

Industry Research Report on Non-Ferrous Metals Industry

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Abbreviation	Full Form	Definition
IMF	International Monetary Fund	Global financial institution providing economic analysis and policy advice.
GDP	Gross Domestic Product	Total value of goods and services produced within a country.
Y-o-Y	Year-on-Year	Compares a metric with the same period in the previous year.
CY	Calendar Year	Twelve-month period from January to December.
FY	Financial Year	Twelve-month accounting period used for financial reporting in India (April–March).
RBI	Reserve Bank of India	India's central bank responsible for monetary policy.
CPI	Consumer Price Index	Measures changes in price levels of consumer goods and services.
GST	Goods and Services Tax	Unified indirect tax levied on goods and services in India.
MOSPI	Ministry of Statistics and Programme Implementation	Government body responsible for official statistics.
GVA	Gross Value Added	Measures the value added to the economy by producers.
GFCF	Gross Fixed Capital Formation	Measures net investment in physical assets.
PFCE	Private Final Consumption Expenditure	Household consumption expenditure on goods and services.
GNDI	Gross National Disposable Income	Income available for consumption and savings.
CAGR	Compound Annual Growth Rate	Annual growth rate over a specified time period.
IIP	Index of Industrial Production	Indicator tracking industrial output growth.

EV	Electric Vehicle	Vehicle powered fully or partially by electricity.
PLI	Production Linked Incentive	Scheme incentivising domestic manufacturing output.
NMP	National Monetization Pipeline	Program to monetize public infrastructure assets.
DFI	Development Finance Institution	Institution providing long-term infrastructure financing.
AMRUT	Atal Mission for Rejuvenation and Urban Transformation	Urban infrastructure development scheme.
PMAY (Urban)	Pradhan Mantri Awas Yojana (Urban)	Affordable housing scheme for urban areas.
NCMM	National Critical Mineral Mission	Mission to secure supply of critical minerals.
EL	Exploration Licence	License permitting mineral exploration activities.
HSN	Harmonized System of Nomenclature	International product classification system.
SX-EW	Solvent Extraction – Electrowinning	Hydrometallurgical copper extraction process.
HVAC	Heating, Ventilation and Air Conditioning	Systems for indoor climate control.
HVACR	Heating, Ventilation, Air Conditioning and Refrigeration	HVAC systems including refrigeration.
AI	Artificial Intelligence	Technology enabling machines to simulate human intelligence.
ML	Machine Learning	AI subset enabling systems to learn from data.
LME	London Metal Exchange	Global exchange for trading base metals.
CMIE	Centre for Monitoring Indian Economy	Economic research and data organization.

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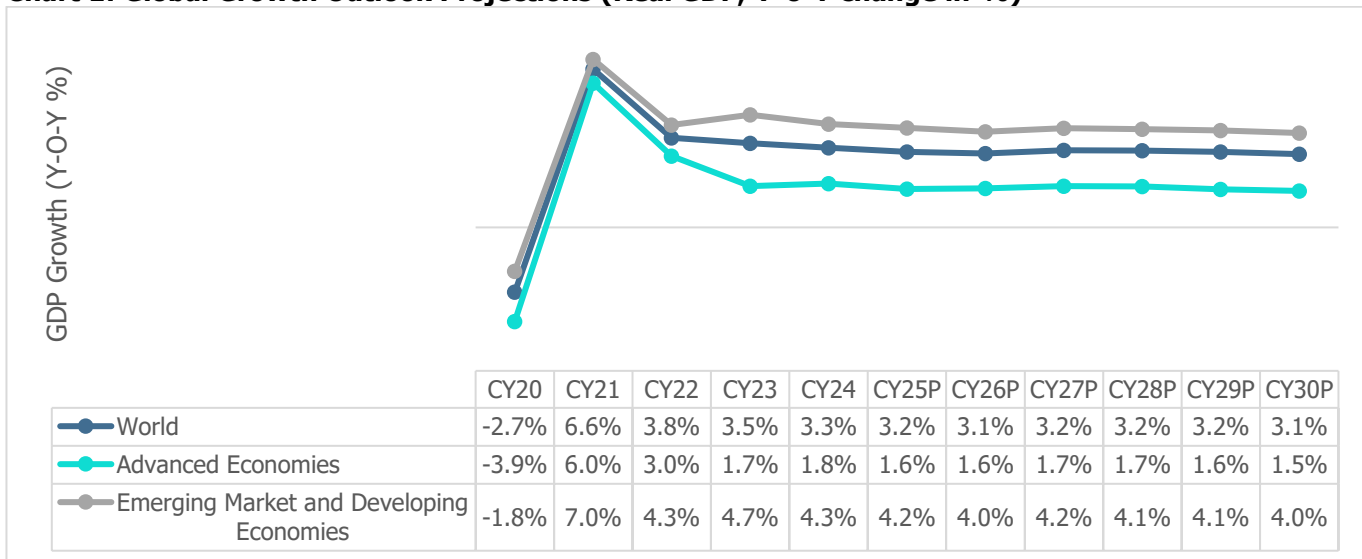
1 Economic Outlook

1.1 Global Economy

Global economic growth expected to sustain at ~3% in near term

Global growth, which reached 3.5% in CY23, stabilized at 3.3% for CY24 and projected to decrease at 3.2% for CY25. Global trade is expected to be disrupted by new US tariffs and countermeasures from trading partners, leading to historically high tariff rates and negatively impacting economic growth projections. The global landscape is expected to change as countries rethink their priorities and policies in response to these new developments. Central banks priority will be to adjust policies, while smart fiscal planning and reforms are key to handling debt and reducing global inequalities.

Chart 1: Global Growth Outlook Projections (Real GDP, Y-o-Y change in %)



Source: IMF – World Economic Outlook, October 2025; Note: P-Projection

Table 1: GDP growth trend comparison - India v/s Other Economies (Real GDP, Y-o-Y change in %)

	Real GDP (Y-o-Y change in %)										
	CY20	CY21	CY22	CY23	CY24	CY25P	CY26P	CY27P	CY28P	CY29P	CY30P
India	-5.8	9.7	7.6	9.2	6.5	6.6	6.2	6.4	6.5	6.5	6.5
China	2.3	8.6	3.1	5.4	5.0	4.8	4.2	4.2	4.0	3.7	3.4
Indonesia	-2.1	3.7	5.3	5.0	5.0	4.9	4.9	5.0	5.0	5.1	5.1
Saudi Arabia	-3.8	6.5	12.0	0.5	2.0	4.0	4.0	3.3	3.3	3.3	3.3
Middle East	-2.3	4.7	6.4	2.6	2.6	3.5	3.8	3.8	3.7	3.7	3.7
Latin America	-6.9	7.4	4.3	2.4	2.4	2.4	2.3	2.6	2.7	2.8	2.6
Brazil	-3.3	4.8	3.0	3.2	3.4	2.4	1.9	2.2	2.3	2.4	2.5
Euro Area	-6.0	6.4	3.6	0.4	0.9	1.2	1.1	1.4	1.3	1.2	1.1
United States	-2.1	6.2	2.5	2.9	2.8	2.0	2.1	2.1	2.1	1.9	1.8

Source: IMF- World Economic Outlook Database (October 2025); Note: P- Projections, India's fiscal year (FY) aligns with the IMF's calendar year (CY). For instance, FY24 corresponds to CY23.

1.2 Indian Economic Outlook

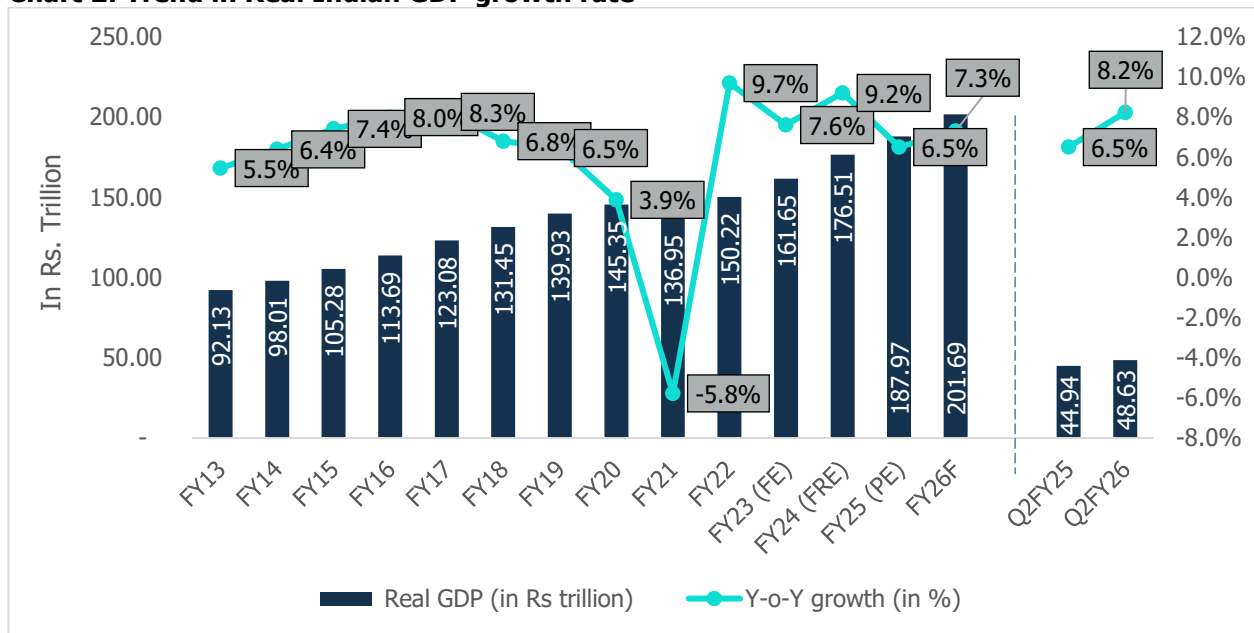
1.2.1 GDP Growth and Outlook

Resilience to External Shocks remains Critical for Near-Term Outlook

India’s economy continues to show rapid growth. In the first quarter of FY26, the country’s GDP grew by 7.8% compared to the same period last year, which saw a 6.5% increase. For the full year FY26, GDP is expected to grow by 6.8%, supported by rising rural demand, better job opportunities, and active business conditions.

In FY25, provisional estimates show a growth of 6.5% (Rs 187.97 trillion), led by robust performance in manufacturing, construction, and financial services. Consumer spending rose by 7.6%, and government spending increased by 3.8%, both contributing to the overall growth. In FY24, India’s GDP grew by 9.2% (Rs 176.5 trillion), the highest in over a decade (excluding the pandemic year).

Chart 2: Trend in Real Indian GDP growth rate



Source: MOSPI, Reserve Bank of India; Note: FE – Final Estimates, FRE- First Revised Estimates, PE – Provisional Estimates, F - Forecasted

GDP Growth Outlook (October 2025)

FY26 GDP Outlook: The RBI projects real GDP growth at 6.8% for 2025-26, driven by strong private consumption, steady investment, and resilient rural and urban demand. A favorable monsoon, robust services sector and improving corporate balance sheets support this outlook.

However, risks from prolonged geopolitical tensions, global trade disruptions, and weather-related uncertainties remain. Taking these into account, the RBI has reaffirmed its growth projections.

Table 2: RBI’s GDP Growth Outlook (Y-o-Y %)

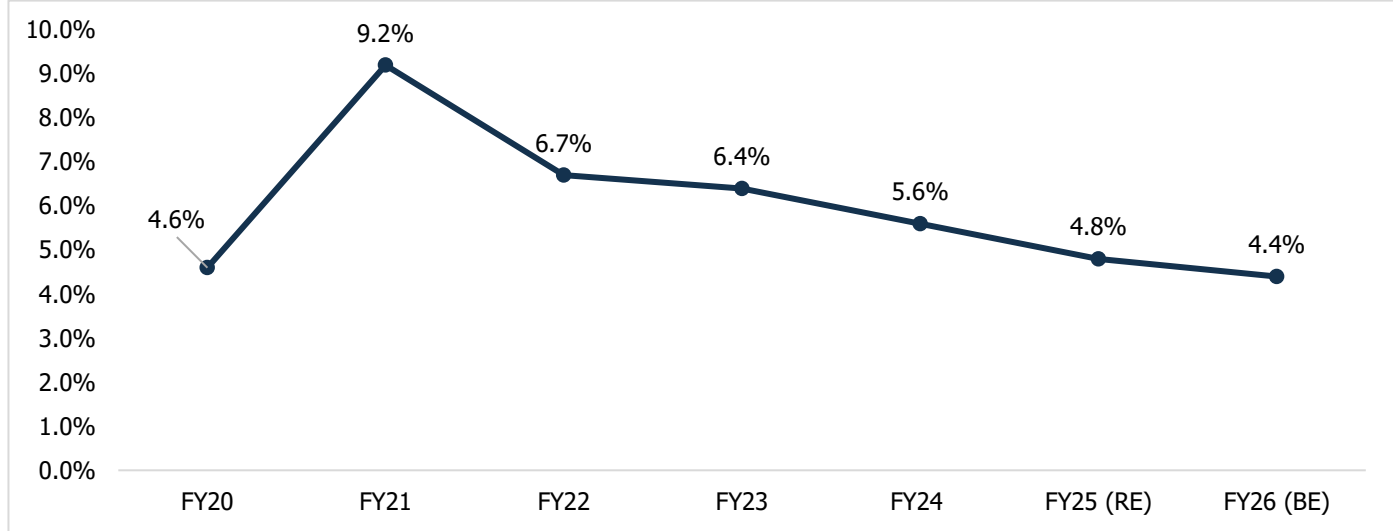
FY26P (complete year)	Q2FY26P	Q3FY26P	Q4FY26P	Q1FY27P
6.8%	7.0%	6.4%	6.2%	6.4%

Source: Reserve Bank of India; Note: P-Projected

1.2.2 Fiscal Deficit (as a % of GDP)

In FY21, India's fiscal deficit was 9.2% due to the impact of COVID-19, since then it has seen a steady improvement is expected to reduce to 4.8% of GDP FY25 (RE), driven by strong economic growth and higher tax and non-tax revenues. The government aims for further fiscal consolidation, setting a target of 4.4% of GDP for FY26 to maintain fiscal prudence.

Chart 3: Gross Fiscal Deficit (% of GDP)

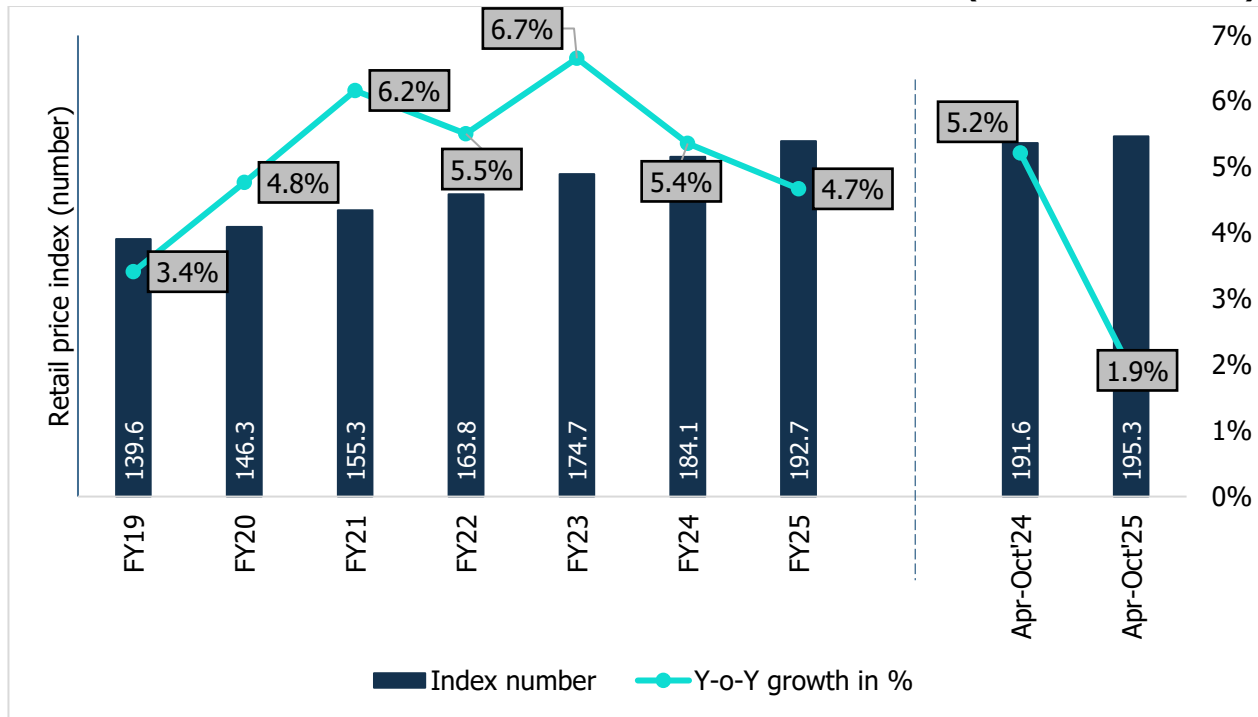


Source: RBI; Note: RE-Revised Estimates, BE-Budget Estimates

1.2.3 Consumer Price Index

The Consumer Price Index (CPI) for the April–October 2025 recorded a combined inflation rate of 1.9%, marking the lowest quarterly retail inflation of the current CPI series. The moderation was driven by the impact of decline in GST, favorable base effect and to drop in inflation of Oils and fats, Vegetables, Fruits, Egg, Footwear, Cereals and products, Transport and Communication etc.

Chart 4: Retail Price Inflation in terms of index and Y-o-Y Growth in % (Base: 2011-12=100)

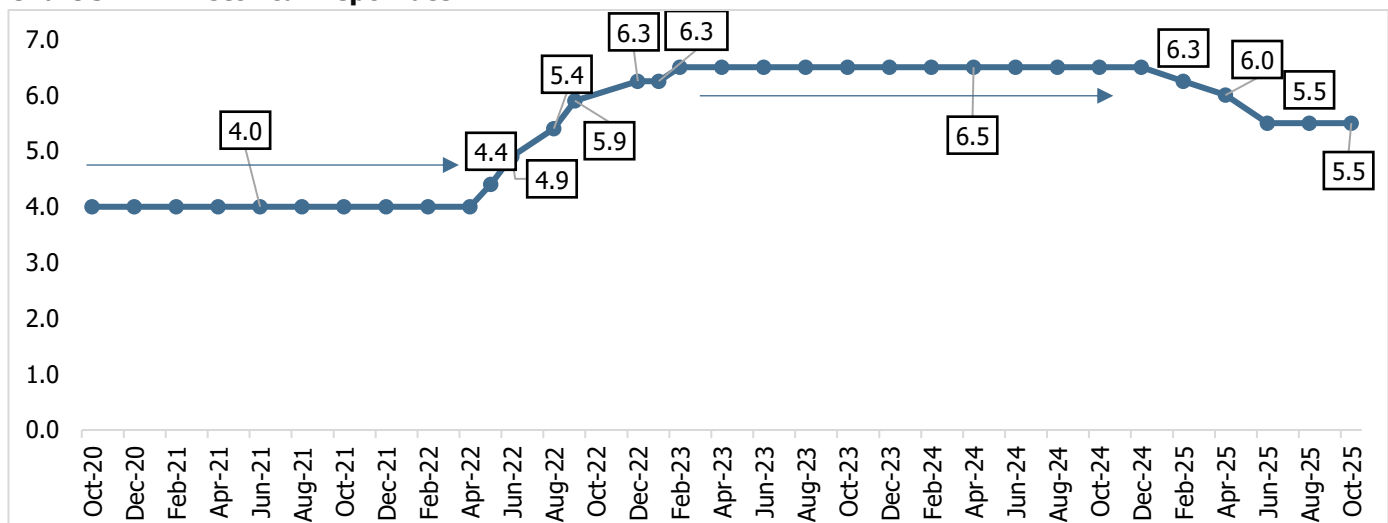


Source: MOSPI

The CPI is primarily factored in by RBI while preparing their bi-monthly monetary policy. At the bi-monthly meeting held in August 2025, RBI projected inflation at 3.1% for FY26 with inflation during Q2FY26 at 2.1% and Q3FY26 at 3.1%, Q4FY26 at 4.4% and Q1FY27 at 4.9%.

Considering the current inflation situation, RBI maintained the repo rate to 5.5% in the August 2025 meeting of the Monetary Policy Committee.

Chart 5: RBI historical Repo Rate



Source: RBI

Further, the central bank continued its stance as 'neutral'. The economic growth outlook for India is expected to maintain momentum, supported by private consumption and continued growth in fixed capital formation. The uncertainty has resurfaced as the temporary pause on US tariff hikes has ended and higher duties on some Indian exports now apply, even though trade talks have resumed.

The RBI has adopted for a non-inflationary growth with the foundations of strong demand and supply with a good macroeconomic balance. The domestic growth and inflation curve require the policies to be supportive of the volatile trade conditions.

1.2.4 GVA in the Industrial Sector

Gross Value Added (GVA) is the measure of the value of goods and services produced in an economy. GVA gives a picture of the supply side whereas GDP represents consumption. India's recovery in FY25 was powered by a broad-based rebound across sectors.

The agriculture and allied sector grew by 4.6% in FY25 (up from 2.7% in FY24), supported by good monsoon, better crop output, and strong allied activities. The industrial sector grew by 5.9% in FY25, down from 10.8% in FY24 due to weaker manufacturing, with FY24 growth driven by strong manufacturing sales, construction (9.4%), utilities, and supportive policies.

From H1FY25 to H1FY26, the overall GVA at basic price had a Y-o-Y growth from 6.2% to 7.9%, indicating stronger economic performance. Most sectors showed growth, with Industrial sector growing from 6.1% to 7.0% in H1FY26. However, Mining & Quarrying declined sharply from 3.6% to -1.8%, and Electricity, Gas & Water supply decreased considerably from 6.5% to 2.4%.

Table 3: Industrial sector growth (Y-o-Y growth) -at Constant Prices

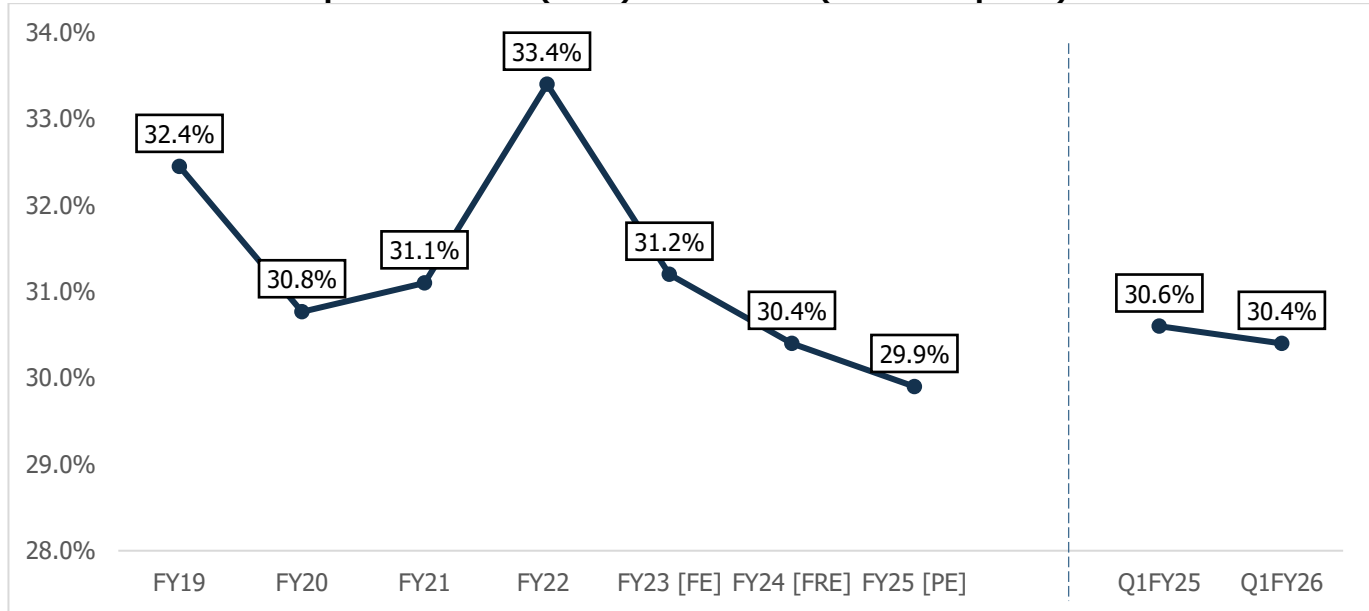
At constant Prices	FY19	FY20	FY21	FY22	FY23 (FE)	FY24 (FRE)	FY25 (PE)	H1FY25	H1FY26
Agriculture, Forestry & Fishing	2.1	6.2	4.1	4.6	5.1	2.7	4.6	2.7	3.6
Industry	5.3	-1.4	-0.9	12.2	2.0	10.8	5.9	6.1	7.0
Mining & Quarrying	-0.9	-3.0	-8.6	6.3	2.8	3.2	2.7	3.6	-1.8
Manufacturing	5.4	-3.0	2.9	10.0	-3.0	12.3	4.5	4.8	8.4
Electricity, Gas, Water Supply & Other Utility Services	7.9	2.3	-4.3	10.3	11.5	8.6	5.9	6.5	2.4
Construction	6.5	1.6	-5.7	19.9	10.0	10.4	9.4	9.3	7.4
GVA at Basic Price	5.8	3.9	-4.2	9.4	7.2	8.6	6.4	6.2	7.9

Source: MOSPI; Note: FRE – First Revised Estimates, FE – Final Estimates, PE- Provisional Estimates

1.2.5 Investment Trend in Infrastructure

Gross Fixed Capital Formation (GFCF) is a measure of net increase in physical assets. In FY23, the ratio of investment (GFCF) to GDP remained flat, as compared to FY22 which was at 33.4%. The growth stabilized at 30.4% in FY24 before falling to 29.9% in FY25. The moderation reflects cautious capital spending by both government and private corporations, which has persistently lagged overall GDP growth. In Q1FY26, GFCF as a proportion in GDP, marginally declined to 30.4% as compared to 30.6% in Q1FY25.

