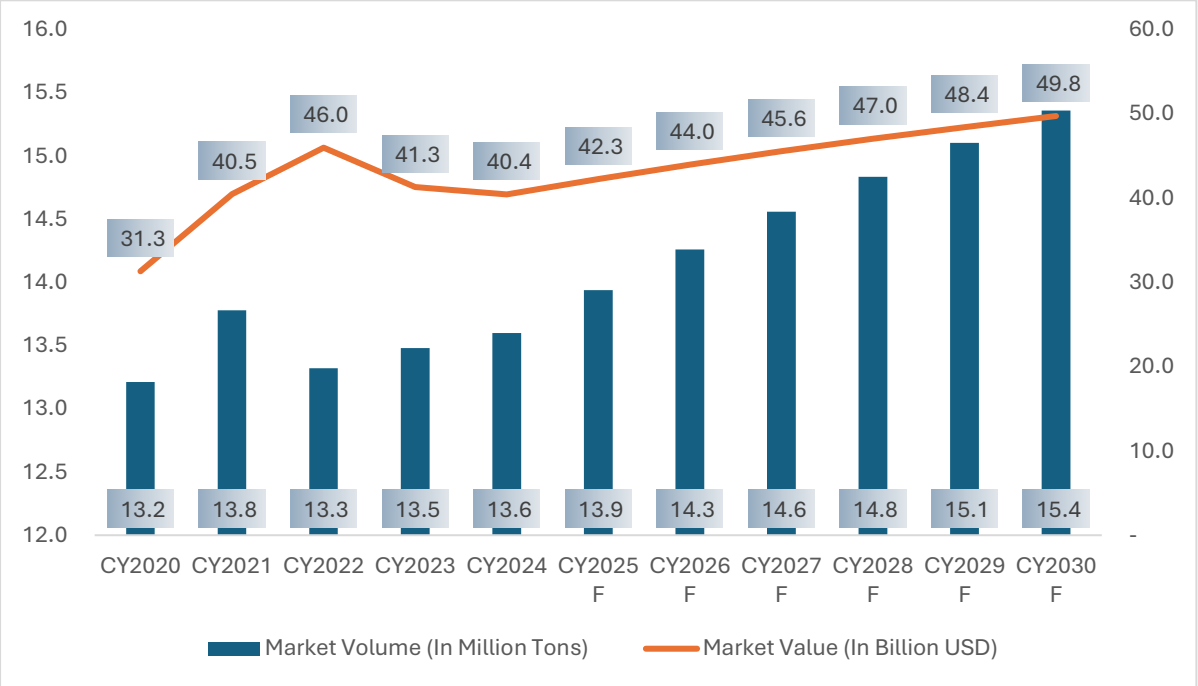
**Informal E-Waste and Global Waste Trade:** Global e-waste generation reached 137 billion lbs in 2022, yet less than 25% was formally recycled. Significant volumes are exported to regions with weak environmental oversight, where hazardous informal recycling puts workers and ecosystems at risk.

**Geopolitical Disruptions:** Ongoing geopolitical events (e.g., the Russia–Ukraine conflict, energy price surges) have further inflated energy and input costs, widening regional competitiveness gaps.

### 3.9 Other Metals- Zinc, Stainless Steel and Copper

#### 3.9.1 Zinc

**Chart: Global Zinc Market Forecast: Sales Volume (in Million Tons) and Value (in Billion USD)**




Source: IMARC, ICRA Analytics

The global zinc market reached a value of USD 40.4 billion and a volume of 13.6 million tons in CY2024, registering a CAGR of 6.6% in value and 0.8% in volume during the period CY2020–CY2024.

The market's growth is largely fuelled by zinc's extensive application in the construction industry, owing to its durability, corrosion resistance, and low maintenance needs. Zinc is widely used in roofing, facades, gutters, and structural components, valued not only for its performance but also its visual appeal. Zinc-coated steel is becoming increasingly popular in structural uses due to its strength and resistance to corrosion, making it well-suited for long-term infrastructure. As modern architecture places greater emphasis on sustainability and weather resistance, zinc demand is expected to rise, particularly in urban development and large-scale construction.

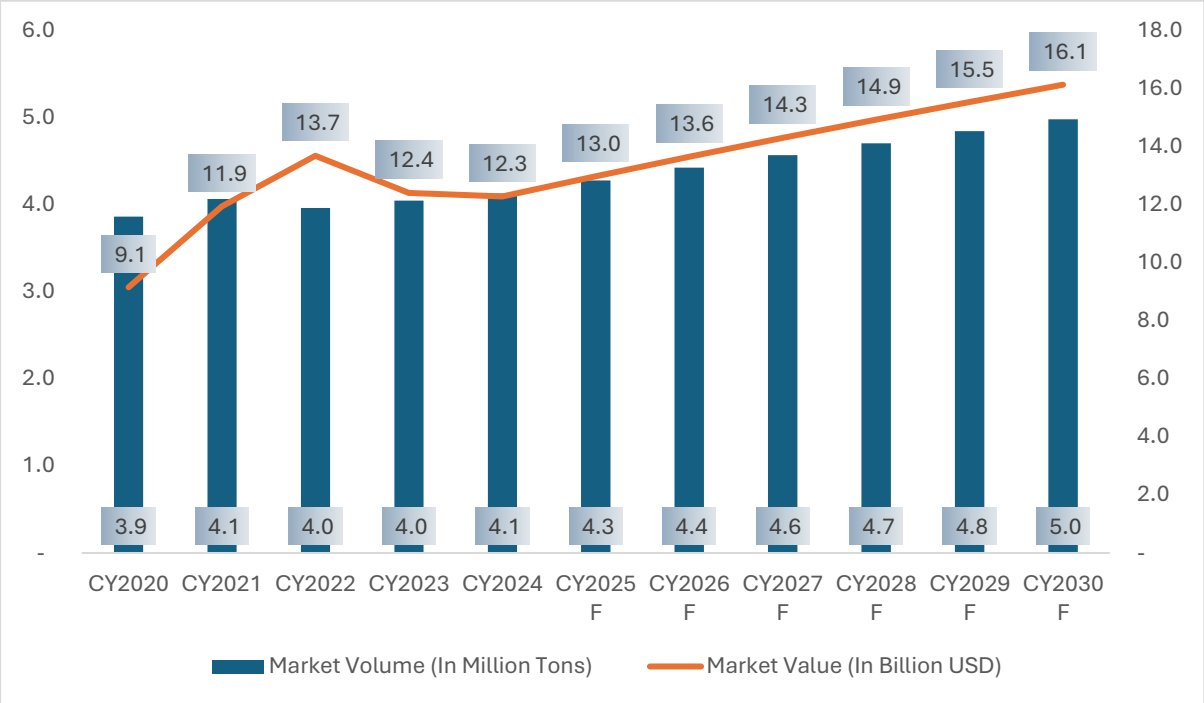
Additionally, zinc prices saw an upward trend in the early years, driven by industrial demand and supply disruptions. Later, prices slightly declined or stabilized, reflecting easing supply constraints and normalized global demand.

Looking ahead, the global zinc market is anticipated to reach a value of USD 49.8 billion and a volume of 15.4 million tons by CY2030, reflecting a CAGR of 3.3% in value and 2.1% in volume between CY2025 and CY2030.

The market is also expected to benefit from growing interest in zinc-based batteries, especially for energy storage systems. As the world shifts toward renewable energy and electric transportation, zinc battery technologies are emerging as cost-effective and sustainable alternatives to traditional options. Additionally, the ongoing urbanization and industrialization in emerging economies are likely to increase zinc demand across a range of industries, reinforcing its role in both traditional and emerging applications.

### 3.9.1.1 Commentary on specific recycled & recovered metals- Recycled Zinc

**Chart: Global Recycled Zinc Market Forecast: Sales Volume (in Million Tons) and Volume (in Billion USD)**




Source: IMARC, ICRA Analytics

The global recycled zinc market reached a value of USD 12.3 billion and a volume of 4.1 million tons in CY2024, recording a CAGR of 7.6% in value and 1.3% in volume from CY2020 to CY2024.

Growth in the recycled zinc market is being driven by rising sustainability goals, circular economy mandates, and increasing industry-wide focus on resource efficiency. Zinc's ability to be recycled without any loss in quality makes it a vital component in decarbonization strategies, especially in sectors like galvanizing, battery manufacturing, and construction. As environmental regulations tighten and industries work to lower carbon emissions, the demand for recycled zinc is expected to rise consistently. Moreover, recycling secondary zinc saves up to 76% of the energy required for primary production, making it an economical and environmentally friendly option for manufacturers globally. The global emphasis on green infrastructure, electrification, and corrosion-resistant materials is set to further strengthen demand.

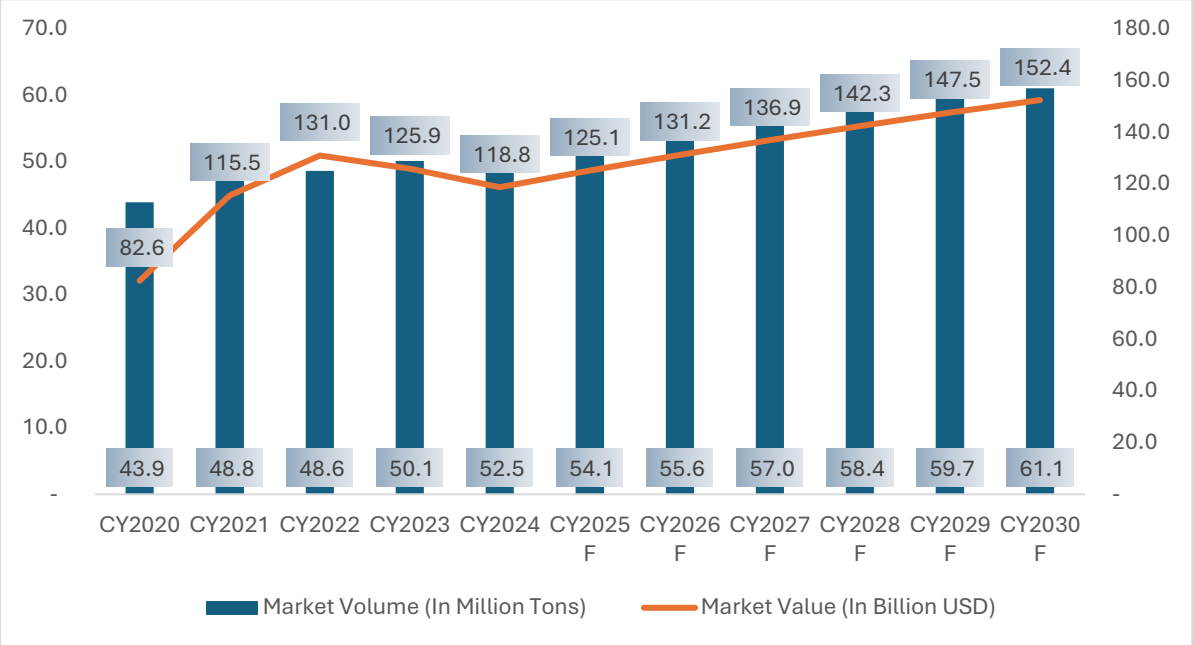
Looking ahead, the global recycled zinc market is projected to reach a value of USD 16.1 billion and a volume of 5.0 million tons by CY2030, with a CAGR of 4.4% in value and 3.1% in volume during CY2025–CY2030.

Strategic developments like Befesa S.A.'s complete acquisition of American Zinc Recycling's North Carolina facility highlight the market's forward momentum. This plant the only facility in the world producing "green" zinc entirely from recycled materials using advanced solvent extraction technology demonstrates innovation in recycling processes. With a production capacity of 140,000 tons per year, the plant bolsters Befesa S.A.'s U.S. electric arc furnace dust (EAFD) recycling network and helps address zinc smelting shortages in North America. Such initiatives are expected to not only increase global recycled zinc supply but also improve processing efficiency and environmental performance, reinforcing recycled zinc's importance in the low-

carbon industrial value chain. Additionally, the price of recycled zinc increased during the period, reflecting stronger demand in green infrastructure and galvanized products, along with higher energy costs affecting recycling operations.

### 3.9.2 Stainless Steel

**Chart: Global Stainless Steel Market Forecast: Sales Volume (in Million Tons) and Volume (in USD Billion)**




Source: IMARC, ICRA Analytics

The global stainless-steel market reached a value of USD 118.8 billion and a volume of 52.5 million tons in CY2024, with a CAGR of 9.5% in value and 4.6% in volume between CY2020 and CY2024.

Market growth is being driven by strong construction activity and the versatile applications of stainless steel in structural and architectural elements such as beams, columns, railings, roofing, staircases, and pool canopies. Increasing use of cryogenic stainless-steel grades in LNG logistics and expanding government support for green hydrogen infrastructure are also key demand drivers. Moreover, the prices of primary stainless steel rose steadily due to raw material shortages and a strong recovery in construction and manufacturing. Later, the prices showed slight moderation, indicating more balanced market conditions.

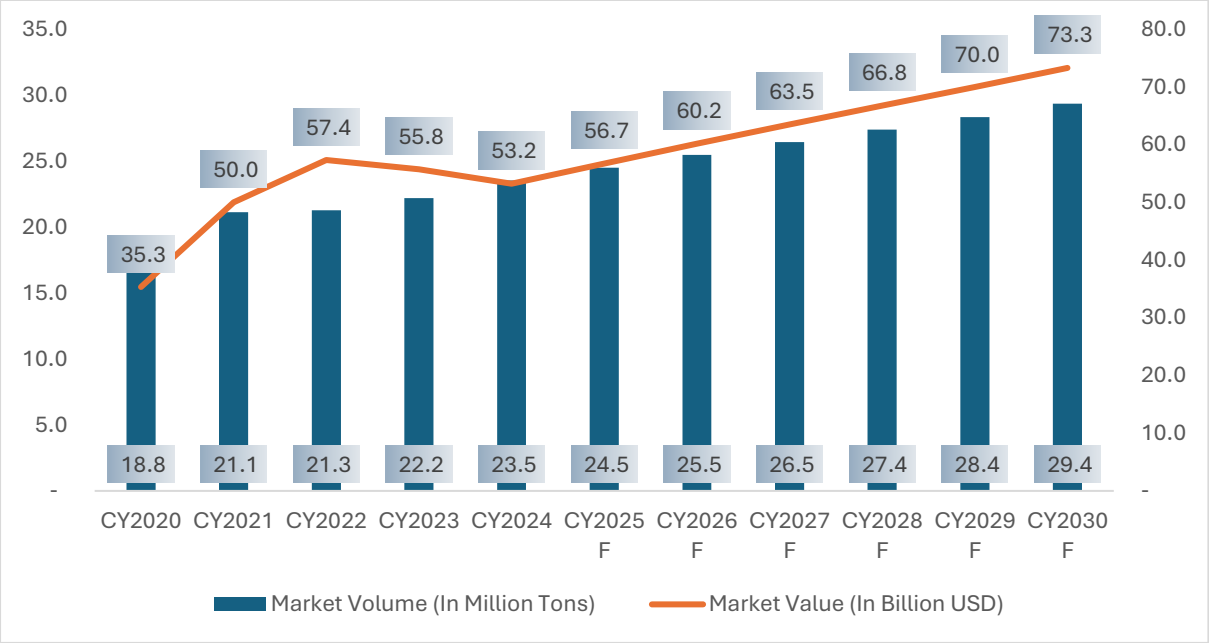
To adapt to raw material price volatility, producers are accelerating electrification of production processes and boosting the use of recycled materials, aligning with evolving "green steel" standards. Moreover, downstream industries such as food processing and coastal infrastructure are expected to increase demand for premium stainless-steel grades to improve durability and reduce long-term maintenance costs.

Looking ahead, the global stainless-steel market is forecasted to reach a value of USD 152.4 billion and a volume of 61.1 million tons by CY2030, representing a CAGR of 4.0% and 2.5%, respectively, during CY2025–CY2030.

Continued market growth is also expected to be fuelled by strategic investments and sustainability-driven innovations. In May 2024, Jindal Stainless Ltd announced a USD 650 million investment to expand its production capacity in Indonesia by 40%, indicating rising demand. Similarly, the June 2025 merger between United States Steel Corporation and Nippon Steel Corporation reflects ongoing industry consolidation and growth initiatives, including a new facility planned for 2028. On the sustainability front, companies like Outokumpu Oyj, in collaboration with Nordic Steel AS, are introducing low-emission solutions such as Circle Green stainless steel, which offers up to 92% lower carbon emissions a move expected to reshape the market and address increasing demand for eco-friendly materials.

### 3.9.2.1 Commentary on specific recycled & recovered metals- Recycled Stainless Steel

**Chart: Global Recycled Stainless Steel Market Forecast: Sales Volume (in Million Tons) and Volume (in USD Billion)**




Source: IMARC, ICRA Analytics

The global recycled stainless-steel market reached a value of USD 53.2 billion and a volume of 23.5 million tons in CY2024, reflecting a CAGR of 10.8% in value and 5.7% in volume over the period CY2020–CY2024.

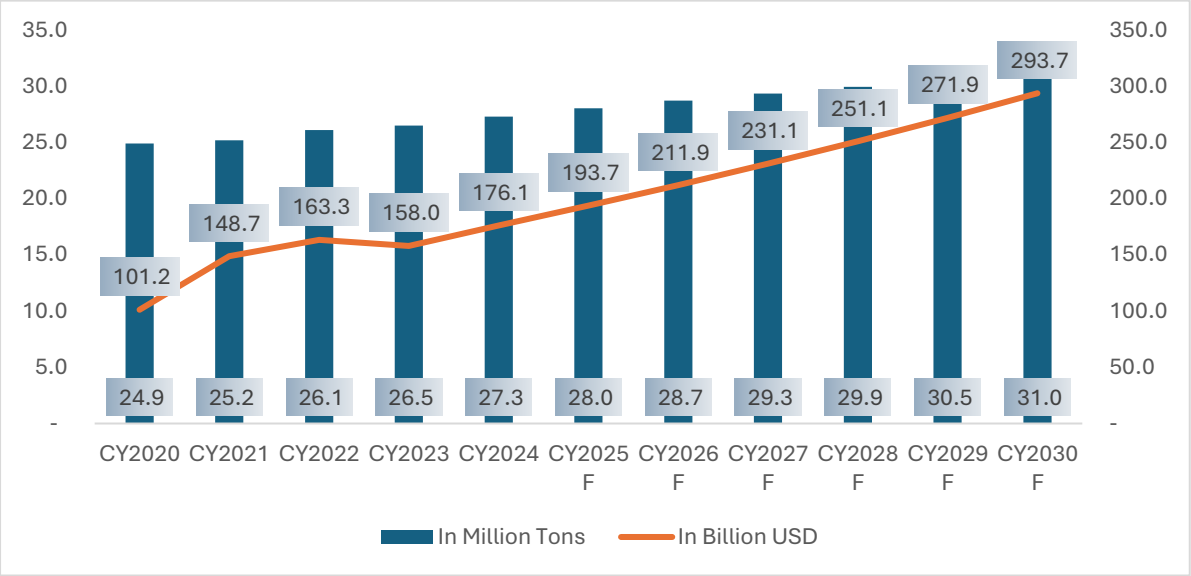
Market growth is being driven by the urgent push for decarbonization in the steel sector and the increasing need for sustainable, high-performance materials across industries such as automotive, construction, and manufacturing. Stainless steel's ability to be recycled infinitely without quality loss makes it highly suitable for circular economy models, encouraging further investment in recycling infrastructure. For instance, Oryx Stainless Group, based in the Netherlands, recently launched a new facility in Johor, Malaysia, strategically located to supply recycled materials near key Asian manufacturing regions. This plant alone is expected to cut emissions by nearly 1 million metric tons annually, highlighting the critical role of recycled stainless steel in supporting both national and corporate climate objectives. Moreover, the recycled stainless steel market value has increased steadily over the past years. This trend underscores a rising preference for recycled inputs in industrial manufacturing, particularly in regions focused on carbon footprint reduction.

Looking forward, the global recycled stainless-steel market is projected to reach a value of USD 73.3 billion and a volume of 29.4 million tons by CY2030, marking a CAGR of 5.3% in value and 3.7% in volume during CY2025–CY2030.

Companies such as Kuusakoski Oy in Finland are setting new benchmarks with 100% carbon-free steel scrap processing in response to increasing demand from European manufacturers for low-emission, traceable inputs. The company's Veitsiluoto facility will increase recycling capacity by 150,000 metric tons per year, helping major clients like Outokumpu Oyjim reduce their carbon footprints. These efforts are part of a broader industry shift toward carbon-neutral operations and regionalized sourcing, which is poised to further strengthen the recycled stainless-steel market. As purity, traceability, and integrated logistics become key differentiators, manufacturers are placing greater emphasis on sustainability alongside traditional factors such as performance and cost-efficiency.

### 3.9.3 Copper

**Chart: Global Copper Market Forecast: Sales Volume (in Million Tons) and Volume (in USD Billion)**




Source: IMARC, ICRA Analytics

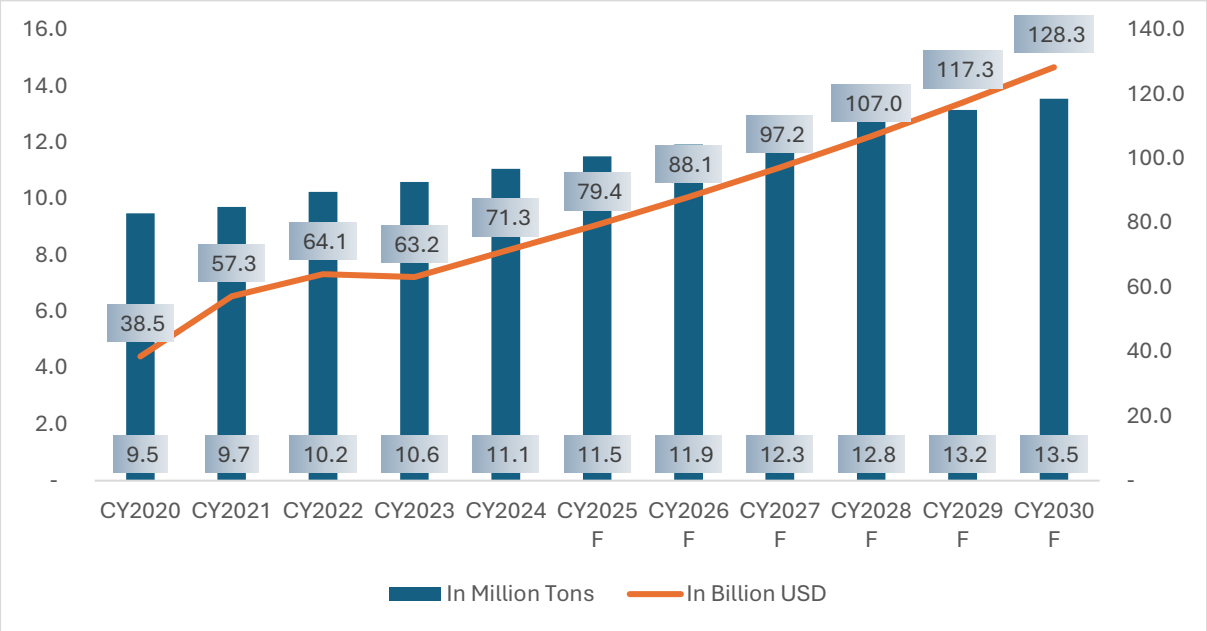
The global copper market reached a value of USD 176.1 Billion and a volume of 27.3 million Tons in CY2024, representing a CAGR of 14.9% and 2.3%, respectively, during CY2020–CY2024. Looking forward, the global copper market is expected to reach a value of USD 293.7 Billion and a volume of 31.0 million Tons by CY2030, reflecting a CAGR of 8.7% and 2.1%, respectively, during CY2025– CY2030.

The global copper market is poised for steady growth, driven by robust demand from key sectors, including construction, automotive, electrical and electronics, and renewable energy. The rising adoption of electric vehicles (EVs), expansion of power grids, and ongoing urbanization in emerging economies are significant growth drivers. The Asia-Pacific region continues to dominate global consumption, particularly in China and India, due to their robust infrastructure and manufacturing activities. However, concerns over supply constraints, environmental regulations, and resource depletion are increasing the importance of alternative sources, such as recycled copper. Additionally, copper prices exhibited a rising trend. This growth was

supported by increased demand across construction, automotive, and electronics sectors, alongside supply constraints and expanding infrastructure needs in emerging economies.

### 3.9.3.1 Commentary on specific recycled & recovered metals- Recycled Copper

**Chart: Global Recycled Copper Market Forecast: Sales Volume (in Million Tons) and Volume (in USD Billion)**




Source: IMARC, ICRA Analytics

The global recycled copper market reached a value of USD 71.3 Billion and a volume of 11.06 million Tons in CY2024, representing a CAGR of 16.7% and 4.0%, respectively, during CY2020–CY2024. Looking forward, the global copper market is expected to reach a value of USD 128.3 Billion and a volume of 13.6 million Tons by CY2030, reflecting a CAGR of 10.1% and 3.3%, respectively, during CY2025–CY2030.