Chart 6: Gross Fixed Capital Formation (GFCF) as % of GDP (At current prices)



Source: MOSPI; Note: FRE- First Revised Estimates, FE – Final Estimates, PE- Provisional Estimates

Overall, the support of public investment in infrastructure is likely to gain traction due to initiatives such as Atmanirbhar Bharat, Make in India, and Production-linked Incentive (PLI) scheme announced across various sectors.

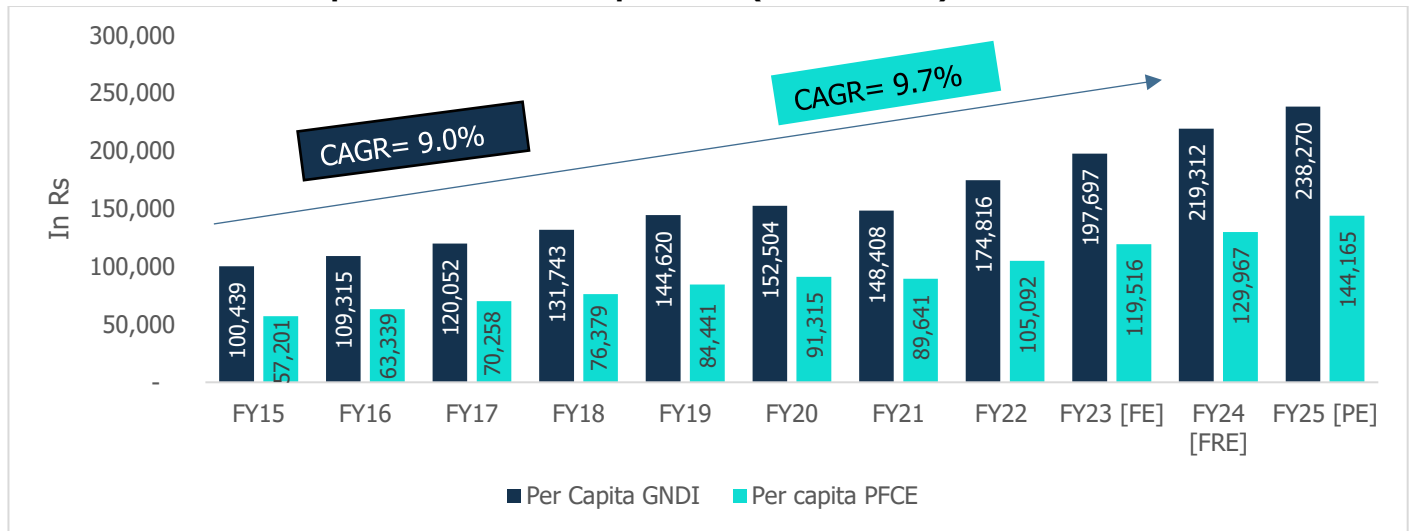
1.2.6 Per capita PFCE and GNDI

- **Increasing Disposable Income and Consumer Spending**

Gross National Disposable Income (GNDI) is a measure of the income available to the nation for final consumption and gross savings. Between the period FY15 to FY25, per capita GNDI at current prices registered a CAGR of 9.0%. More disposable income drives more consumption, thereby driving economic growth.

With increase in disposable income, there has been a gradual change in consumer spending behaviour as well. Per capita Private Final Consumption Expenditure (PFCE) which is measure of consumer spending has also showcased significant growth from FY15 to FY25 at a CAGR of 9.7%.

Chart 7: Trend of Per Capita GNDI and Per Capita PFCE (Current Price)



Source: MOSPI; Note: FRE – First Revised Estimates, FE – Final Estimates, PE- Provisional Estimates

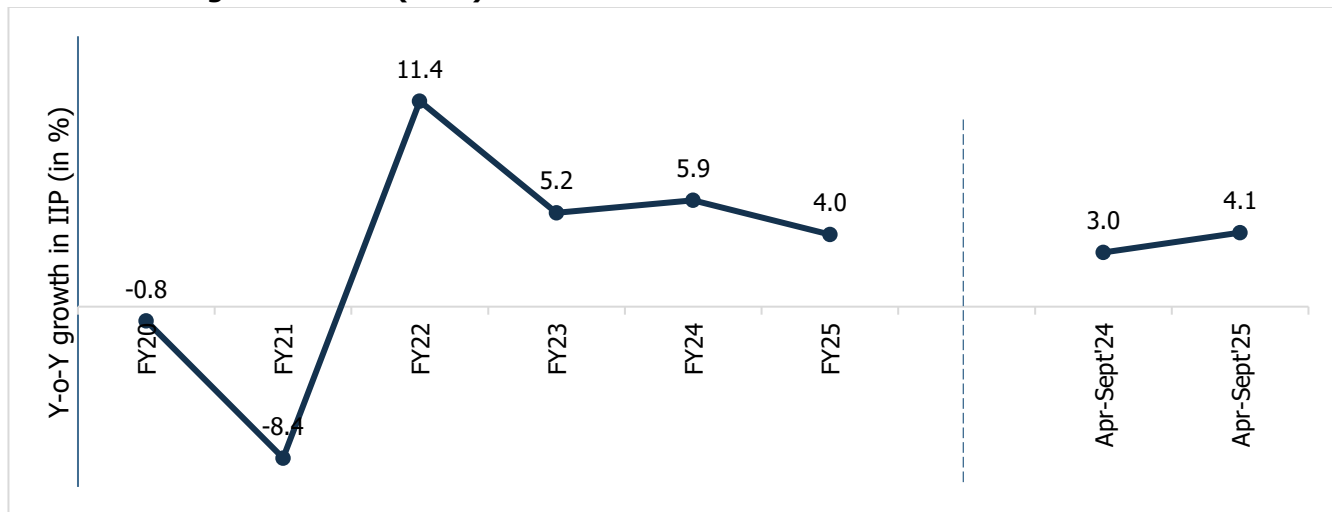
1.2.7 Industrial Growth

The Quick Estimates of the Index of Industrial Production (IIP) for September 2025 show a growth of 4.0%, remaining unchanged from August 2025. The year-on-year moderation reflects weakness across major segments, primarily due to contractions in electricity, mining, and consumer non-durables.

In September 2025, industrial growth was supported by Manufacturing (4.8%) and Electricity (3.1%). Within manufacturing, notable growth was recorded in basic metals, electrical equipment, motor vehicles, trailers and semi-trailers.

Use-based indices reflected mixed trends, with strong growth in Infrastructure Goods (10.5%), but declines in Consumer Durables and Non-Durables indicating subdued consumption and Capital goods. Manufacturing contributed significantly to overall industrial growth. This was primarily driven by strong performance in segments such as pharmaceuticals, motor vehicles, beverages, and electrical equipment.

Chart 8: Y-o-Y growth in IIP (in %)



Source: MOSPI

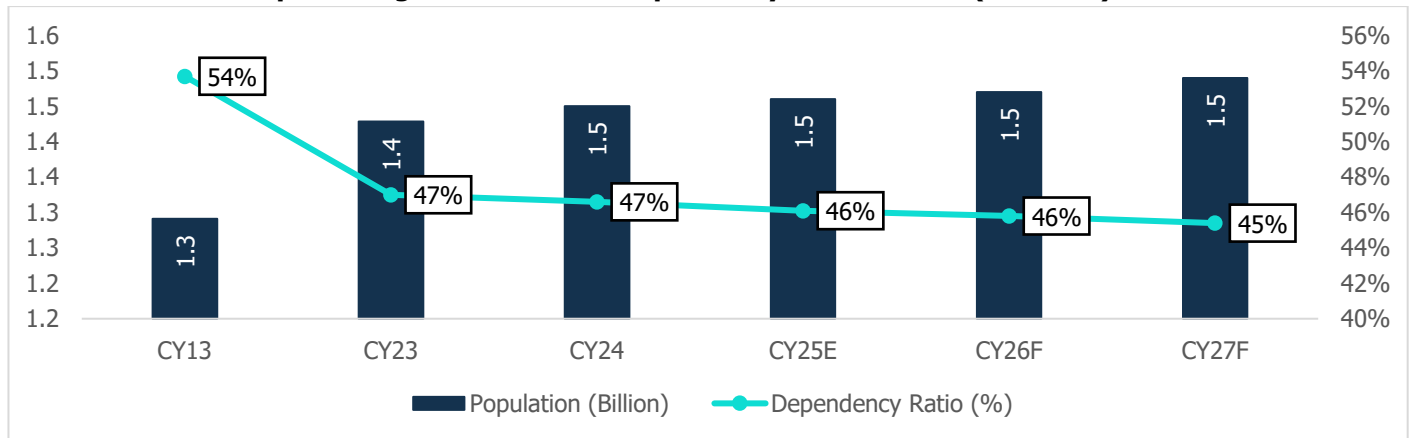
1.2.8 Overview on Key Demographic Parameters

• **Population growth and Urbanization**

The trajectory of economic growth of India and private consumption is driven by socio-economic factors such as demographics and urbanization. According to the world bank, India’s population in CY22 surpassed 1.42 billion, slightly higher than China’s population (1.41 billion) and became the most populous country in the world.

Age Dependency Ratio is the ratio of dependents to the working age population, i.e., 15 to 64 years, wherein dependents are population younger than 15 and older than 64. This ratio has been on a declining trend. Declining dependency means the country has an improving share of working-age population generating income, which is a good sign for the economy. It was as high as 76% in 1983, which has reduced to 47% in CY23. However, this ratio is expected to rise again to 54% by CY36, driven by an increase in the elderly population as life expectancy improves.

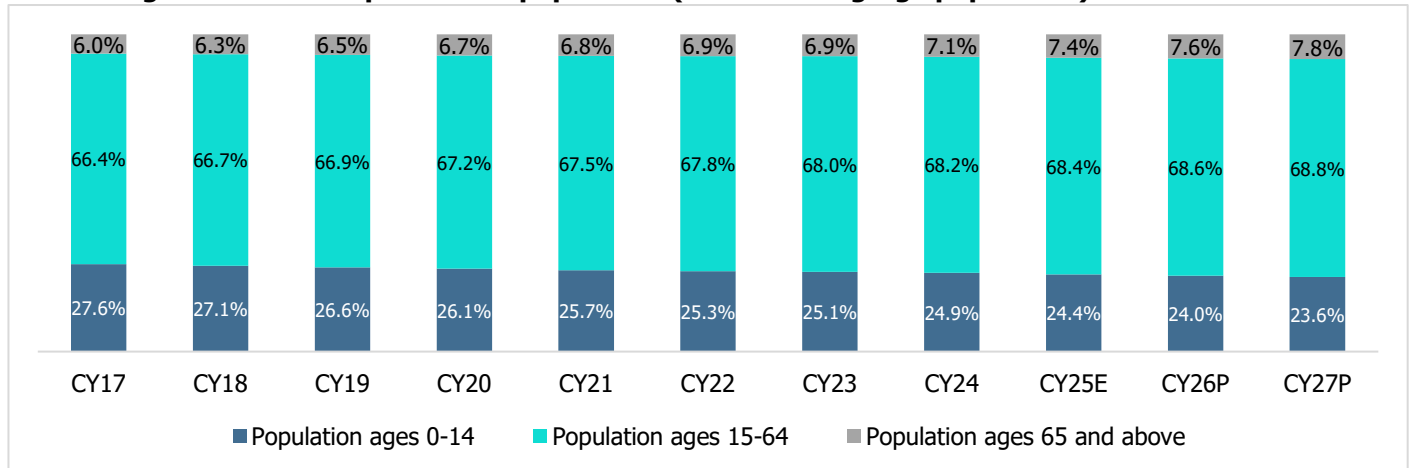
Chart 8: Trend in Population growth vis-à-vis dependency ratio in India (in Billion)



Source: World Bank Database, MOSPI; Note; E- Estimated, F- Forecasted

Despite a projected rise in the dependency ratio to 54% by CY36, India’s young and growing workforce, especially in newly urbanised towns, will continue to drive income growth and consumer demand. This presents strong opportunities for sectors like consumer electronics, transportation, and railways. Rising employment, urbanisation, and government investment in rural development and digital infrastructure will further boost demand, while increased tech adoption supports long-term consumption growth across both urban and rural markets.

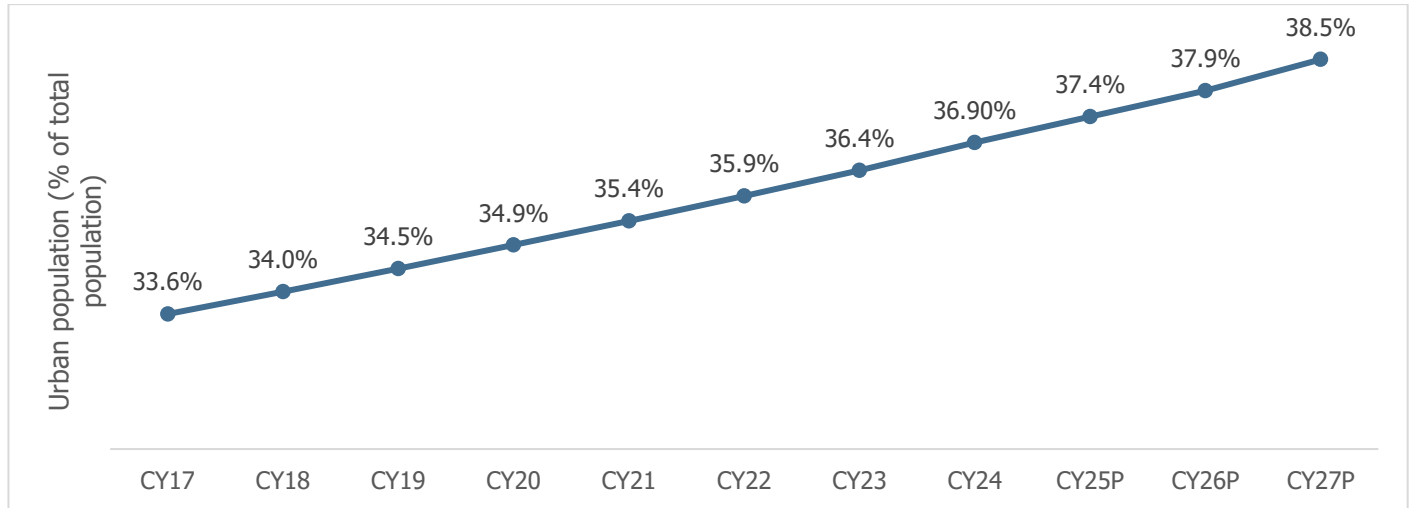
Chart 9: Age-Wise Break Up of Indian population (% of working-age population)



Source: World Bank Database; Note; E- Estimated, F- Forecasted

The urban population is significantly growing in India. The urban population in India is estimated to have increased from 413 million (32% of total population) in CY13 to 519.5 million (36.4% of total population) in the year CY23. India is undergoing a significant urban transformation, with the urban population projected to rise to 40% by CY36. This shift is driven by factors such as improved living standards, increased employment opportunities in urban areas, and government initiatives aimed at urban development. This rapid urbanisation might necessitate substantial investments in infrastructure, housing, and transportation.

Chart 10: Urbanization Trend in India



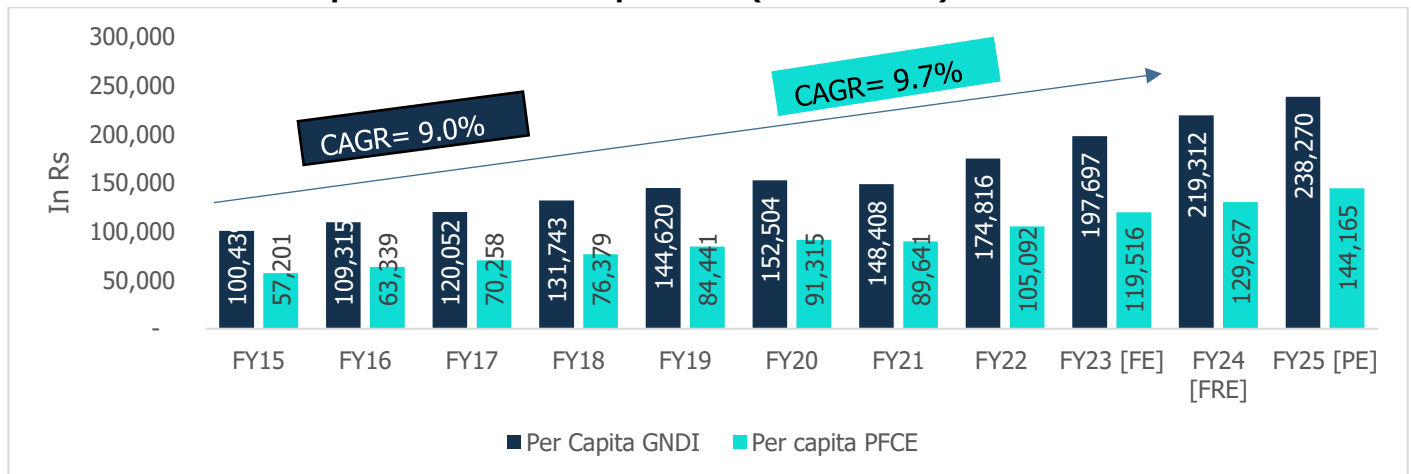
Source: World Bank Database; Note: E- Estimated, F- Forecasted

• **Increasing Disposable Income and Consumer Spending**

Gross National Disposable Income (GNDI) is a measure of the income available to the nation for final consumption and gross savings. Between the period FY15 to FY25, per capita GNDI at current prices registered a CAGR of 9.0%. More disposable income drives more consumption, thereby driving economic growth.

With increase in disposable income, there has been a gradual change in consumer spending behaviour as well. Per capita Private Final Consumption Expenditure (PFCE) which is measure of consumer spending has also showcased significant growth from FY15 to FY25 at a CAGR of 9.7%.

Chart 9: Trend of Per Capita GNDI and Per Capita PFCE (Current Price)

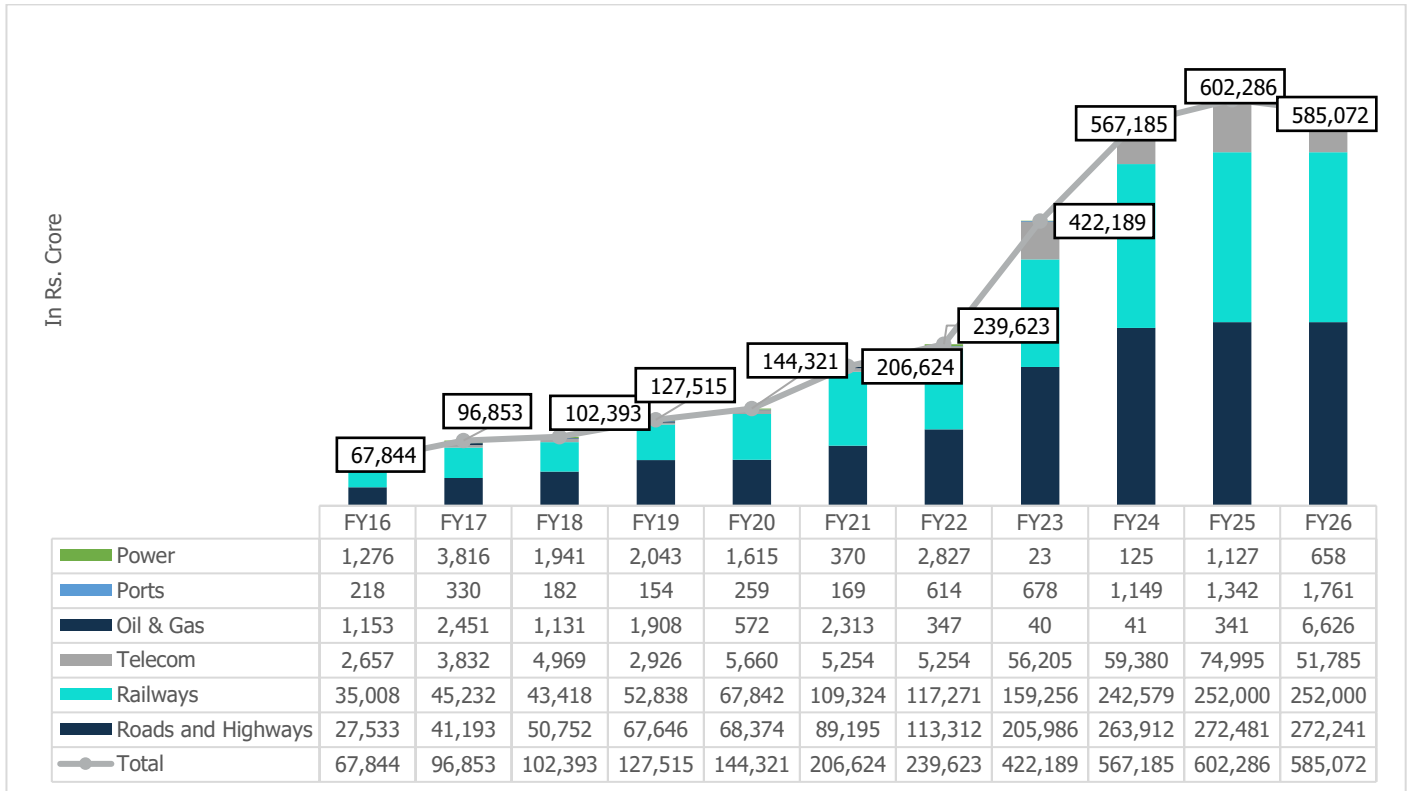


Source: MOSPI; Note: FRE – First Revised Estimates, FE – Final Estimates, PE- Provisional Estimates

1.2.9 Budgetary expenditure on Infrastructure

With the growing population, the long-term need for robust infrastructure is necessary for economic development. This generates the need for massive investments in the development and modernization of infrastructure facilities, which will not only cater to the growing demand but will also ensure competitiveness in the global market.

Chart 10: Budgetary outlay towards infrastructure



Source: Union Budget FY26 document

Some of the key government infrastructure schemes include:

- The government has announced plans for the National Monetization Pipeline (NMP) and Development Finance Institution (DFI) to improve the financing of infrastructure projects
- The government has helped the growth of urbanization through a number of schemes and projects, including the **Smart Cities Mission**, the **Atal Mission for Rejuvenation and Urban Transformation (AMRUT)**, and the **Pradhan Mantri Awas Yojana (Urban)**.

1.2.10 Recent Developments and Macro-economic trends affecting the sector

India’s copper industry is currently influenced by strong demand linked to economic expansion and structural transformation. Consumption across construction, infrastructure, renewable energy and consumer durables has been rising sharply, reflecting broader industrial growth and urbanisation. This trend underscores copper’s critical role as an input for power transmission, electric mobility and clean energy infrastructure, making it a benchmark for broader economic activity.

On the supply side, domestic refined copper output has historically been limited relative to demand, prompting significant imports of cathodes and semi-finished products to bridge the gap. Recent policy shifts, including duty exemptions on

certain copper imports and investments by major industrial groups in smelting capacity, aim to stimulate local production. However, industry associations have raised concerns about the impact of zero-duty imports under free-trade agreements on domestic smelting and refining viability, highlighting potential competitive pressures and trade-policy risks.

Macroeconomic headwinds and global price dynamics are also pivotal. Copper prices internationally have trended higher as market participants emphasise tightening supply and robust long-term demand linked to electrification and energy transition technologies. These global price signals influence domestic costs, investment decisions and inventory management in India's copper value chain.

Policy emphasis on energy transition and industrial competitiveness under broader national development goals reinforces copper's strategic importance. Growing allocation to renewable energy rollouts, electric vehicle ecosystems, and distributed infrastructure indirectly buoy copper demand while encouraging domestic downstream capabilities. Meanwhile, the industry's push for stronger quality standards and supply chain resilience reflects both economic priorities and concerns over import dependence.

In summary, India's copper sector is navigating the intersection of robust demand growth, constrained domestic supply, global price volatility, and trade-policy impacts, set against the backdrop of broader macro-economic trends towards decarbonisation and industrialisation. Strategic policy support and investment in local capacity will be critical to balancing these forces and ensuring long-term sectoral resilience.

1.2.11 Key Growth Drivers in the Copper Value Chain

- **Energy Transition and Renewable Infrastructure:**

Copper is indispensable for renewable energy systems because of its superior electrical and thermal conductivity. Solar photovoltaic installations, wind turbines and grid modernization projects rely on extensive copper wiring, transformers and grounding systems. As nations strive to meet decarbonisation commitments and expand clean energy capacity, the rapid deployment of renewables significantly increases demand for copper throughout generation, transmission and distribution networks.

- **Electric Mobility and Transportation Electrification:**

The ongoing shift from internal combustion engines to electric vehicles (EVs) is a structural demand driver. EVs require substantially more copper for electric motors, battery connectors, wiring harnesses and charging infrastructure compared to traditional vehicles. This higher material intensity embeds copper deeply into future transport systems, and rising EV adoption—both globally and in India's two- and three-wheeler segments—underpins robust and sustained demand across the entire copper supply chain.

- **Building, Infrastructure & Urbanisation:**

Urban expansion and large-scale infrastructure programmes are foundational demand pillars. In India, increased use of up-sized copper wiring, cables and transformers in residential, commercial and industrial projects mirrors broader economic growth and higher construction output. Infrastructure build-outs in power transmission, railways and utilities also intensify copper usage, linking macro-economic activity directly to metal consumption.

- **Electronics and High-Purity Applications:**

Advanced manufacturing sectors—including electronics, semiconductors and industrial automation—are driving demand for high-purity copper products. In India, policy measures like Production-Linked Incentive (PLI) schemes have stimulated investments in domestic electronics production, increasing the usage of copper in printed circuit boards, connectors and precision components, and expanding value addition beyond basic electrical applications.

- **Policy Support and Strategic Investment:**

Government initiatives that prioritise renewable energy targets, domestic manufacturing competitiveness and infrastructure development indirectly underpin copper demand. In India, policies aimed at attracting foreign investment into smelting, refining and downstream capacities seek to narrow the supply gap and secure long-term raw material access, reinforcing the strategic importance of copper in national economic plans.

- **Supply Chain Dynamics and Global Market Pressures:**

On the global stage, tightening supply due to declining ore grades, ageing mines and geopolitical uncertainties has heightened the strategic value of copper. This constrained supply, juxtaposed with robust demand growth, accentuates investment in recycling, exploration and capacity expansion across the value chain. Although India remains dependent on imports to bridge demand-supply imbalances, global price signals and supply constraints influence domestic procurement, inventory strategies and investment decisions.

1.3 Concluding Remarks

Global economic growth faces headwinds from geopolitical tensions, volatile commodity prices, high interest rates, inflation, financial market volatility, climate change, and rising public debt. However, India's economy remains relatively strong, with an IMF forecast of 6.6% GDP growth in CY25 (FY26 according to the fiscal year), compared to the global projection of 3.2%. Key drivers include strong domestic demand, government capital expenditure and moderating inflation.

Public investment is expected to exhibit healthy growth as the government has allocated a strong capital expenditure of about Rs. 11.21 lakh crores for FY26. The private sector's intent to invest is also showing improvement as per the data announced on new project investments and resilience shown by the import of capital goods. Additionally, improvement in rural demand owing to healthy sowing, improving reservoir levels, and progress in south-west monsoon along with government's thrust on capex and other policy support will aid the investment cycle in gaining further traction.

The recent 56th meeting of the Goods and Services Tax (GST) Council announced some major changes in the existing GST structure. The focus is majorly on simplifying it to a two-tiered GST tax structure of 5% and 18%, phasing out the currently existing 12% and 28% slabs. There is also a de-merit tax rate for luxury and 'sin' goods at a 40% tax slab. These changes are typically aimed at increasing the disposable income and in turn boosting consumption, as well as promoting the ease of doing business. The GST rationalization is expected to be a positive step towards economic growth, stimulating private consumption and ease inflationary pressures. The recent revisions in income tax rates, coupled with the reduction in GST, are expected to result in savings of over Rs 2.5 lakh crore, which is likely to further boost the consumption.

Recent developments indicate that the impact of U.S. tariffs on India's exports is likely to remain limited, with sector-specific exposure in areas such as engineering goods, while overall dependence remains moderate. Notably, under the

2026 India–U.S. interim trade framework, tariffs on a significant portion of Indian exports have been reduced from earlier elevated levels, with several categories receiving partial or full duty relief, improving export competitiveness.

While negotiations are still ongoing amid evolving U.S. tariff policies, both countries continue to work toward a broader trade agreement and improved market access.

Overall, despite some near-term uncertainties, India’s competitive manufacturing base and strengthening trade relations position it well for sustained export growth.

2 Global Non-Ferrous Metals Industry

2.1 Overview of the Global Non-Ferrous Metals Industry

The global non-ferrous metals industry encompasses a broad range of metals such as aluminium, copper, zinc, nickel, tin, titanium and lead, all characterised by the absence of iron as the major constituent and by attributes such as lighter weight, high conductivity or corrosion resistance.

One of the industry's core growth drivers is the rising demand from sectors such as automotive, electronics, construction and clean energy. Non-ferrous metals find use in body panels, wiring, heat sinks, structural components and battery enclosures in particular as vehicle manufacturers move toward electric mobility and infrastructure develops globally.

Sustainability and recycling are playing an ever larger role. The recycling of non-ferrous metals reduces reliance on primary mineral sourcing and helps lower energy use and greenhouse-gas emissions. This transition is supported by technological improvements in processing, sorting and treatment of scrap.

The industry also exhibits notable regional dynamics: rapid industrialisation across Asia-Pacific has lifted demand, while established regions such as North America and Europe are focusing strongly on value-added processing, circular economy practices and tighter environmental regulation.

In summary, the global non-ferrous metals sector stands at an inflection point where escalating demand from electrification and infrastructure, combined with the push for sustainability and recycling, is reshaping how and where these metals are produced and recycled.

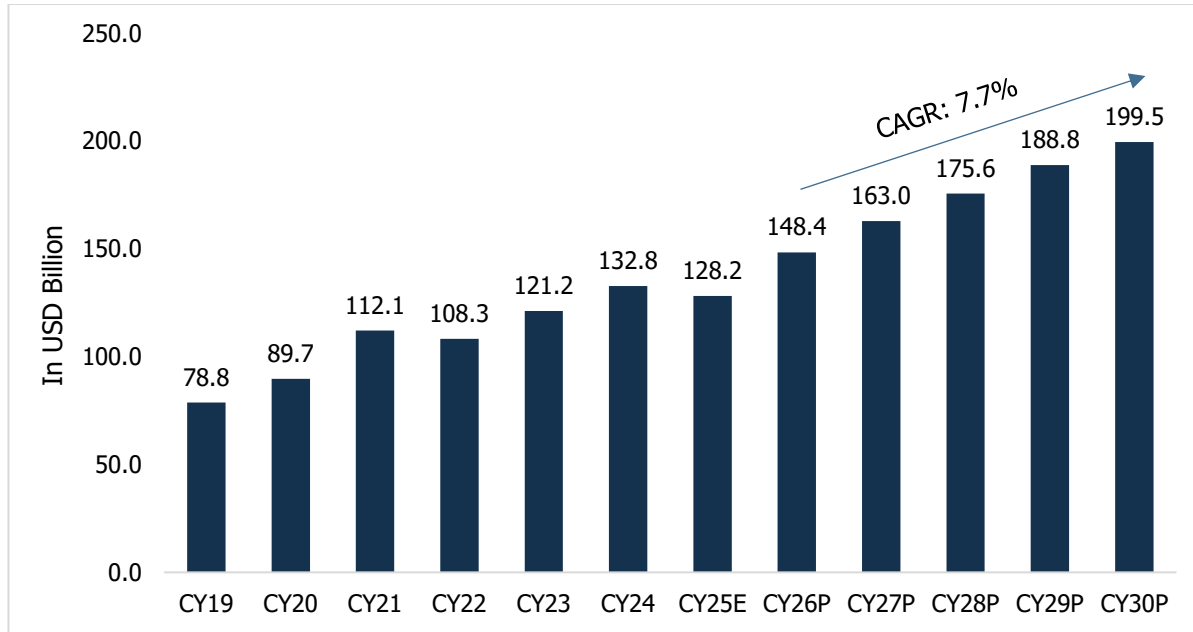
2.2 Production and Consumption of Non-Ferrous Metals

2.2.1 Copper

Production

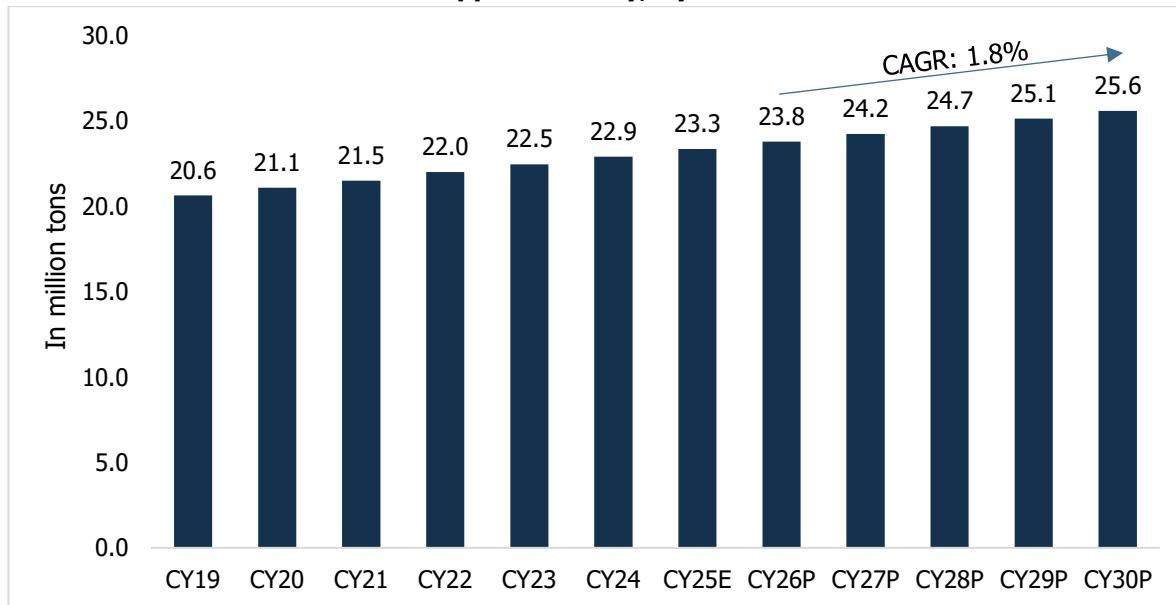
The global production of copper has long followed a pattern of incremental expansion, driven by rising demand and investment in mining infrastructure. Historically, new mines, expansions of existing operations and increased recovery from older deposits supported this growth. Production benefited from high-grade ore bodies, favourable regulatory environments in major producing countries, and steady improvements in mining and processing technologies. However, in recent years the growth rate of copper output has begun to moderate, as many of the easiest-to-develop deposits are now behind us, and ore grades are declining. For example, the average ore grade has fallen significantly in many large operations, which raises production cost and complexity. On the supply side, longer permitting processes, greater environmental scrutiny, and the need for large upfront capital make new project development slower than before. Looking ahead, production growth is likely to face further headwinds unless new world-class deposits are brought online, or existing operations are significantly upgraded. In short, global copper production is entering a more challenging phase: steady but slower growth, with potential for supply bottlenecks if new capacity does not materialize in time.

Chart 11: Production of Global Copper Industry, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 12: Production of Global Copper Industry, By Volume



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

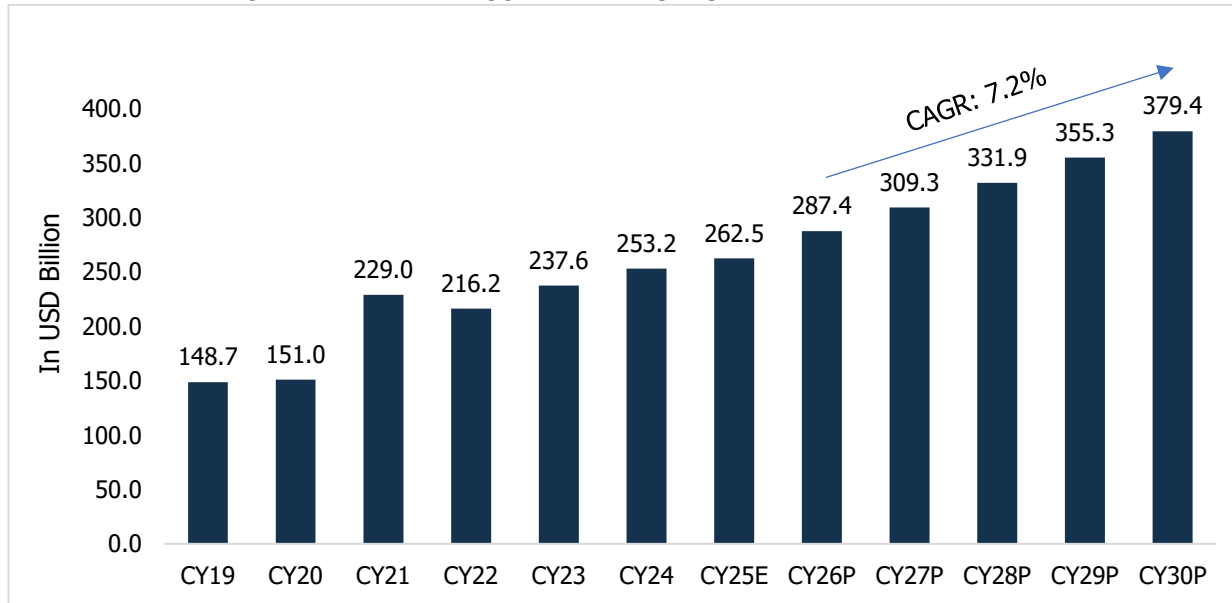
Consumption

Copper consumption around the world has been propelled by broad-based growth in infrastructure, construction, manufacturing, electrification and urbanisation. In the early decades, it was largely driven by conventional uses such as wiring, plumbing, building construction and industrial machinery. As emerging economies experienced rapid growth and increased urban population, the volume of copper integrated into buildings, power grids, transport and manufacturing expanded significantly. More recently, a powerful new wave of demand has emerged: the transition to renewable energy systems, the electrification of transport (especially electric vehicles and charging infrastructure), digital infrastructure

expansion including data centres, and the growth of smart grid technologies. These new end-uses are far more copper-intensive per unit of output than many traditional applications. Looking forward, the consumption trend remains durable. As governments worldwide commit to decarbonisation, smart cities and upgraded infrastructure, copper is likely to benefit from that momentum. Regions such as Asia and Africa where urbanisation and industrialisation are still accelerating offer further upside. However, the rate of growth may vary and will be influenced by economic cycles, substitution risks, and supply-side constraints.

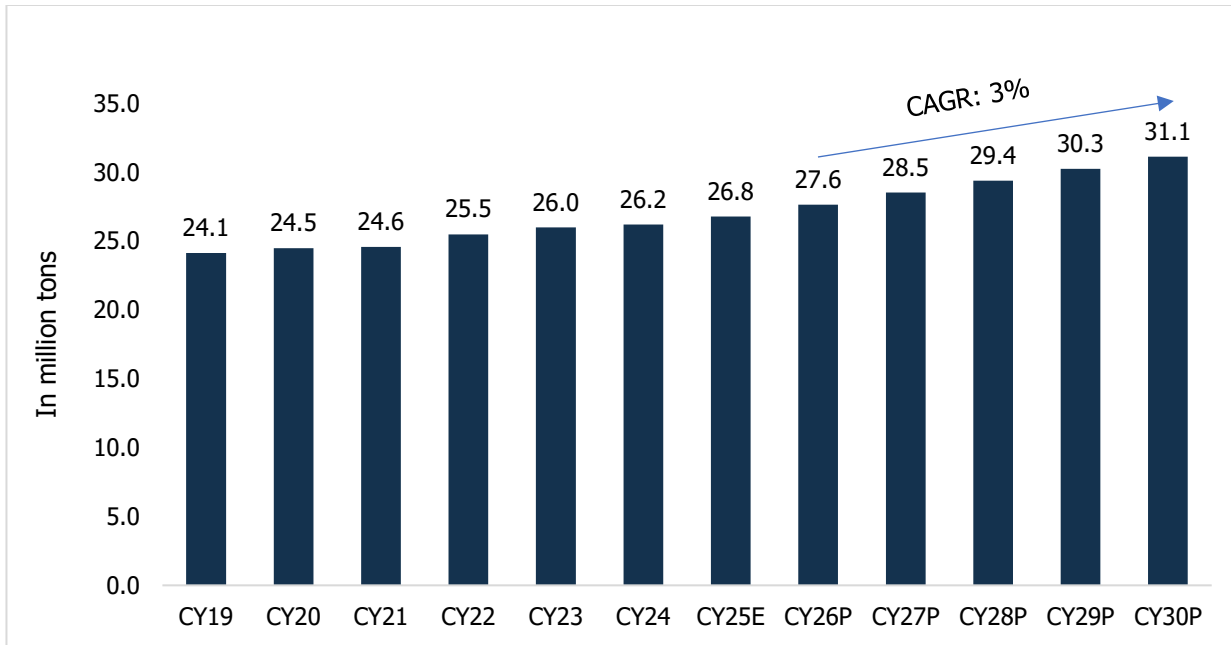
The absence of a visible COVID-related dip in global copper consumption reflects the metal’s resilience, as the marginal decline in 2020 was largely offset by a rapid recovery in the second half of the year, particularly driven by strong demand from China and infrastructure-led stimulus. As a result, annual consumption trends appear relatively stable, with short-term disruptions masked by structural demand strength and data smoothing in long-term projections.

Chart 13: Consumption of Global Copper Industry, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 14: Consumption of Global Copper Industry, By Volume



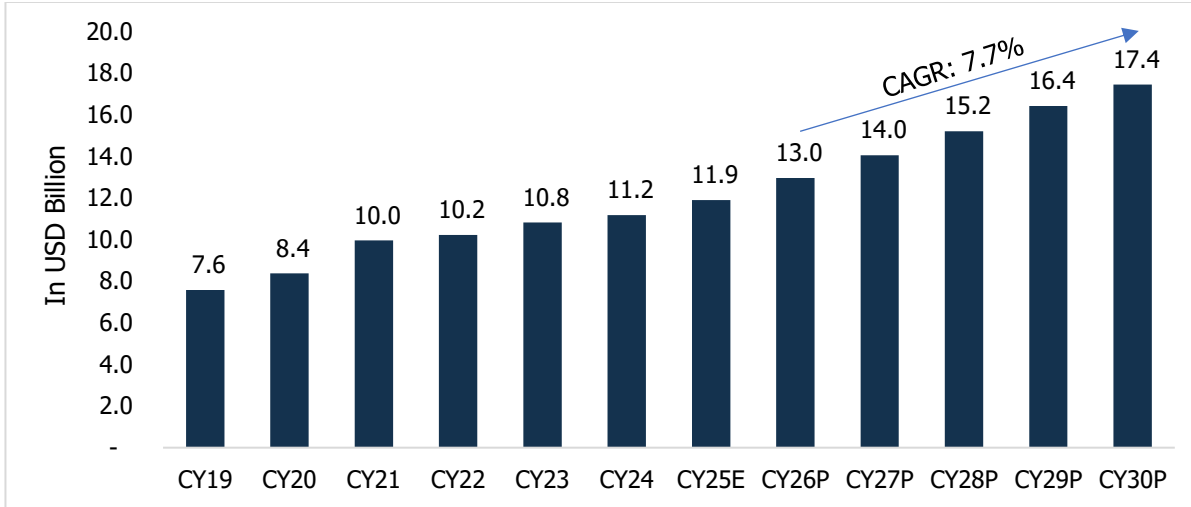
Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

2.2.2 Brass

Production

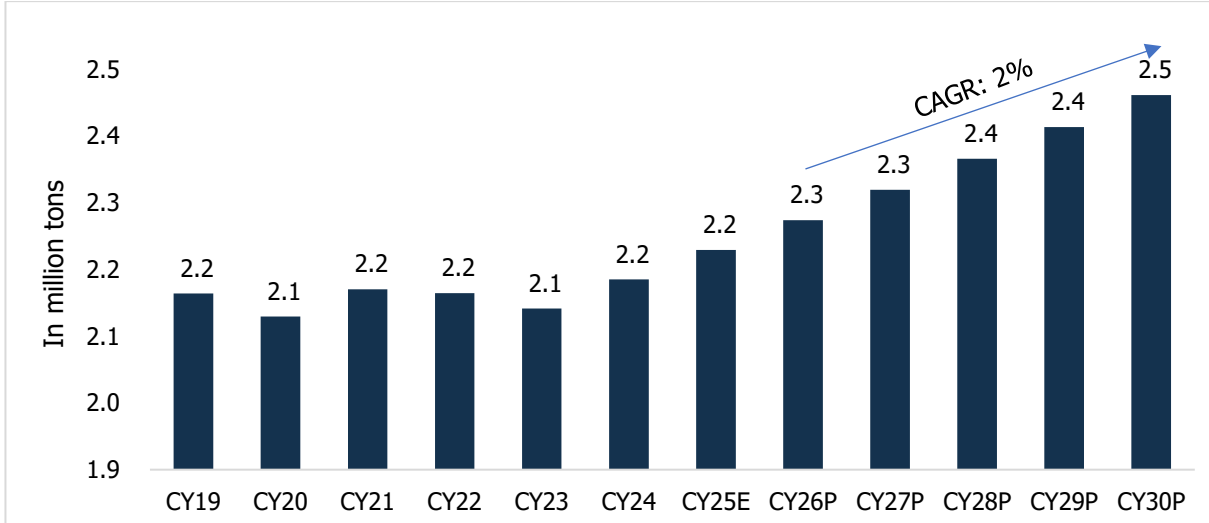
Global brass production has grown steadily over recent years, underpinned by its broad utility across plumbing, electrical fittings, automotive components and decorative hardware. The alloy’s resilience, machinability and corrosion resistance make it a preferred choice for many manufacturing segments worldwide. On the production side, one notable trend is the increasing use of recycled brass content, which enables producers to reduce reliance on primary copper and zinc inputs, cut energy intensity and improve sustainability. Manufacturers have also adopted more advanced casting and extrusion technologies, creating finer tolerances and more complex shapes at lower cost. These investments, paired with global growth in infrastructure and manufacturing capacity especially across Asia-Pacific have helped expand output. Looking ahead, production is likely to remain robust, supported by the shift toward “lead-free” brass alloys (driven by regulatory and health concerns) and the rising demand for precision brass components in sectors like electronics, aerospace and renewable energy. However, growth may moderate if raw-material pricing becomes more volatile, and if substitution by alternative materials intensifies.