The recycled copper market is experiencing accelerated growth as industries and governments emphasize sustainability and circular economy practices. Recycled copper is gaining preference due to its significantly lower energy consumption compared to primary copper extraction, as well as its role in reducing carbon emissions. Demand is particularly strong from the electrical and electronics, construction, and transportation sectors. As scrap recovery systems and environmental regulations improve globally, recycled copper is expected to play a crucial role in meeting the world's growing demand for copper. Thus, the recycled copper market experienced a steady rise. This upward trend highlights increasing adoption of secondary copper due to sustainability concerns and tighter supply of primary copper.

## 4. Domestic Metal Recycling & Recovery Market

### 4.1 Market Overview and Recycling Timeline

India is recognized as the second-largest steel producer globally and the third-largest consumer of aluminium, propelled by swift industrialization, infrastructure enhancement, and growth in the automotive sector. These developments result in significant quantities of scrap, particularly in aluminium, zinc, and stainless steel three metals that are highly recyclable and essential for sustainable industrial advancement. Although global recycling rates are relatively higher, India manages to recycle only 40% of its recyclable metal waste. This shortfall represents a considerable opportunity for expansion within the domestic recycling industry. Heightened environmental awareness, increasing material demand, and a transition towards sustainable practices are generating momentum. The market is experiencing rising interest from startups, investors, and policymakers who are in search of scalable, eco-friendly solutions that lessen reliance on raw material imports and reduce environmental harm through effective metal recovery.

The recycling process in India generally commences after metals such as aluminium, zinc, and stainless steel have been utilized in sectors like construction, transportation, and consumer products. Once these materials are used, they enter the scrap stream, where inefficient collection systems frequently hinder the recycling process. Currently, India recycles merely 40% of its recyclable metal, which is considerably lower than global benchmarks. Importantly, India is positioned as the world's lowest-cost producer of recycled aluminium, giving it a major competitive advantage in global and domestic markets. This cost leadership offers Indian recyclers and manufacturers the opportunity to scale operations, drive exports, and offer environmentally sustainable alternatives at commercially viable prices. In response, the government has introduced an ambitious policy framework that mandates a minimum recycled content in non-ferrous metals starting from FY2028 initially set at 5%, with plans to escalate to 10–25% by FY2031. Specifically, the recycled content targets are set at 10% for aluminium, 20% for copper, and 25% for zinc. These initiatives are designed to expedite the transition from consumption to reuse, formalize the management of scrap materials, and bolster long-term sustainability objectives. If implemented promptly, these measures could greatly improve resource efficiency and lower emissions across various sectors.

Aluminium, recognized for its lightweight properties and resistance to corrosion, is extensively utilized in the construction, automotive, and packaging industries, making it a significant area of interest for recyclers. As its usage continues to grow in these vital sectors, the recycling of aluminium is becoming increasingly essential to promote material efficiency and sustainability. Zinc, which is vital for preventing corrosion in galvanised products, along with stainless steel, appreciated for its strength and adaptability, plays a crucial role in infrastructure and manufacturing. As per industry forecasts, India's domestic aluminium consumption is projected to rise from 4.9 MT in FY24 to 8.5 MT by FY30 (short-term), 18 MT by FY40 (medium-term), and 28 MT by FY47 (long-term)and the overall domestic aluminium capacity (including both primary and secondary) should scale up to 37 million tonnes per annum (MTPA) to meet this demand and export potential.

However, India currently lacks a comprehensive, nationwide recycling framework to effectively recover these metals. With supportive policies, heightened awareness, and efficient collection systems, the recycling of these metals can grow swiftly. Focusing on the recovery of aluminium,

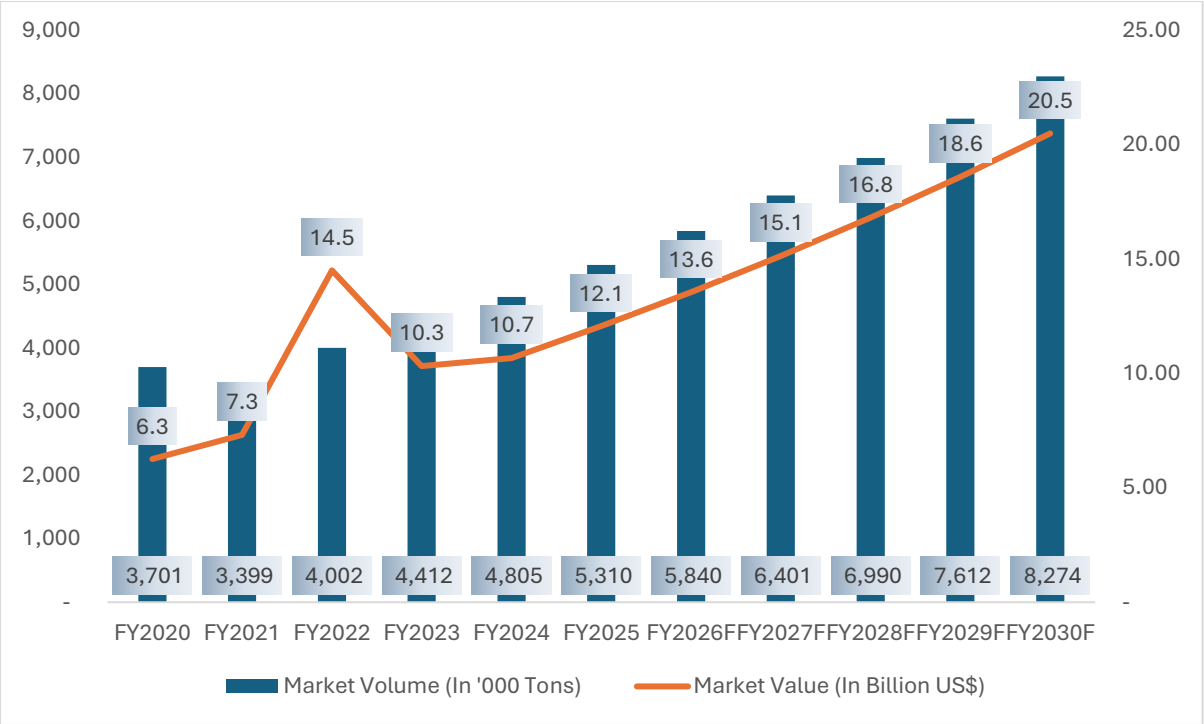
zinc, and stainless steel not only satisfies industrial needs but also aligns with climate objectives, diminishes reliance on mining, and enhances India's role in the global circular economy.

India's metal recycling and recovery industry is undergoing a structural transformation, driven by rising sustainability imperatives, resource efficiency goals, depleting natural resources and evolving policy frameworks. As the third-largest generator of e-waste globally and a significant producer of ferrous and non-ferrous scrap, India presents a high-potential landscape for organized recycling activities. Key policy drivers include the Extended Producer Responsibility (EPR) frameworks for both e-waste and batteries, the Vehicle Scrappage Policy targeting the systematic retirement of end-of-life vehicles, and the National Non-Ferrous Metal Scrap Recycling Framework (2020), which emphasizes scientific processing and traceability of non-ferrous scrap. The Steel Scrap Recycling Policy further aims to reduce import dependency and enhance domestic scrap quality, while the National Resource Efficiency Policy (NREP) sets circular economy benchmarks across sectors. These initiatives are complemented by the Battery Waste Management Rules (2022), which mandate safe recycling practices and material recovery from used batteries collectively reinforcing India's transition toward a more resource-efficient, low-carbon industrial ecosystem. According to Tata Steel MD and CEO T V Narendran, the recycling industry is poised to surpass traditional mining in economic value by 2050. This shift underscores a long-term transition from resource extraction to resource recovery, particularly in urban settings. The emergence of "urban mining" the process of recovering valuable and critical minerals from discarded electronic devices is expected to play a pivotal role in addressing India's resource scarcity while supporting its fast-growing consumption of electronics and infrastructure materials.

### 4.2 Domestic Demand Projections in terms of Value and volume (FY2020 to FY2030E)

#### 4.2.1 Aluminium

**Chart: Indian Aluminium Market Forecast: Sales Volume (in 000's Tons) and Sales Value (in Billion USD)**




Source: IMARC, ICRA Analytics

The aluminium market in India reached a value of USD 12.07 Billion and a volume of 5,310 thousand tons in FY2025, representing a CAGR of 13.9% and 7.5%, respectively, during FY2020–FY2025.

The increasing adoption of aluminium in the automotive and transport sectors is propelling the growth of the aluminium market in India. Aluminium's high strength-to-weight ratio and lightweight properties, along with its excellent corrosion resistance, make it a highly suitable material for car production. Compared to steel, aluminium is approximately one-third the weight, enabling a 10–15% reduction in vehicle weight when substituted in structural components. This weight savings can lead to 6–8% improvement in fuel efficiency and a corresponding reduction in $CO_2$ emissions of up to 12 grams per kilometer, making aluminium a preferred choice in lightweight vehicle design. As India transitions towards electric vehicles (EVs), there is a rising demand for aluminium components in battery casings, body structures, and chassis, which contributes to improved vehicle efficiency and mileage. Around 2 million EVs were delivered in FY2024, highlighting the nation's shift towards sustainable transportation. Government initiatives have lowered costs and enhanced consumer access to EVs, including the FAME II scheme, which provides subsidies of up to INR 10,000 per kWh. This movement towards electric mobility is significantly influencing the Indian aluminium market. Additionally, the railways and aerospace sectors are also incorporating aluminium to improve fuel efficiency and durability. Globally, India is the lowest aluminium scrap processing cost, giving it a considerable cost advantage over the other nations. For instance, total cost of alloying, energy, power, labour and consumables combined in India is approx. USD 163 per MT, while in the USA it is USD 199 per MT, in western Europe it is USD 187 per MT and in China it is USD 166 per MT.

**Price Trends:**

**LME-Linked Price Movement:** Aluminium prices in India are primarily influenced by international benchmarks such as the London Metal Exchange (LME). Any fluctuations in LME prices directly impact domestic rates, with adjustments made through premiums or discounts based on local demand and supply conditions. Aluminium, a critical material across modern industries, plays a vital role in sectors such as construction, transportation, packaging, and renewable energy. As of June 2025, aluminium prices on the LME are trading between USD 2,450 and USD 2,600 per ton. This recent 10–15% uptick since January is largely driven by renewed US-China tariffs, supply chain disruptions, and rising energy costs.

**Impact of Power and Input Costs:** The production of primary aluminium is highly energy-intensive, consuming large quantities of electricity, which makes power tariffs a crucial cost component. In India, where captive coal-based power is common among large smelters, any rise in coal prices or power shortages directly increases cost pressures. These increases are generally passed on to buyers, contributing to overall price inflation. Additionally, other input costs like alumina, caustic soda, cryolite, and pitch play a role in shaping final pricing trends, especially when there is volatility in international raw material markets.

**Demand from Infrastructure and Automotive:** India's growing infrastructure development, including projects under Smart Cities, National Highways, and renewable energy installations, drives consistent demand for aluminium. Moreover, rising vehicle production and the ongoing transition toward electric mobility are increasing the use of aluminium in battery enclosures, frames, and body panels. These trends create sustained demand-side pressure, supporting higher aluminium prices. In packaging, beverage cans and flexible foils have also witnessed rising demand due to urban lifestyle changes and higher per capita consumption.

**Import Parity and Supply Dynamics:** Domestic prices also reflect global supply chain issues and import parity levels. If imports become costlier due to freight or duties, domestic producers may raise prices accordingly.

Looking forward, the aluminium market in India is expected to reach a value of USD 20.49 Billion and a volume of 8,274 thousand Tons by FY2030, reflecting a CAGR of 10.8% and 9.1%, respectively, during FY2026–FY2030.

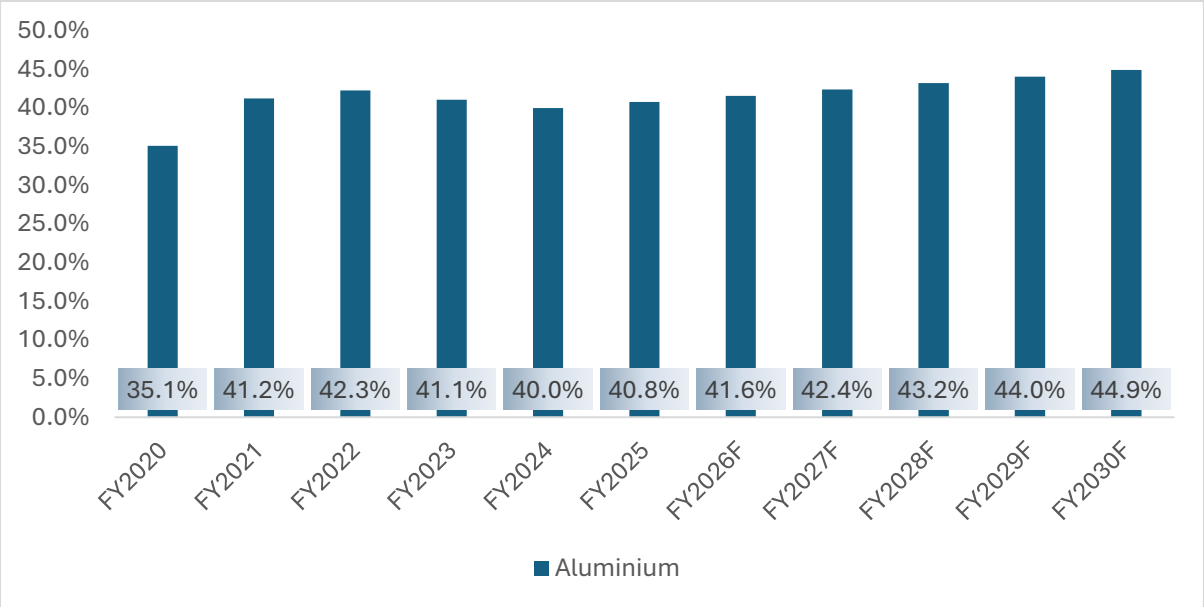
India's aluminium sector is witnessing significant growth, propelled by an increase in domestic production capacity and a heightened emphasis on recycling initiatives. Leading manufacturers are expanding their operations to satisfy the growing demand from essential industries such as construction, packaging, and electronics. Government backing through programs like 'Make in India' and production-linked incentive (PLI) schemes is further enhancing industrial confidence and facilitating capacity expansion. However, India still lags behind global benchmarks in aluminium recycling performance. The End-of-Life Recycling Rate (EOL-RR) for aluminium in India stands at approximately 30%, significantly lower than the global average of 56%. This is largely due to a lower old scrap recovery rate and less efficient recycling infrastructure. In contrast, Europe achieves an EOL-RR (End-Of-Life Recycling Rate) of around 64% with a recycling efficiency of 81%, while China boasts an old scrap recovery rate of over 80%. Bridging this gap presents a major opportunity for India to improve material circularity, reduce import dependency, and align with global sustainability targets.

The Vision Document on Aluminium Metal for India 2025 aims to provide a strategic framework for the sustainable growth and self-reliance of India's aluminium sector, aligning with the

'Atmanirbhar Bharat' and 'Viksit Bharat' initiatives. It seeks to strengthen domestic production, reduce import dependency, and achieve net-zero emissions by 2047, while addressing challenges such as raw material availability, high energy costs, and global competition. A key focus is on scaling aluminium recycling, targeting a 6% End-of-Life Recycling Rate by 2047, as recycling uses only 5% of the energy required for primary production, making it critical for sustainability and cost efficiency. The document projects secondary aluminium production capacity in India to grow from ~2 MT in FY24 to 3.5 MT by FY30. It outlines a strategic roadmap to scale up aluminium production sixfold by 2047, aiming to expand bauxite production capacity to 150 MTPA, double the national aluminium recycling rate, promote the adoption of low-carbon technologies, and strengthen raw material security through targeted policy reforms and institutional mechanisms.

### 4.3 Share of Recycled/Recovered Metals in Domestic Demand

**Chart: India: Share of Recycled/Recovered Metals in Total Demand, (in %), FY2020-FY2030F**

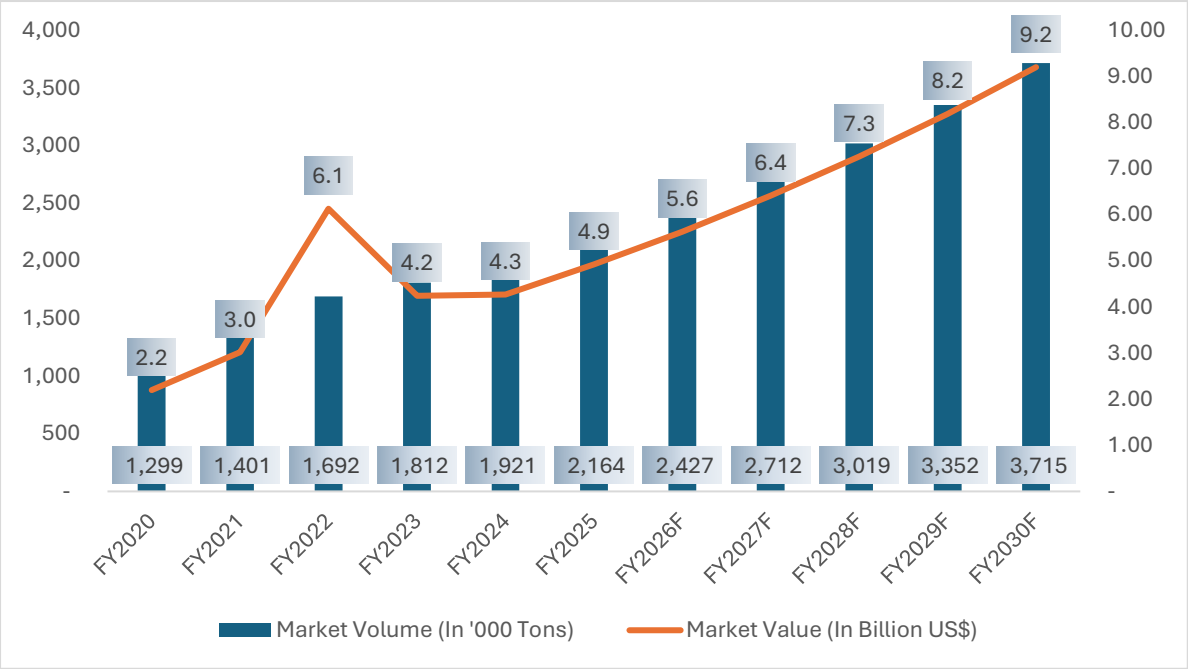



Source: IMARC, ICRA Analytics

Due to better cost dynamics the share of secondary aluminium in aggregate aluminium market in India rose to 40.8% as of FY2025 from 35.1% in FY2020 and is further expected to increase to 44.9% in FY2030.

### 4.3.1 Recycled Aluminium

**Chart: India: Recycled Aluminium Market: Sales Volume (in '000 Tons) and Sales Value (in Billion USD), FY2020-FY2030F**




Source: IMARC, ICRA Analytics

The recycled aluminium market in India reached a value of USD 4.92 Billion and a volume of 2,164 thousand Tons in FY25, representing a CAGR of 17.4% and 10.8%, respectively, during FY2020–FY2025.

The market for recycled aluminium in India is being driven by increasing environmental awareness, advantages in energy efficiency, and a surge in demand from various sectors including infrastructure, transportation, power, and consumer goods. Recycled aluminium production represents the fastest-growing segment within the industry, primarily due to its considerably reduced carbon emissions releasing only 0.3 metric tons of $CO_2$ per ton, in stark contrast to the 14 metric tons produced by primary aluminium manufacturing. This sustainability benefit is anticipated to enhance adoption rates as industries strive to achieve their decarbonization objectives. In FY2023, the Material Recycling Association of India (MRAI) has called for a reduction of scrap import duties to 0%, emphasizing that recycled aluminium is crucial for facilitating India's swift urbanization and industrial expansion while minimizing environmental repercussions. Due to the large economic, environmental and social advantages of recycling and the disadvantages of mining, primary producers across the world are shifting to develop new sources of recycled metal. For instance, Emirates Global Aluminium (EGA), the largest industrial company in the UAE outside oil and gas, is constructing the country's largest aluminium recycling facility.

CMR Green Technologies Limited has a market share of ~10-12% in the recycled aluminium industry, in terms of volume sold, in FY2025.

**Price Trends:**

**Scrap Availability as a Key Driver:** Prices of recycled aluminium are closely linked to the availability and cost of aluminium scrap. Limited access to imported scrap types such as Tense,

Taint Tabor, Zorba, and Wheels significantly increases raw material costs for secondary smelters. Domestic scrap availability is often inconsistent and of varying quality, further complicating procurement. Seasonal variations, regulatory restrictions on imports, and competition among recyclers all contribute to price volatility. Moreover, the informal nature of India's scrap collection and segregation network limits the availability of clean, processable scrap, raising dependence on imports. Further, metal scrap prices vary in international markets, and are different in different countries.

**Dependence on Automotive Demand:** Recycled aluminium grades such as ADC12, LM6, and other die-casting alloys are in high demand from the automotive sector, especially for engine components, housings, and transmission parts. As OEMs ramp up production, particularly in two-wheelers and small passenger cars, demand for these ingots surges. Additionally, with the rise of EV manufacturing and light weighting requirements, secondary aluminium consumption in castings is increasing. This sectoral dependence means any fluctuations in automotive output due to chip shortages, regulatory changes, or demand shifts have a direct impact on pricing trends.

**Import Constraints and BIS Certification:**,. Government policies and customs duties play a decisive role in shaping recycled aluminium prices in India. In the Union Budget 2025–26, the basic customs duty on non-ferrous scrap such as lead, zinc, copper, brass, and lithium-ion battery scrap was eliminated, easing raw material costs for those sectors. However, aluminium scrap was excluded, with the 2.5% duty retained. This differential treatment puts upward pressure on aluminium scrap prices compared to other metals, creating a relative disadvantage for secondary producers. Industry bodies like the Material Recycling Association of India (MRAI) have argued that the duty artificially inflates prices and reflects lobbying by the primary aluminium sector to limit competitive advantages for recyclers. Until domestic scrap supply becomes sufficient and consistent in quality, such duties are expected to remain a critical factor influencing the pricing dynamics of recycled aluminium in India

**Conversion Costs and Spreads:** The profitability of recycling hinges on the conversion spread the difference between the purchase price of scrap and the selling price of recycled ingots. If scrap prices rise (due to scarcity or high demand) but selling prices of ingots do not increase proportionally, recyclers face margin compression. Other factors affecting conversion costs include energy tariffs, labour costs, flux and alloying element, and furnace efficiency. In such cases, recyclers may delay production or pass on increased costs to buyers, affecting final pricing in the market.

Looking forward, the recycled aluminium market in India is expected to reach a value of USD 9.20 Billion and a volume of 3,715 thousand Tons by FY2030, reflecting a CAGR of 13.2% and 11.2%, respectively, during FY2026–FY2030.

Policy and digital infrastructure developments are playing a pivotal role in accelerating India's recycled aluminium market. A significant advancement came with the launch of a National Non-Ferrous Metal Scrap Recycling Portal by the Ministry of Mines in 2024. This digital platform is designed to facilitate traceability, improve scrap collection logistics, and support data-driven policymaking by integrating stakeholders across the recycling value chain from scrap collectors and processors to manufacturers. It marks a strategic move toward formalising the recycling sector, which has historically been fragmented and informal. In parallel, India continues to impose a 2.5% import duty on aluminium scrap, which is a critical issue for domestic recyclers. Aluminium scrap forms the bulk of India's aluminium imports accounting for nearly 80% of total

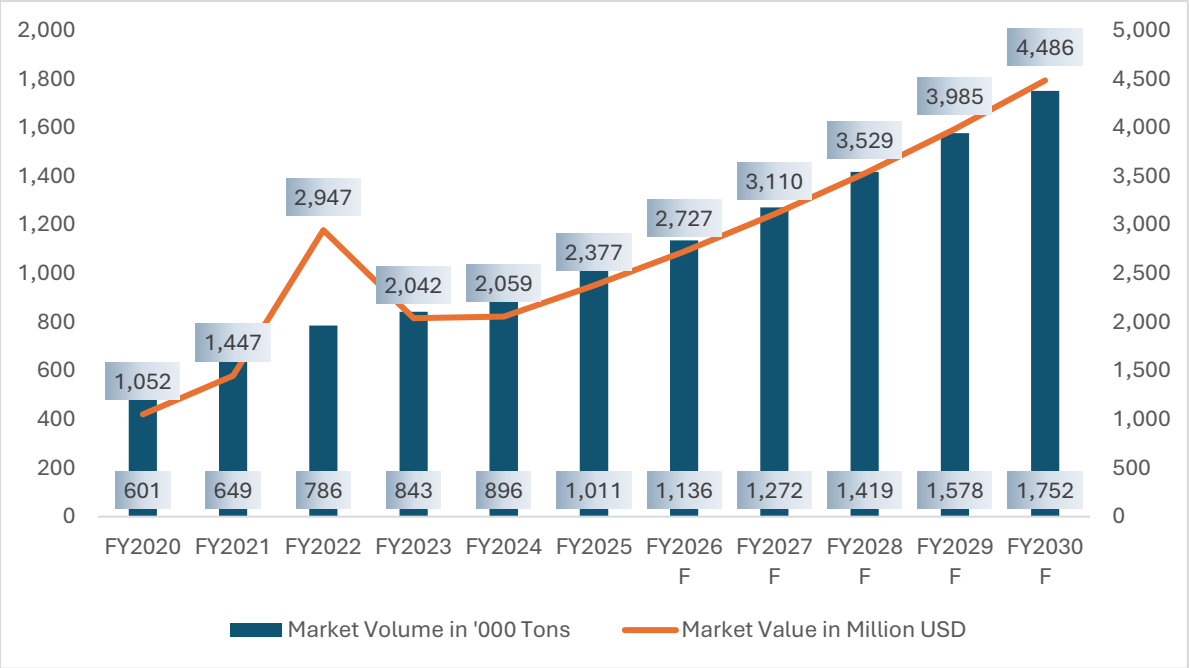
aluminium import volumes. Despite abundant domestic demand, this tariff structure discourages efficient scrap inflow. It incentivises manufacturers to shift recycling operations to low-duty regions such as Malaysia and Thailand, where aluminium scrap can be imported duty-free. India's aluminium scrap imports have witnessed a rising trend over the last five years, driven by increasing demand from secondary producers and a widening gap between domestic scrap availability and consumption. For example, aluminium scrap imports rose from around 1.2 million tonnes in FY2019 to approximately 1.8 million tonnes in FY2024, underlining India's growing reliance on imported scrap. As the government seeks to reduce import dependency and improve the efficiency of the domestic recycling ecosystem, initiatives such as the national portal and proposed policy support like scrap collection infrastructure investment, incentives for organized recyclers, and potential revisions to the import duty structure are expected to enhance recycling capacity and ensure long-term sustainability and supply security for the Indian aluminium sector.

### 4.3.2 Split of Recycled Aluminium

| Cast | FY2020 | FY2021 | FY2022 | FY2023 | FY2024 | FY2025 | FY2026 F | FY2027 F | FY2028 F | FY2029 F | FY2030 F |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Market Volume in '000 Tons** | 601 | 649 | 786 | 843 | 896 | 1,011 | 1,136 | 1,272 | 1,419 | 1,578 | 1,752 |
| **Market Value in Million USD** | 1,052 | 1,447 | 2,947 | 2,042 | 2,059 | 2,377 | 2,727 | 3,110 | 3,529 | 3,985 | 4,486 |
| **Rolled** | | | | | | | | | | | |
| **Market Volume in '000 Tons** | 347 | 376 | 457 | 492 | 525 | 595 | 671 | 754 | 845 | 943 | 1,051 |
| **Market Value in Million USD** | 591 | 816 | 1,669 | 1,161 | 1,176 | 1,363 | 1,570 | 1,797 | 2,046 | 2,320 | 2,622 |
| **Extrusion** | | | | | | | | | | | |
| **Market Volume in '000 Tons** | 217 | 231 | 275 | 290 | 304 | 338 | 373 | 411 | 451 | 493 | 539 |
| **Market Value in Million USD** | 345 | 467 | 935 | 638 | 633 | 718 | 810 | 907 | 1,011 | 1,123 | 1,242 |
| **Others** | | | | | | | | | | | |
| **Market Volume in '000 Tons** | 134 | 144 | 174 | 186 | 196 | 221 | 247 | 275 | 305 | 338 | 374 |
| **Market Value in Million USD** | 210 | 287 | 582 | 401 | 403 | 463 | 528 | 599 | 677 | 761 | 852 |

Source: IMARC Group, ICRA Analytics

#### 4.3.2.1 Cast Aluminium:




Source: IMARC, ICRA Analytics

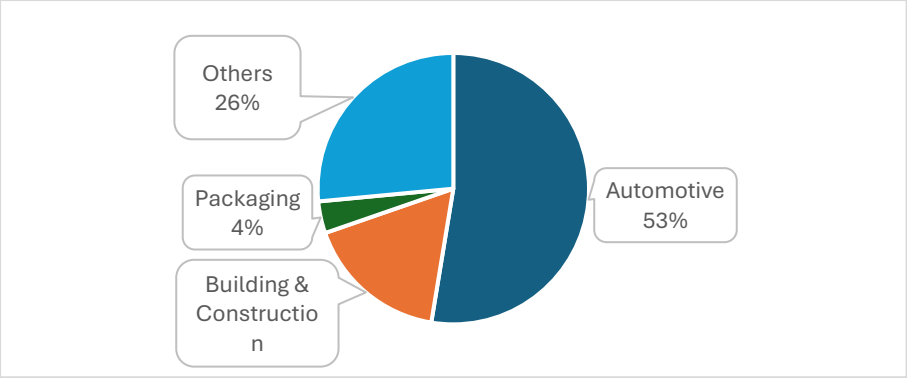
Cast aluminium remains the leading segment in India's recycled aluminium market, accounting for 46.7% of total secondary aluminium demand in FY2025.

Its dominance is driven by its wide application in the automotive, electrical, and industrial machinery sectors. With excellent fluidity and castability, recycled cast aluminium is extensively used in engine components, pump housings, motor parts, and EV structures. The ongoing transition toward electric mobility and lightweighting initiatives has further elevated demand for aluminium castings. Additionally, India's automotive sector supported by vehicle electrification, fuel-efficiency norms, and domestic manufacturing policies is stimulating demand for high-strength, low-carbon materials like recycled cast aluminium. The government's initiatives around scrap processing parks and recycling clusters are also boosting the supply and processing of aluminium scrap. The availability of low-cost labour and localised secondary production capabilities enhances the cost-effectiveness of cast aluminium in India's industrial value chains.

CMR Green Technologies Limited has a market share of ~42-45%, in terms of volume sold in the cast alloy segment pertaining to automotive industry for FY2025.

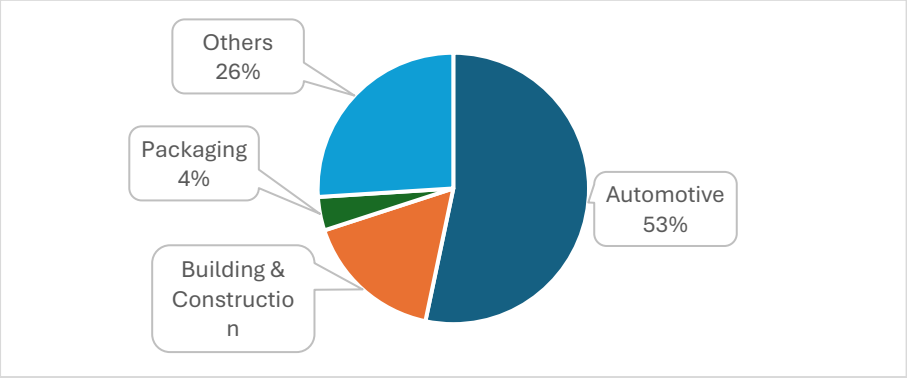
**Market segregation by end-user segment (in % terms)**

**Cast Aluminium in FY2020**



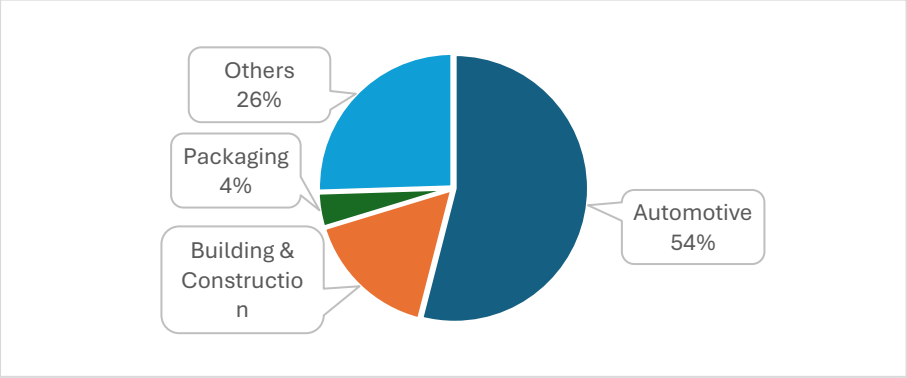

Source: IMARC, ICRA Analytics

**Cast Aluminium in FY2025**



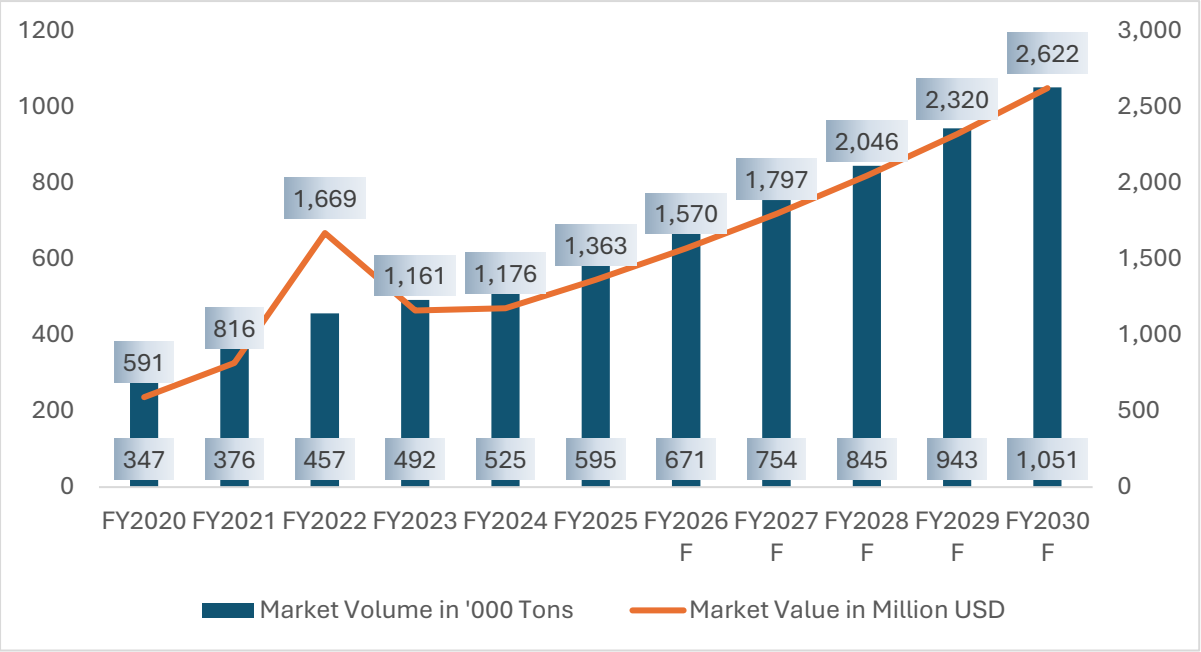

Source: IMARC, ICRA Analytics

**Cast Aluminium in CY2030 F**




Source: IMARC, ICRA Analytics

#### 4.3.2.2 Rolled Aluminium:



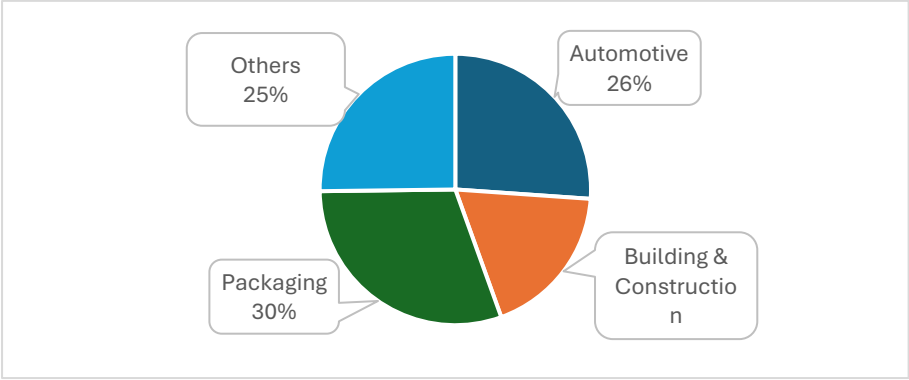

Source: IMARC, ICRA Analytics

Recycled rolled aluminium accounted for 27.5% of India's total secondary aluminium consumption in FY2025.

It is extensively used in packaging, pharmaceutical foils, construction panels, cookware, and transportation. The growing demand for lightweight and recyclable packaging particularly in urban centres has supported the growth of rolled aluminium, especially in food and beverage applications. India's aluminium rolling capacity is expanding with significant private and public investments in closed-loop recycling systems. Domestic players are increasingly focused on improving surface quality and thickness uniformity to meet the needs of packaging and export markets. Furthermore, increased demand from solar panel frames and HVAC ducting applications is creating new avenues for rolled aluminium in the construction and renewables sectors.

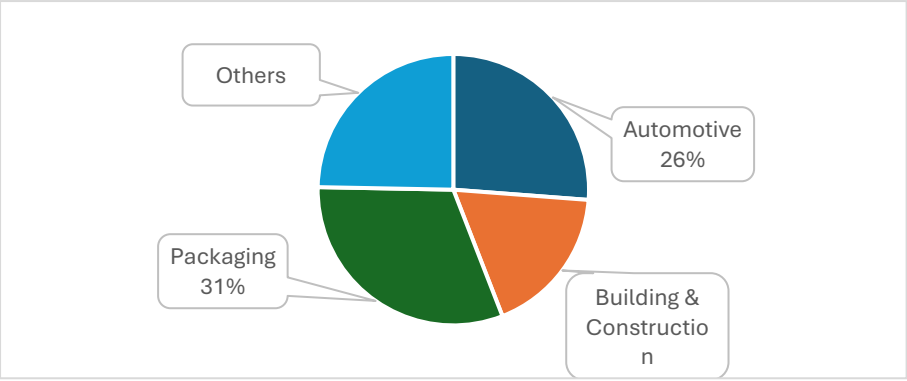
**Market segregation by end-user segment (in % terms)**

**Rolled Aluminium in FY2020**



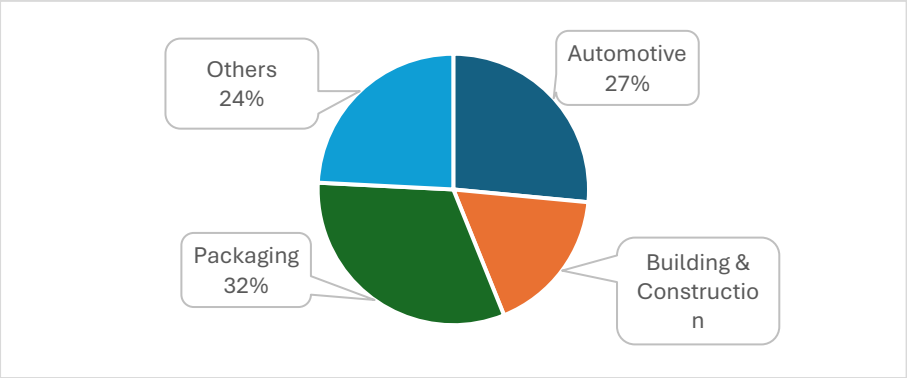

Source: IMARC, ICRA Analytics

**Rolled Aluminium in FY2025**



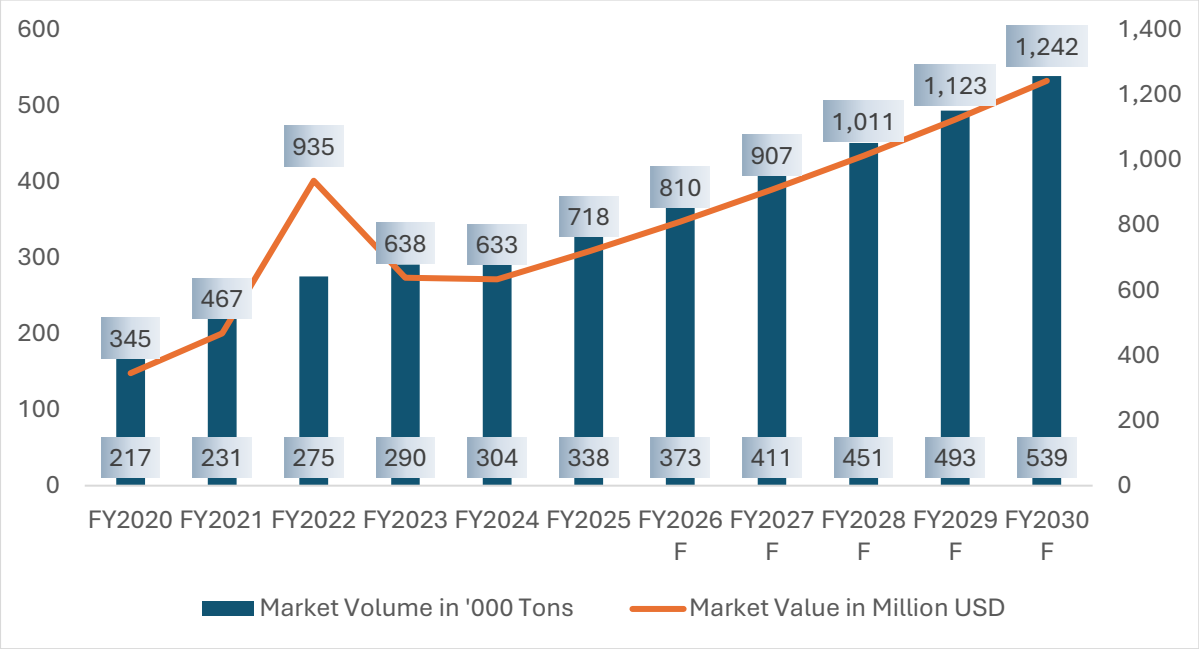

Source: IMARC, ICRA Analytics

**Rolled Aluminium in FY2030F**




Source: IMARC, ICRA Analytics

**4.3.2.3 Extruded Aluminium:**




Source: IMARC, ICRA Analytics

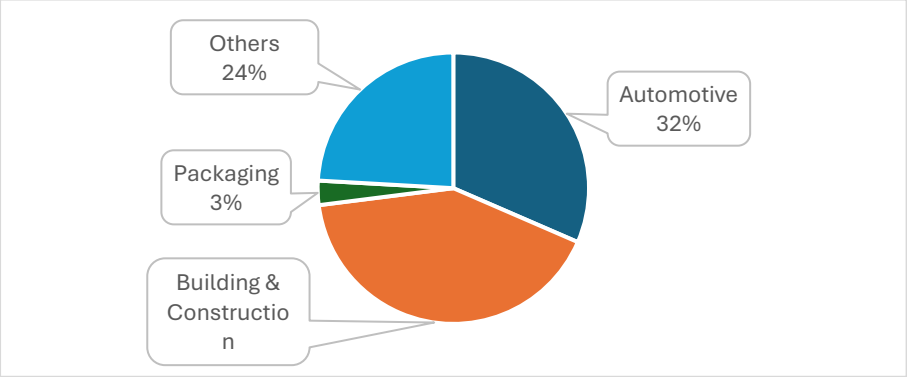
Extruded aluminium formed 15.6% of India's total recycled aluminium market in FY2025.

It is widely used in the building and construction (B&C) sector for producing window and door frames, curtain walls, and modular structures. The growing emphasis on sustainable infrastructure, smart cities, and affordable housing has led to increased demand for durable, corrosion-resistant extrusions. Further, in the automotive segment, with increasing demand in battery electric vehicles (BEVs), the focus has shifted toward aluminium extrusions and sheets that better support lightweight structures, battery enclosures, and safety-critical body parts and therefore, the automotive extrusions wrought aluminium market is likely to grow with higher EV penetration. Recycled wrought aluminium is poised for substantial growth, underpinned by its superior carbon efficiency, lower cost and significant environmental advantages. While cast aluminium has been recycled globally for several decades, advancements in scrap sorting technologies have now made it feasible to produce high purity wrought aluminium.

India's extrusion segment is also seeing technological upgrades. In October 2024, Nupur Recyclers Ltd. entered the recycled aluminium extrusion segment through its subsidiary, Nupur Extrusion, setting up a new plant in Haryana with a planned capacity of 5,000–6,000 tons annually. The plant will cater to solar panel frames, green construction materials, and industrial profiles. Local manufacturing and extrusion innovations are expected to play a key role in reducing the import dependency for structural aluminium components while supporting India's carbon reduction goals.

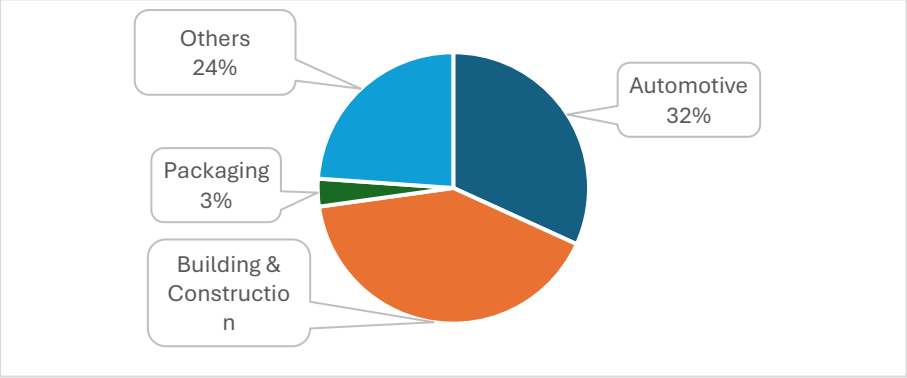
**Market segregation by end-user segment (in % terms)**

**Extruded Aluminium in FY2020**



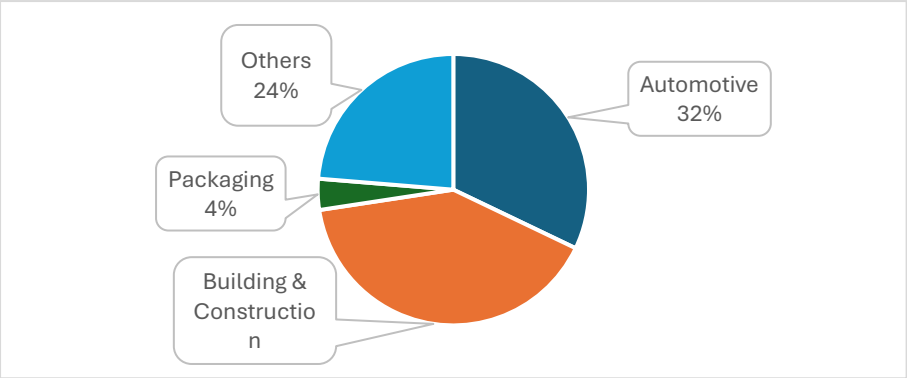

Source: IMARC, ICRA Analytics

**Extruded Aluminium in FY2025**



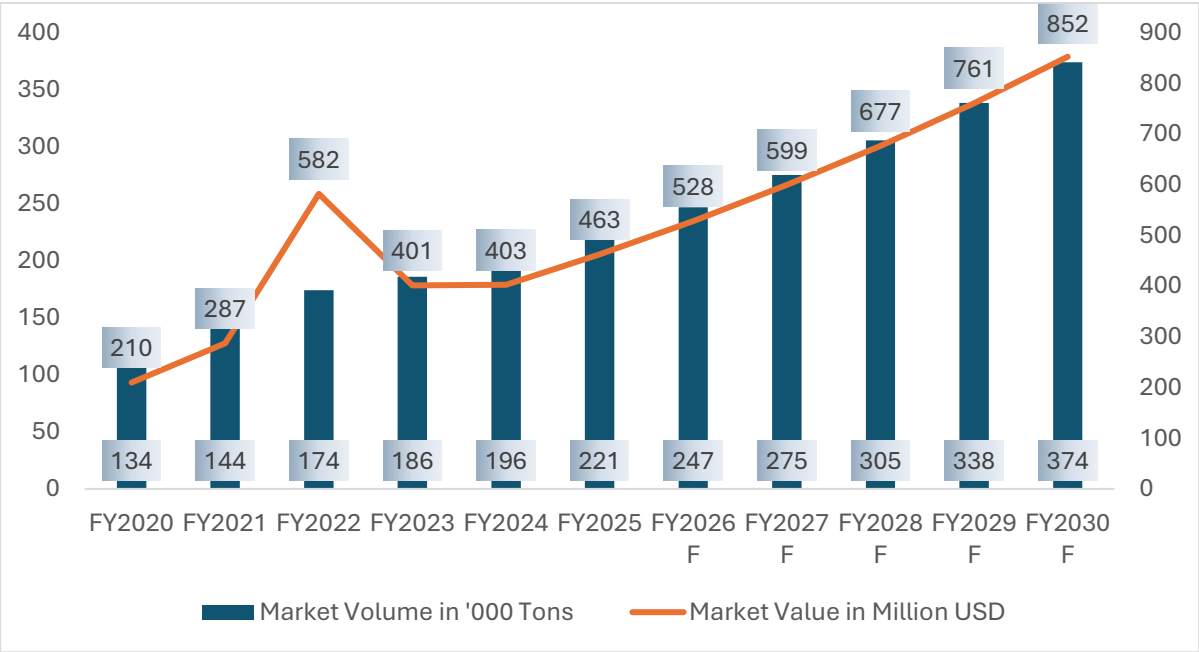

Source: IMARC, ICRA Analytics

**Extruded Aluminium in FY2030F**




Source: IMARC, ICRA Analytics

**4.3.2.4 Other Product Types:**




Source: IMARC, ICRA Analytics

Other product wise segment formed 10.2% of India's total recycled aluminium market in FY2025. This segment includes powders and pastes.