Chart 15: Production of Global Brass Industry, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 16: Production of Global Brass Industry, By Volume

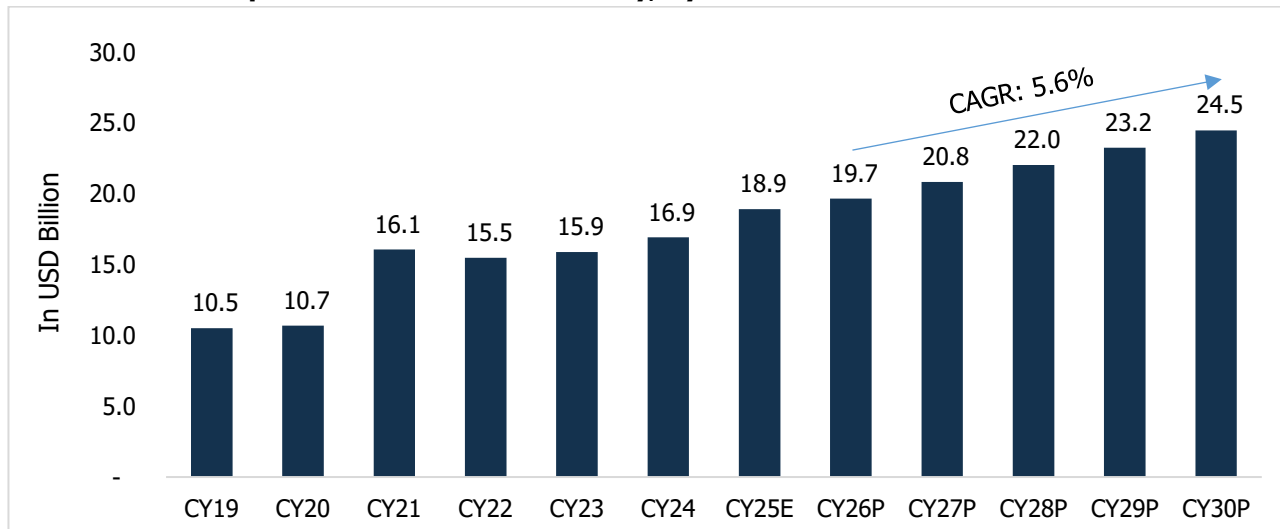


Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Consumption

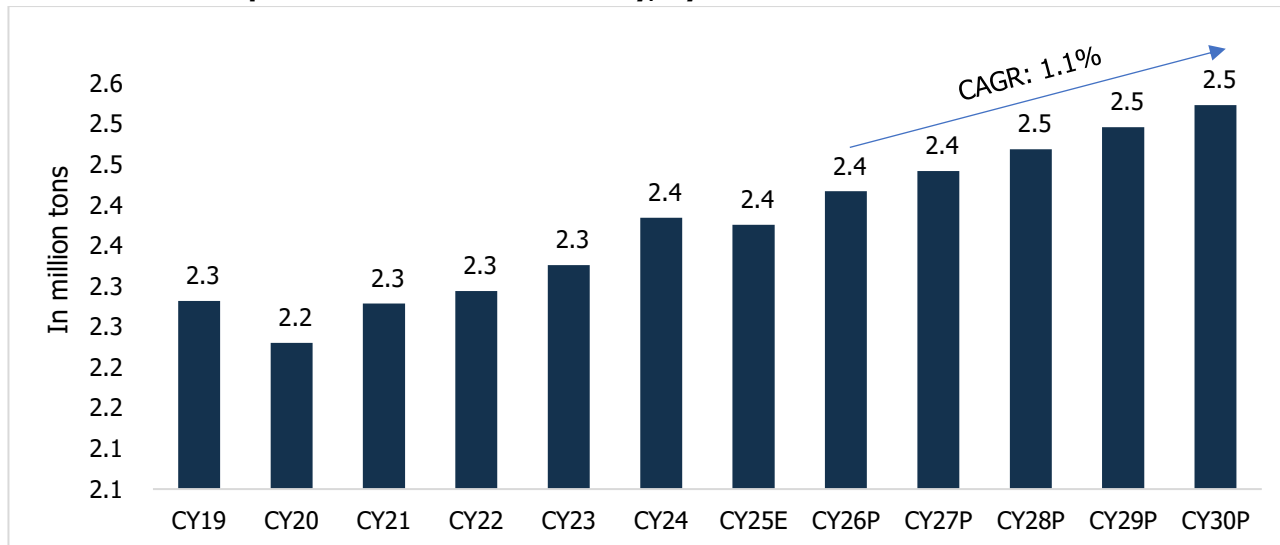
Brass consumption globally has been shaped by long-standing demand from construction, plumbing, HVAC, electrical systems and automotive manufacturing. Historically, expansion in residential and commercial building construction, urban infrastructure development, and general mechanical engineering lifted demand for brass rods, bars, fittings and sheets. More recently, newer growth drivers have emerged: electric vehicles and charging infrastructure require high-conductivity components, electronics and data centres use precision brass connectors and terminals, and sustainable manufacturing emphasises recyclable materials – all favouring brass as a material. Regions such as Asia-Pacific dominate consumption growth, driven by rapid industrialisation, urbanisation and a rising middle class. Forward-looking demand looks promising: smart buildings, grid modernisation, green manufacturing and high-precision engineering will continue to support brass use. The rate of growth may vary by region, depending on regulatory change (for example, lead-free mandates), material substitution pressure (for example aluminium or plastics) and the pace of infrastructure spending. Overall, brass remains well-positioned as a material of choice in many growth-sectors of the global economy.

Chart 17: Consumption of Global Brass Industry, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 18: Consumption of Global Brass Industry, By Volume



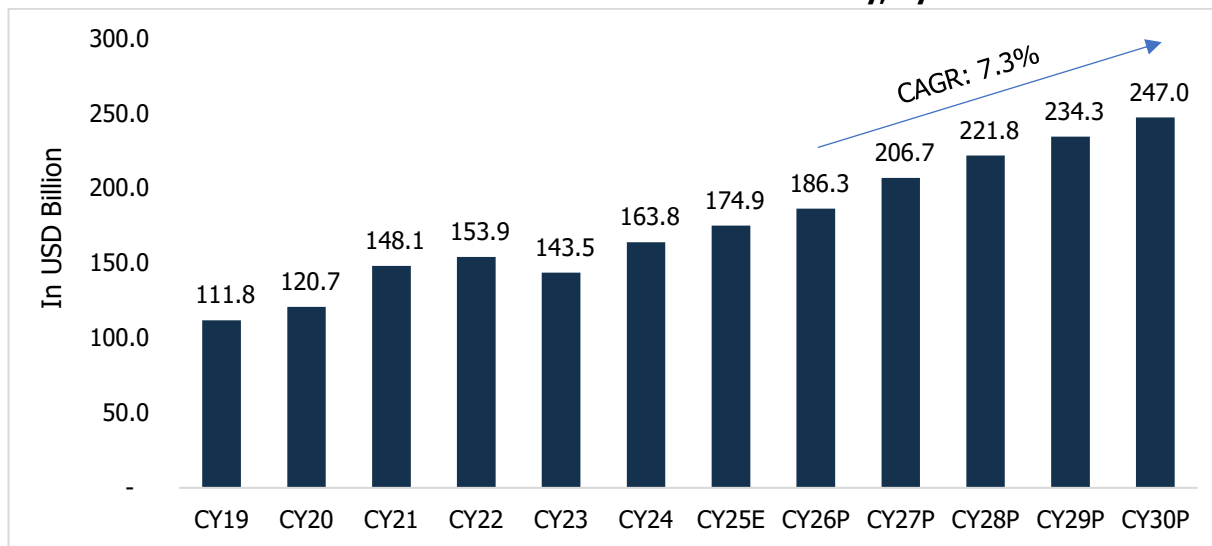
Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

2.2.3 Others

Production

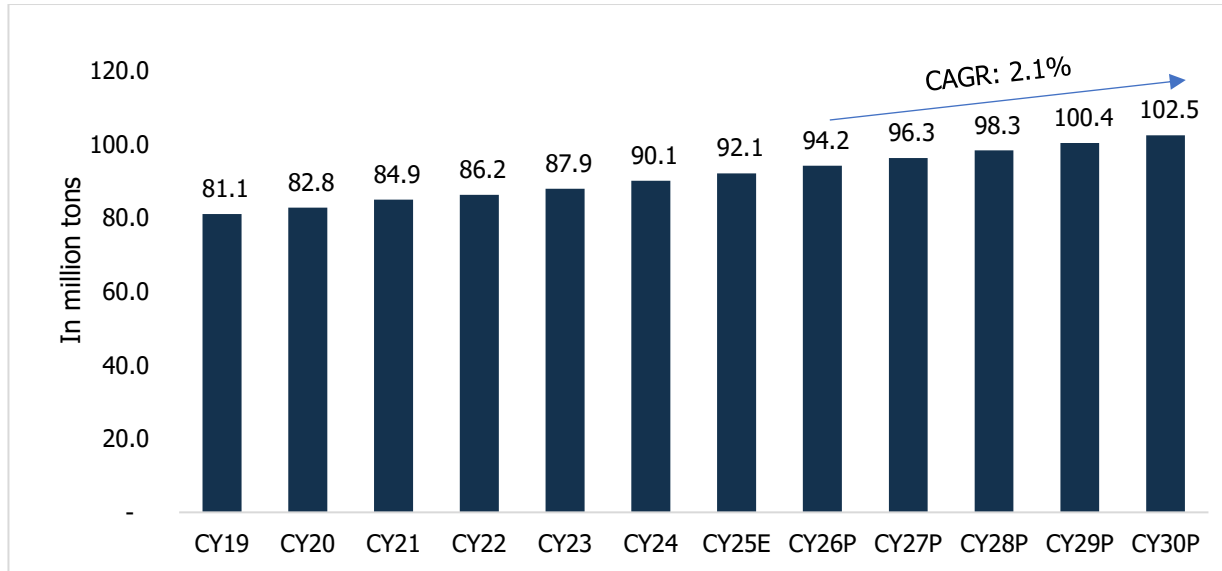
Production of other non-ferrous metals notably aluminium, zinc, nickel, lead, tin, titanium and specialty alloys expanded over recent decades as industrialisation, lightweighting and electrification progressed worldwide. Historically, expansion was driven by large-scale investments in mining and smelting capacity, access to high-quality bauxite and nickel sulfide deposits, and improvements in refining and casting technologies. Producers also benefited from economies of scale and more efficient energy use in newer plants. Recycling increasingly complements primary production: secondary supply from scrap collection and remelting has grown in importance, helping reduce energy intensity and raw-material dependence. On the supply side, however, production faces headwinds from declining ore grades in mature mines, tighter permitting and environmental scrutiny, and high capital requirements for new projects. Technological innovation for example in low-emissions smelting, electrolysis processes and material substitution in alloys will shape which metals see the most incremental supply. Going forward, production growth will be uneven across metals: those tied to decarbonisation pathways and lightweight engineering (like aluminium and nickel for batteries) are likely to attract investment, while metals exposed to substitution or limited by constrained ore bodies may see slower expansion. Overall, a mix of primary and secondary production, plus targeted technology upgrades, will determine the next phase of supply growth.

Chart 19: Production of Global Other Non-Ferrous Metal Industry, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 20: Production of Global Other Non-Ferrous Metal Industry, By Volume

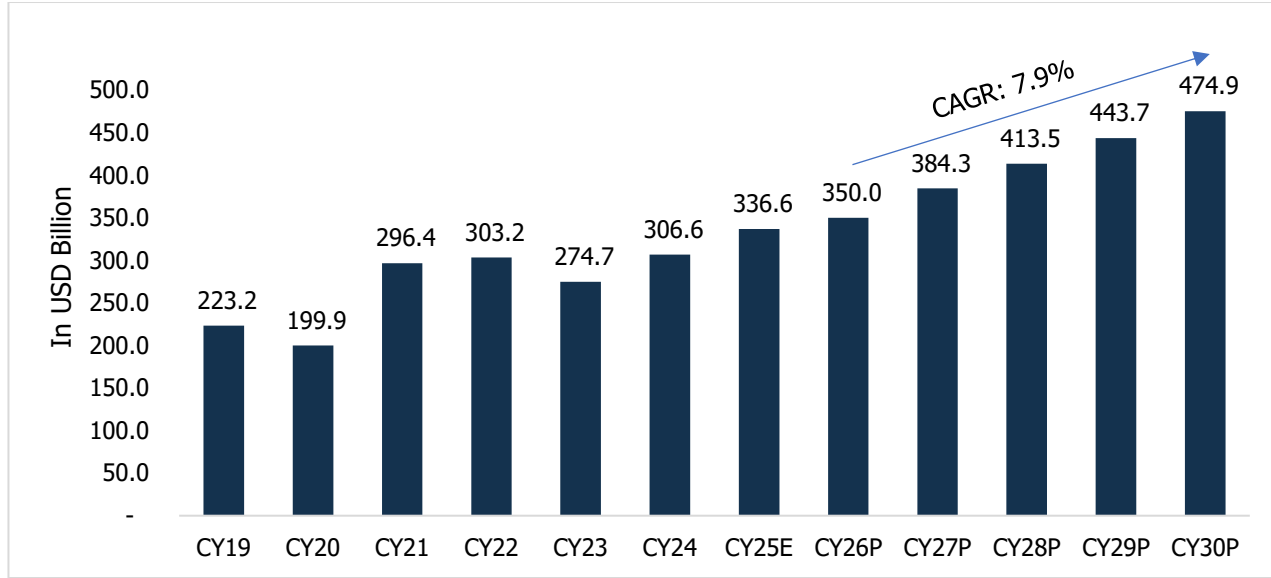


Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Consumption

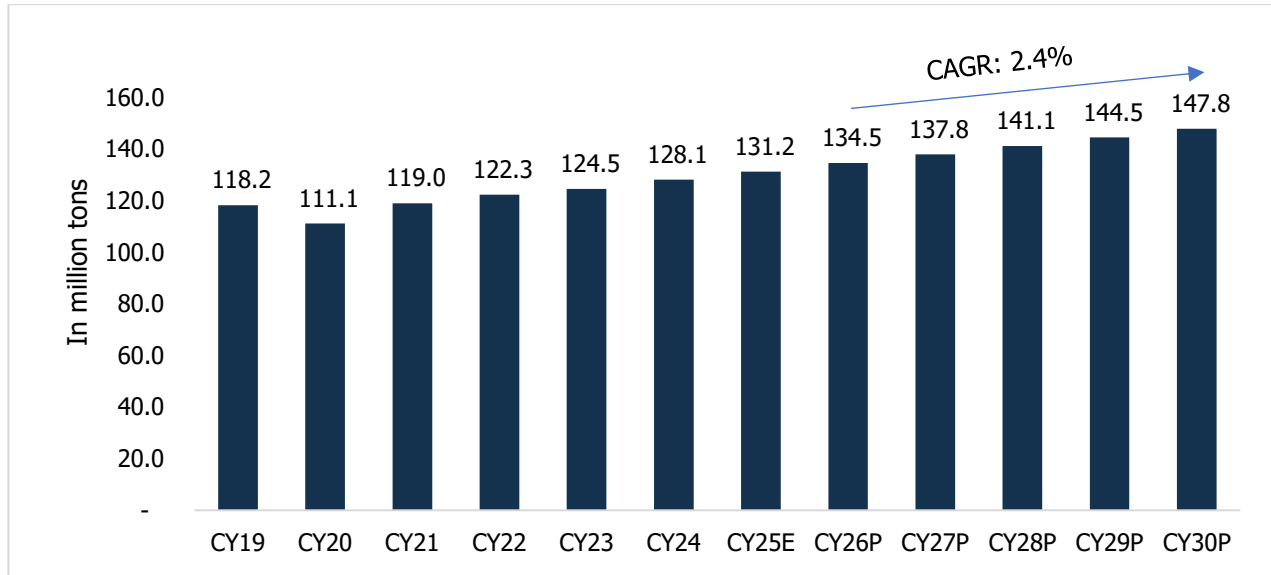
Consumption patterns for aluminium, zinc, nickel, tin, lead, titanium and related non-ferrous metals have been shaped by structural industrial trends: urbanisation and construction, automotive lightweighting, corrosion-resistant coatings, electronics miniaturisation and the energy transition. Aluminium’s lightweighting benefits made it a preferred material in transport and building façades; zinc underpins galvanising for infrastructure durability; nickel feeds stainless steels and battery chemistries; tin and lead support soldering and specialty applications. Demand growth in emerging markets drove much of the past rise, as manufacturing bases expanded and per-capita metal use increased with rising incomes. More recently, electrification and renewable energy deployment created new, metal-intensive end uses for instance, certain battery technologies and grid components increase demand for specific non-ferrous inputs. Looking ahead, consumption will be shaped by three forces: decarbonisation and electrification which lift demand for battery-relevant and conductive metals; circularity and recycling policies which may temper primary demand as secondary supplies grow; and substitution pressures where polymers, composites or alternative alloys replace traditional metals in some applications. Regional infrastructure cycles and manufacturing reshoring will also influence which markets absorb additional metal demand. In sum, consumption is likely to remain robust but differentiated by metal, end-use and the pace of technological and policy shifts.

Chart 21: Consumption of Global Other Non-Ferrous Metal Industry, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 22: Consumption of Global Other Non-Ferrous Metal Industry, By Volume

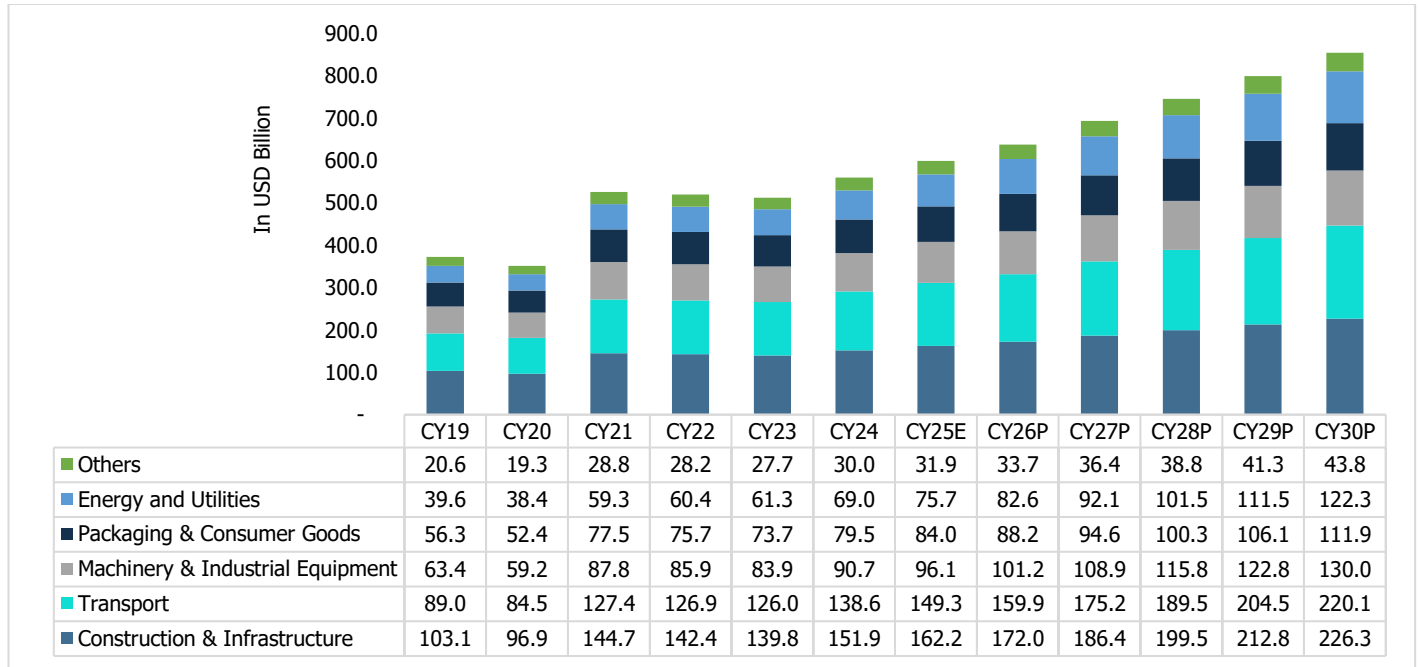


Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

2.3 Consumption of Non-Ferrous Metals, by End-User Industry

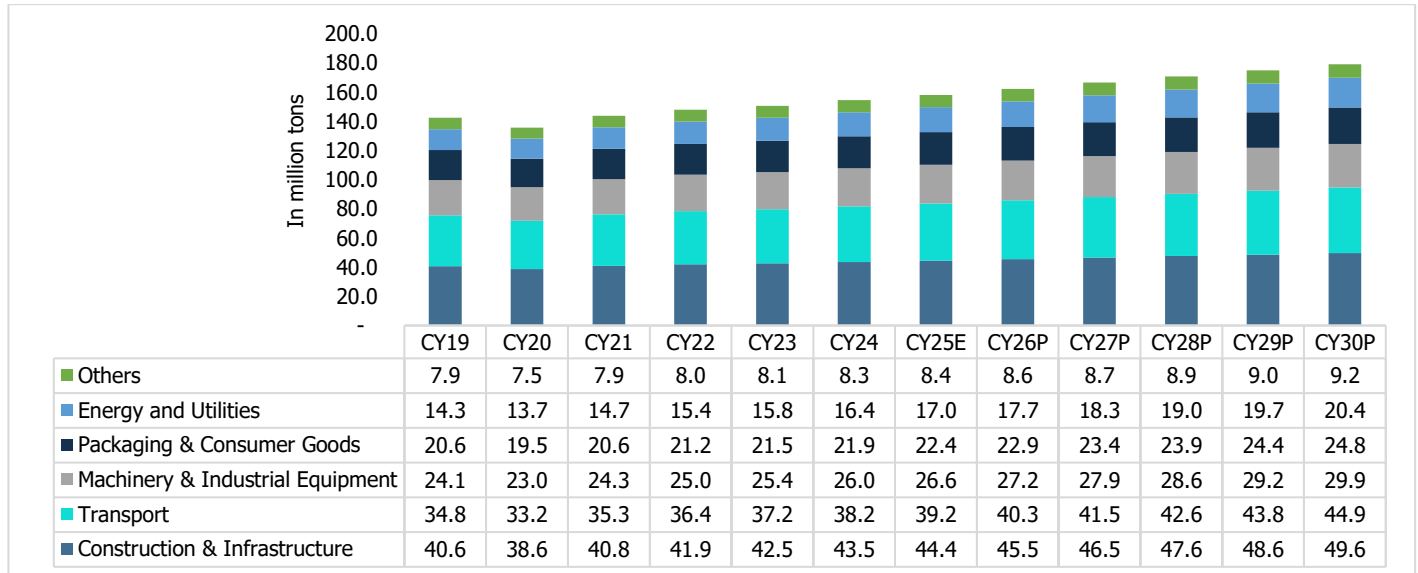
End-Use Industry	Historical Growth Drivers (CY19–CY24)	Future Growth Drivers (CY25–CY30P)
Construction & Infrastructure	Urbanization, infrastructure expansion in emerging economies, housing and real estate recovery, and industrial construction. Public spending on bridges, metro rail, airports, and smart cities also boosted non-ferrous use (especially aluminium and copper).	Accelerated infrastructure renewal, green buildings, and urban redevelopment. Government-led infrastructure stimulus and adoption of energy-efficient materials (lightweight aluminium, copper wiring) will drive continued demand.
Transport	Growth in automotive, aerospace, and rail production. Aluminium and copper demand rose from lightweighting and electrification trends in vehicles. Maritime trade recovery also supported consumption.	Transition to electric mobility (EVs), expansion of high-speed rail and metro systems, and aerospace fleet modernization. Increased copper intensity in EVs and charging infrastructure will remain a key driver.
Machinery & Industrial Equipment	Expansion of manufacturing, mining, and agricultural equipment sectors. Rising industrial automation and capital expenditure supported base metal demand.	Growth in industrial automation, robotics, and clean manufacturing. Demand from renewable energy equipment, heat exchangers, and electrical machinery will strengthen copper and aluminium use.
Packaging & Consumer Goods	Higher demand for aluminium cans, foils, and consumer durables. Urban consumption and sustainability-led shift from plastics boosted aluminium and other non-ferrous packaging use.	Sustainable and recyclable packaging expansion, greater penetration of premium consumer goods, and circular economy regulations encouraging aluminium reuse.
Energy & Utilities	Grid expansion, rural electrification, and renewable energy installations boosted copper and aluminium cable demand.	Accelerated renewable energy deployment (solar, wind), grid modernization, and energy storage expansion will sharply increase copper and aluminium intensity.
Others	General industrial uses, defense applications, and niche alloys supported stable base demand.	Growth in data centers, hydrogen economy, and advanced electronics will diversify non-ferrous metal applications, particularly in high-conductivity and corrosion-resistant alloys.

Chart 23: Consumption of Global Non-Ferrous Metal Industry, by Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 24: Consumption of Global Non-Ferrous Metal Industry, by Volume



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

2.4 Technological Advancements

Technology/ Innovation	Description	Impact on Copper
Bioleaching & Microbial Leaching	Use of specialized microbes to oxidize copper ores (esp. chalcopyrite) in situ.	Enables economic recovery from low-grade or difficult ores; can increase copper recovery ($\approx 85\%$) without high-heat smelting; lowers water/energy footprint (versus pyrometallurgy).
Electrochemical Leaching	An electrochemical process that catalyzes sulphide oxidation without biological agents.	Faster and cleaner Cu extraction (no smelter needed); extends mine life on low-grade ore; smaller land/water footprint and lower capex than flotation + smelting.
In-Situ & Novel Recovery (Ekion EK-ISR)	Electrokinetic In Situ Recovery (EK-ISR): a fully electric, in-situ leaching method that injects reagents and electric fields into orebodies to dissolve metals underground.	Recovers copper (and other metals) from ore without open-pit mining or tailings; eliminates solid waste and dust; operates on intermittent renewables; prototypes have demonstrated Cu recovery.
Autonomous & Digital Mining	Deployment of robotic/remote equipment and data-driven operations. For example, Anglo American's Quellaveco mine (Peru) operates 30 autonomous haul trucks and remote-controlled drills from a digital control centre. Platforms like Datarock use ML for rapid core logging.	Improves safety (removes operators from hazard), boosts productivity and uptime, and enables real-time optimisation. Data analytics (AI/ML) accelerates exploration and orebody modeling, reducing costs.
Polymetallic Circular Smelting (Kofiln)	A novel flash-smelting approach using closed-solid/gas reactors (no molten bath). Kofiln's process feeds poly-metal concentrates into a furnace where exothermic reactions melt copper, using green hydrogen reductant and capturing sulfides.	Nearly eliminates sulphur dioxide emissions and fuels the furnace; dramatically lowers energy use. Yields high-purity copper and byproducts (e.g. gold) from complex concentrates, supporting a near-zero-emissions copper refining cycle.
AI/Robotics in Recycling	Use of machine learning, vision and robotics to sort and recover metals from e-waste/scrap. Cutting-edge systems can automatically identify copper and other metals in shredded electronics, maximizing yield.	Improves purity and efficiency of scrap sorting, increasing the fraction of copper recovered from e-waste streams. Enhances circularity by feeding more secondary Cu into the market while cutting contamination and costs.
Autonomous Haulage & Drilling	Remote-operated and self-driving machinery in mining. E.g., Quellaveco runs 30 driverless trucks and six remote drilling rigs. Integrated Operations Centers and digital twins coordinate fleets and processes.	Dramatically boosts productivity and safety by operating machines around-the-clock and reducing human error/exposure. Provides the data foundation for continuous optimization and predictive maintenance in copper mines.

Technology/ Innovation	Description	Impact on Copper
High-Conductivity Cu-Ti Alloy	A new copper-titanium alloy developed for electronics. For instance, JX Metals created a Cu-Ti alloy with 1.5–2× higher electrical conductivity than conventional Cu-Ti alloys (while matching their strength).	Improves performance of high-current connectors and heat-dissipating springs in devices (e.g. smartphones, EVs). Higher conductivity alloys can carry more current with less loss, aiding compact, high-speed electronics and EV powertrains.

2.5 Impact of Tariffs on the Global Non-Ferrous Metals Industry

The global non-ferrous metals industry is currently navigating a period of heightened complexity driven by shifting trade dynamics, evolving tariff structures, and geopolitical realignments. Recent tariff actions across major economies have disrupted traditional supply chains, altered trade flows, and reshaped pricing mechanisms. While the intent behind such measures often centers on protecting domestic industries, encouraging local manufacturing, or addressing perceived trade imbalances, the resulting uncertainty has led to price volatility and uneven market access. For producers, tariffs on raw materials and semi-finished goods have increased input costs and compressed profit margins, while consumers are facing higher prices for end-use products spanning construction, infrastructure, energy, and technology sectors.

The imposition and adjustment of tariffs have also accelerated structural shifts in sourcing and production strategies. Manufacturers are increasingly diversifying supply chains, seeking alternative raw material sources, and investing in recycling or secondary production to reduce exposure to trade barriers. Regions with lower tariff dependencies and strong domestic resource bases have become more attractive for investment, while export-driven economies are facing greater competition and margin pressure. Furthermore, tariff-induced price distortions are prompting substitution among materials and driving innovation in alloy development, efficiency enhancement, and circular economy initiatives.

From a broader perspective, tariffs have underscored the interdependence of global supply networks. The sector’s reliance on cross-border trade for raw materials, intermediate goods, and technology integration makes it particularly sensitive to policy shifts. Consequently, sustained tariff uncertainty can deter long-term capital investment and delay capacity expansion projects. However, this environment has also opened opportunities for strategic partnerships, regional trade agreements, and the localization of value chains to enhance resilience. Emerging economies, supported by infrastructure growth, renewable energy expansion, and industrial modernization, continue to offer demand stability even amid tariff disruptions.

Looking ahead, the global industry’s ability to adapt will depend on balancing trade protection measures with efforts to ensure resource security and sustainability. Tariff policies that incentivize recycling, green manufacturing, and responsible sourcing could ultimately strengthen the long-term competitiveness of the sector. Yet, persistent policy unpredictability and geopolitical tension remain major challenges. As nations recalibrate industrial policies and trade strategies, the non-ferrous metals ecosystem is entering a more fragmented but potentially more self-reliant phase one where innovation, supply diversification, and environmental stewardship will define the future growth trajectory.

3 Indian Non-Ferrous Metals Industry

3.1 Overview of the Indian Non-Ferrous Metals Industry

The Indian non-ferrous metals industry plays a vital role in supporting the nation's industrial, infrastructure, and manufacturing growth. It encompasses key metals such as aluminium, copper, zinc, lead, and nickel, which are essential for sectors including power, construction, transportation, renewables, and electronics. The industry has evolved from being import-dependent to achieving significant self-sufficiency in several segments, supported by integrated domestic producers, technological advancements, and rising downstream capacity. Notably, Gujarat has emerged as a key hub within the sector and is the highest-producing state for copper cathodes and copper wires, as per the latest government data available.

India's expanding infrastructure pipeline, rapid urbanization, and the government's emphasis on domestic manufacturing under initiatives like Make in India and Atmanirbhar Bharat have created a strong foundation for sustained demand. The growing focus on electric mobility, renewable energy, and grid modernization is further enhancing consumption prospects. Policies promoting recycling and the circular economy are gradually improving raw material efficiency and reducing dependence on imported scrap.

However, the sector continues to face challenges such as fluctuating global commodity prices, energy costs, and regulatory complexities. Limited availability of high-grade domestic ore in some segments and environmental concerns related to mining and smelting also pose hurdles. Despite these constraints, India's position as one of the world's fastest-growing metal consumers provides a strong long-term outlook. With sustained policy support, technological innovation, and investments in green production, the Indian non-ferrous metals industry is poised to strengthen its global competitiveness and contribute meaningfully to sustainable industrial development.

India's positioning in Global Copper Industry

India holds a strategically evolving position in the global copper industry, shaped by its growing domestic demand, expanding manufacturing base, and increasing role in regional trade. The country has developed strong refining and downstream capacities, supported by leading integrated producers with global-scale operations. Copper is critical for India's industrial ecosystem particularly in power transmission, renewable energy, automotive manufacturing, and electronics sectors that are expanding rapidly under national infrastructure and electrification initiatives.

While India possesses moderate domestic reserves, much of its refined output relies on imported concentrates, linking the sector closely to global trade flows and price cycles. In recent years, policy efforts have emphasized self-reliance, improved recycling infrastructure, and sustainable sourcing to mitigate external dependencies. India has also been positioning itself as a key hub for copper-based value-added products such as rods, wires, and tubes, catering to both domestic and export markets.

Globally, India's demand trajectory aligns with the broader shift toward energy transition and digitalization. Rising investment in renewable energy, electric vehicles, and grid modernization is driving consistent consumption growth. However, volatility in global prices, trade barriers, and raw material availability remain challenges. Nonetheless, India's favorable policy environment, strong downstream capabilities, and growing participation in global supply chains are strengthening its presence in the international copper market, positioning it as an emerging and increasingly influential player in the years ahead.

3.2 Production and Consumption of Non-Ferrous Metals

Production

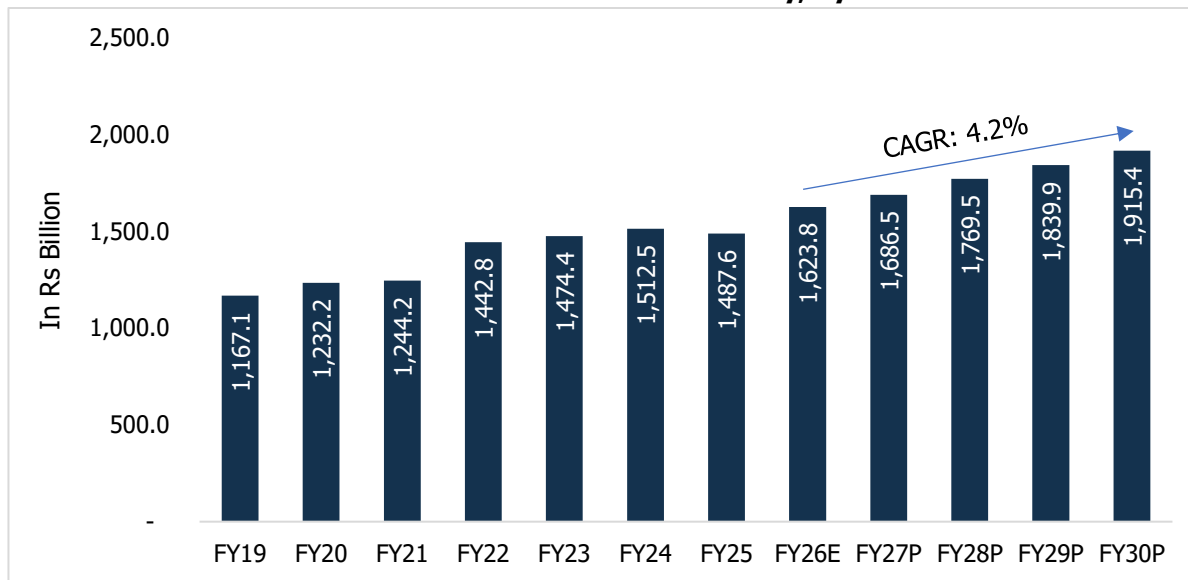
Global production of non-ferrous metals has witnessed steady growth over the past decade, driven by industrial expansion, urbanization, and the diversification of end-use industries. Continuous demand for lightweight, corrosion-

resistant, and high-conductivity materials has encouraged both capacity additions and technological modernization across major producing regions. Countries such as China, India, Australia, Russia, and those in South America have emerged as key centers for primary and refined production. The past growth in output has largely been supported by large-scale infrastructure development, industrial automation, and the evolution of renewable energy and electric mobility ecosystems that rely heavily on non-ferrous metals.

In recent years, the integration of digitization, process automation, and improved recycling technologies has enhanced operational efficiency and reduced energy intensity in production. The shift toward cleaner and sustainable manufacturing practices is reshaping the competitive landscape, with many producers investing in low-carbon smelting, renewable power sourcing, and closed-loop recycling. Going forward, production growth is expected to be influenced by the global transition to green energy systems, electric transportation, and the expansion of data and communication networks. However, challenges such as resource depletion, stricter environmental regulations, and trade disruptions could moderate output growth in certain regions. Long-term sustainability and secure access to raw materials will remain central to the future expansion of non-ferrous metal production.

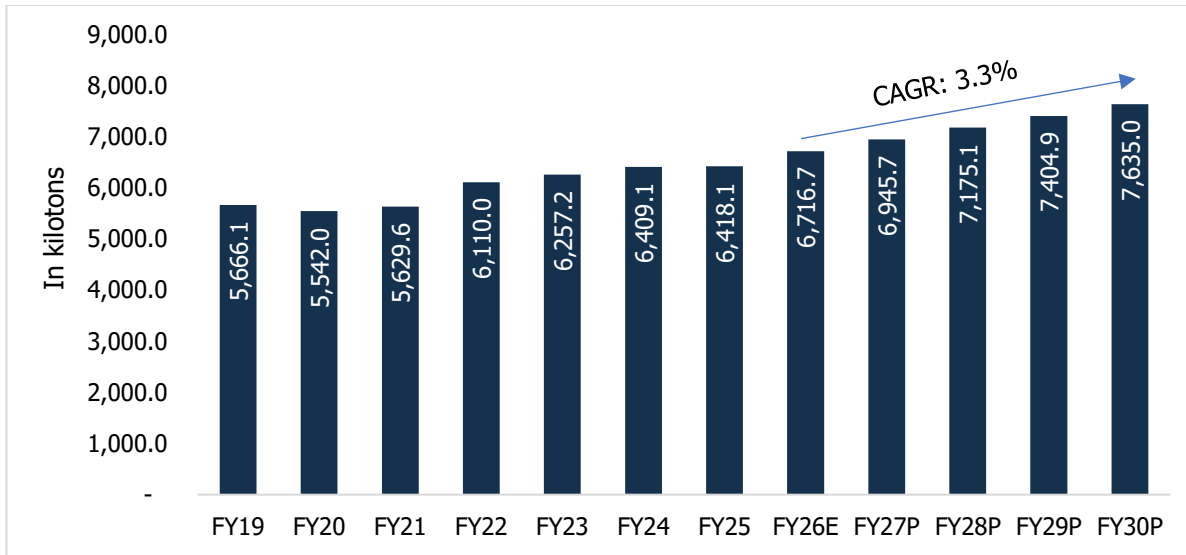
The Indian non-ferrous metals industry is expected to record steady and resilient growth over the coming years, supported by strong demand fundamentals across infrastructure, renewable energy, electric mobility, power transmission, and construction. Ongoing government initiatives focused on infrastructure expansion, domestic manufacturing, and energy transition are driving sustained consumption of key metals such as aluminium, copper, and zinc. In addition, rising urbanization, increased electrification, and the push for cleaner energy solutions are further strengthening long-term demand prospects.

Chart 25: Production of Indian Non-Ferrous Metal Industry, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 26: Production of Indian Non-Ferrous Metal Industry, By Volume



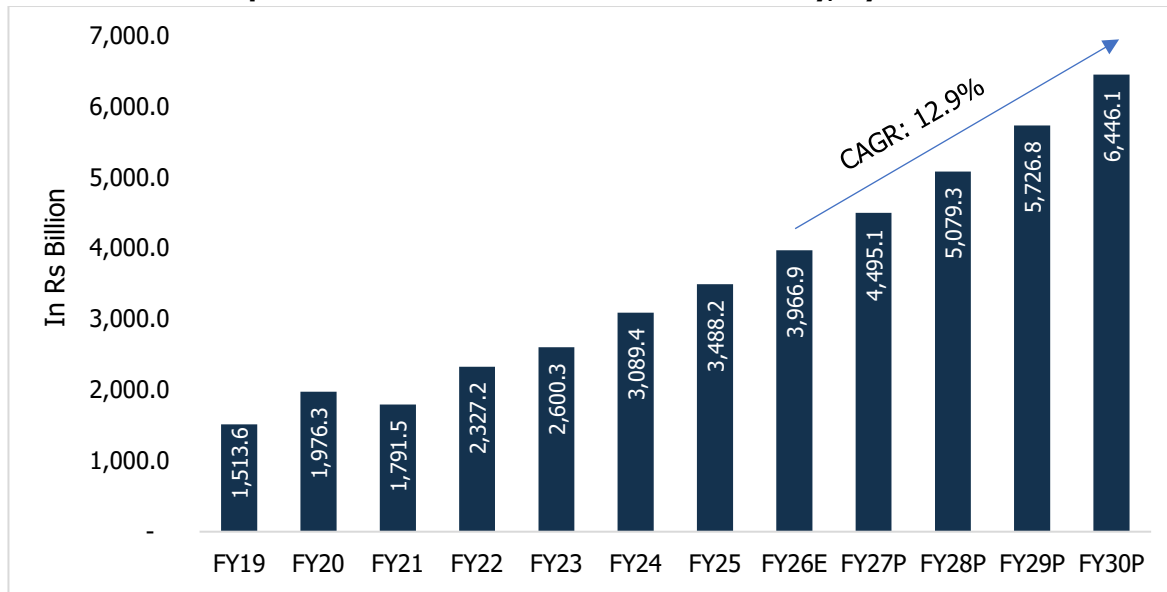
Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Consumption

Consumption of non-ferrous metals has expanded significantly, reflecting their growing role in modern economies. Historically, demand growth has been anchored in infrastructure, construction, power generation, and industrial machinery. Over time, this base has diversified with the emergence of renewable energy technologies, electric vehicles, digital infrastructure, and advanced consumer electronics, all of which rely on non-ferrous metals for conductivity, durability, and design flexibility. The rapid industrialization and urbanization of emerging economies have been key demand drivers, supported by public investments in housing, transport, and utilities.

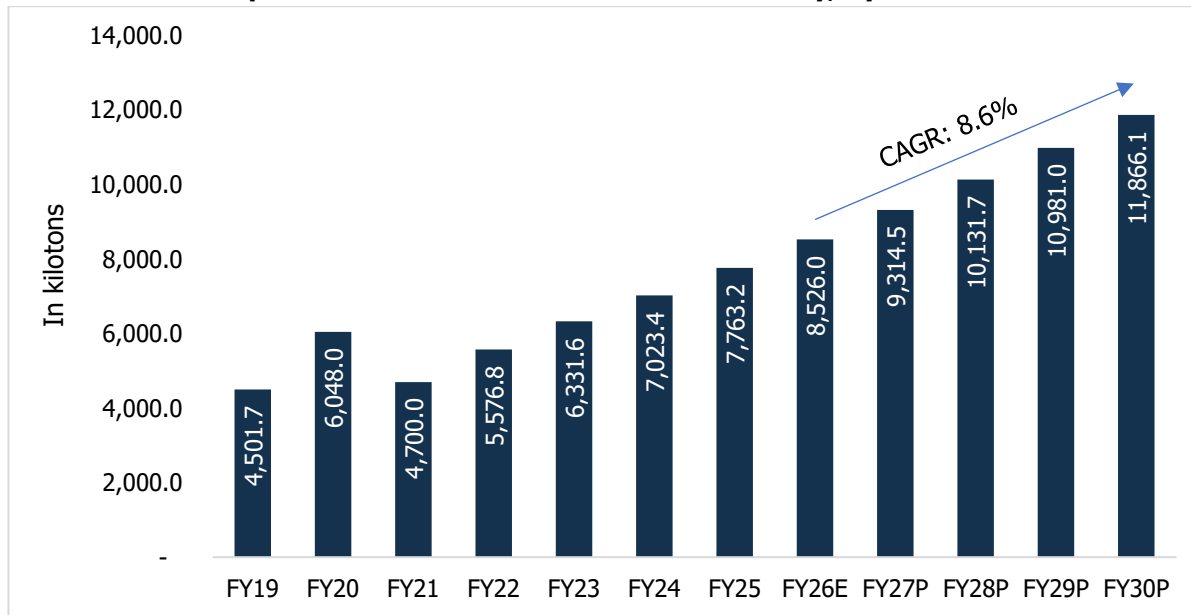
Looking ahead, the global energy transition is expected to be the most influential factor shaping consumption. The expansion of solar and wind power, widespread electrification of transport, and modernization of power grids will significantly increase the intensity of metal use. Additionally, technological trends such as automation, robotics, and smart manufacturing are expected to sustain structural demand. Recycling and circular economy practices will complement primary consumption, ensuring material availability and sustainability. However, high price volatility, evolving trade policies, and supply bottlenecks may introduce near-term constraints. Overall, the global non-ferrous metals consumption outlook remains robust, supported by long-term shifts toward cleaner technologies, infrastructure resilience, and the continued modernization of industrial systems worldwide.

Chart 27: Consumption of Indian Non-Ferrous Metal Industry, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 28: Consumption of Indian Non-Ferrous Metal Industry, By Volume



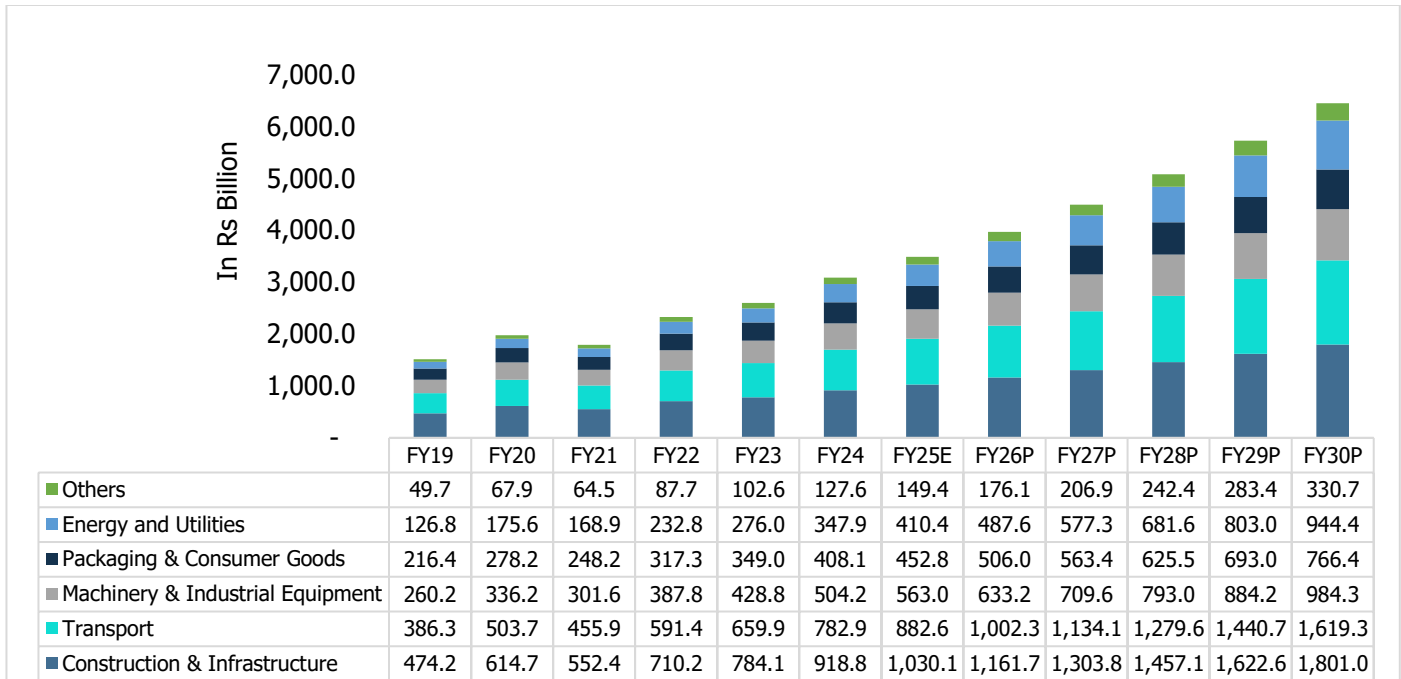
Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Analysis of production versus consumption in India’s non-ferrous metals industry shows a clear and widening shortfall: domestic output is expanding only modestly while demand is accelerating, causing consumption to overtake production in recent years. That structural deficit makes the sector persistently reliant on imports to bridge the gap, which in turn raises working capital needs for procurement, logistics and inventory until materials are processed or sold. With strong, ongoing demand from rapidly growing end-use sectors, notably electric vehicles, renewable energy, power infrastructure and electronics, upward pressure on domestic consumption is likely to continue, keeping import dependence and financing requirements high for the foreseeable future.