The increasing usage of aluminium in drawn and powder forms is becoming a notable driver of aluminium demand. Drawn aluminium products such as wires and tubes are gaining popularity due to their lightweight, corrosion-resistant properties, and are extensively used in electrical transmission, construction scaffolding, and automotive tubing. Simultaneously, aluminium powder and paste are witnessing rising demand in niche but growing sectors. Aluminium powder is widely used in explosives and metallic inks for printing applications, while aluminium paste plays a critical role in the automotive sector for delivering premium metallic finishes in paints and coatings. These diverse applications across high-value industries are driving the growth of specialised aluminium forms, thereby expanding the overall consumption.

### 4.4 End-User Industry Demand Trends

India's demand for recycled metals particularly aluminium and stainless steel is witnessing a strong upward trajectory, driven by sustainability targets, industrial regulations, and circular economy initiatives across key end-user sectors such as automotive, packaging, and construction.

In the automotive sector, regulatory momentum is rapidly pushing the industry toward greater recycled content usage. As per proposed Extended Producer Responsibility (EPR) rules, vehicle manufacturers in India may be required to use at least 20% recycled materials by weight in metal components starting from FY2027, with this mandate increasing to 30% by FY2029. This shift is aligned with India's push to operationalize more Registered Vehicle Scrapping Facilities (RVSFs), of which 31 are currently active, with another 29 approved.

The packaging sector, particularly in aluminium, is also witnessing robust growth in recycling. With increased urbanization, demand for sustainable packaging, and cost efficiencies associated with recycled materials, India's aluminium packaging industry is shifting toward closed-loop systems. Beverage cans, foil packaging, and laminated containers are increasingly incorporating recycled aluminium, driven by both corporate ESG targets and consumer preference for eco-conscious brands.

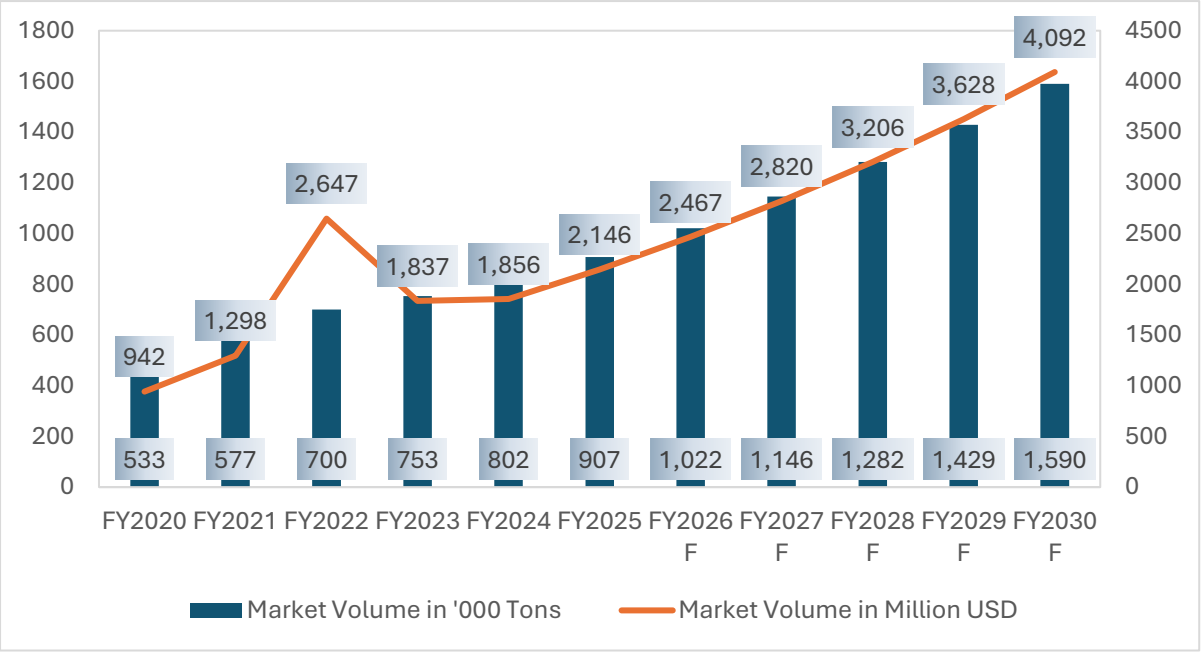
In the construction sector, stainless steel and aluminium recycling is gaining traction due to rising infrastructure spending and green building mandates. Builders and contractors are incorporating recycled stainless steel into rebar, pipes, and structural components for LEED-certified projects. With India's ambitious urban infrastructure pipeline and Smart Cities Mission, the sector is expected to significantly boost demand for recycled metal inputs especially as energy savings and environmental compliance become central to procurement strategies

#### 4.4.1 Split of End-User Industry

| Automotive | FY2020 | FY2021 | FY2022 | FY2023 | FY2024 | FY2025 | FY2026 F | FY2027 F | FY2028 F | FY2029 F | FY2030 F |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Market Volume in '000 Tons** | 533 | 577 | 700 | 753 | 802 | 907 | 1,022 | 1,146 | 1,282 | 1,429 | 1,590 |
| **Market Value in Million USD** | 942 | 1,298 | 2,647 | 1,837 | 1,856 | 2,146 | 2,467 | 2,820 | 3,206 | 3,628 | 4,092 |
| **Building & Construction** | | | | | | | | | | | |
| **Market Volume in '000 Tons** | 292 | 312 | 373 | 396 | 415 | 463 | 514 | 568 | 626 | 688 | 754 |
| **Market Value in Million USD** | 470 | 640 | 1,287 | 882 | 879 | 1,004 | 1,137 | 1,280 | 1,433 | 1,598 | 1,776 |
| **Packaging** | | | | | | | | | | | |
| **Market Volume in '000 Tons** | 138 | 150 | 183 | 199 | 213 | 242 | 275 | 310 | 349 | 391 | 438 |
| **Market Value in Million USD** | 212 | 295 | 607 | 426 | 434 | 507 | 587 | 677 | 775 | 884 | 1,006 |
| **Others** | | | | | | | | | | | |
| **Market Volume in '000 Tons** | 336 | 362 | 436 | 465 | 491 | 552 | 617 | 687 | 763 | 844 | 933 |
| **Market Value in Million USD** | 574 | 785 | 1,591 | 1,097 | 1,101 | 1,265 | 1,443 | 1,638 | 1,849 | 2,078 | 2,328 |

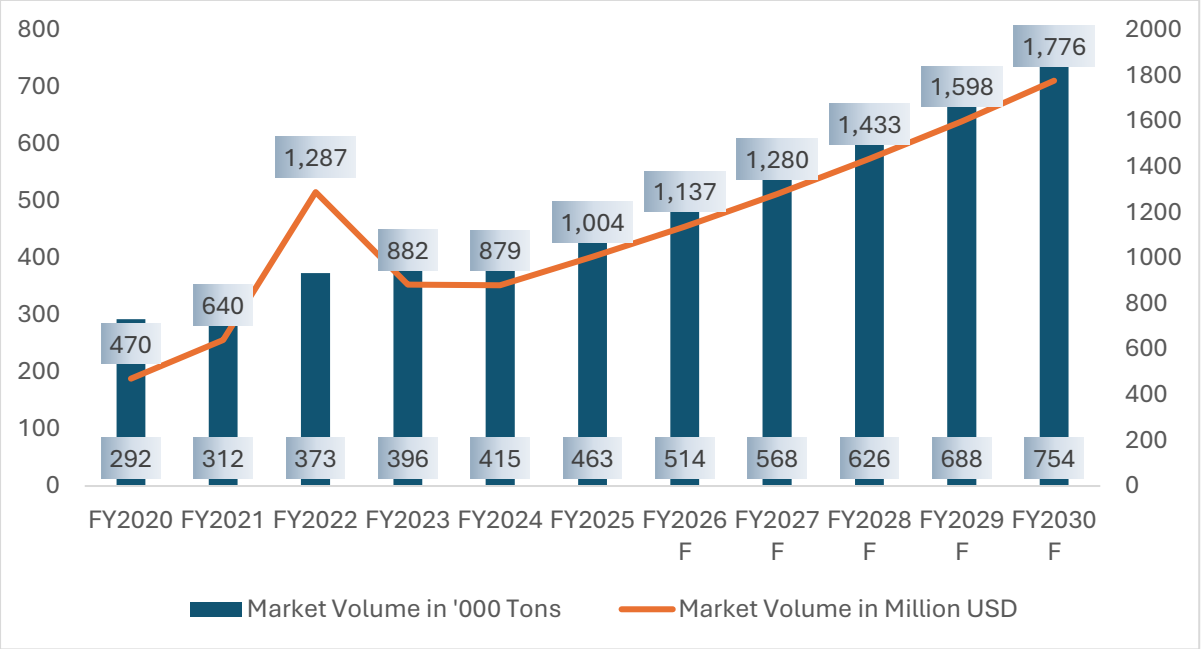
Source: IMARC Group, ICRA Analytics

#### 4.4.1.1 Automotive Industry:



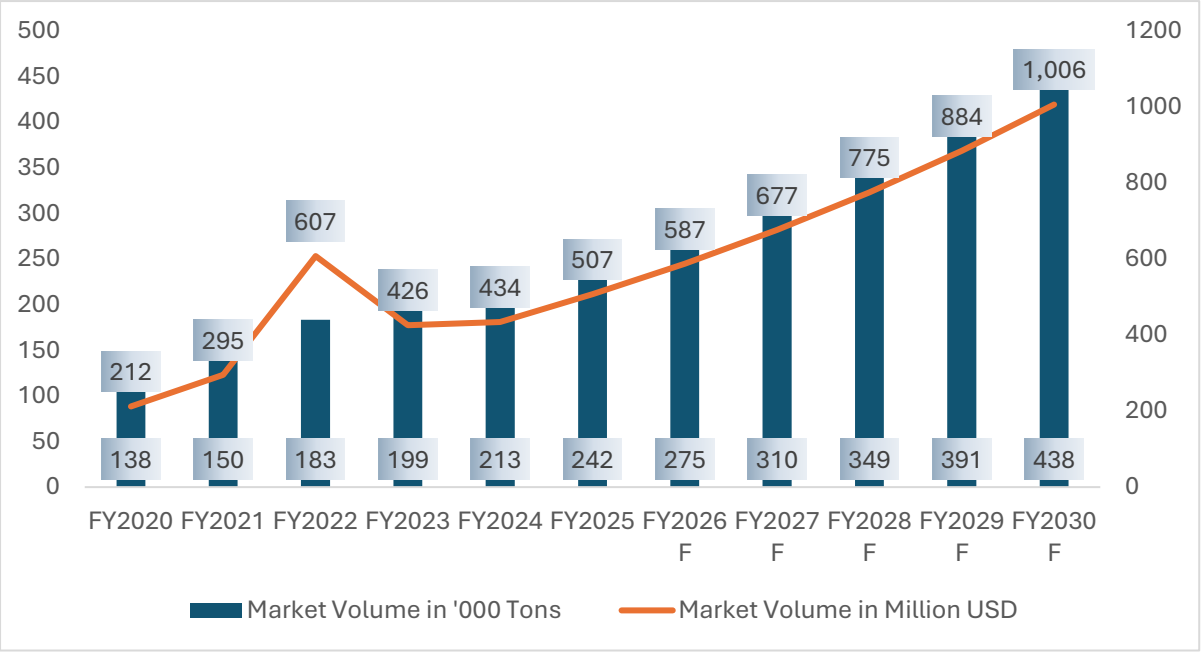

Source: IMARC, ICRA Analytics

#### 4.4.1.2 Building & Construction Industry:



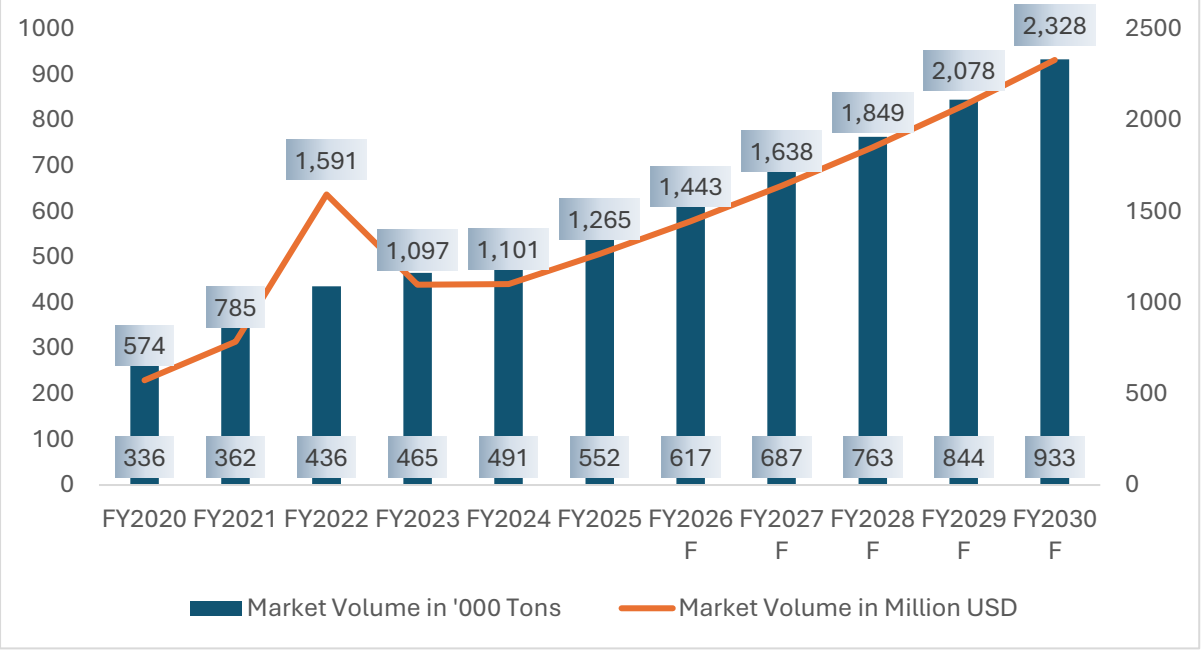

Source: IMARC, ICRA Analytics

#### 4.4.1.3 Packaging Industry:




Source: IMARC, ICRA Analytics

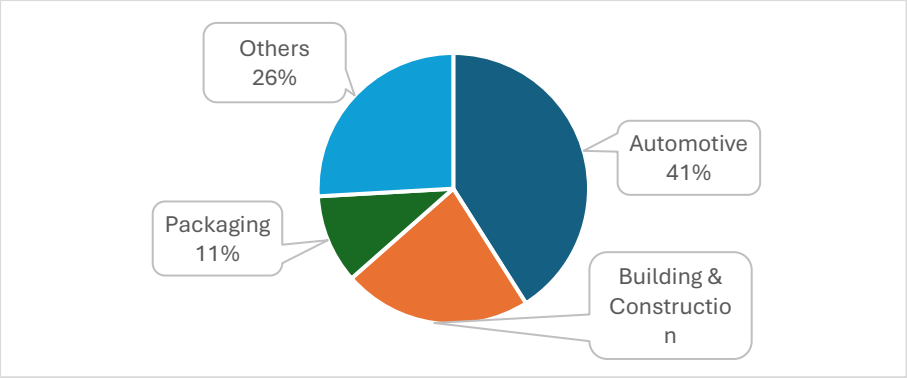
#### 4.4.1.4 Others Industry:




Source: IMARC, ICRA Analytics

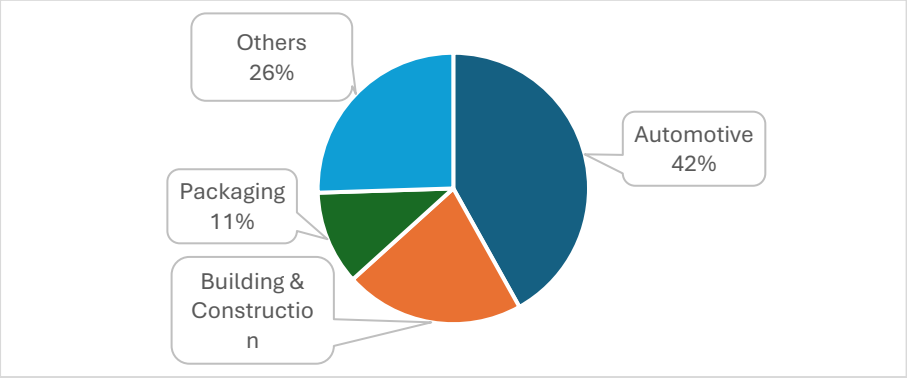
**Market segregation by end-user industry shares (in % terms)**

**End-User Industries Shares in FY2020**



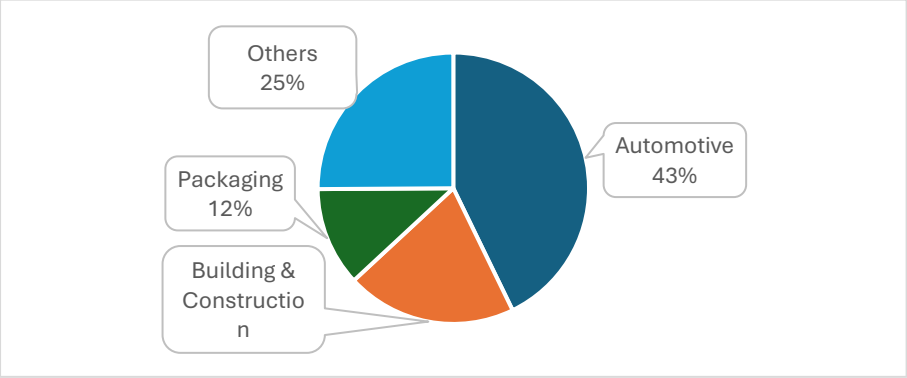

Source: IMARC, ICRA Analytics

**End-User Industries Shares in FY2025**




Source: IMARC, ICRA Analytics

**End-User Industries Shares in FY2030 F**




Source: IMARC, ICRA Analytics

In FY2025, the recycled aluminium market in India by end-user industry reached volumes of 907 thousand tons in automotive, 463 thousand tons in building & construction, 242 thousand tons in packaging, and 552 thousand tons in other applications, growing at CAGRs of 11.2%, 9.7%, 11.9%, and 10.4%, respectively, during FY2020–FY2025. Rapid urbanization and smart infrastructure projects in India are expected to boost the use of recycled aluminium in the construction industry. From window frames and roofing to structural reinforcements and

facades, recycled aluminium offers corrosion resistance, durability, and design flexibility. Green building certifications like GRIHA and LEED are also encouraging developers to adopt more sustainable materials

Looking forward, the recycled aluminium market in India is projected to reach 1,590 thousand tons in automotive, 754 thousand tons in building & construction, 438 thousand tons in packaging, and 933 thousand tons in other applications by FY2030, growing at CAGRs of 11.7%, 10.1%, 12.3%, and 10.9%, respectively, during FY2026–FY2030.

In sectors such as electricals, consumer appliances, and industrial machinery, the use of recycled aluminium is expected to propel growth due to its excellent conductivity, lightweight nature, and sustainability benefits. The Make in India initiative and expansion of the electronics and white goods market are further increasing the demand for affordable and eco-friendly raw materials like recycled aluminium

In FY2025, the recycled aluminium market in India by end-user industry reached values of USD 2,146 Million in automotive, USD 1,004 Million in building & construction, USD 507 Million in packaging, and USD 1,265 Million in other applications, growing at CAGRs of 17.9%, 16.4%, 19.1%, and 17.1%, respectively, during FY2020–FY2025. push for electric mobility. India's automotive sector is witnessing a structural transformation, driving robust demand for recycled aluminium. Overall vehicle production is projected to grow at a CAGR of 5–7% until 2028, while the rapid rise in electric vehicle (EV) adoption, expected to reach 10–15% in 4Ws and 45–55% in 2Ws will further boost aluminium use, given EVs require 50–60% more aluminium than ICE vehicles. Recycled aluminium, in particular, is gaining traction due to its role in lightweighting, cost efficiency, and sustainability. Consumer preference is also shifting toward SUVs and premium models, which typically use three times more aluminium than entry-level cars. Meanwhile, stricter fuel efficiency norms like CAFE are pushing OEMs to reduce vehicle weight, increasing aluminium content by 10–15% per vehicle, especially in castings and extrusions. The localisation of auto component manufacturing is prompting Indian OEMs to source aluminium domestically, creating opportunities for recyclers. Simultaneously, the government's push for sustainability through circularity initiatives and likely EPR mandates is accelerating the integration of low-carbon materials. As a result, recycled aluminium is increasingly used in engine blocks, body panels, and structural parts due to its high strength-to-weight ratio, reduced emissions, and alignment with the industry's decarbonization goals.

**Evolving Trends in India's Automotive Industry:**

**EV Revolution Driving Aluminium Intensity:** EV penetration is expected to rise from under 1% today to 10–15% by 2028, with an even sharper increase in the two-wheeler segment (~45–55% adoption). EVs have significantly higher aluminium intensity ~ 50–60% more than ICE vehicles due to the usage of lightweight castings and battery housings. This shift will be a major demand driver for secondary aluminium, especially ADC12-grade alloys.

**Premiumization of Passenger Vehicles:** The Indian passenger vehicle market is shifting towards SUVs and premium sedans, driven by rising incomes, aspirational buying, and better roads. SUVs are especially popular for their ground clearance, space, and road presence. As these vehicles use more aluminium up to 85 kg per unit versus 25–50 kg in hatchbacks this trend is set to significantly boost aluminium demand in the auto sector.

**Lightweighting Driven by Regulations:** Emissions and fuel-efficiency norms like CAFE are pushing automakers to adopt lightweight materials. This trend could increase aluminium content by 10–15% per vehicle across all fuel types, including hybrids and ICE vehicles.

Localisation and Import Barriers: With rising production costs in China and greater geopolitical risks, Indian OEMs are localizing more of their component sourcing. BIS certification requirements have also curtailed imports of wheel alloys, pushing up domestic demand for primary aluminium.

**Sustainability and Circular Economy Push:** The Indian government's strong thrust on recycling and Extended Producer Responsibility (EPR) norms is boosting demand for recycled aluminium, as automakers increasingly seek low-carbon, sustainable inputs.

Looking forward, the recycled aluminium market in India is projected to reach USD 4,092 Million in automotive, USD 1,776 Million in building & construction, USD 1,006 Million in packaging, and USD 2,328 Million in other applications by FY2030, growing at CAGRs of 13.5%, 11.8%, 14.4%, and 12.7%, respectively, during FY2026–FY2030.

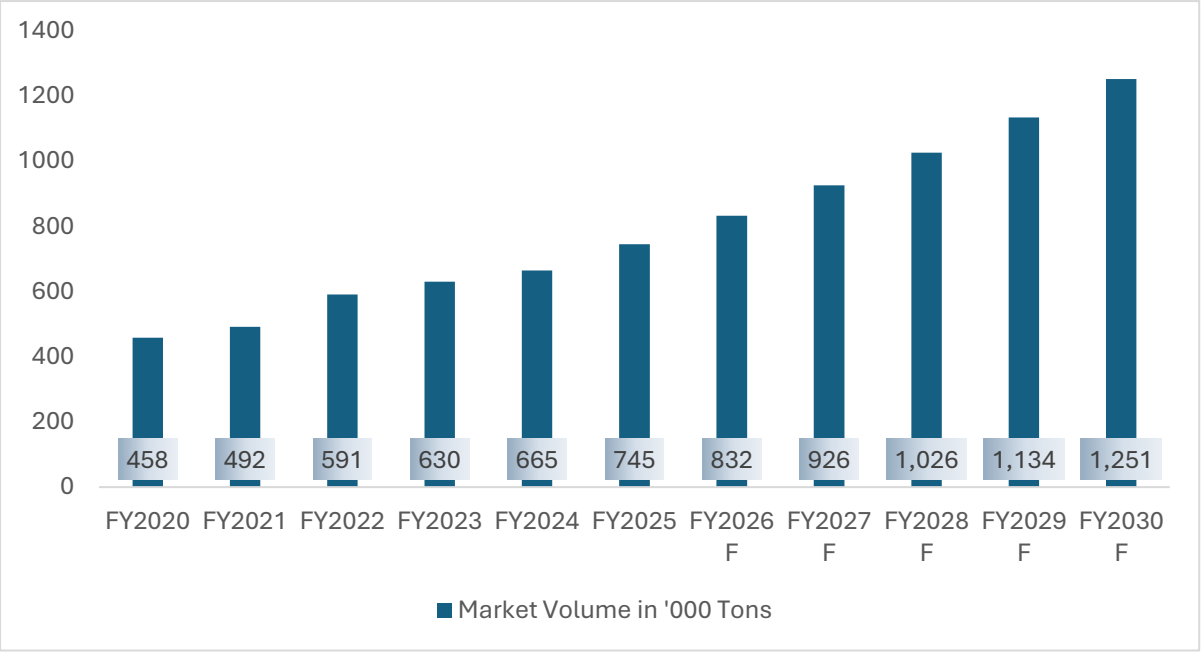
The demand for sustainable and recyclable packaging solutions in India is expected to augment the use of recycled aluminium, particularly in food and beverage, pharmaceutical, and personal care sectors. Aluminium's ability to preserve product quality, along with increasing environmental awareness and regulatory pressure to reduce plastic use, is driving the shift toward aluminium cans, and foil-based packaging.

### 4.4.2 Region wise breakup

| West & Central India | FY2020 | FY2021 | FY2022 | FY2023 | FY2024 | FY2025 | FY2026 F | FY2027 F | FY2028 F | FY2029 F | FY2030 F |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Market Volume in '000 Tons** | 458 | 492 | 591 | 630 | 665 | 745 | 832 | 926 | 1026 | 1134 | 1251 |
| **South India** | | | | | | | | | | | |
| **Market Volume in '000 Tons** | 420 | 453 | 549 | 589 | 625 | 706 | 793 | 887 | 990 | 1101 | 1222 |
| **North India** | | | | | | | | | | | |
| **Market Volume in '000 Tons** | 323 | 351 | 428 | 461 | 493 | 559 | 631 | 710 | 796 | 889 | 992 |
| **East India** | | | | | | | | | | | |
| **Market Volume in '000 Tons** | 98 | 105 | 125 | 132 | 139 | 154 | 171 | 189 | 208 | 228 | 250 |

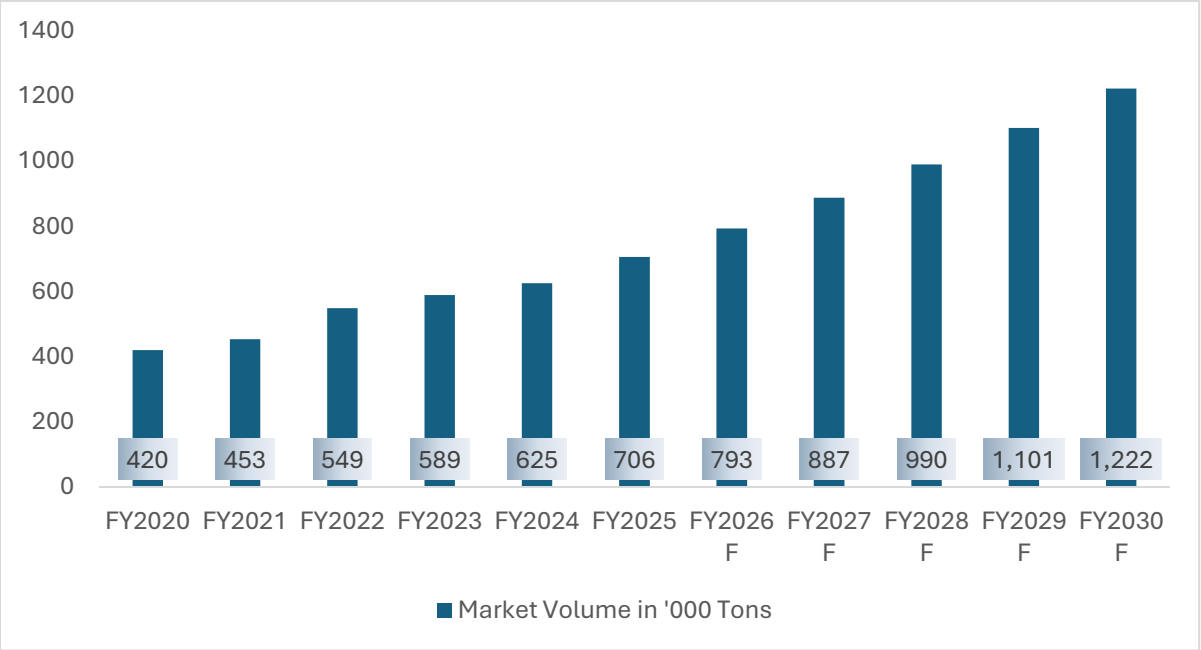
Source: IMARC Group, ICRA Analytics

### 4.4.2.1: West and Central India



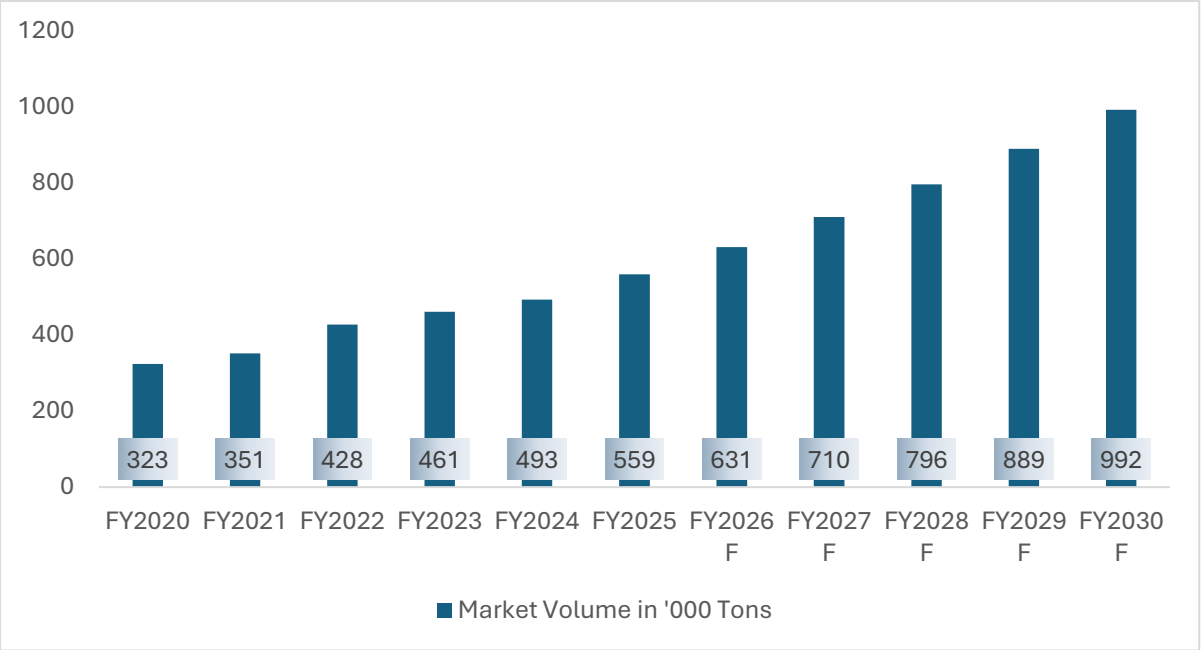

Source: IMARC Group, ICRA Analytics

### 4.4.2.2: South India



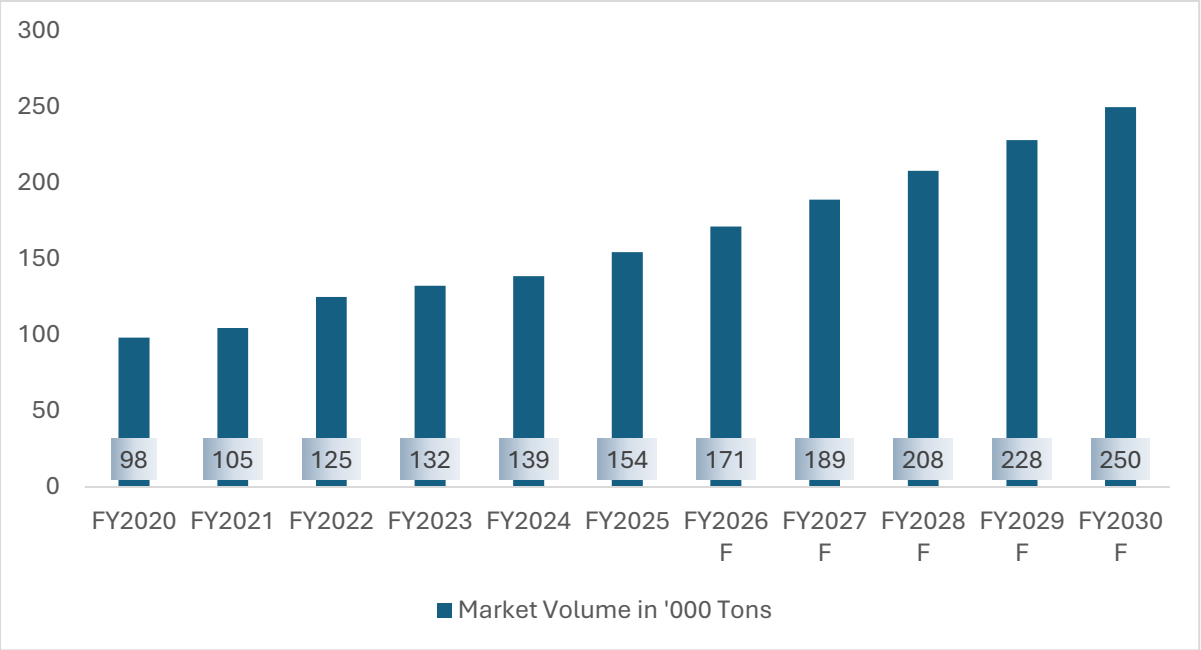

Source: IMARC Group, ICRA Analytics

### 4.4.2.3: North India




Source: IMARC Group, ICRA Analytics

### 4.4.2.4: East India

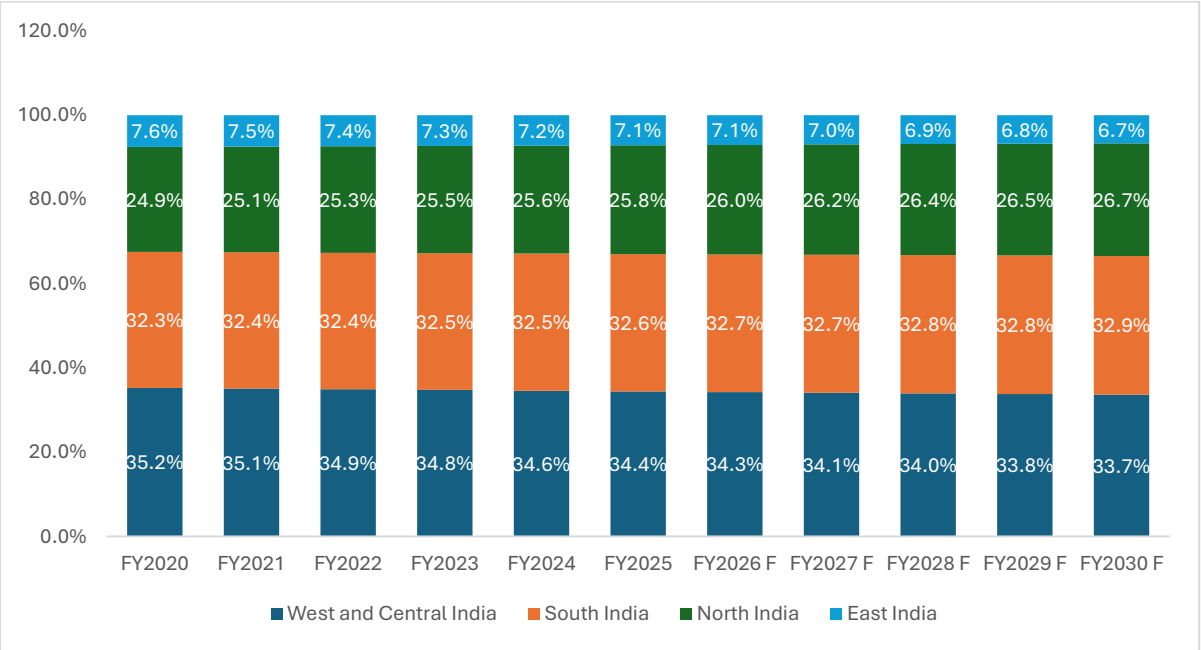



### 4.4.3 Region-Wise Demand for Recycled & Recovered Metals from Key Geographies

| Region (Share in %) | FY2020 | FY2021 | FY2022 | FY2023 | FY2024 | FY2025 | FY2026 F | FY2027 F | FY2028 F | FY2029 F | FY2030 F |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **West and Central India** | 35.2% | 35.1% | 34.9% | 34.8% | 34.6% | 34.4% | 34.3% | 34.1% | 34.0% | 33.8% | 33.7% |
| **South India** | 32.3% | 32.4% | 32.4% | 32.5% | 32.5% | 32.6% | 32.7% | 32.7% | 32.8% | 32.8% | 32.9% |
| **North India** | 24.9% | 25.1% | 25.3% | 25.5% | 25.6% | 25.8% | 26.0% | 26.2% | 26.4% | 26.5% | 26.7% |
| **East India** | 7.6% | 7.5% | 7.4% | 7.3% | 7.2% | 7.1% | 7.1% | 7.0% | 6.9% | 6.8% | 6.7% |

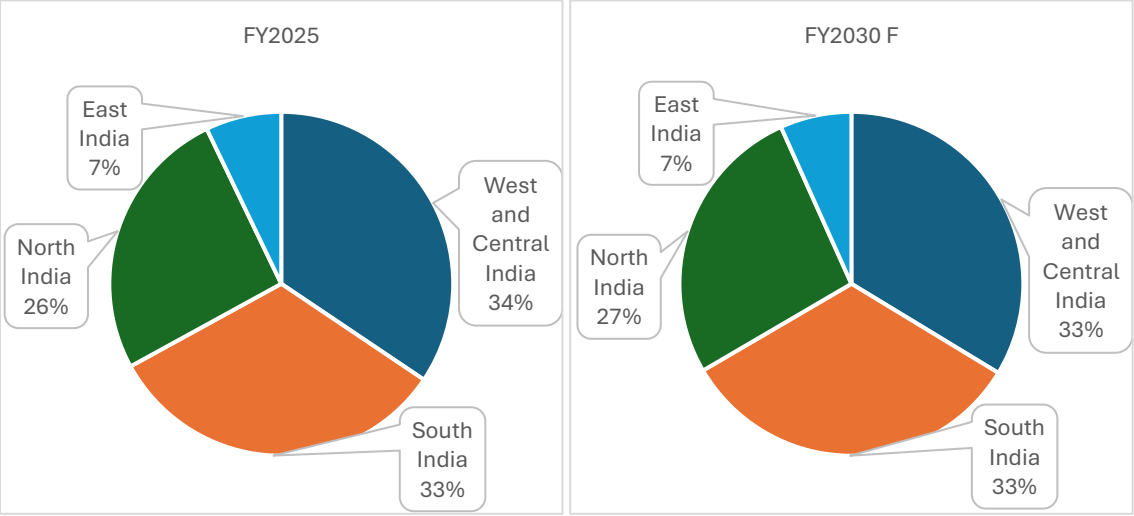
Source: IMARC Group, ICRA Analytics

**India Recycled Aluminium Market: Region-Wise Volume Share (in %):**




Source: IMARC Group, ICRA Analytics

**Region-wise share of volume in FY2025 and FY2030 F**




Source: IMARC Group, ICRA Analytics

### 4.5 Trends in Molten vs Solid Aluminium

India is undergoing a significant transformation in aluminium consumption not only shifting from primary to secondary aluminium but also moving from solid (ingot) to molten aluminium delivery. This transition is being driven by sectors such as automotive, die-casting, and packaging, which are increasingly focused on cost efficiency, emission reduction, and operational productivity. Unlike solid aluminium, which requires storage, remelting, and intermediate handling at the customer's facility leading to energy losses, dross formation, and longer lead times molten aluminium can be directly fed into casting or processing operations. This creates a more efficient supply chain and reduces both fixed and variable costs associated with furnaces, fuel, and

manpower. These operational and environmental advantages make molten aluminium a preferred choice for industries aligning with decarbonization goals and ESG commitments.

In the automotive sector, rising electric vehicle production and just-in-time (JIT) casting operations are accelerating the adoption of molten aluminium. Die-casting facilities are increasingly being located adjacent to aluminium smelters to ensure uninterrupted molten supply, bypassing storage and handling inefficiencies associated with solid ingots. For example, Craftsman Automation has strategically located its manufacturing facilities in Coimbatore and Bangalore, near major automotive manufacturing hubs, to provide Just-in-Time (JIT) supply to customers' facilities within hours. The packaging sector, while still in early stages, is exploring molten aluminium for large-volume applications, benefiting from energy savings and improved metal utilization. Typically, molten delivery offers total estimated savings of 6–7% compared to solid ingots, with 2–3% from reduced melt loss, ~3% from lower energy requirements, and ~1% from operational efficiencies such as reduced manpower and inventory costs. These benefits are particularly attractive to downstream manufacturers aiming to optimise costs and meet ESG goals. While the automotive and EV sectors increasingly favour recycled aluminium for lightweighting and environmental performance, this preference applies across both solid and molten forms. To fully harness this momentum, India must scale up its molten handling and logistics infrastructure, enabling broader adoption of this efficient, low-carbon feedstock.

Rising environmental awareness and regulatory mandates are also supporting molten aluminium adoption. India's primary aluminium industry emits 14 tonnes of $CO_2$ per tonne of aluminium, one of the highest rates globally, whereas recycled aluminium emits only 0.3 tonnes. With climate targets and government incentives, industries are increasingly turning to molten aluminium. Moreover, molten (or liquid) aluminium offers additional sustainability and cost benefits by eliminating the need for remelting, saving approximately 528 kg of $CO_2$ emissions per metric tonne. Recycling is also 95% more energy-efficient than primary production, making it the preferred choice for sectors pursuing ESG compliance. This transition is evident in the faster growth of aluminium recycling compared to primary aluminium production, spurred by policy support and evolving industrial priorities.

Following are the companies scored as per S&P Global Corporate Sustainability Assessment (CSA) Score in the aluminium industry for CY2024:

| Companies | Total CSA Score |
|---|---|
| Hindalco Industries Limited | 87 |
| Vedanta Aluminium Limited | 77 |
| Companhia Brasileira de Alumínio | 72 |
| Norsk Hydro ASA | 65 |
| Alcoa Corporation | 60 |
| CMR Green Technologies Limited | 49 |
| Press Metal Aluminium Holdings Berhad | 48 |

Source: S&P Global Corporate Sustainability Assessment (CSA) Score, 2024

CMR Green Technologies Limited has the 6th highest score as per S&P Global Corporate Sustainability Assessment (CSA) Score amongst the companies in the aluminium industry scored by S&P Global.

India is emerging as a competitive exporter of aluminium, backed by low-cost production and its strategic position in the China+1 supply chain strategy. Initiatives like the National Infrastructure Pipeline (NIP), increased investment in renewables, and rising aluminium applications in EVs,

solar panels, and wind energy systems are unlocking new domestic opportunities for molten aluminium. However, sustained growth will depend on securing a consistent scrap supply, investing in advanced recycling infrastructure, and scaling up green aluminium production. With the global shift toward sustainable materials, India's secondary (molten) aluminium sector is poised to play a critical role in both domestic growth and global supply chains.

In India, the supply of liquid aluminium is limited to only a select group of players, owing to the high technical expertise, infrastructure, and operational precision required in this space. Unlike conventional ingot supply, delivering liquid aluminium demands stringent temperature control, specialized logistics, and just-in-time delivery capabilities to ensure quality and consistency for end-use industries such as automotive and manufacturing. As a result, only a handful of established and technologically advanced recyclers and smelters are able to operate in this niche segment. The players operating in this segment are CMR Green Technologies Limited, Shree Balaji Alumnicast and Century Aluminium Manufacturing.

### 4.5.1 Advantages of Recycled Aluminium

**Massive Energy Savings and Lower Carbon Emissions:**

Recycled aluminium unlocks significant efficiency gains across energy, material, and quality metrics. It consumes only ~5% of the energy required to produce aluminium from bauxite via the Hall–Héroult process translating to a ~95% energy savings. As per industry estimates, every one tonne of aluminium manufactured through primary route, consumes 5-6 tonnes of bauxite, 1-1.5 tonne of limestone, 20-25 tonnes of water, and approximately 14,000 Kwh of power which is saved while doing it through the secondary/recycling route. Furthermore, each tonne of aluminium ingot manufactured through primary route emits approximately 3,830 kilograms of carbon dioxide compared with approximately 290 kilograms of carbon dioxide for aluminium manufactured through scrap recycling

**Significant Cost Efficiency for Customers:** In India's cost-sensitive manufacturing environment, recycled aluminium presents a more affordable option than solid primary aluminium. By eliminating the energy-intensive extraction and refining stages, it significantly lowers production costs. These savings are passed down the value chain to manufacturers and end consumers, helping to maintain competitive pricing in sectors such as construction, automotive, and appliances. Typically, recycled aluminium is cheaper than primary aluminium while being at par with primary metal in terms of quality for the same alloy.

**Reduced Environmental Footprint and Land Use:** Unlike solid aluminium, which depends heavily on bauxite mining often resulting in land degradation and biodiversity loss recycled aluminium sidesteps these environmental costs entirely. Recycling aluminium diverts millions of tonnes of scrap from landfills and drastically cuts down on deforestation and water usage associated with mining. This is particularly vital in India, where natural resource conservation and waste management are top priorities. By adopting molten aluminium, industries not only safeguard non-renewable resources but also reinforce India's circular economy agenda, driving environmental sustainability across its rapidly expanding industrial base. The process of primary aluminium production through refineries results in the generation of large quantities of solid waste amounting to approximately 2-2.5 tonnes for 1 tonne aluminium produced hence effecting the environment, unlike secondary aluminium where solid and liquid discharge is close to negligible.

**Support for Policy Mandates and Circular Economy Objectives:** India's policy momentum is clearly shifting toward circular manufacturing, with mandates such as a minimum 5% recycled content in aluminium products by FY28, rising to 10% by FY31. Using recycled aluminium sourced directly from recycled scrap enables manufacturers to integrate recycled content seamlessly into production lines without intermediate solidification, ensuring compliance with lower energy input, fewer process steps, and faster turnaround. This direct-use approach not only supports India's circular economy goals by reducing raw material dependency and carbon emissions but also positions adopters to gain early-mover advantages, such as access to green incentives, lower ESG risk scores, and stronger appeal to sustainability-focused buyers.

**Versatility in Applications and Alloy Composition:** Being in pre alloyed form, recycled aluminium scrap offers greater customization flexibility during production. This is particularly valuable in India's varied industrial sectors such as construction, automotive, and electrical where different applications demand specific material traits. Once the recycled aluminium is purified and, where required, alloyed, the molten metal is cast into ingots or other intermediate forms. These ingots serve as feedstock for diverse industries, enabling the production of new aluminium products across sectors.

### 4.5.2 Benefits of Molten Aluminium

**Simplified Production and Quicker Turnaround:** Liquid aluminium cannot be stored and accordingly, customers employ just-in-time ("**JIT**") inventory strategy in terms of which, they receive the products only as they are needed. This inventory model requires an uninterrupted supply of raw materials thereby increasing the customer's dependence on the suppliers.

**Savings**

Even compared to recycled solid aluminium, the molten form eliminates the need to reheat ingots to ~660°C, resulting in significant energy savings. In addition to energy efficiency, molten aluminium ensures higher material yield. It also bypasses key steps such as solidification, storage, remelting, and casting thereby removing both fixed and variable costs associated with furnaces, fuel, handling, and downtime. These operational savings, combined with improved material utilization and lower emissions (up to 90% less air pollution), directly support India's clean manufacturing agenda under the circular economy and net-zero goals

### 4.5.3 Challenges of molten aluminium

**Transport Limitations:** Liquid aluminium must be transported in specialized, insulated crucibles to maintain its molten state (above 660°C for aluminium). This requirement limits its use to facilities located near customers. Typically, transportation is feasible only within a 20–25-kilometer radius and a travel time of 45–60 minutes. As a result, manufacturing facilities supplying molten aluminium often need to be situated adjacent to customer premises to ensure uninterrupted delivery.

**Safety Risks:** Molten aluminium poses significant safety risks, including spills. This requires stringent safety protocols and trained personnel.,

**Limited Flexibility:** Facilities relying on liquid aluminium are tied to customer' schedules, reducing operational flexibility compared to solid ingots, which can be stored and melted on-demand.

### 4.6 Value Chain Overview

**India: Metal Recycling and Recovery Market: Value Chain Analysis**

**Raw Materials Collection**

Raw materials are sourced from a wide range of inputs, including discarded consumer products, construction waste, end-of-life vehicles, industrial scrap, and outdated appliances.

- In the case of aluminium, common sources include used automotive parts, used beverage cans, electrical wires, and aluminium sheets & extrusions.
- Zinc scrap is primarily recovered from galvanized steel, die-cast parts, and zinc ash.
- Stainless steel is recycled from medical devices, household utensils, and industrial equipment.

These materials are collected through both formal and informal networks, including scrap dealers, organized recycling systems, and public collection bins.

**Recycling Process**

The recycling process includes sorting, cleaning, shredding, and melting of scrap metals.