3.3 Consumption of Non-Ferrous Metals, by End-User Industry

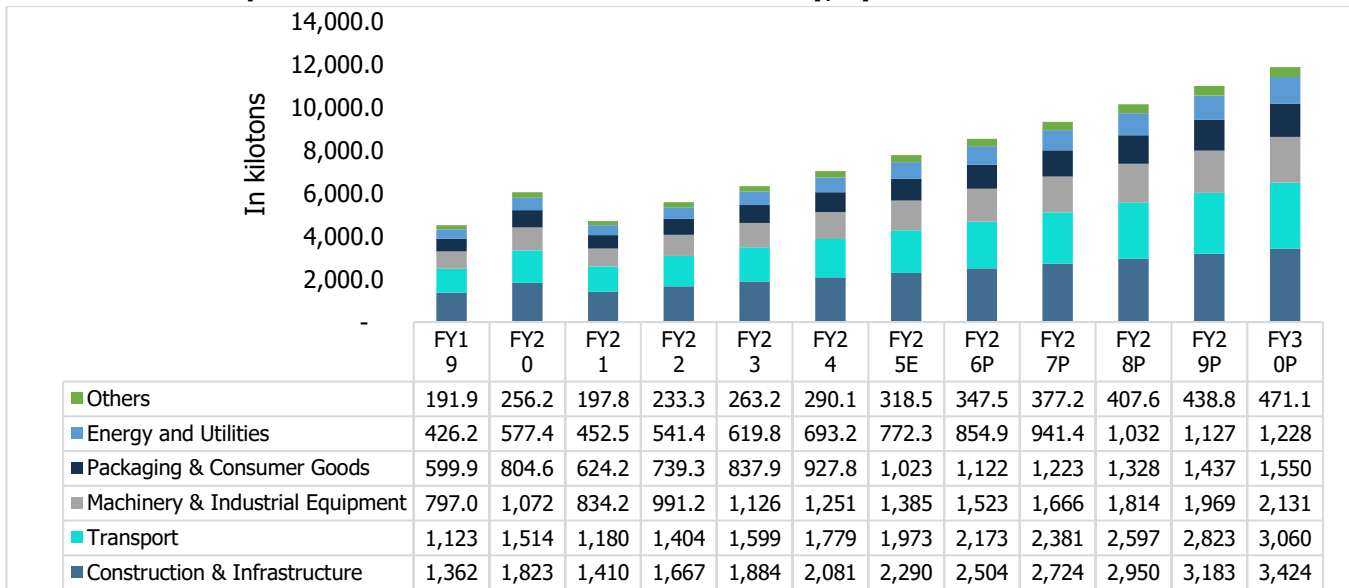
End-Use Industry	Historical Drivers of Consumption Growth	Future Drivers of Consumption Growth
Construction & Infrastructure	Large-scale urbanisation, real estate expansion, and public infrastructure projects such as roads, bridges, metro systems, and affordable housing created sustained demand. Increased use of durable and corrosion-resistant materials in wiring, plumbing, and architectural applications also contributed.	Expansion of smart cities, green buildings, renewable-linked grid infrastructure, and modern transport networks. Adoption of energy-efficient building standards and electrification of public infrastructure will raise intensity of metal usage.
Transport (Automotive, Rail, Marine, Aviation)	Growth in internal combustion vehicle manufacturing, railway electrification, and commercial vehicle fleet expansion supported consumption. Lightweighting trends in automotive and bus body fabrication also played a role.	EV penetration, battery pack manufacturing, charging infrastructure rollout, high-speed rail and metro projects, and modernisation of ports and aviation facilities. Increasing preference for lightweight, high-conductivity components across mobility platforms.
Machinery & Industrial Equipment	Expansion of manufacturing activity in engineering goods, power equipment, and capital goods. Rising mechanisation in agriculture and industrial automation acted as key drivers.	Growth in automation, robotics, process industries, and renewable equipment manufacturing. Government push for Make in India, semiconductor assembly, and domestic capital goods production will boost demand.
Packaging & Consumer Goods	Strong demand from FMCG, beverage packaging, household durables, and cookware segments. Growth in organised retail and rising disposable incomes supported volume expansion.	Rise of e-commerce packaging, premiumisation in consumer goods, lightweight packaging solutions, and higher penetration of small appliances. Sustainability-driven shift toward recyclable packaging materials.
Energy & Utilities	Grid expansion, electrification of rural India, and investments in transmission and distribution networks historically drove usage. Growth in thermal and hydro power projects also supported demand.	Renewable energy expansion (solar, wind), rooftop solar adoption, battery storage systems, and strengthening of national grid networks. Replacement of aging infrastructure with more efficient systems.
Others (Electronics, Telecom, Defence, etc.)	Increased mobile phone penetration, electronics manufacturing, defence procurement, and telecom network expansion contributed steadily.	5G deployment, data center expansion, semiconductor assembly, defence indigenisation, and growth in digital infrastructure. Rising demand for high-purity metal applications in EV electronics and automation systems.

Chart 29: Consumption of Indian Non-Ferrous Metal Industry, by Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 30: Consumption of Indian Non-Ferrous Metal Industry, by Volume



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

3.4 Trade Data of Non-Ferrous Metal

3.4.1 Copper Anodes for Electrolytic Refining

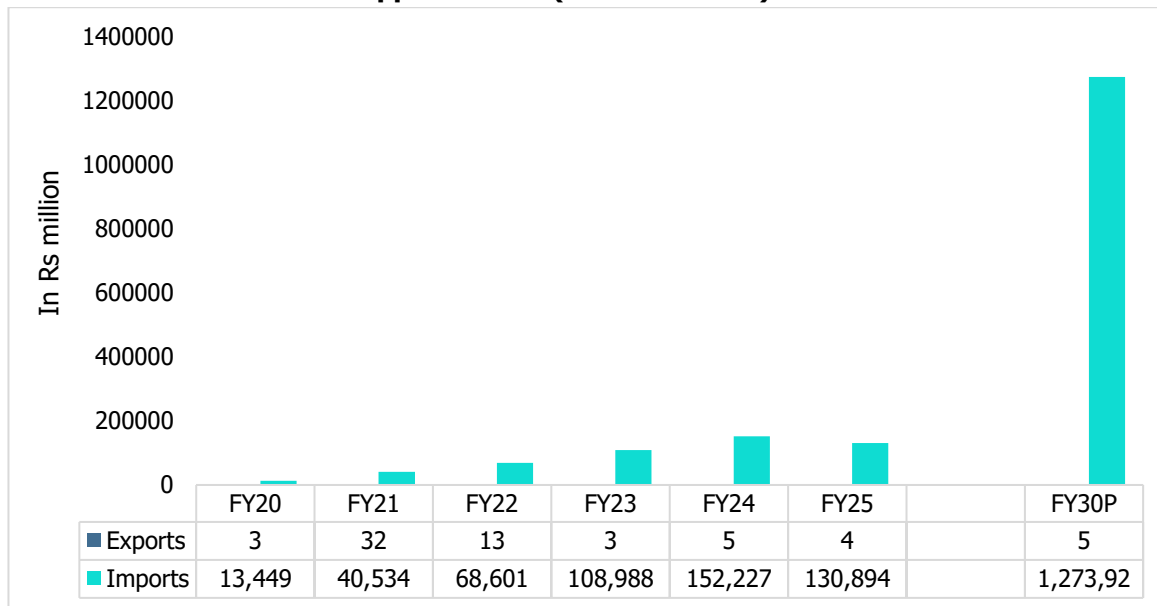
The trade pattern for this product over FY20–FY25 reflects a structurally import-dependent market with consistently negligible exports and strong growth in import volumes and values, indicating rising domestic demand being met primarily through global sourcing. Imports have increased significantly from Rs 13,449 million in FY20 to Rs 152,227 million in FY24, before moderating slightly to Rs 130,894 million in FY25. This translates into a robust growth trajectory

over the period, supported by a parallel rise in import volumes from 31,221 tonnes in FY20 to a peak of 204,222 tonnes in FY24, followed by a correction to 166,091 tonnes in FY25. The temporary decline in FY25 suggests normalization after a peak demand phase or possible inventory adjustments rather than a structural slowdown. Using the overall growth trend, imports are projected to rise sharply by FY30, reaching approximately Rs 1,273,920 million and 883,582 tonnes, highlighting a continued and deepening reliance on imports.

In contrast, exports have remained minimal and largely insignificant throughout the period, both in value and volume terms. Export values fluctuated within a narrow range, from Rs 3 million in FY20 to Rs 5 million in FY24 and FY30 projections, while volumes also remained low, peaking modestly at 15 tonnes in FY22 before declining again. This indicates the absence of a competitive export base and reinforces India’s role as a net importer in this segment. The lack of any sustained export growth or notable spikes further suggests that domestic production is either limited or primarily geared toward internal consumption rather than international markets.

Overall, the data underscores a clear structural imbalance, with strong and growing import dependence driven by domestic demand, while exports remain incidental and non-material. The projected sharp increase by FY30 further emphasizes the need for capacity expansion or import substitution strategies if dependency is to be reduced.

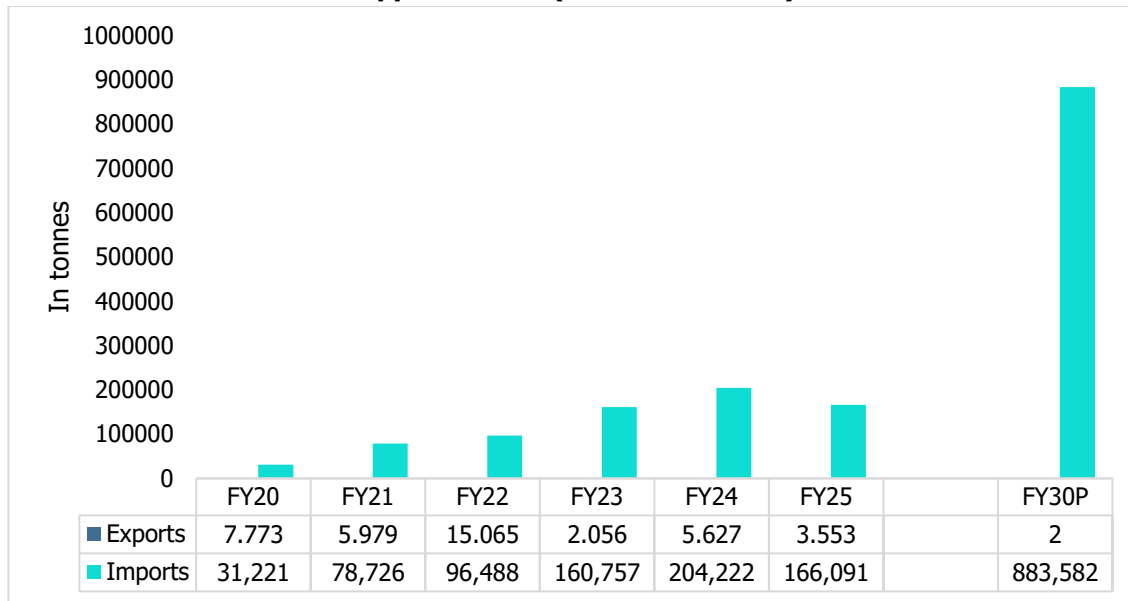
Chart 31: Trade Data for Copper Anodes (In value terms)



Source: Ministry of Commerce and Industry

Note: P-Projected, HSN Code: 74020090

Chart 32: Trade Data for Copper Anodes (In volume terms)

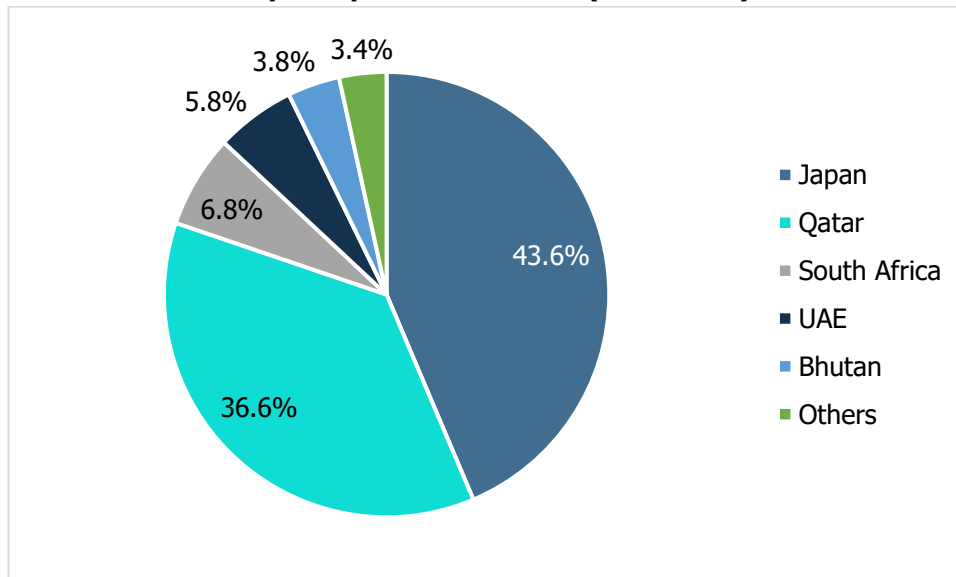


Source: Ministry of Commerce and Industry

Note: P-Projected, HSN Code: 74020090

Top 5 Export destinations

Chart 33: India's top 5 Export destinations (As of FY25)

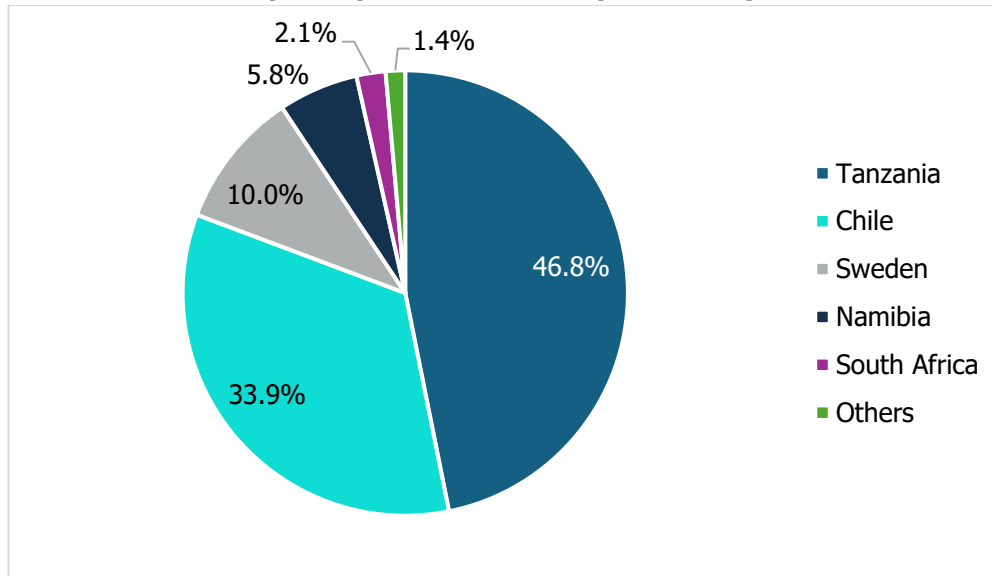


Source: Ministry of Commerce and Industry

Note: HSN Code: 74020090

Top 5 Import destinations

Chart 34: India's top 5 Import destinations (As of FY25)



Source: Ministry of Commerce and Industry
Note: HSN Code: 74020090

Major Trading Partners

The export market is relatively concentrated, with Japan emerging as the largest trading partner, accounting for 43.6% of total exports in FY25, followed by Qatar at 36.6%. Together, these two countries contribute over 80% of total exports, indicating a high dependence on a limited number of destinations. Other export markets such as South Africa (6.8%), UAE (5.8%), and Bhutan (3.8%) hold comparatively smaller shares, while the rest of the world contributes only 3.4%, reflecting limited diversification in export destinations.

On the import side, sourcing is similarly concentrated, with Tanzania being the dominant supplier at 46.8%, followed by Chile at 33.9%. These two countries together account for over 80% of total imports, highlighting significant reliance on them for supply. Other contributors include Sweden (10.0%), Namibia (5.8%), and South Africa (2.1%), while the share of other countries remains minimal at 1.4%. Overall, both exports and imports exhibit a concentrated trade structure with a few key partners dominating the trade flows.

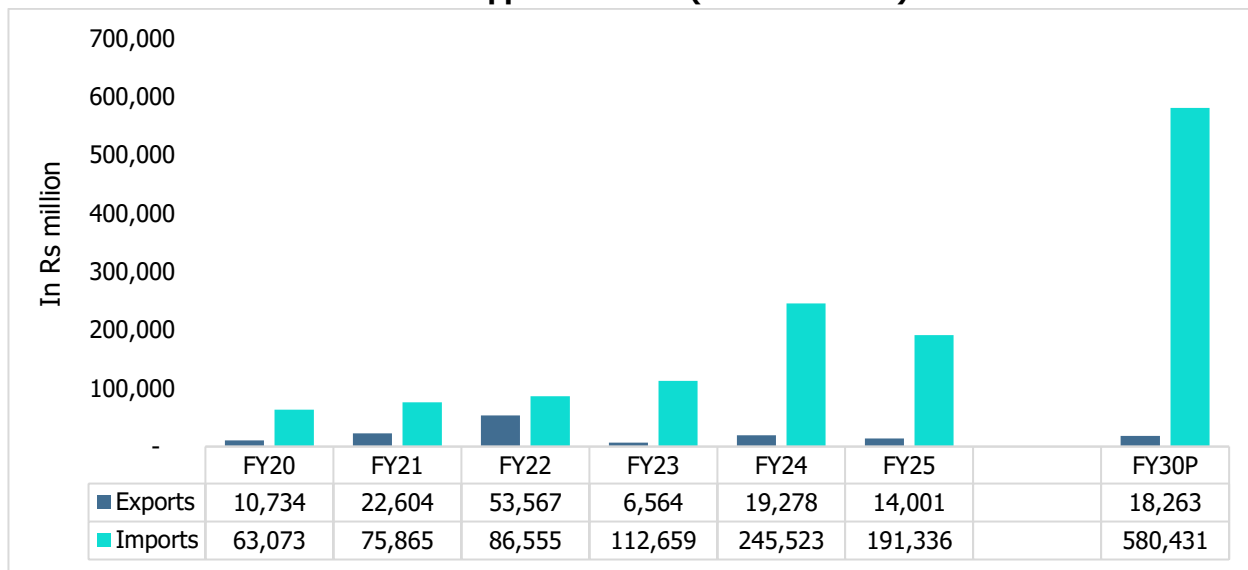
3.4.2 Cathodes and Sections of Cathodes of Refined Copper

The trade dynamics for FY20–FY25 highlight a structurally import-driven market, with India remaining a consistent net importer amid fluctuating export performance. Imports have shown a strong upward trajectory, rising from Rs 63,073 million in FY20 to a peak of Rs 245,523 million in FY24, before moderating to Rs 191,336 million in FY25. This growth is mirrored in volume terms, with imports increasing from 142,323 tonnes in FY20 to 363,052 tonnes in FY24, followed by a decline to 239,163 tonnes in FY25. The sharp rise until FY24 indicates robust domestic demand from downstream sectors such as electricals, infrastructure, and manufacturing, while the subsequent correction in FY25 suggests normalization in demand, price softening, or inventory adjustments.

In contrast, exports were highly volatile and relatively insignificant compared to imports. Export value increased from Rs 10,734 million in FY20 to a peak of Rs 53,567 million in FY22, accompanied by a rise in volumes from 25,781 tonnes to 75,451 tonnes. However, this momentum was not sustained, with exports sharply declining to Rs 6,564 million in FY23 and partially recovering to Rs 19,278 million in FY24 before easing again to Rs 14,001 million in FY25. A similar trend is observed in volumes, reflecting the absence of a stable export base. The spike in FY22 appears to be an outlier, possibly driven by temporary global supply disruptions, arbitrage opportunities, or re-exports rather than a structural improvement in India’s export competitiveness.

Overall, the data underscores India’s dependence on imports to meet domestic copper demand, with exports playing a limited and inconsistent role. The divergence between steady import growth and volatile export performance reinforces India’s position as a consumption-driven market for refined copper cathodes, with trade patterns closely linked to domestic industrial activity and global copper price cycles.

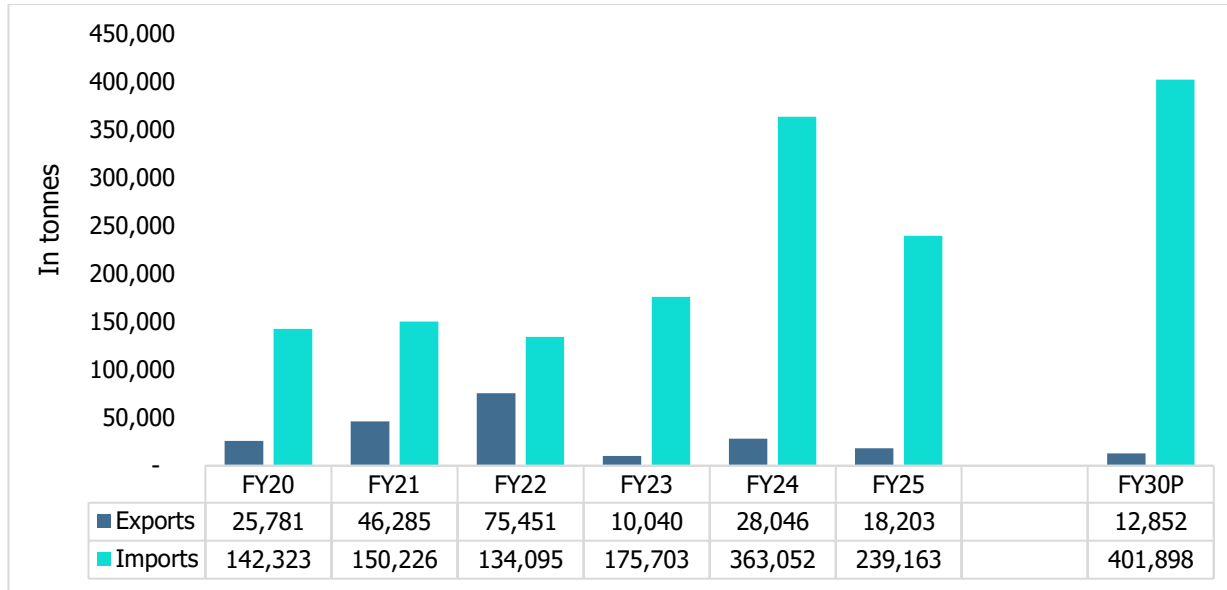
Chart 35: Trade Data for Refined Copper Cathodes (In value terms)



Source: Ministry of Commerce and Industry

Note: P-Projected, HSN Code: 74031100

Chart 36: Trade Data for Refined Copper Cathodes (In volume terms)

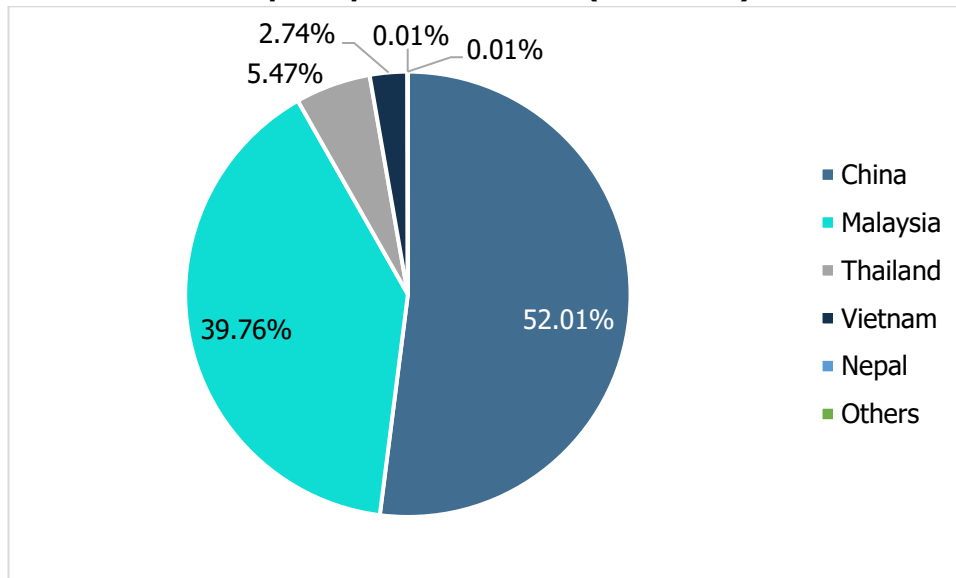


Source: Ministry of Commerce and Industry

Note: P-Projected, HSN Code: 74031100

Top 5 Export destinations

Chart 37: India's top 5 Export destinations (As of FY25)

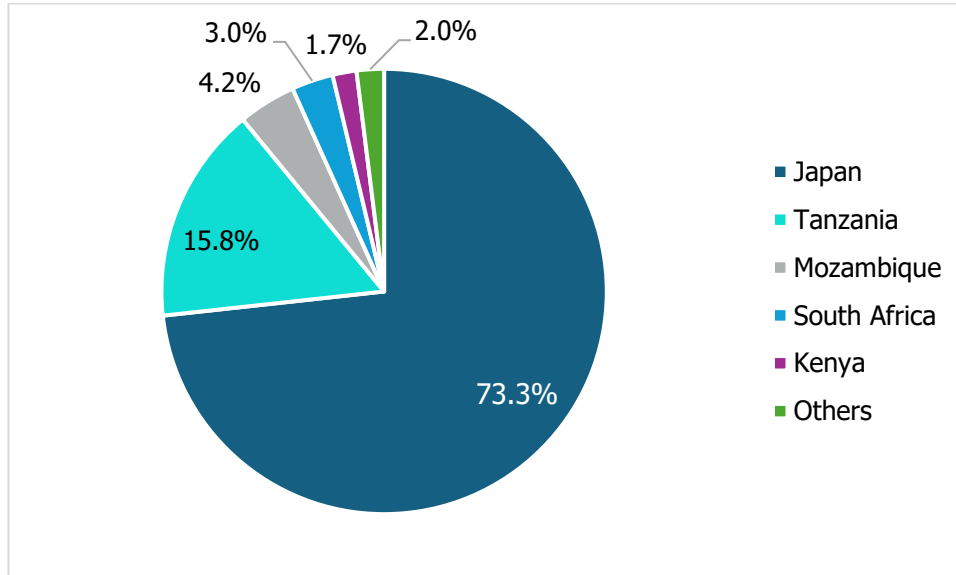


Source: Ministry of Commerce and Industry

Note: HSN Code: 74031100

Top 5 Import destinations

Chart 38: India's top 5 Import destinations (As of FY25)



Source: Ministry of Commerce and Industry
Note: HSN Code: 74031100

Major Trading Partners

The export landscape is highly concentrated, with China dominating as the largest destination, accounting for 52.0% of total exports in FY25, followed by Malaysia at 39.8%. Together, these two countries contribute over 90% of exports, indicating a strong reliance on a narrow set of markets. Other destinations such as Thailand (5.5%) and Vietnam (2.7%) hold relatively small shares, while Nepal and other countries contribute negligibly, reflecting limited diversification in export outreach.