- Aluminium and zinc are at their respective melting points (approximately 660°C and 420°C). Impurities are removed using fluxing agents, filtration, and skimming techniques, rather than through melting alone.
- Stainless steel requires additional processes such as grade sorting (e.g., 304, 316) and alloy composition adjustments before remelting at much higher temperatures (typically 1,400–1,500°C).

Advanced technologies, including eddy current separation and XRF (X-ray fluorescence) analysis, are used to maintain material quality and purity. Overall, the recycling process greatly reduces energy use and emissions when compared to primary metal production.

**End User**

Recycled metals are utilized across various industries.

- Aluminium is used in automotive parts, construction products, and packaging materials.

- Zinc is applied in galvanization, die-casting, and zinc oxide manufacturing.
- Stainless steel is employed in food processing machinery, architectural structures, medical tools, and transport systems.

These industries favor recycled metals for their cost-effectiveness, reduced carbon emissions, and reliable performance. The increasing emphasis on sustainability continues to accelerate adoption among end users.

### 4.6.1 Aluminium - Recycling Process

Aluminium is among the most efficiently recycled metals worldwide, offering up to 95% energy savings and achieving an exceptionally high metal recovery rate, all while retaining the same quality and properties as primary aluminium even after multiple recycling cycles. The recycling process emits only 5% of the greenhouse gases compared to primary aluminium production, making it significantly more environmentally sustainable. This drastic reduction in energy consumption and emissions positions aluminium recycling as a critical driver of India's circular economy, particularly as demand for low carbon materials continues to grow.


**Collection:** Aluminium scrap is gathered from various sources including beverage cans, automotive parts, household goods, and construction debris. This scrap is collected through municipal recycling bins, landfills, scrapyards, dismantling units, and manufacturing waste.

**Transportation:** Once collected, the scrap is transported to recycling units via road or rail depending on distance, volume, and cost feasibility. Logistics play a key role in managing scrap flow efficiently.

**Preparation:** Scrap arriving at the facility is inspected and pre-sorted. Large contaminants like wood, glass, or plastic are removed manually or with machinery before shredding.

**Shredding:** The aluminium scrap is broken down into smaller, manageable pieces using industrial shredders or cutting tools. This helps increase surface area and improves downstream separation and melting efficiency.

**Sorting and Separation:** Advanced techniques like magnetic separation, eddy current systems, and air classification are used to remove unwanted metals or impurities like iron or plastic from the aluminium shreds.

**Cleaning:** The shredded and sorted scrap is then cleaned through thermal or chemical treatment to eliminate paints, coatings, and dirt that may affect melt purity.

**Melting and Refining:** The cleaned scrap is melted in a furnace (typically rotary or reverb types) at ~700–750°C. Fluxing agents or inert gases are used to refine the molten aluminium by removing dissolved impurities.

**Casting:** The refined molten aluminium is poured into moulds or cast into ingots, billets, or sheets. These are then sent to downstream manufacturers for use in auto parts, packaging, or construction.

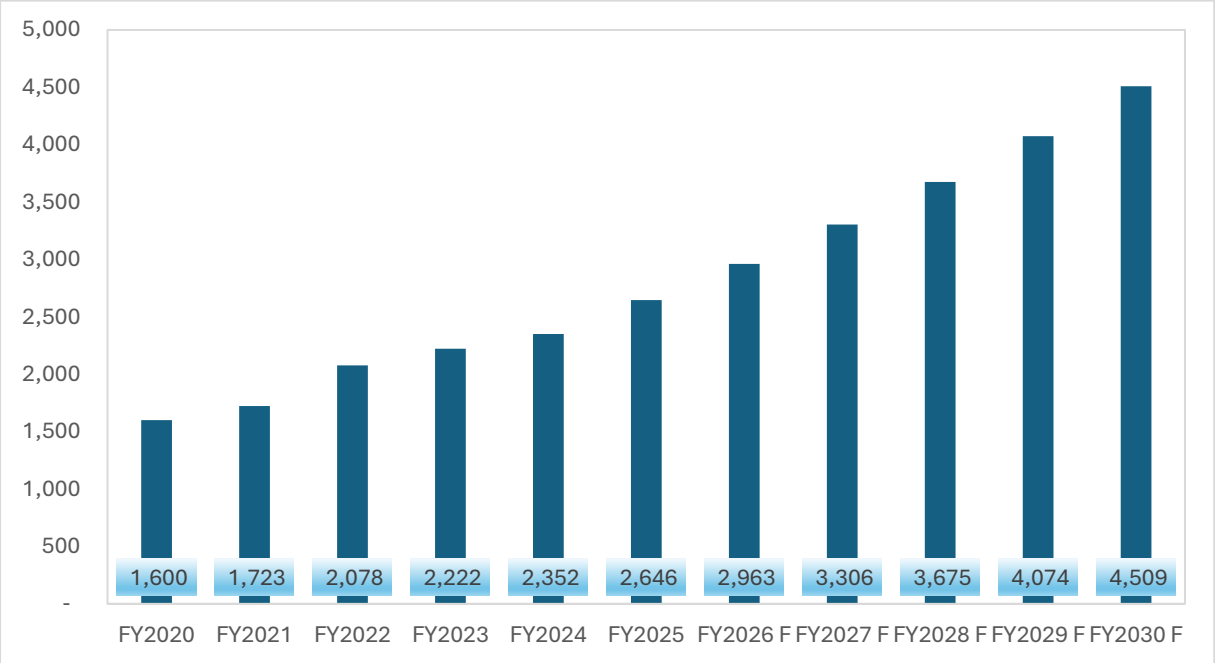
### 4.6.2 Availability of Raw Materials

**Aluminium:** India's aluminium recycling framework sources scrap from various categories, including used automobiles, wire, sheet, extrusion, UBC (Used Beverage Cans), and industrial borings. Wire scrap is mainly derived from obsolete electrical motors and home appliances like air conditioners and refrigerators, where wires are stripped or lightly incinerated to extract the metal. Sheet scrap collected from construction and industrial sectors is classified under ISRI codes such as TAINT TABOR (clean) and TALE (painted or insulated). Extrusion scrap, like 6063 (TATA) or (TREAD) from architectural profiles or 6061 (TUTU) from automotive and aerospace parts, provides high-purity aluminium in varied shapes. UBC scrap comes from recycled beverage cans, sourced via bins and community collection programs. Additionally, borings and turnings coded as TEENS/TELIC are produced from machining activities in manufacturing and form another key source of high-grade aluminium scrap. Zorba scrap is a mixed non-ferrous metal scrap, primarily aluminium, mixed with other metals like copper, brass, zinc, and magnesium, typically from shredded vehicles or appliances.

Suppliers such as Apple Steels are active contributors in sourcing aluminium scrap within India.

## 4.7 Installed Capacity Analysis

### 4.7.1 Installed capacity trends of Recycled Aluminium



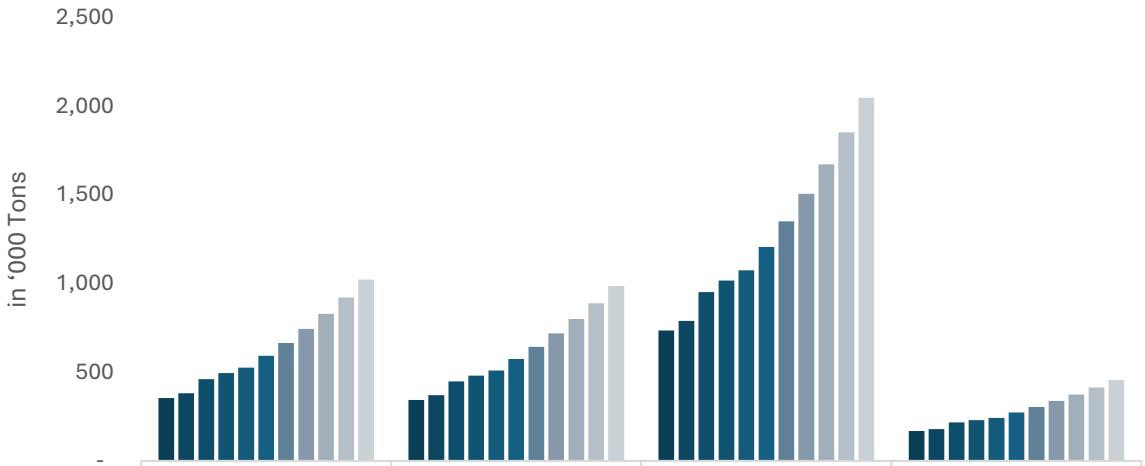

Source: IMARC, ICRA Analytics

The installed capacity of recycled aluminium in India reached 2,646 thousand Tons in FY2025, registering a CAGR of 10.6% during FY2020–FY2025. Looking forward, the installed capacity is expected to rise to 4,509 thousand Tons by FY2030, growing at a CAGR of 11.1% during FY2026–FY2030.

The growth in India's recycled aluminium capacity is being propelled by strong demand from the automotive, electrical, and construction industries, which are increasingly adopting lightweight and sustainable materials. Government-led initiatives encouraging circular economy practices have further accelerated investments in new recycling infrastructure. Moreover, the significantly

lower energy requirements of secondary aluminium production, compared to primary production, are motivating stakeholders to scale up their recycling capabilities.

### 4.7.2 India: Recycled Aluminium Market: Region-Wise Installed Capacity




| | West and Central India | South India | North India | East India |
|---|---|---|---|---|
| FY2020 | 354 | 344 | 734 | 168 |
| FY2021 | 382 | 371 | 790 | 180 |
| FY2022 | 462 | 448 | 951 | 216 |
| FY2023 | 495 | 480 | 1,016 | 231 |
| FY2024 | 525 | 509 | 1,074 | 243 |
| FY2025 | 593 | 574 | 1,207 | 273 |
| FY2026 F | 665 | 644 | 1,350 | 304 |
| FY2027 F | 744 | 719 | 1,505 | 338 |
| FY2028 F | 829 | 801 | 1,672 | 374 |
| FY2029 F | 921 | 889 | 1,851 | 413 |
| FY2030 F | 1,021 | 985 | 2,047 | 455 |

Source: IMARC, ICRA Analytics

In FY2025, the installed capacity of recycled aluminium in India by region stood at 593 thousand Tons in West and Central India, 574 thousand Tons in South India, 1,207 thousand Tons in North India, and 273 thousand Tons in East India, registering respective CAGRs of 10.9%, 10.8%, 10.5%, and 10.2% during FY2020–FY2025.

West and Central India have established themselves as pivotal regions for recycled aluminium capacity growth, supported by a robust automotive and industrial ecosystem, especially in Maharashtra and Gujarat. The presence of large aluminium manufacturers, along with efficient scrap collection networks and strategic port access, has enabled both streamlined scrap imports and finished goods exports.

Looking ahead, by FY2030, the installed capacity of recycled aluminium is expected to reach 1,021 thousand Tons in West and Central India, 985 thousand Tons in South India, 2,047 thousand Tons in North India, and 455 thousand Tons in East India, expanding at respective CAGRs of 11.3%, 11.2%, 11.0%, and 10.6% during FY2026–FY2030.

In South India, states such as Tamil Nadu, Karnataka, and Telangana are key drivers of capacity expansion, owing to rising demand from the electrical equipment, construction materials, and

packaging industries. Continued policy support, growth of industrial clusters, and increasing investments in green technologies are fostering the development of new recycling facilities in the region.

### 4.8 Analysis of import/export scenario for key metals

**Table: Metal Recycling Market: Import Volume (in Tons)**

| India Import Volume (in Tons) | FY 2020 | FY 2021 | FY 2022 | FY 2023 | FY 2024 | FY 2025 |
|---|---|---|---|---|---|---|
| **Aluminium (Waste and Scrap)** | 13,47,923 | 13,69,546 | 16,62,468 | 17,34,969 | 17,67,048 | 18,14,896 |

Source: IMARC, ICRA Analytics

**Table: India: Metal Recycling (Aluminium (Waste and Scrap)) Market: Import Volume (in Tons)**

| Import Volume (in Tons) | FY2020 | FY2021 | FY2022 | FY2023 | FY2024 | FY2025 |
|---|---|---|---|---|---|---|
| **India (Total)** | **13,47,923** | **13,69,546** | **16,62,468** | **17,34,969** | **17,67,048** | **18,14,896** |
| **USA** | 3,32,120 | 3,30,610 | 4,77,676 | 4,86,632 | 4,66,841 | 4,08,145 |
| **United Arab Emirates** | 1,19,227 | 1,19,357 | 1,46,086 | 1,56,901 | 1,61,107 | 1,75,761 |
| **Saudi Arabia** | 1,13,303 | 1,21,458 | 1,56,288 | 1,59,585 | 1,41,951 | 1,63,501 |
| **United Kingdom** | 1,50,668 | 1,40,031 | 1,70,160 | 1,97,009 | 1,55,436 | 1,70,273 |
| **Netherlands** | 63,209 | 73,027 | 76,125 | 71,765 | 77,868 | 83,319 |
| **Australia** | 73,544 | 74,882 | 50,050 | 53,242 | 71,661 | 83,987 |
| **Rest of World** | 4,95,852 | 5,10,181 | 5,86,083 | 6,09,835 | 6,92,185 | 7,29,910 |

Note: 760200 (Waste and scrap, of aluminium) is the HSN Code for above import/export data.
Source: International Trade Centre, ICRA Analytics

**Table: India: Metal Recycling (Aluminium (Waste and Scrap)) Market: Import Volume (Y-o-Y Growth Rate %)**

| Import Volume (Y-o-Y Growth Rate %) | FY2020/21 | FY2021/22 | FY2022/23 | FY2023/24 | FY2024/25 |
|---|---|---|---|---|---|
| **India** | **1.60%** | **21.40%** | **4.40%** | **1.80%** | **2.70%** |
| **USA** | -0.50% | 44.50% | 1.90% | -4.10% | -12.60% |
| **United Arab Emirates** | 0.10% | 22.40% | 7.40% | 2.70% | 9.10% |
| **Saudi Arabia** | 7.20% | 28.70% | 2.10% | -11.00% | 15.20% |
| **United Kingdom** | -7.10% | 21.50% | 15.80% | -21.10% | 9.50% |
| **Netherlands** | 15.50% | 4.20% | -5.70% | 8.50% | 7.00% |
| **Australia** | 1.80% | -33.20% | 6.40% | 34.60% | 17.20% |
| **Rest of World** | 2.90% | 14.90% | 4.10% | 13.50% | 5.50% |

Source: International Trade Centre, ICRA Analytics

**Table: Metal Recycling Market: Export Volume (in Tons)**

| India Export Volume (in Tons) | FY 2020 | FY 2021 | FY 2022 | FY 2023 | FY 2024 | FY 2025 |
|---|---|---|---|---|---|---|
| **Aluminium (Waste and Scrap)** | 6,108 | 5,430 | 9,530 | 9,609 | 10,651 | 12,547 |

Source: IMARC, ICRA Analytics

**Table: India: Metal Recycling (Aluminium (Waste and Scrap)) Market: Export Volume (in Tons)**

| Export Volume (in Tons) | FY2020 | FY2021 | FY2022 | FY2023 | FY2024 | FY2025 |
|---|---|---|---|---|---|---|
| **India** | 6,108 | 5,430 | 9,530 | 9,609 | 10,651 | 12,547 |

Note: 760200 (Waste and scrap, of aluminium) is the HSN Code for above import/export data.
Source: International Trade Centre, ICRA Analytics

**Table: Metal Recycling Market: Production Capacity vs Actual Production (in '000 Tons), FY2025**

| Recycled Metals (in '000 Tons) | Production Capacity | Actual Production |
|---|---|---|
| **Recycled Aluminium** | 2,250 | 2,187 |

Source: IMARC, ICRA Analytics

**Table: Metal Recycling Market: Production Capacity vs Actual Production (in '000 Tons), FY2025**

| Metals (in '000 Tons) | Primary Metal Production | Recycled Metal Production |
|---|---|---|
| **Aluminium** | 4,191 | 2,187 |

Source: IMARC, ICRA Analytics

### 4.9 Metal Recycling Initiatives by State Governments in India

Several state governments have undertaken proactive measures to integrate circular economy principles and enhance recycling infrastructure. Some notable initiatives include:

**Maharashtra:**

- The state is developing four Circular Economy Parks in Aurangabad, Pune, Nagpur, and Ratnagiri.
- These parks will support recycling in sectors like shipbreaking, auto parts, e-waste, and steel scrap.
- MTC Group signed an MoU with the state to establish India's first Circular Economy Park, focusing on metals, plastics, and e-waste recycling.

**Gujarat:**

- Home to Alang-Sosiya, the world's largest shipbreaking yard, Gujarat has built a globally recognized metals recycling hub.
- The state is expanding this model to other forms of metal recycling, leveraging its strategic coastal access and port infrastructure.

**Tamil Nadu:**

- Licensed four e-waste facilities and 38 dismantlers; a large battery and magnet recycling facility is underway in SIPCOT's Krishnagiri Mobility Park.
- Pondy Oxides & Chemicals Ltd. (POCL) is investing ₹500 crore to build recycling plants for non-ferrous metals, lithium-ion batteries, and rare earth magnets.

**Delhi:**

- Announced India's first E-Waste Eco Park in Holambi Kalan to process 51,000 tonnes of e-waste annually.
- Includes zones for refurbishing, testing, plastic recovery, and second-hand electronics resale.
- Expected to generate 1,000+ green jobs, run on a PPP model.

**Karnataka:**

- The Transport Department plans to implement a vehicle scrapping policy, with facilities proposed in Tumakuru, Koppal, and Bengaluru Rural.
- A proposal to set up a modern ship recycling yard along the Karnataka coast.

**Rajasthan:**

- Rajasthan is setting up India's first Integrated Waste Recycling Park (WRP) in Tholai, Jaipur.
- The WRP will recycle e-waste, metal scrap, hazardous waste, plastic, PV panel waste, and end-of-life vehicles, offering a model for multipurpose recycling hubs.

**Telangana:**

- Over 100 non-ferrous metal units in Hyderabad participated in a government-supported initiative led by JNARDDC to promote aluminium, copper, and lead recycling.
- A demonstration plant showcasing energy-efficient recycling technologies is under development.

**4.9.1 Capacity-related details of key players in the domestic metal recycling space-**

- CMR Green Technologies Limited has an installed capacity for domestic metal recycling of 5,20,950 MTPA as on 31st March 2025. It has a capacity advantage over domestic players, with an installed capacity of around 4 times of the nearest competitor in the domestic recycled aluminium space, as of 31st March 2025. It has a clientele coverage of most of the major Original Equipment Manufacturer (OEMs) and Tier 1 automotive suppliers in India. CMR's liquid aluminium supply enabled by its footprint covering multiple automotive clusters across India, and side-by-side facilities.

- Daiki Aluminium Industry India Pvt Ltd operates a secondary aluminium facility with an installed capacity ranging from 70,000 to 110,000 MTPA.

- Century Aluminium Manufacturing has installed annual capacity of nearly 68,000 MTPA of Aluminium alloys and 15,000 MTPA of Zinc alloys

- G.R. Metalloy Private Limited has recycling capacity ranging between 25,000 to 40,000 MTPA.

- IMAC Alloy Casting Pvt. Ltd has an installed recycling capacity of 20,000 MTPA.

- Shree Balaji Alumnicast Pvt. Ltd combined actual production capacity stands at 1,22,000 MTPA.

- Sree Sumangala Metals and Industries Pvt. Ltd have an annual aluminium alloy production capacity of 40,000 MTPA

- Sunalco Alloys Pvt. Ltd has a production capacity of approximately 72,000 MTPA

- Baheti Recycling Industries Ltd has a total installed production capacity of 29,160 MTPA.

- Gravita India Limited has a consolidated installed recycling capacity of 3,30,000 MTPA covering lead recycling, plastic recycling, aluminium recycling and rubber recycling.

- Jain Metals has Installed Recycling Capacity for Lead of 1,84,000 MTPA, Copper of 1,17,005 MTPA, Aluminium of 24,000 MTPA

- MTC Group handles around 2,20,000 MTPA, dealing in ferrous and non-ferrous scrap, ferro alloys, base and minor metals, and manufacturing TMT bars, structural steel, copper tubes, and aluminium alloys.

- Pondy Oxides & Chemicals has Installed Recycling Capacity for Lead of 1,32,000 MTPA, Copper of 6,000 MTPA, Aluminium of 12,000 MTPA.

**4.9.2 Capacity-related details of key players in the global metal recycling space-**

The global aluminium recycling industry is highly fragmented, with thousands of small and mid-sized recyclers operating across regions. This fragmentation is driven by the widespread availability of scrap, varying levels of technology adoption, and the presence of localized collection and processing networks. Despite this, aluminium recycling plays a critical role in meeting the world's growing demand for sustainable and cost-efficient aluminium, as it consumes significantly less energy than primary production and aligns with the global shift towards circular economy practices.

Amid this fragmented landscape, a few large players in key regions particularly in China, India, and Europe stand out due to their sizeable capacities, advanced technologies, and integrated operations. These players not only account for a meaningful share of the global recycling output but also form an essential link in the international aluminium supply chain, supplying recycled metal to major end-use sectors such as automotive, construction, packaging, and electrical industries. Their scale, efficiency, and ability to secure steady scrap supply give them a competitive edge, positioning them as pivotal contributors to the global aluminium market.

The table below outlines the installed recycling capacities of some of the major players that represent a significant share of the global aluminium recycling industry.

| Company | Aluminium Capacity (Tonnes p.a.) |
|---|---|
| Novelis | 25,00,000 |
| Shadong Innovation | 10,00,000 |
| Sigma Group | 10,00,000 |
| Lizhong Sitong Light Alloys Group | 9,33,200 |
| Huajin International | 8,50,000 |
| Constellium | 7,79,000 |
| Norsk Hydro | 6,70,000 |
| Speira Germany | 6,50,000 |
| Real Alloy | 5,60,000 |
| Daiki Aluminium | 5,20,000 |
| Yechiu Metal Recycling Group's | 5,00,000 |
| Nikkei MC Aluminium | 4,72,000 |
| CMR Green Technologies Limited | 4,61,000 |
| Raffmetal | 3,50,000 |
| CSMET Group | 3,34,000 |
| Latasa Reciclagem | 3,30,000 |

CMR Green Technologies Limited ranks among the largest players in the global aluminium recycling industry in terms of installed capacity as of 31st March 2025.

### 4.10 Threats and challenges in the Indian metal recycling and recovery market

❖ **Regulations and Policy Adherence:** The Indian metal recycling industry operates under a fragmented and evolving regulatory landscape. Despite policies like the Steel Scrap Recycling Policy (2019) and the Vehicle Scrappage Policy (2021), there is no unified, comprehensive national-level recycling framework covering all metals. This has led to inconsistencies in enforcement and lack of clarity across states.
Additionally:

- Stringent import regulations and quality restrictions on scrap material, along with rising import duties, have escalated raw material costs for domestic recyclers.
- The absence of a generic policy for metal recycling (as opposed to product-specific policies like e-waste or batteries) results in piecemeal implementation and weak accountability.
- Informal sector dominance undermines environmental norms and worker safety.

❖ **Infrastructure Gaps:** The industry suffers from obsolete machinery, inefficient processing, and low recovery rates, especially for non-ferrous metals like aluminium, copper, and zinc.
Key gaps include:

- Lack of structured collection and reverse logistics systems for both ferrous and non-ferrous waste.
- Limited processing capacity particularly modern shredders, furnaces, and smelters hinders optimal metal recovery.
- High energy costs due to outdated technology make operations inefficient and environmentally taxing.

❖ **Supply Chain:** India's metal recycling supply chain is highly fragmented and informal, which limits traceability, price transparency, and standardization.

- Absence of digital traceability and centralized scrap tracking mechanisms.
- Scrap sourcing heavily relies on unorganized networks (kabadiwalas), resulting in inconsistent quality.
- Import dependency: In FY2022–23, India imported 9.8 million tonnes of ferrous scrap for steelmaking and remains the world's 2$^{nd}$ largest aluminium scrap importer, receiving 296,000 tonnes from the EU alone as of 2024.
- Informal sector dominance undermines environmental norms and worker safety. This reliance exposes the market to:
    - Geopolitical volatility, duties, and shipping disruptions.
    - Price risk tied to global indices like the London Metal Exchange (LME).

❖ **Absence of Digital Traceability and Centralized Scrap Tracking Mechanisms:** The absence of digital traceability in India's metal recycling industry creates major inefficiencies, as scrap often passes through multiple informal channels without records of its origin, quality, or handling. This opacity not only reduces operational efficiency but also weakens enforcement of frameworks like Extended Producer Responsibility (EPR), since regulators and producers cannot verify whether collected material is being recycled in safe, environmentally responsible ways. In the absence of blockchain or IoT-enabled monitoring, scrap transactions remain vulnerable to

fraud, under-reporting, and misclassification, undermining both industry trust and investor confidence. As highlighted as India's broader e-waste challenge, digital traceability tools like product registries or blockchain systems could transform the sector, but their absence continues to slow progress.

Moreover, the lack of centralized scrap-tracking mechanisms further fragments India's recycling ecosystem, with data scattered across informal collectors, intermediaries, and small-scale recyclers who rarely integrate with formal channels. This decentralization prevents effective monitoring of material flows, accurate demand–supply forecasting, or the creation of secondary markets for recycled metals. A national digital registry similar to the proposed Digital Product Passport in the EU could provide unique identification for scrap batches, enabling transparent tracking from collection to processing. However, in India, the absence of such a unified framework leaves the system highly inefficient, with majority of recycling still handled outside the formal sector. In conclusion, without centralized digital infrastructure, India risks losing in recyclable value while continuing to rely on imports to meet industrial demand.

❖ **Other Risks (Market, Environment, Social):**

- Volatile global prices (e.g., aluminium) erode profitability for recyclers.
- Poor hazardous waste management and non-compliance with pollution control norms lead to serious environmental and health risks.
- Low awareness and lack of formal training among laborers worsen working conditions, particularly in informal scrapyards.

### 4.11 Details on Collection Network, Hedging Mechanisms & Contracts in Indian Metal Recycling and Recovery Market

**Collection Network:** India, being the world's third-largest generator of e-waste and a significant producer of metal scrap, has a deeply rooted and largely informal collection network. The supply chain for metal scrap is primarily driven by kabadiwalas (local scrap dealers), waste-pickers, small aggregators, and micro-enterprises. These informal participants act as the main collectors, especially in urban and semi-urban areas, forming the backbone of India's material recovery ecosystem. Industrial hubs in states such as Uttar Pradesh, Haryana, Gujarat, Maharashtra, and Tamil Nadu, along with key ports like Nhava Sheva and Kandla, serve as important centers for metal scrap collection and aggregation. Additionally, metal scrap imports also contribute significantly to India's supply chain.

In recent years, formal organizations such as Tata Steel Recycling, MTC Group, and Recykal have begun integrating informal collectors through digital tools, training initiatives, and formal onboarding processes. These efforts are typically aligned with Extended Producer Responsibility (EPR) mandates, helping streamline scrap collection, boost traceability, and support regulatory compliance. This hybrid model of informal-formal collaboration increases the scalability of metal recovery operations and improves supply chain efficiency. For example, Tata Steel employs a digital platform called FerroHaat to digitize its scrap sourcing process, particularly for steel scrap. The app enables scrap traders to register and connect with Tata Steel, creating a more organized and reliable procurement network within the steel industry.

**Hedging Mechanism:** To minimize earnings volatility caused by fluctuations in commodity prices, Indian recyclers especially those involved in exports have adopted structured hedging practices, including:

- LME Futures: Widely used to hedge price risks associated with base metals like copper, zinc, aluminium, and nickel.
- MCX Futures: Gaining traction for domestic hedging, particularly in the case of aluminium.
- Forward/Options Contracts: Deployed by larger players to manage pricing risks in specialty alloys or under fixed-volume agreements.
- Back-to-Back Hedging: A strategy where scrap procurement and finished metal sales are aligned through pre-priced contracts, thereby securing margins.

A key recent development is the formal notification of ADC-12 aluminium alloy India's most widely used cast alloy under the Securities Contracts Regulation Act, allowing its trading on MCX. Previously unhedged, ADC-12 can now be traded similarly to base metals like lead. This enables recyclers to deploy back-to-back hedging strategies, reduce margin uncertainty, and operate closer to full capacity, especially in auto-grade alloy production. The move is expected to enhance risk management and improve planning for both domestic and export-facing recyclers.

**Hedging Mechanism for Importers:** Player in the industry such as the CMR, faces inherent risks due to fluctuations in foreign exchange rates and international commodity prices. As part of common industry practice, the company engages in monthly price negotiations with customers, enabling the passthrough of input cost fluctuations and thereby reducing overall market risk exposure

**Key Terms of Contracts:** Indian metal recycling firms, especially those catering to large industrial or international clients, operate under structured contracts that typically include the following elements:

- Pricing Mechanism: Pricing is often linked to international benchmarks such as the London Metal Exchange (LME), with adjustments made for metal grade, impurity content, and logistics costs.
- Volume and Tenure: Contracts may range from spot transactions to quarterly or annual offtake arrangements. Long-term contracts are frequently signed with OEMs and reliable scrap suppliers.
- Quality Specifications: Definitions are standardized using ISRI (Institute of Scrap Recycling Industries) or BIS (Bureau of Indian Standards) codes to maintain uniformity in metal composition and impurity thresholds.
- Delivery Terms: Based on buyer preferences, deliveries may follow terms such as FOB (Free on Board), CIF (Cost, Insurance, and Freight), or ex-works.
- Payment and Settlement: Payments are generally tied to delivery milestones, with some agreements permitting advance payments or post-shipment settlements upon quality inspection.

**Global Customer Base:** India's metal recycling industry continues to expand its international reach, supplying clients across Europe, Southeast Asia, the Middle East, and North America. Exported materials processed scrap and secondary metals serve automotive, electronics, and construction manufacturers. The customer base includes global OEMs and alloy makers looking for low-carbon, consistent, and traceable inputs. As demand for ESG-compliant and circular economy-aligned sourcing grows globally, Indian recyclers are increasingly positioned as preferred partners.

### 4.12 Case Study: Growth of Electric Vehicles in China and the Surge in Aluminium Consumption in the Automotive Sector

#### 4.12.1 Aluminium Intensity in EVs: A 70% Growth in Five Years

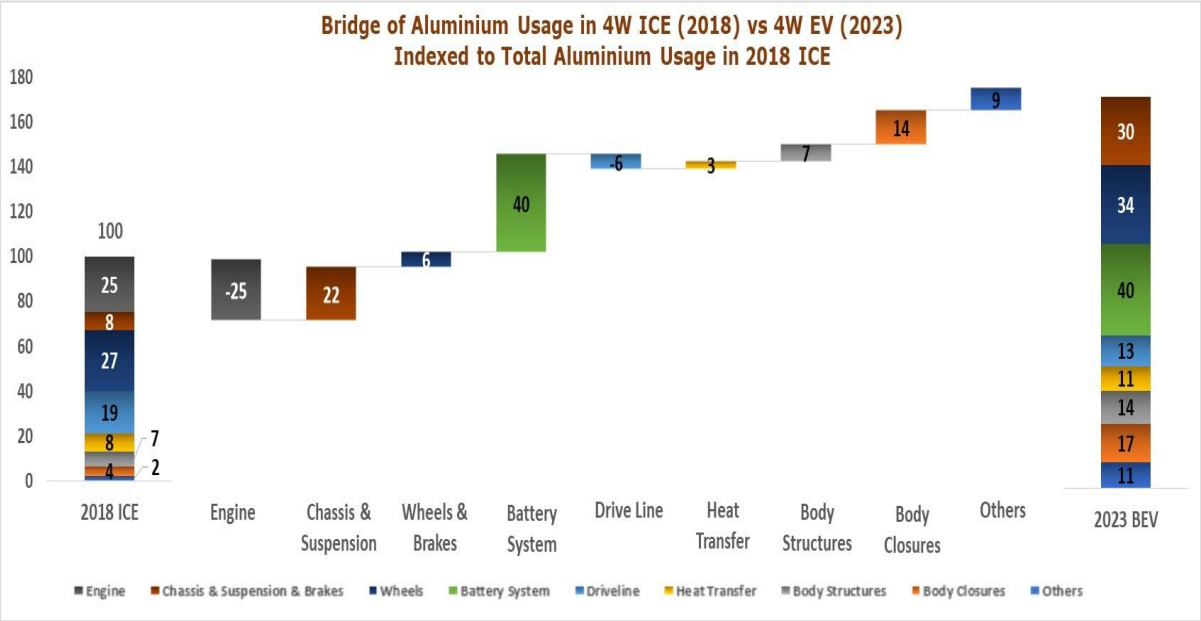
China has emerged as a global leader in the adoption of electric vehicles (EVs), driven by stringent emission norms, robust government support, and growing consumer demand for sustainable mobility solutions. A critical material supporting this shift is aluminium, whose usage in EV manufacturing has grown significantly due to its role in enhancing vehicle performance, reducing weight, and enabling battery system integration. This case study explores the dramatic increase in aluminium consumption in China's EV segment between 2018 and 2023 and highlights the underlying factors that make a compelling case for aluminium's expanding role in the automotive industry.

**Key Takeaways**

In 2023, aluminium content in four-wheeler battery electric vehicles (BEVs) in China increased by approximately 70% compared to the aluminium used in internal combustion engine (ICE) vehicles in 2018. This leap is primarily driven by the elimination of traditional engine components mainly made of cast aluminium and their replacement with battery systems and lightweight body parts that demand alternative aluminium forms like sheets and extrusions.

As per the aluminium usage bridge analysis, aluminium demand in components such as engines and drivelines decreased significantly in EVs (~31% of the 2018 aluminium content). However, this was offset by a sharp rise in aluminium usage for battery systems (~40% of 2018 ICE aluminium content), which includes casings, cooling plates, and structural battery enclosures. Additional gains came from lightweighting strategies applied to chassis, suspensions, body structures, and closures collectively adding nearly 43 units to the aluminium index, contributing to the final value of 170 in 2023 from a base of 100 in 2018.

The graph below illustrates the shift in aluminium usage across vehicle components, emphasizing how battery systems, body closures, and lightweight chassis have driven the bulk of the increase in EVs.



Source: International Aluminium Institute – Report on Assessment of Aluminium Usage in China's Automobile Industry 2016~2030 by CM Group, ICRA Analytics

### 4.12.2 Transformation in Aluminium Product Mix: Shift from Castings to Sheets

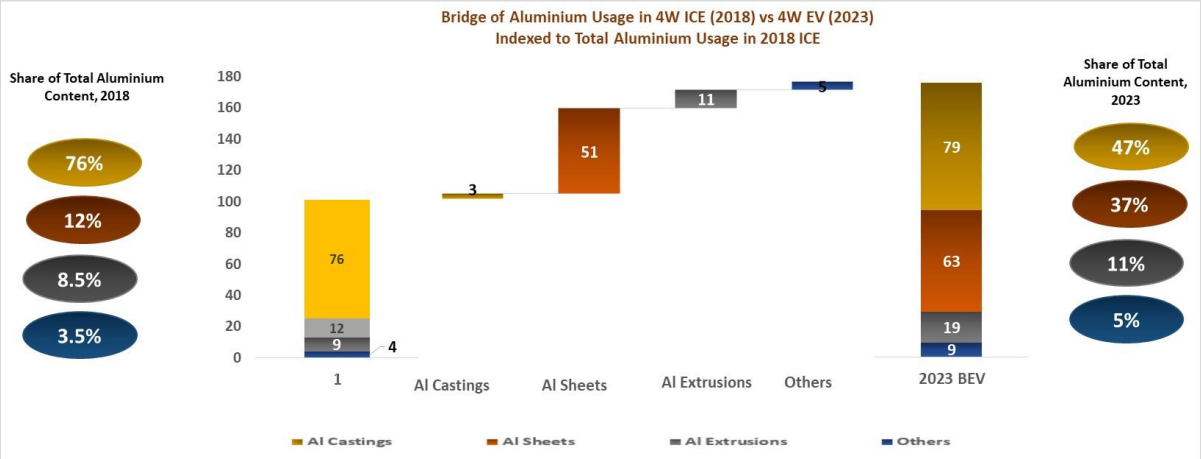
The shift in aluminium consumption patterns within China's automotive sector reflects the broader structural evolution brought on by electrification. As traditional cast-heavy components like engines and gearboxes lose relevance in battery electric vehicles (BEVs), the focus has shifted toward aluminium sheets and extrusions that better support lightweight structures, battery enclosures, and safety-critical body parts. This transition not only showcases aluminium's adaptability across evolving vehicle architectures but also reinforces its growing strategic importance in enabling the future of electric mobility

**Key Takeaways**

A major change in aluminium consumption patterns lies in the evolving mix of aluminium forms. In 2018, aluminium castings dominated automotive aluminium usage in ICE vehicles, accounting for about 76% of the total aluminium content. This was due to their extensive application in engine blocks, gearboxes, and other heavy mechanical systems. In contrast, 2023 BEVs show a marked reduction in casting share to 47%, reflecting the decline of traditional engine components in EV architecture. Overall casting content remains similar due to higher overall aluminium intensity in EVs in 2023.

This shift is counterbalanced by a surge in aluminium sheet usage, which rose from 12% in 2018 to 37% in 2023. These sheets are vital for manufacturing body-in-white (BIW) parts and battery casings, owing to their excellent strength-toweight ratio, corrosion resistance, and formability. Extrusions and other aluminium forms have maintained their share (~8.5% in 2018 vs 11% in 2023), primarily supporting structural reinforcement and trim applications in the EV ecosystem.

The graph below shows a clear shift from cast aluminium to greater use of sheets and extrusions, reflecting a fundamental change in design and manufacturing across China's evolving EV landscape.




Source: International Aluminium Institute – Report on Assessment of Aluminium Usage in China's Automobile Industry 2016~2030 by CM Group, ICRA Analytics

### 4.12.3 Strategic Implications for the Aluminium Industry

The increase in aluminium usage per vehicle unit in China's EV segment not only signifies a shift in automotive material demand but also underscores long-term structural opportunities for

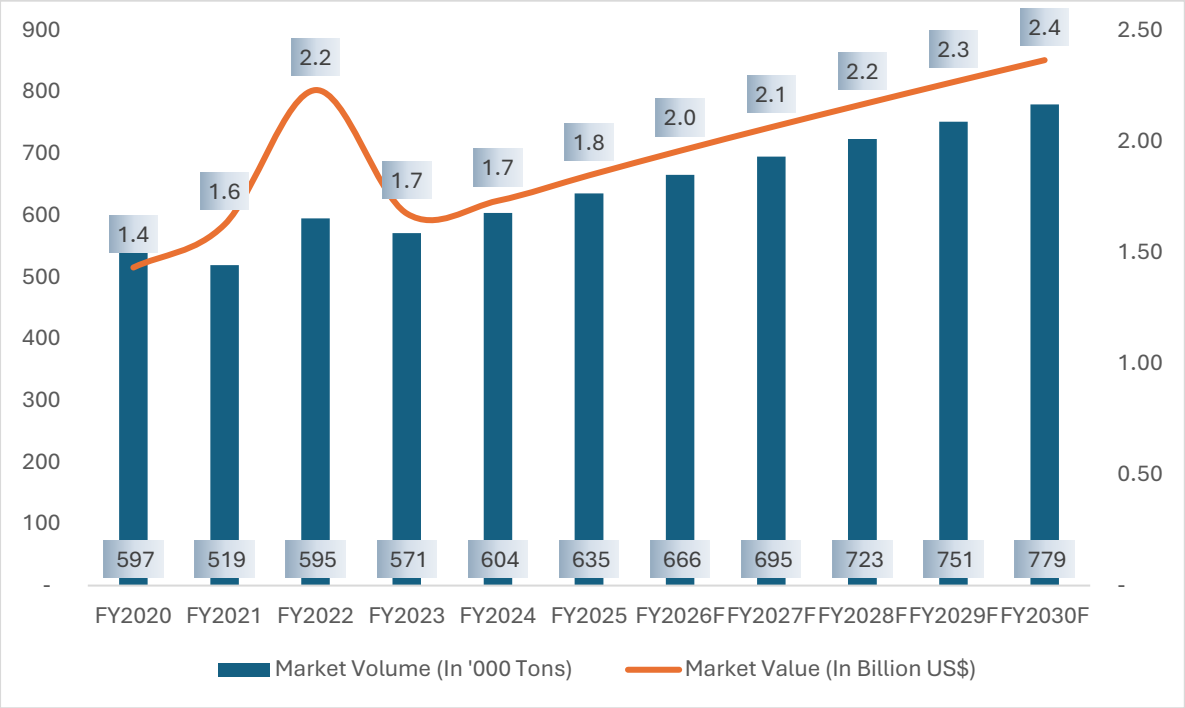
aluminium producers. With rising EV penetration globally mirroring trends observed in China OEMs are expected to lean more on aluminium to meet regulatory and efficiency requirements.

In summary, China's EV transition between 2018 and 2023 demonstrates how aluminium has become a critical enabler of the new automotive paradigm. The sharp rise in aluminium demand, driven by battery systems and lightweighting strategies, alongside a rebalancing of product mix away from castings toward sheets and extrusions, illustrates the growing indispensability of aluminium in the mobility value chain. As the global automotive industry moves toward electrification, China's experience offers a strong case for increasing aluminium intensity across vehicle platforms.

### 4.13 Other Metals- Zinc, Stainless Steel and Copper

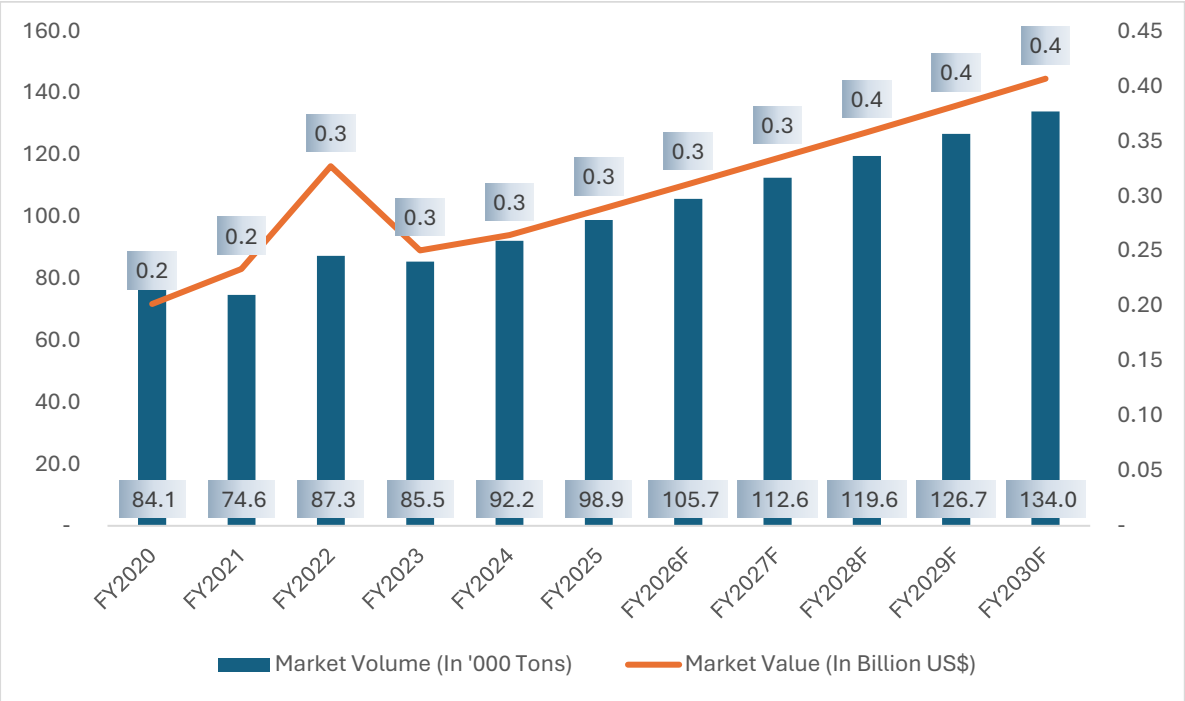
#### 4.13.1 Zinc

**Chart: Indian Zinc Market Forecast: Sales Volume (in 000's Tons) and Sales Value (in Billion USD)**




Source: IMARC, ICRA Analytics

**Chart: India: Recycled Zinc Market: Sales Volume (in '000 Tons) and Sales Value (in Billion USD), FY2020-FY2030F**




Source: IMARC, ICRA Analytics

India's zinc market is being driven by the rapid growth of infrastructure in the country and the increasing focus on materials that resist corrosion. Zinc, which is extensively utilized in galvanization, is essential for improving the durability of steel structures.

The recycled zinc market in India reached a value of USD 0.3 Billion and a volume of 98.9 thousand Tons in FY2025, representing a CAGR of 8.5% and 3.3%, respectively, during FY20–FY25.

India's recycled zinc market is being boosted by the country's rapid urbanization, expanding steel production, and an urgent need to reduce corrosion-related infrastructure losses. Zinc recycling offers a sustainable solution to these challenges, particularly as demand rises in the galvanizing of steel used in construction, railways, and automotive sectors. With India striving to reduce its reliance on imported raw materials and meet its sustainability targets, the adoption of recycled zinc is projected to increase. Government initiatives aimed at promoting metal recycling, including the recent launch of a national recycling portal, are expected to enhance transparency, improve collection networks, and attract investment in zinc recycling infrastructure.

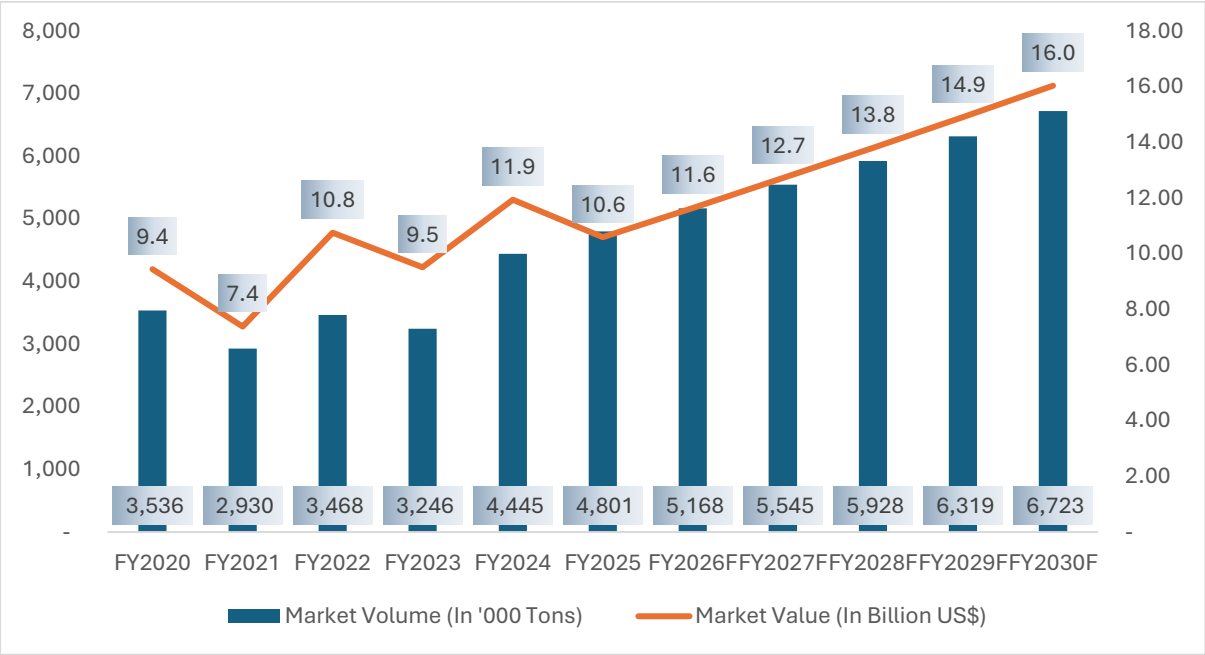
Looking forward, the recycled zinc market in India is expected to reach a value of USD 0.4 Billion and a volume of 134.0 thousand Tons by FY30, reflecting a CAGR of 7.5% and 6.1%, respectively, during FY26–FY30.

The automotive industry is projected to increase the demand for zinc in the upcoming years. Strategic initiatives aimed at enhancing galvanization within the Indian automotive sector are expected to open a significant growth opportunity for the zinc market, underscoring its critical role in both mobility and infrastructure domains. As industrial output and infrastructure investments rise, the demand for cost-effective, corrosion-resistant, and sustainable zinc inputs

is expected to augment, positioning recycled zinc as a vital component in India's long-term industrial growth strategy.