On the import side, Japan emerges as the overwhelmingly dominant supplier, accounting for 73.3% of total imports, highlighting a significant dependence on a single country. Tanzania is the second-largest source at 15.8%, followed by Mozambique (4.2%), South Africa (3.0%), and Kenya (1.7%). The remaining share of 2.0% is distributed among other countries. Overall, imports are even more concentrated than exports, with a heavy reliance on Japan and select African nations, underscoring potential supply-side concentration risks.

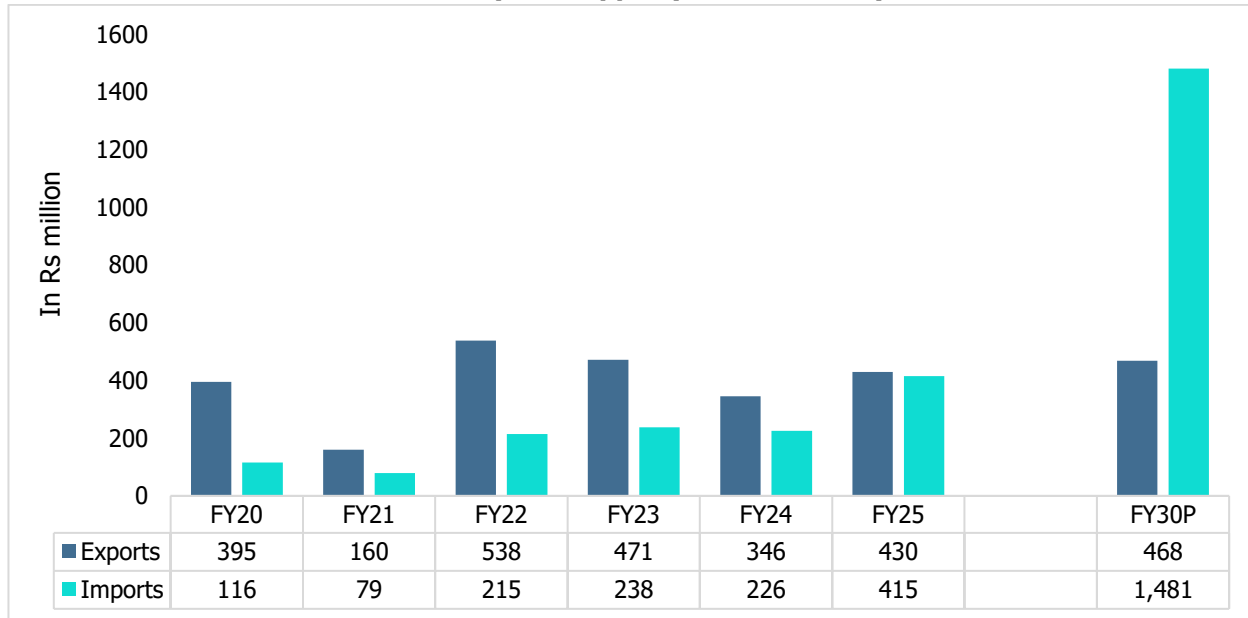
3.4.3 Master Alloys of Copper

The trade pattern over FY20–FY25 reflects a relatively balanced but evolving trade structure, with India transitioning from a net exporter position toward a more import-reliant scenario in recent years. Export performance has been volatile, with values declining sharply from Rs 395 million in FY20 to Rs 160 million in FY21, before recovering significantly to Rs 538 million in FY22. However, this recovery was not sustained, as exports moderated to Rs 471 million in FY23, declined further to Rs 346 million in FY24, and then saw a mild rebound to Rs 430 million in FY25. A similar trend is observed in volume terms, with exports falling from 810 tonnes in FY20 to 326 tonnes in FY21, rising to 753 tonnes in FY22, and subsequently declining to 463 tonnes in FY24 before improving to 549 tonnes in FY25. This fluctuation suggests inconsistent export demand and the absence of a stable international market presence.

On the import side, a clear upward trend is visible, particularly in recent years. Import values increased from Rs 116 million in FY20 to Rs 238 million in FY23, followed by a slight dip to Rs 226 million in FY24, and then a sharp rise to Rs 415 million in FY25. Volume trends also support this pattern, with imports growing from 140 tonnes in FY20 to 311 tonnes in FY25, despite some interim fluctuations. The sharp increase in FY25 imports, both in value and volume, indicates rising domestic demand for copper master alloys, potentially driven by growth in downstream sectors such as automotive, electrical, and industrial manufacturing.

Overall, the data suggests that while exports remain present, their volatility contrasts with the more consistent growth in imports, pointing toward increasing domestic consumption and partial reliance on global sourcing. The narrowing gap between exports and imports in earlier years and the reversal in FY25 highlights a gradual shift in trade dynamics, with imports gaining prominence in meeting domestic requirements.

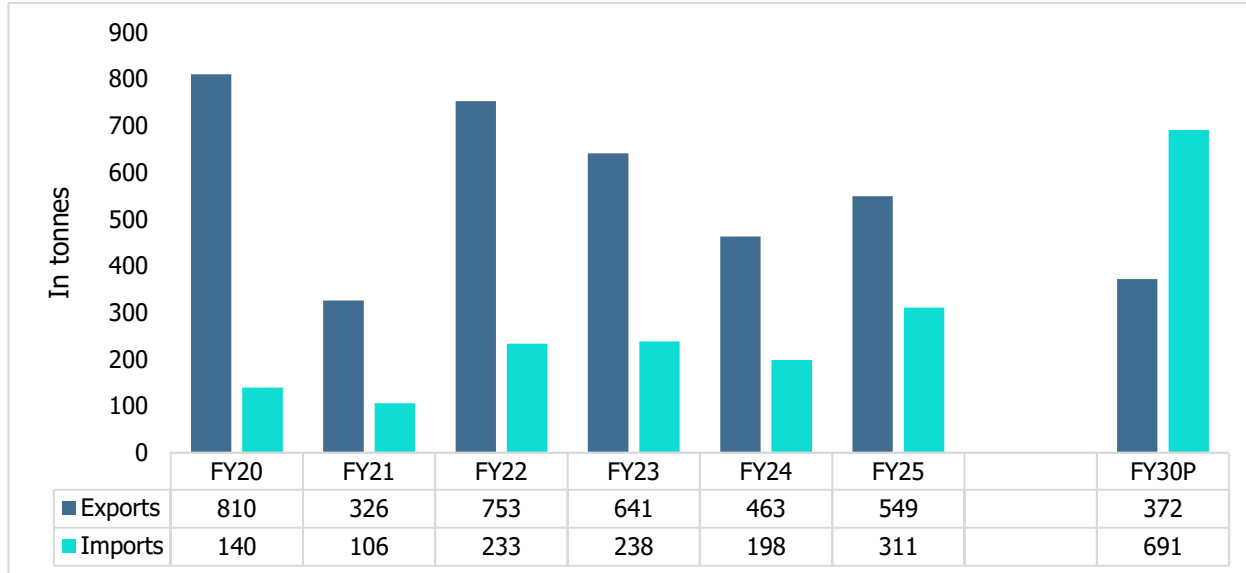
Chart 39: Trade Data for Master Alloys of Copper (In value terms)



Source: Ministry of Commerce and Industry

Note: P-Projected, HSN Code: 74050000

Chart 40: Trade Data for Master Alloys of Copper (In volume terms)

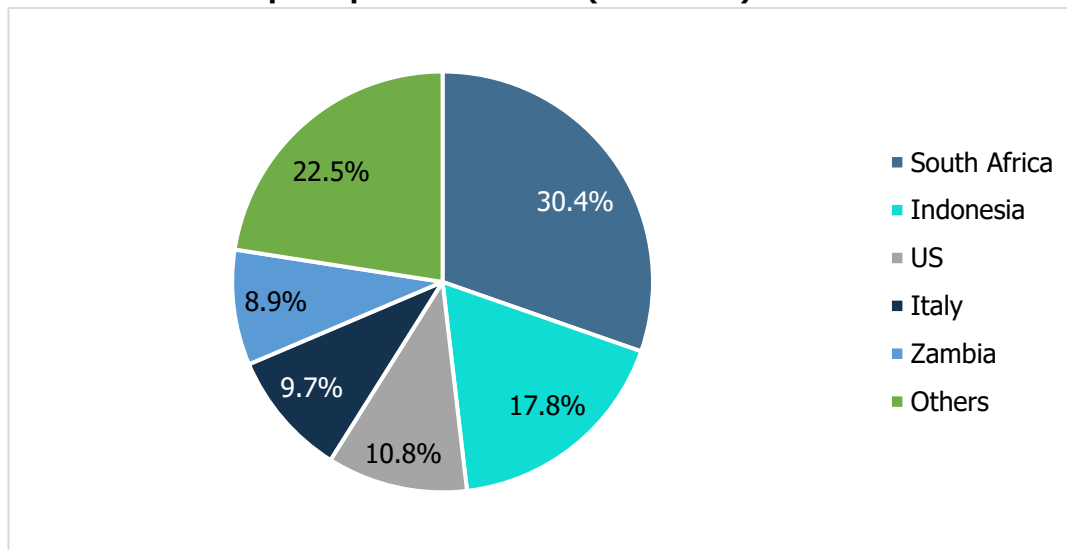


Source: Ministry of Commerce and Industry

Note: P-Projected, HSN Code: 74050000

Top 5 Export destinations

Chart 41: India's top 5 Export destinations (As of FY25)

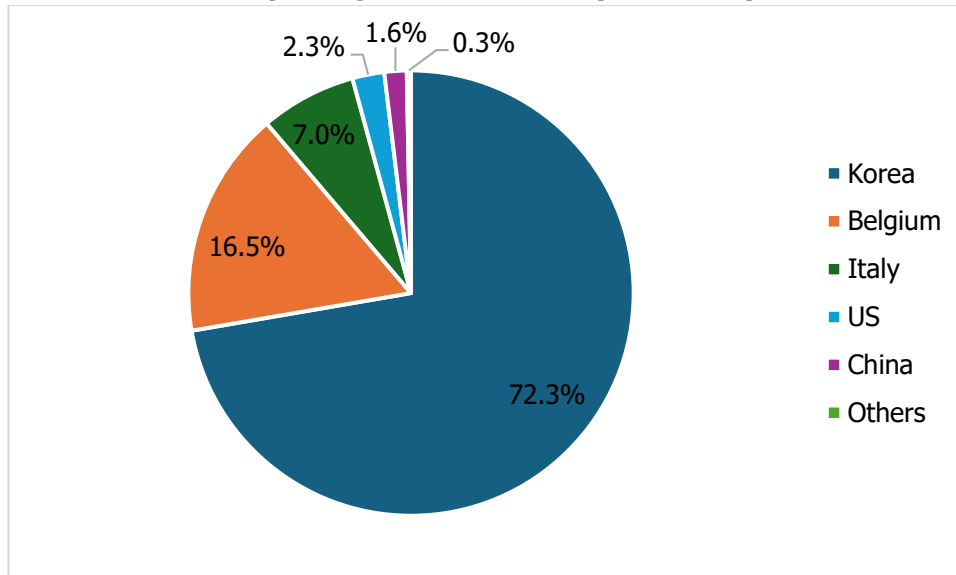


Source: Ministry of Commerce and Industry

Note: HSN Code: 74050000

Top 5 Import destinations

Chart 42: India's top 5 Import destinations (As of FY25)



Source: Ministry of Commerce and Industry
Note: HSN Code: 74050000

Major Trading Partners

The export base for this product is relatively diversified, with South Africa emerging as the largest destination, accounting for 30.4% of total exports in FY25. Other key markets include Indonesia (17.8%), the United States (10.8%), Italy (9.7%), and Zambia (8.9%), while the remaining 22.5% is distributed across various countries. This indicates a reasonably balanced export spread without excessive dependence on a single market, although South Africa remains the most significant partner.

On the import side, the sourcing pattern is highly concentrated, with South Korea dominating as the primary supplier at 72.3% of total imports. Belgium follows at 16.5%, while Italy contributes 7.0%. Other countries such as the United States (2.3%) and China (1.6%) hold relatively minor shares, with the rest of the world accounting for just 0.3%. Overall, imports are heavily reliant on a few key suppliers—particularly South Korea highlighting a concentrated sourcing structure compared to the more diversified export profile.

3.4.4 Copper Bars

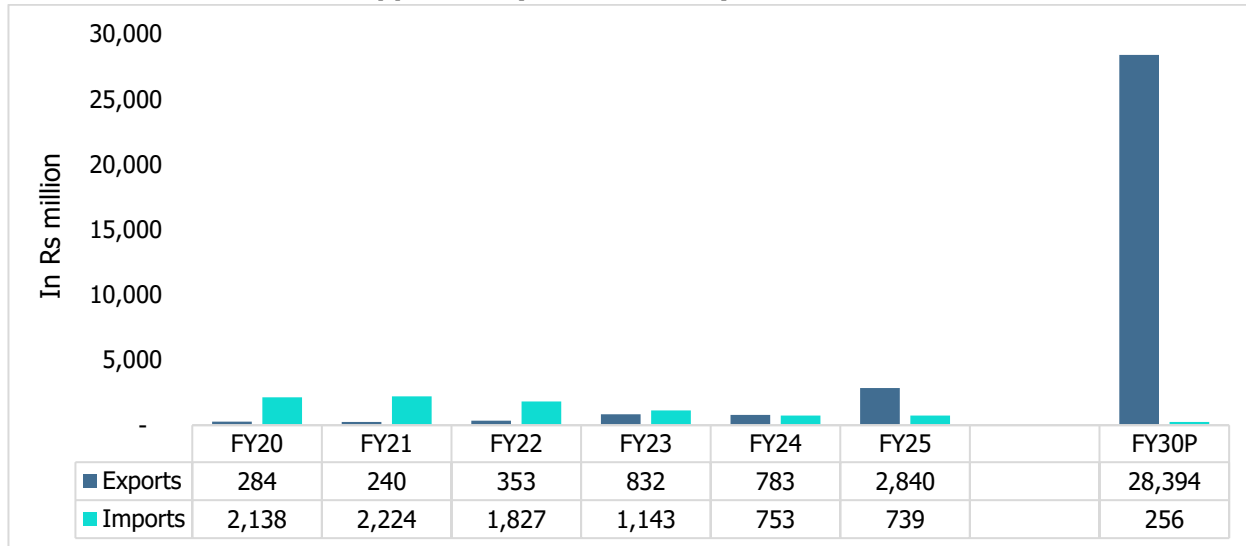
The trade pattern over FY20–FY25 reflects a clear structural shift from import dependence toward a strong export-oriented market. In the initial years, India was a net importer, with import values significantly higher at Rs 2,138 million in FY20 compared to exports of Rs 284 million. However, imports have steadily declined over the period, falling to Rs 739 million in FY25, accompanied by a sharp reduction in volumes from 4,037 tonnes in FY20 to 741 tonnes in FY25. This consistent decline indicates improving domestic production capabilities and reduced reliance on foreign suppliers.

Conversely, exports have demonstrated strong and accelerating growth, particularly from FY23 onwards. Export value increased from Rs 284 million in FY20 to Rs 832 million in FY23, followed by a slight moderation in FY24 at Rs 783 million, before surging sharply to Rs 2,840 million in FY25. A similar trend is observed in volumes, which rose from 505 tonnes in FY20 to 2,914 tonnes in FY25, highlighting a significant scale-up in outbound shipments. This sharp rise

suggests enhanced global competitiveness, possibly driven by cost advantages, improved quality standards, or increased demand in international markets.

The divergence between declining imports and rapidly rising exports underscores a structural transformation in India’s trade position for this product, shifting from a net importer to a net exporter. Looking ahead, projections for FY30 indicate a continuation of this trend, with exports expected to grow substantially to Rs 28,394 million and 16,805 tonnes, while imports are projected to decline further to Rs 256 million and 136 tonnes. Overall, the data reflects strengthening domestic manufacturing capabilities, growing export orientation, and increasing integration into global supply chains for copper wrought bars.

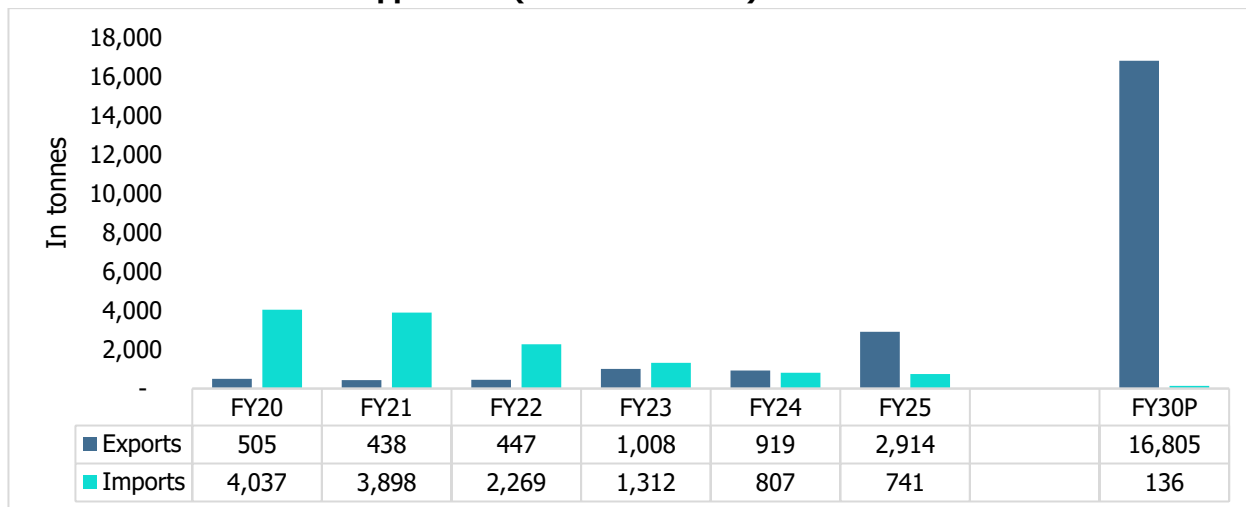
Chart 43: Trade Data for Copper Bars (In value terms)



Source: Ministry of Commerce and Industry

Note: P-Projected, HSN Code: 74071030

Chart 44: Trade Data for Copper Bars (In volume terms)

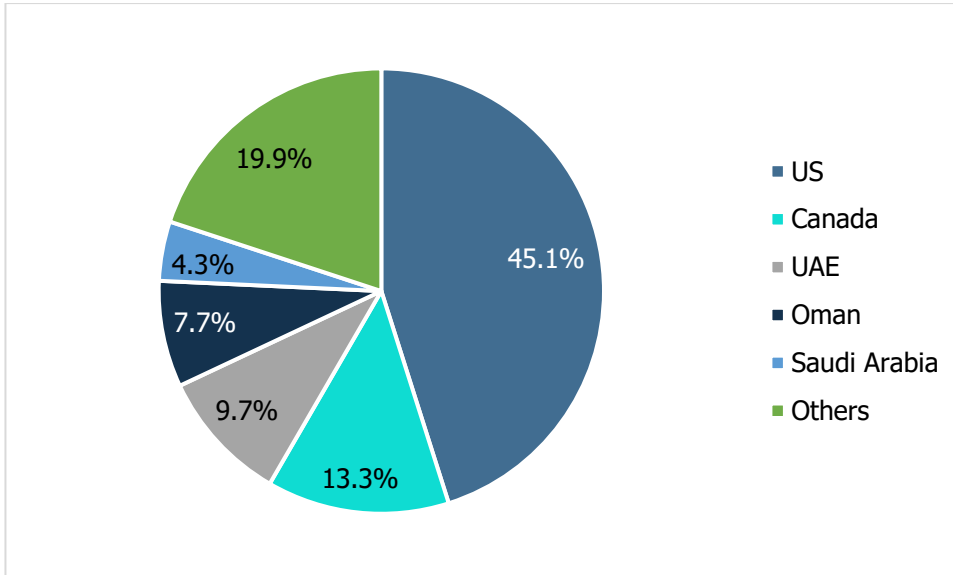


Source: Ministry of Commerce and Industry

Note: P-Projected, HSN Code: 74071030

Top 5 Export destinations

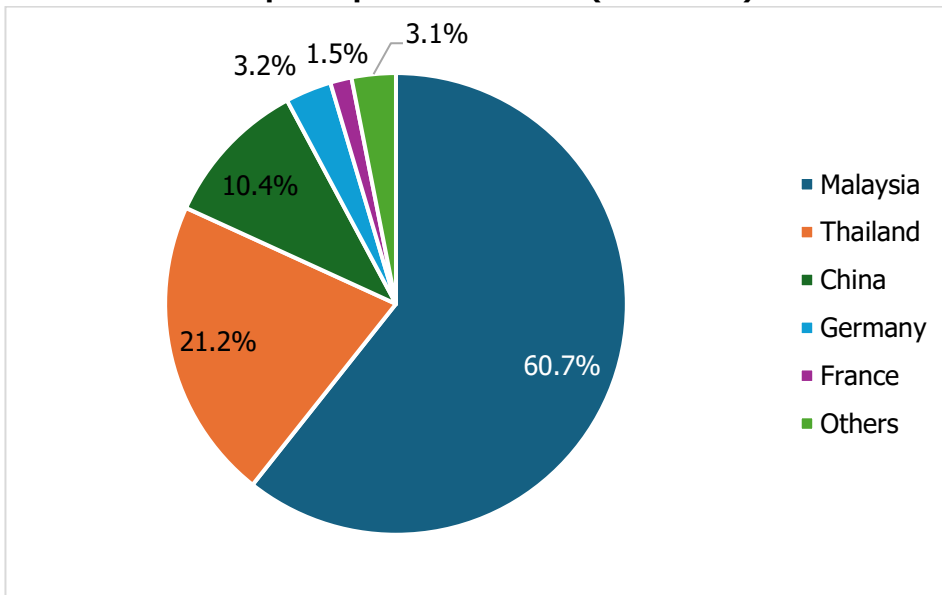
Chart 45: India's top 5 Export destinations (As of FY25)



Source: Ministry of Commerce and Industry
Note: HSN Code: 74071030

Top 5 Import destinations

Chart 46: India's top 5 Import destinations (As of FY25)



Source: Ministry of Commerce and Industry
Note: HSN Code: 74071030

Major Trading Partners

The export profile for this product is moderately concentrated, with the United States emerging as the largest destination, accounting for 45.1% of total exports in FY25. Other key markets include Canada (13.3%), UAE (9.7%), Oman (7.7%),

and Saudi Arabia (4.3%), while the remaining 19.9% is distributed across various countries. This indicates a strong presence in North America and the Middle East, with the US being the dominant export partner.

On the import side, sourcing is more concentrated, with Malaysia leading as the primary supplier at 60.7% of total imports. This is followed by Thailand (21.2%) and China (10.4%), together accounting for a significant majority of imports. Other contributors such as Germany (3.2%) and France (1.5%) hold relatively small shares, with the rest of the world accounting for 3.1%. Overall, imports are heavily dependent on Southeast Asian countries, particularly Malaysia, indicating a concentrated sourcing pattern compared to a relatively more diversified export base.