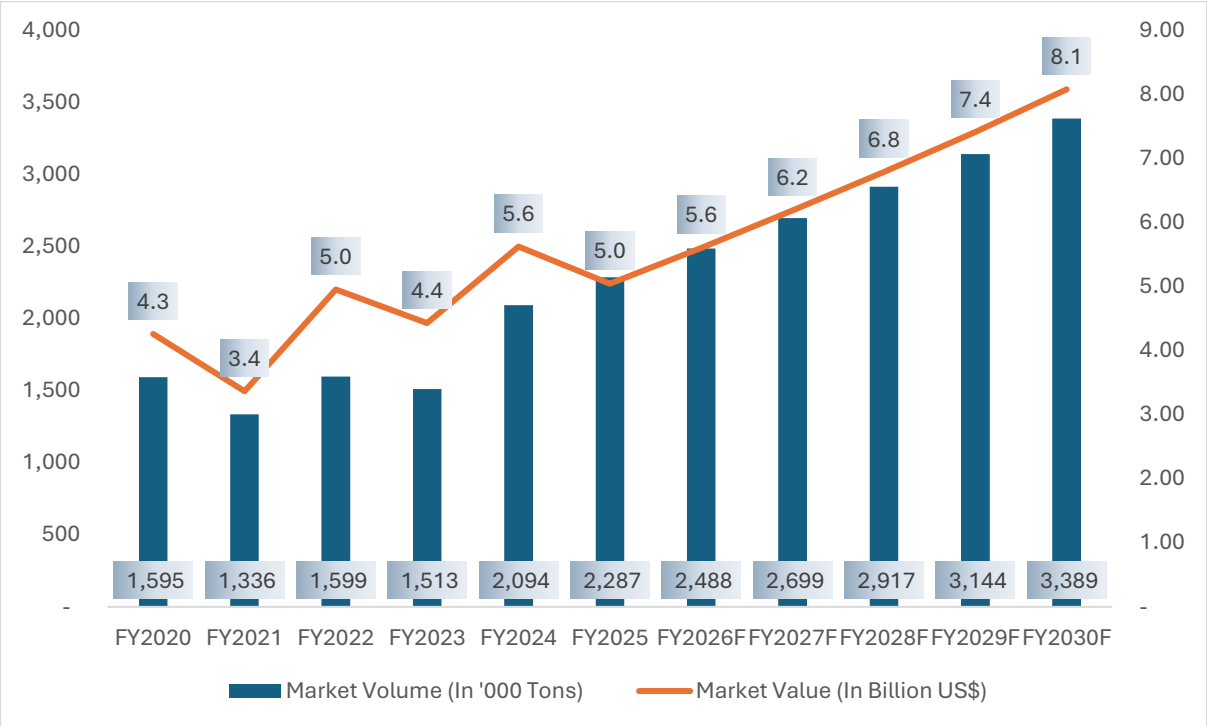
### 4.13.2 Stainless Steel

**Chart: Indian Stainless Steel Market Forecast: Sales Volume (in 000's Tons) and Sales Value (in Billion USD)**




Source: IMARC, ICRA Analytics

**Chart: India: Recycled Stainless-Steel Market: Sales Volume (in '000 Tons) and Sales Value (in Billion USD), FY2020-FY2030F**




Source: IMARC, ICRA Analytics

The stainless-steel market in India is being driven by its extensive applicability across various sectors and the rapid industrial growth of the country. The exceptional properties of stainless steel such as its resistance to corrosion, high tensile strength, flexibility, visual appeal, and minimal maintenance requirements render it a favoured option compared to conventional carbon steel. These attributes are anticipated to enhance demand in key industries, including construction, automotive manufacturing, railways, and infrastructure development. As these sectors expand, the requirement for dependable and high-performance materials is expected to increase the consumption of stainless steel throughout the nation.

The recycled stainless-steel market in India reached a value of USD 5.0 Billion and a volume of 2,287 thousand Tons in FY25, representing a CAGR of 3.1% and 7.5%, respectively, during FY20–FY25.

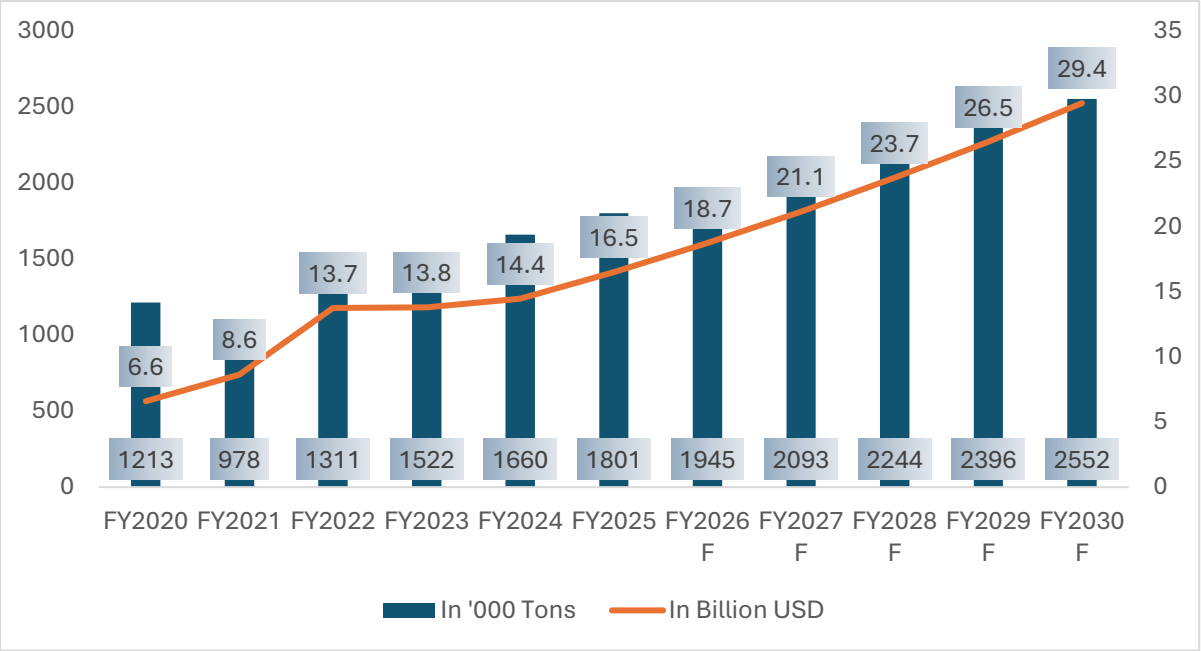
India's recycled stainless-steel market is being propelled by rising environmental awareness, stricter regulations, and the growing need for sustainable industrial practices. Companies are transitioning by investing in cutting-edge sorting technology and setting quality benchmarks in stainless steel recycling.

Looking forward, the recycled stainless-steel market in India is expected to reach a value of US 8.1 billion and a volume of 3,389 thousand Tons by FY30, reflecting a CAGR of 9.7% and 8.0%, respectively, during FY26–FY30.

Stainless steel is in harmony with India's sustainability objectives because of its recyclability and extended product lifespan, which minimizes the need for replacements and lessens environmental effects. This congruence with eco-friendly construction and manufacturing methods is projected to further stimulate market expansion. As India progresses in urbanization and infrastructure investment, the adaptability and resilience of stainless steel establish it as an essential material for sustainable development. Its growing influence in defining the future of India's construction and manufacturing industries is expected to ensure steady demand throughout the forecast period. The sector is also being bolstered by broader policy and industry outlooks that project recycling to surpass traditional mining in importance by FY2050.

### 4.13.3 Copper

**Chart: Indian Copper Market Forecast: Sales Volume (in '000 Tons) and Sales Value (in Billion USD)**

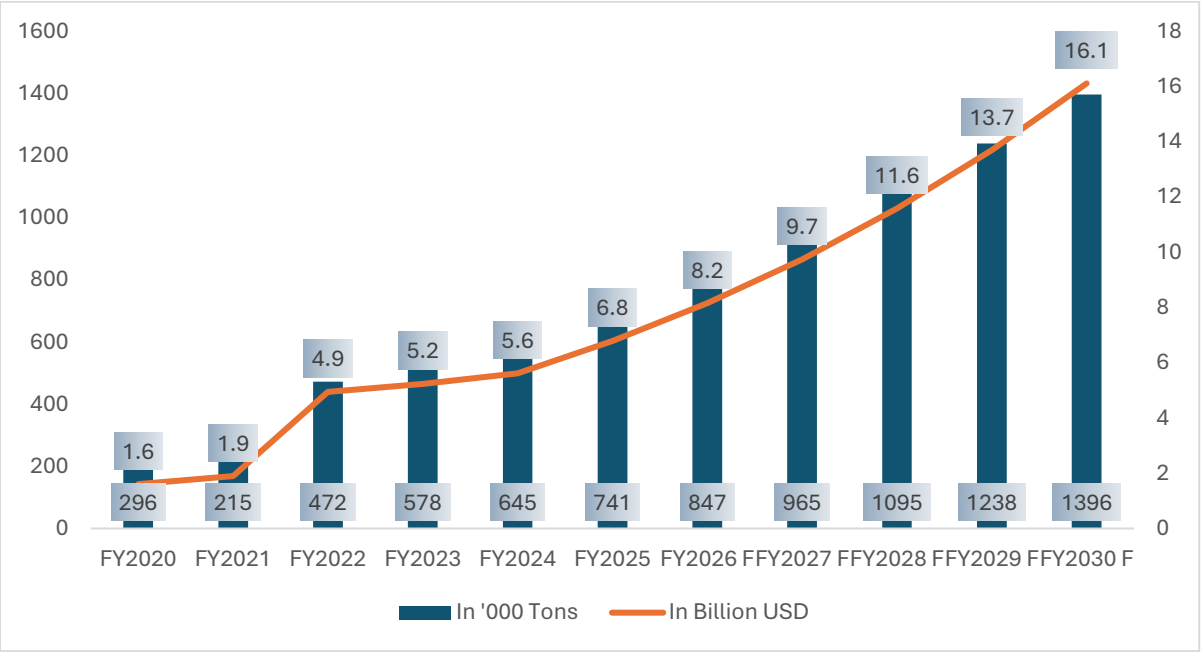



Source: IMARC, ICRA Analytics

India copper market reached a value of USD 14.4 Billion and a volume of 1,660 thousand Tons in 2024, representing a CAGR of 20.2% and 8.2%, respectively, during FY2020–FY2024. Looking forward, India copper market is expected to reach a value of USD 29.4 Billion and a volume of 2,552 thousand Tons by 2030, reflecting a CAGR of 12.0% and 7.0%, respectively, during FY2025–FY2030.

The Indian copper market is experiencing consistent growth, primarily driven by expanding infrastructure, power transmission projects, and increasing investments in renewable energy and electric mobility. Key end-use sectors such as construction, power generation and distribution, automotive (especially electric vehicles), and electronics are fueling demand for refined copper and copper-based products. With the government's continued focus on urbanization, smart cities, make in India, and domestic manufacturing under schemes like PLI (Production Linked Incentive), the demand outlook remains positive. Copper prices in India have generally mirrored global trends, witnessing a gradual rise in recent years due to global demand-supply imbalances, raw material shortages, and logistical constraints. As infrastructure development and electrification accelerate, India is expected to remain a major contributor to Asia-Pacific copper demand growth.

**Chart: India: Recycled Copper Market: Sales Volume (in '000 Tons) and Sales Value (in Billion USD), FY2020-FY2030F**




Source: IMARC, ICRA Analytics

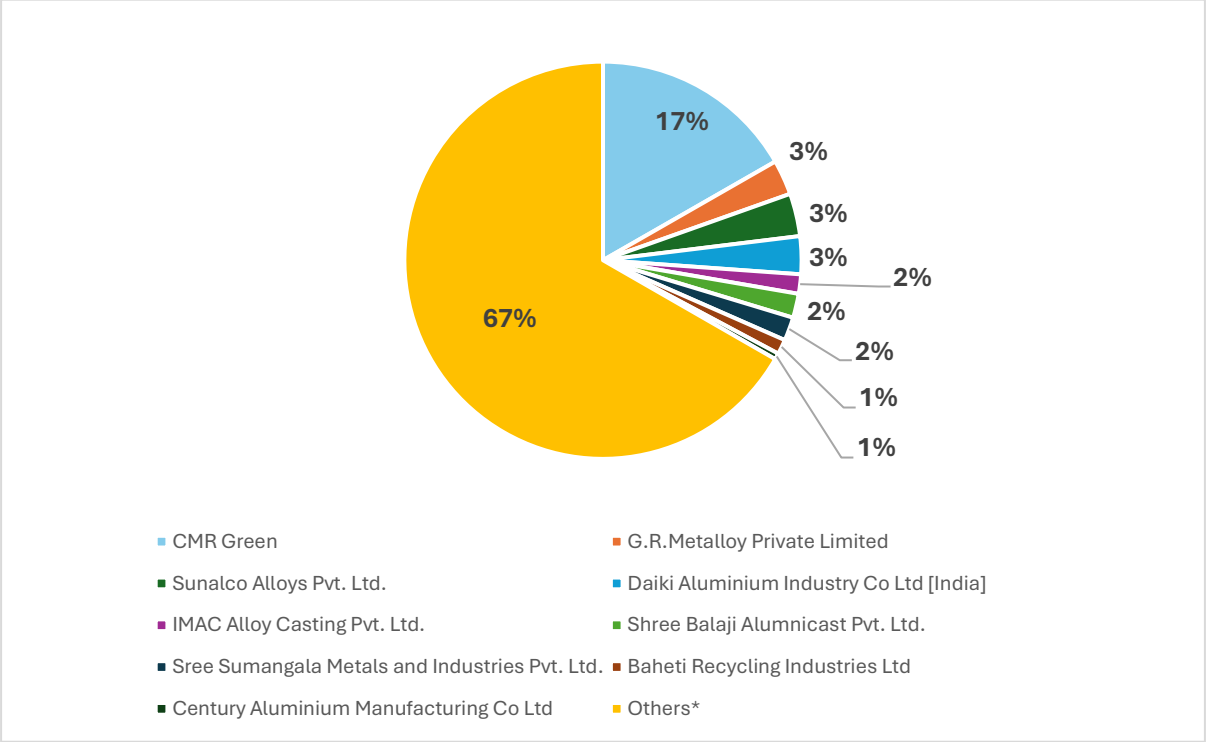
India recycled copper market reached a value of USD 5.61 Billion and a volume of 645 thousand Tons in 2024, representing a CAGR of 36.8% and 21.5%, respectively, during 2020–2024. Looking forward, India copper market is expected to reach a value of USD 16.10 Billion and a volume of 1,396 thousand Tons by 2030, reflecting a CAGR of 18.8% and 13.5%, respectively, during 2025–2030.

The recycled copper market in India is witnessing robust growth, driven by rising awareness of environmental sustainability, energy efficiency, and the economic benefits of recycling. With primary copper production limited by domestic mining capacity and environmental restrictions, recycled copper is becoming an increasingly important source of supply. The Indian government's focus on circular economy initiatives and resource conservation has further encouraged the use of secondary copper across industries. Key demand drivers include the electrical and electronics sector, construction, automotive, and manufacturing, where copper's conductivity and recyclability make it indispensable. Recycled copper is also favoured for its lower carbon footprint and up to 85% lower energy requirements compared to primary production, making it an attractive option amid India's green transition. As a result, the market for secondary copper continues to rise steadily, supported by both industrial demand and policy momentum.

## 5. Competitive Landscape

### 5.1 Aluminium recycling industry players

**Market share of aluminium recycling industry players for FY2024 (% in terms of value)**




Source: Annual report, Industry, company websites, IMARC, ICRA Analytics

**Others consist of small and medium players, which commanded estimated 65-67% of the aluminium recycling industry supply for FY2024, while large players mentioned in the chart accounted for the rest.*

- **CMR Green Technologies Limited-** The company processes, manufactures and sells aluminium alloys (in ingot and liquid form), zinc alloy ingots and segregated furnace ready scrap of stainless steel, copper, brass, zinc, lead and magnesium, amongst others. Company revenue from operation has a CAGR of around 23% from year FY2007 to FY2025. Among the domestic peer company set considered in the aluminium recycling industry, it is the only player to have multiple Joint Ventures with global Japanese players including Nikkei MC, Nippon Light Metal and Toyota Tsusho in India.

  The company uses advanced technology for scrap separation as well as melting & alloying allowing for better scrap separation efficiency and ability to process a larger variety of scrap qualities.

- **Baheti Recycling Industries Ltd (BRIL) -** BRIL processes aluminium-based metal scrap to manufacture aluminium alloys in the form of ingots, cubes, shots, and notch bars. The company's product range includes Aluminium Notch Bar, Aluminium Shots, Aluminium Deox, Aluminium Cubes, Aluminium Alloy Ingots, etc.

- **Century Aluminium Manufacturing Co Ltd -** Century Aluminium Mfg. Co. Ltd., specializes in manufacturing aluminium and zinc alloys. Company has wide variety of

Aluminium Alloys and zinc alloys which are used in automobile, hardware and other industries.

- **G.R. Metalloy Private Limited Co Ltd-** Company is engaged in the Manufacturer, Supplier, Importer, Trader and Exporter of Aluminum Products. The Company's has various range of products like Aluminium Notch Bar, Aluminium Blocks, Aluminium Sheet, Aluminium Shots etc.

- **IMAC Alloy Casting Pvt. Ltd.-** IMAC Alloy Casting is manufacturer of aluminium and zinc-based alloys in South India. Company is specialized in Aluminium alloys, Zinc alloys, lead based alloy, machine components, etc.

- **Shree Balaji Alumnicast Pvt. Ltd.-** Shree Balaji Alumnicast manufacture standard general purpose aluminium alloys (Ingot and liquid) and company also produces zinc alloys.

- **Sree Sumangala Metals and Industries Pvt. Ltd.-** Sree Sumangala Metals and Industries Pvt. Ltd. (SSMI), operates across four core verticals aluminium alloy manufacturing, metal recycling, auto component manufacturing, and sheet metal components.

- **Sunalco Alloys Pvt. Ltd.-** Sunalco Alloys Pvt Ltd is an aluminium alloy manufacturer in India.

- **Daiki Aluminium Industry Co Ltd [India]** - Daiki Aluminium Industry Co Ltd [India] is an affiliated company of a Secondary Aluminium Alloy Japan's Daiki Group. maker in aluminium alloy ingots.

**5.2 Other metal recycling industry players**

- **MTC Group-** MTC Group, is an Indian conglomerate engaged in metal recycling, trading, and manufacturing.

- **Jain Metals-** Jain Metal Group is into non-ferrous metal recycling and manufacturing. It transforms copper, aluminium, and lead scrap into ingots and alloys used across automotive, electrical, construction, and industrial sectors. With advanced recycling facilities capable of processing multiple metals at one location, the company ensures sustainable, consistent, and high-standard production.

- **Gravita India Limited-** Gravita India Limited is a recycling company and its segments include Lead processing, Aluminium processing, Turn-key solutions and Plastic manufacturing**.**
  The company operates state-of-the-art facilities across India and international locations focused on lead, aluminium, plastic, rubber, and tyre recycling.

- **Pondy Oxides & Chemicals**- Pondy Oxides and Chemicals Limited is an India-based company, which is engaged in producing lead, lead alloys and plastic additives. The company is into converting lead scraps of various forms into lead metal and alloys. It carries out smelting of lead battery scrap to produce secondary lead metal which is further transformed into pure lead and specific lead alloys.

### 5.3 Financial benchmarking of key peers in the sector

**Table: Financial benchmarking of key peer companies for the Financial Year 2025**

**Comparison with Aluminium recycling industry players**

| Particulars | For the period ending March 31, 2025 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | CMR Green Technologies Limited | Baheti Recycling Industries Limited | Century Aluminium Manufacturing Co Limited | G.R. Metalloys Private Limited | IMAC Alloy Casting Private Limited | Shree Balaji Alumnicast Private Limited | Sree Sumangala Metals and Industries Private Limited | Sunalco Alloys Private Limited | Daiki Aluminium Industry Private Limited* |
| Revenue from Operations [in ₹ Cr] | 6,666 | 524 | 179 | NA | 518 | NA | NA | NA | 1,024 |
| EBIDTA [[in ₹ Cr] | 304 | 41 | (5) | NA | 12 | NA | NA | NA | (205) |
| PAT [in ₹ Cr] | 155 | 18 | 229 | NA | 5 | NA | NA | NA | (159) |
| Net Debt / Equity | 0.58 | 2.40 | 3.41 | NA | 1.05 | NA | NA | NA | 5.21 |

Source: Company Financial Statements, ICRA Analytics
NA: Not Available
* Financial data is reported basis CY from Jan 2024 till Dec 2024

**Comparison with other metal recycling industry players**

| Particulars | For the period ending March 31, 2025 | | | | |
|---|---|---|---|---|---|
| | CMR Green Technologies Limited | MTC Business Private Limited | Jain Resource Recycling Limited | Gravita India Limited | Pondy Oxides & Chemicals Limited |
| Revenue from Operations [in ₹ Cr] | 6,666 | 7,522 | 6,429 | 3,869 | 2,057 |
| EBIDTA [[in ₹ Cr] | 304 | 126 | 365 | 324 | 105 |
| PAT [in ₹ Cr] | 155 | (1) | 222 | 313 | 58 |
| Net Debt / Equity | 0.58 | 0.75 | 0.93 | -0.06 | 0.12 |

Source: Company Financial Statements, ICRA Analytics,
Jain Resource Recycling Limited's financial information has been sourced from the company's financial statement disclosed for Quarter 2 of FY2026.

CMR Green is a leading non-ferrous metal recycler in terms of installed capacity as of 31st March 2025 and has the highest market share in the Indian secondary aluminium market in terms of revenue from operations for the FY2025 amongst the peer companies.

**Table: Financial benchmarking of key peer companies for the Financial Year 2024**

**Comparison with Aluminium recycling industry players**

| Particulars | For the period ending March 31, 2024 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | CMR Green Technologies Limited | Baheti Recycling Industries Limited | Century Aluminium Manufacturing Co Limited | G.R. Metalloys Private Limited | IMAC Alloy Casting Private Limited | Shree Balaji Alumnicast Private Limited | Sree Sumangala Metals and Industries Private Limited | Sunalco Alloys Private Limited | Daiki Aluminium Industry Private Limited** |
| Revenue from Operations [in ₹ Cr] | 5,952 | 429 | 179 | 1,016 | 561 | 700 | 681 | 1,239 | 1,096 |
| EBIDTA [[in ₹ Cr] | 217 | 20 | (4) | 33 | 8 | 27 | 24 | 49 | (67) |
| PAT [in ₹ Cr] | (839) * | 7 | (25) | 8 | 5 | 7 | 9 | 17 | (107) |
| Net Debt / Equity | 0.36 | 2.37 | -1.43 | 2.21 | 0.98 | 1.71 | 0.88 | 1.12 | 2.81 |

Source: Company Financial Statements, ICRA Analytics NA: Not Available

*It includes non-cash goodwill write off Rs. 1,239 crores

** Financial data is reported basis CY from Jan 2023 till Dec 2023

**Comparison with other metal recycling industry players**

| Particulars | For the period ending March 31, 2024 | | | | |
|---|---|---|---|---|---|
| | CMR Green Technologies Limited | MTC Business Private Limited | Jain Resource Recycling Limited | Gravita India Limited | Pondy Oxides & Chemicals Limited |
| Revenue from Operations [in ₹ Cr] | 5,952 | 6,494 | 4,428 | 3,161 | 1,542 |
| EBIDTA [[in ₹ Cr] | 217 | 147 | 227 | 284 | 72 |
| PAT [in ₹ Cr] | (839) | 42 | 164 | 242 | 32 |
| Net Debt / Equity | 0.36 | 1.07 | 1.65 | 0.52 | 0.20 |

Source: Company Financial Statements, ICRA Analytics NA: Not Available

*It includes non-cash goodwill write off Rs. 1,239 crores

**Table: Financial benchmarking of key peer companies for the Financial Year 2023**

**Comparison with Aluminium recycling industry players**

| Particulars | For the period ending March 31, 2023 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | CMR Green Technologies Limited | Baheti Recycling Industries Limited | Century Aluminium Manufacturing Co Limited | G.R. Metalloys Private Limited | IMAC Alloy Casting Private Limited | Shree Balaji Alumnicast Private Limited | Sree Sumangala Metals and Industries Private Limited | Sunalco Alloys Private Limited | Daiki Aluminium Industry Private Limited* |
| Revenue from Operations [in ₹ Cr] | 5,869 | 360 | 214 | 796 | 801 | 741 | 793 | 1,477 | 1,345 |
| EBIDTA [[in ₹ Cr] | 207 | 13 | (7) | 5 | 13 | 28 | 25 | 61 | 18 |
| PAT [in ₹ Cr] | 105 | 5 | (11) | 7 | 9 | 8 | 10 | 20 | 2 |
| Net Debt / Equity | 0.15 | 1.96 | -1.61 | 3.56 | 1.22 | 2.10 | 1.05 | 1.19 | 0.55 |

Source: Company Financial Statements, ICRA Analytics

NA: Not Available

* Financial data is reported basis Calendar Year from Jan 2022 till Dec 2022

**Comparison with other metal recycling industry players-**

| Particulars | For the period ending March 31, 2023 | | | | |
|---|---|---|---|---|---|
| | CMR Green Technologies Limited | MTC Business Private Limited | Jain Resource Recycling Limited | Gravita India Limited | Pondy Oxides & Chemicals Limited |
| Revenue from Operations [in ₹ Cr] | 5,869 | 7,481 | 3,064 | 2,801 | 1,476 |
| EBIDTA [[in ₹ Cr] | 207 | 278 | 124 | 198 | 77 |
| PAT [in ₹ Cr] | 105 | 106 | 92 | 204 | 75 |
| Net Debt / Equity | 0.15 | 1.27 | 2.92 | 0.51 | 0.56 |

Source: Company Financial Statements, ICRA Analytics

**Table: List of Formulas used for the key peer comparison**

| SR. No. | Formula |
|---|---|
| 1 | Revenue from Operations means the revenue generated from the operations of the company for the year. |
| 2 | EBITDA is calculated as Profit/(loss) for the year from Continuing operations add Finance costs, Depreciation and amortization expense, Exceptional item and Total tax expenses/(credit) less other income and share in (loss) of Joint Ventures (net of tax). |
| 3 | PAT is the Profit after tax from Continuing operations for the year. |
| 4 | Net Debt to equity (in times) is calculated as the Net Debt divided by Total Equity (including non-controlling interest) where net debt represents sum of non-current borrowings and current borrowings less cash and cash equivalent and other bank balances. |

Source: Company Financial Statements, ICRA Analytics