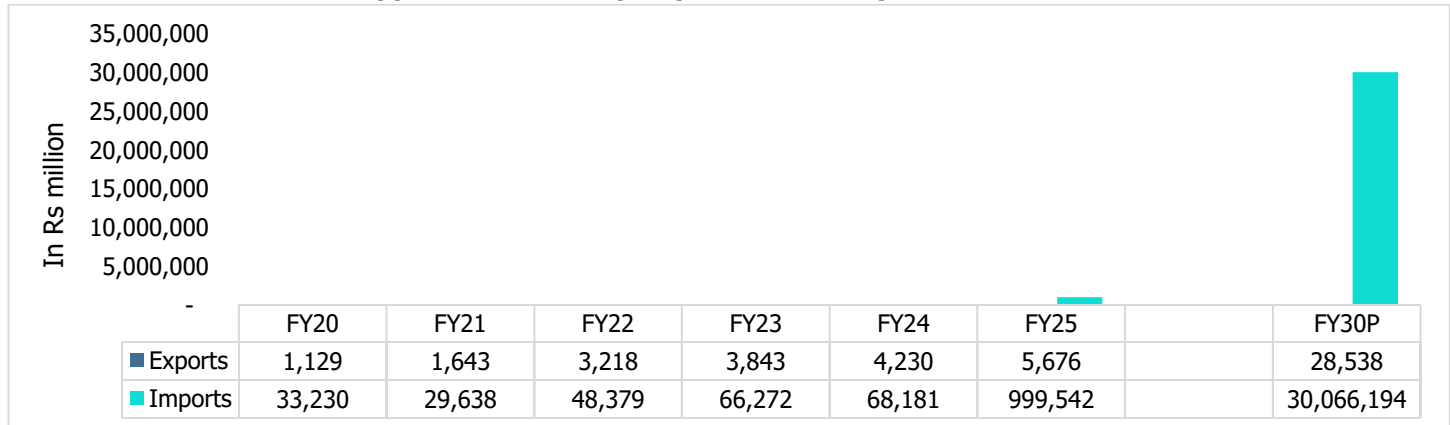
3.4.5 Tubes and Pipes of Refined Copper

The trade pattern over FY20–FY25 reflects a structurally import-dependent market, despite steady growth in exports. Export performance has shown a consistent upward trajectory, with values increasing from Rs 1,129 million in FY20 to Rs 5,676 million in FY25, representing nearly fivefold growth over the period. This rise is supported by a parallel increase in volumes from 1,984 tonnes to 5,730 tonnes, indicating strengthening global demand and improved export competitiveness of Indian manufacturers. The steady, non-volatile growth trend suggests the development of a stable export base in this segment.

In contrast, imports have remained significantly higher than exports throughout the period, underlining India’s reliance on external sources to meet domestic demand. Import values fluctuated initially, declining from Rs 33,230 million in FY20 to Rs 29,638 million in FY21, before rising sharply to Rs 68,181 million in FY24. However, a dramatic spike is observed in FY25, where imports surged to Rs 999,542 million, far exceeding the historical trend. In volume terms, imports have shown relatively steady growth, increasing from 66,443 tonnes in FY20 to 112,320 tonnes in FY25, indicating sustained domestic consumption. The disproportionate rise in import value in FY25 compared to volumes suggests a sharp increase in global copper prices, a shift toward higher-value product imports, or possible data anomalies.

Looking ahead, projections for FY30 indicate a continued expansion in both exports and imports, with exports expected to reach Rs 28,538 million and 16,545 tonnes, while imports are projected to grow substantially to Rs 30,066,194 million and 189,874 tonnes. Overall, the data highlights India’s position as a high-consumption market with growing export capabilities, but with a persistent and widening import dependence driven by strong demand from infrastructure, HVAC, and industrial sectors.

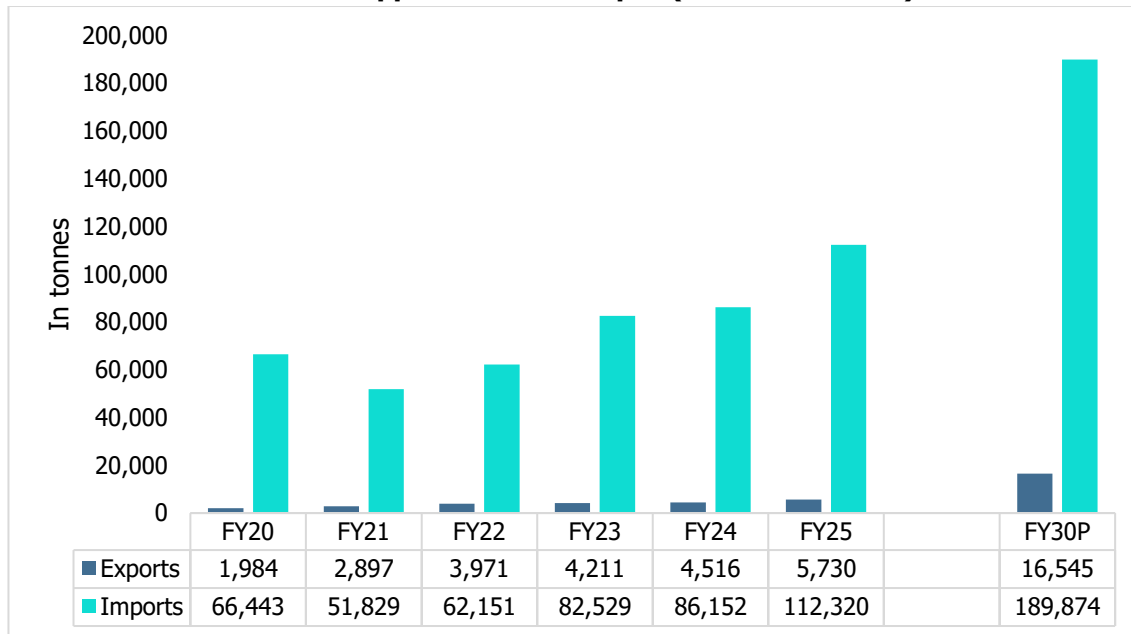
Chart 47: Trade Data for Copper Tubes and Pipes (In value terms)



Source: Ministry of Commerce and Industry

Note: P-Projected, HSN Code: 74111000

Chart 48: Trade Data for Copper Tubes and Pipes (In volume terms)

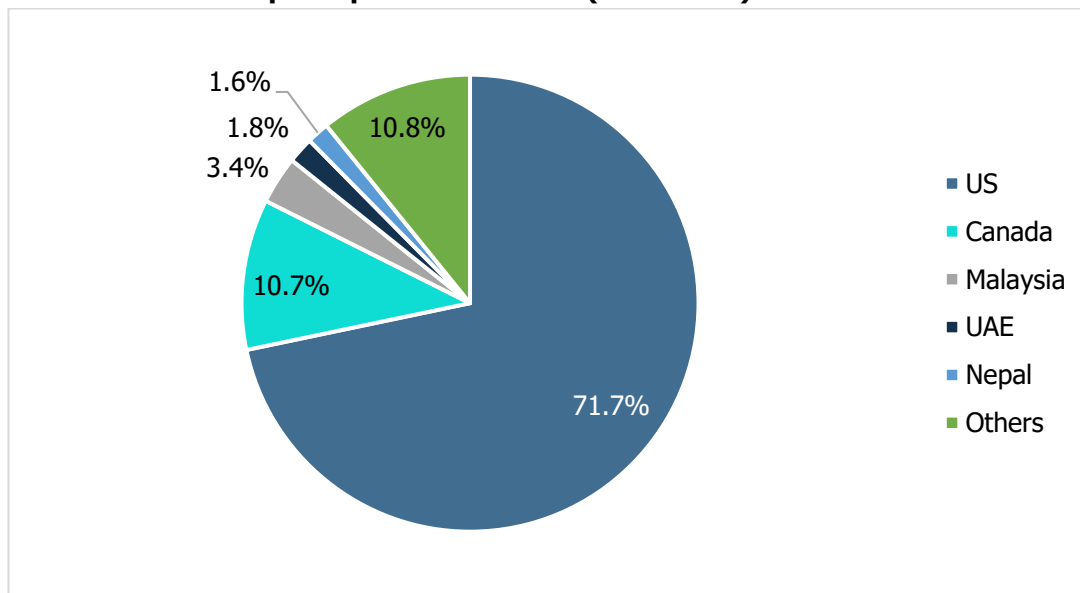


Source: Ministry of Commerce and Industry

Note: P-Projected, HSN Code: 74111000

Top 5 Export destinations

Chart 49: India's top 5 Export destinations (As of FY25)

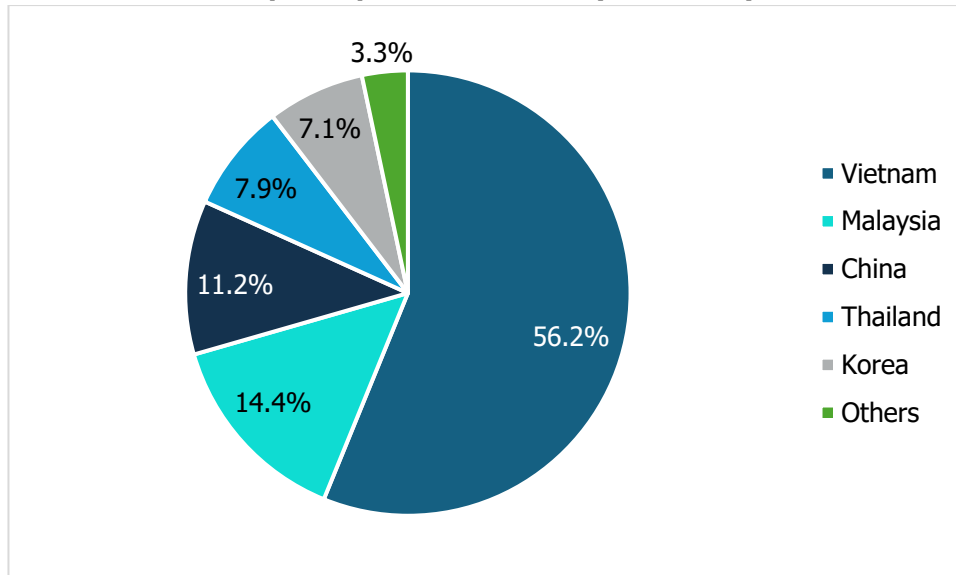


Source: Ministry of Commerce and Industry

Note: HSN Code: 74111000

Top 5 Import destinations

Chart 50: India's top 5 Import destinations (As of FY25)



Source: Ministry of Commerce and Industry
Note: HSN Code: 74111000

Major Trading Partners

The export market is highly concentrated, with the United States dominating as the primary destination, accounting for 71.7% of total exports in FY25. This is followed by Canada at 10.7%, indicating a strong North American focus. Other markets such as Malaysia (3.4%), UAE (1.8%), and Nepal (1.6%) contribute relatively smaller shares, while the remaining 10.8% is distributed across various countries, reflecting limited diversification beyond the top two markets.

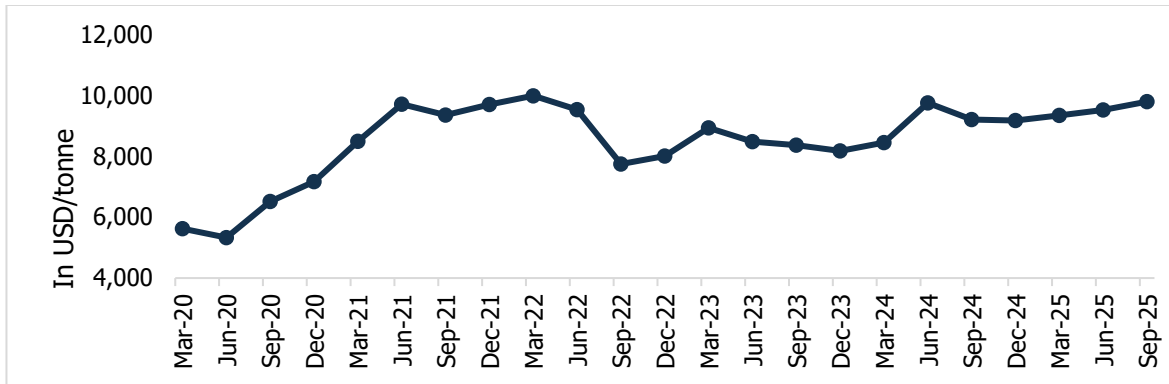
On the import side, sourcing is comparatively more diversified but still led by a few key suppliers. Vietnam is the largest contributor, accounting for 56.2% of total imports, followed by Malaysia (14.4%) and China (11.2%). Other notable suppliers include Thailand (7.9%) and South Korea (7.1%), with the rest of the world contributing 3.3%. Overall, imports are heavily reliant on Southeast Asian countries, particularly Vietnam, while exports are strongly concentrated toward the US market, indicating geographic concentration on both demand and supply sides.

3.5 Price Trends of Non-Ferrous Metals

3.5.1 Copper

During September 2025, prices were on a steadily increasing path quarter wise with prices increasing by 2.9% q-o-q. Copper prices were high throughout 2025, staying near USD 9,600–9,800 per tonne due to strong demand for green energy and infrastructure, tight global supplies, and supply chain challenges. The price had dipped in mid-2022 but quickly rebounded in 2023 and 2024 as global economies recovered and investments increased. Earlier, from 2020 to 2021, prices rose sharply from around USD 5,700 to over USD 10,000 per tonne, driven by post-pandemic recovery and a surge in renewable energy projects. Despite some short-term drops, copper prices remained strong over these years because demand consistently outpaced supply and global investment in new energy and technology stayed high.

Chart 51: Copper Cathode Prices



Source: CMIE

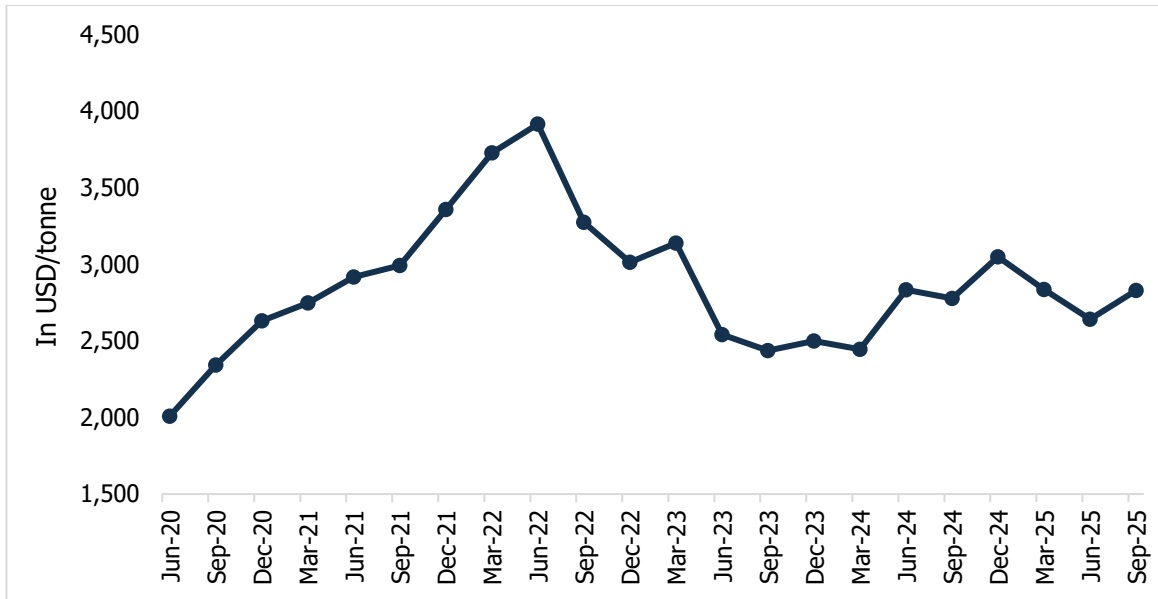
3.5.2 Zinc

As of quarter ending September 2025, prices increased 7.1% q-o-q and 1.9% y-o-y. This was preceded by a decline in June 2025 by 6.9% q-o-q. This was preceded by a decline during March 2025, where prices declined by 7% q-o-q to USD 2,836 per tonne, following an increase in the December 2024 quarter. As of September 2024, prices declined by 2% q-o-q to USD 2,776 per tonne. As of June 2024, the prices stood at USD 2,834 per tonne, a growth rate of 15.9% y-o-y, as demand increased and supply disruptions were observed globally. As of January 2024, prices declined by 24% y-o-y to USD 2,515 per tonne, attributed to weak global demand and increased smelter supply. In January 2023, prices touched USD 3,310 per tonne due to expectations that relaxation of China’s COVID-19 restrictions would trigger a post-pandemic commodity boom. However, the recovery was slower than expected, causing prices to decline throughout the year.

Since September 2022, zinc prices have been on a declining trend, falling to USD 2,939 per tonne in November 2022, down about 11% y-o-y due to a slowdown in global demand. Additionally, the US Dollar index hit a record high amid high interest rates from the US Federal Reserve, weakening commodity demand due to higher foreign exchange costs.

Zinc prices had reached all-time highs of USD 4,360 per tonne in April 2022 on account of strong demand recovery and tight supply. The surge was due to declining global supplies as smelters especially in Europe cut production due to sharp increases in energy costs stemming from the Russia-Ukraine conflict, raising coal and natural gas costs. Meanwhile, Chinese smelting operations were impacted by power shortages.

Chart 52: Zinc Prices



Source: CMIE

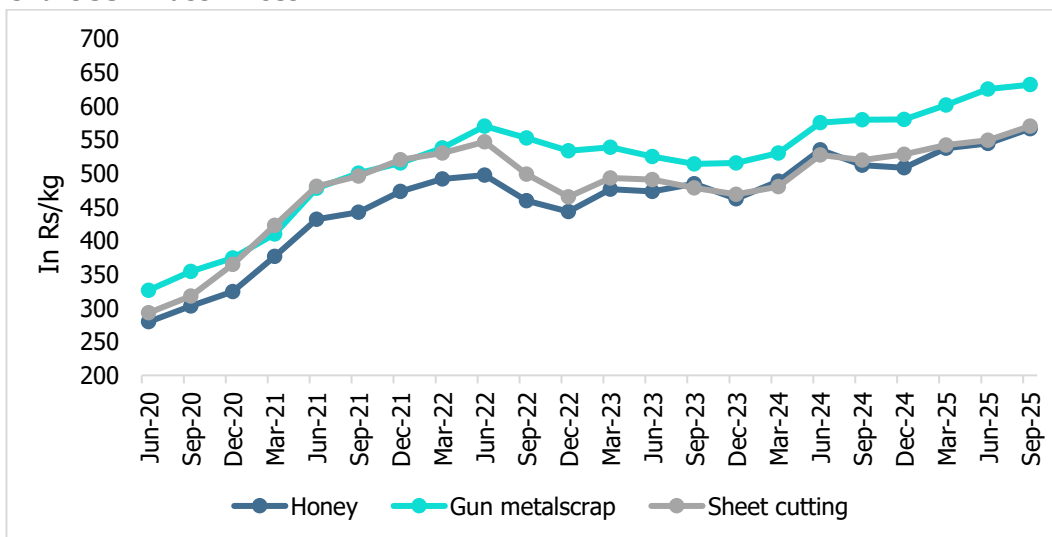
3.5.3 Brass

India's brass sector is export-oriented (especially from clusters like Jamnagar in Gujarat), with domestic consumption tied to construction booms and infrastructure spending under initiatives like PM Gati Shakti. Over the past three years, global supply chain disruptions, rising base metal costs, and India's GDP growth have shaped trends.

Brass prices in India have exhibited upward momentum, driven by surging copper prices (up in 2024 due to supply deficits from mine disruptions in Chile and Peru) and steady zinc gains (supported by galvanizing demand in renewables). This aligns with global LME trends but is amplified in India by import reliance on raw metals and rupee depreciation. Annual averages rose reflecting base metal inflation: copper and zinc .

In summary, India's brass sector navigated 2023–2025 with price-led expansion outstripping volume, signaling a maturing market shifting from quantity to value-add (e.g., lead-free alloys for exports).

Chart 53: Brass Prices



Source: CMIE

3.5.4 Nickel

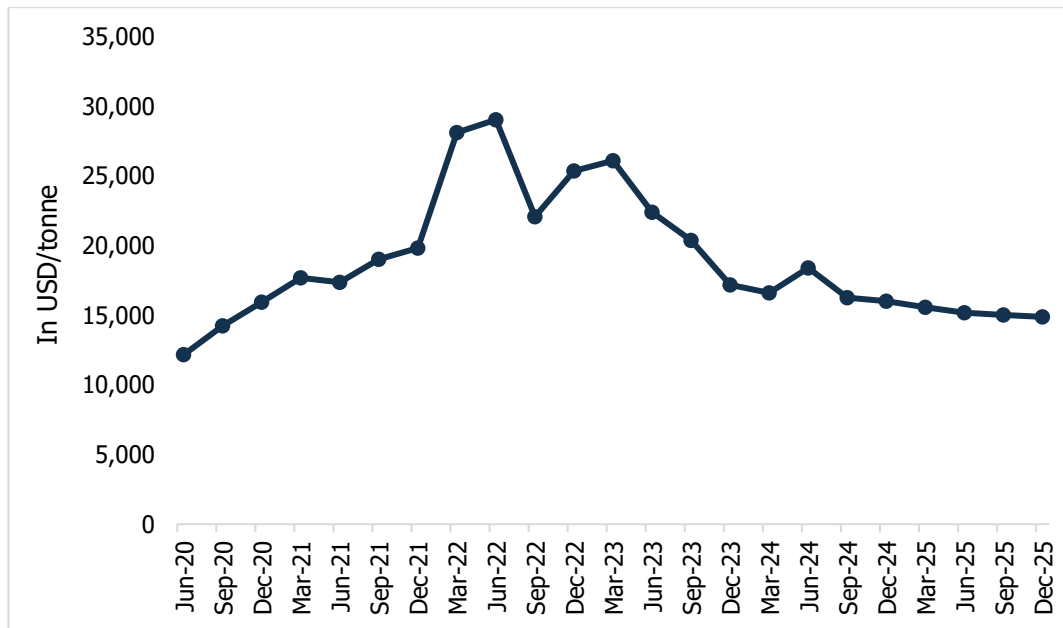
Recently, average nickel prices have stabilized around the USD 14,000-15,000 per tonne range, indicating that the market has reached a near-term equilibrium after significant earlier volatility. This plateau suggests a balance between supply availability and demand growth, with inventories having been replenished and speculative pressures largely alleviated. Demand from key sectors such as stainless steel and emerging batteries for EVs appears steady, but not strong enough to drive prices sharply higher under current global economic conditions.

Looking slightly earlier into 2022–2023, the nickel price trend shows a notable decline from the sharp peaks of early 2022, gradually moving downward through 2023 as industrial demand softened. This downward correction took prices from the high USD 20,000s toward the mid-teens by year-end. The correction aligns with broader macroeconomic headwinds, including slowing growth in major consumers like China and tightening monetary conditions globally, which dampened manufacturing activity and metals demand.

At the height of the cycle in early 2022, average LME nickel prices surged to nearly USD 28,000–30,000 per tonne, the highest level in the series. This spike was driven by elevated risk premiums, supply concerns, and geopolitical tensions that disrupted traditional export flows, injecting heightened volatility into the base metals complex. The peak period reflected both fundamental pressures and speculative trading dynamics amid constrained inventories on the exchange.

Overall, after peaking and correcting sharply, nickel prices have now settled into a more stable band, reflecting a recalibration of market fundamentals and normalized trading conditions.

Chart 54: Nickel Prices



Source: CMIE

3.6 Copper specific Regulatory Framework and Government Policies

- **National Critical Mineral Mission (NCMM)**

India's National Critical Mineral Mission (NCMM), approved in January 2025, commits Rs 34,300 crore over seven years to strengthen the country's supply chain for strategic minerals. The mission covers the entire value chain: exploration, mining, beneficiation, processing, and recovery from end-of-life products, explicitly targeting 24 critical minerals, including copper. This involves dedicated support to grow domestic capacity and reduce import dependence. The mission includes fast-track regulatory clearances for mining, financial incentives for exploration, and support for overseas acquisition of mineral assets. Another key pillar is recycling: NCMM allocates Rs 1,500 crore to incentivize recovery of critical minerals from e-waste, battery scrap and tailings. By supporting exploration, processing, recycling, and innovation, the NCMM is poised to significantly bolster India's copper self-reliance, secure resource availability, and build a more sustainable and resilient critical minerals ecosystem.

- **Exploration & Licensing Reforms**

In 2023, the Indian government amended the Mines and Minerals (Development and Regulation) Act to introduce an Exploration Licence (EL) regime specifically for 29 critical and deep-seated minerals, including copper. This reform enables private companies to bid for ELs via auctions, granting them the right to conduct survey and prospecting work over large areas. In early 2025, India held its first-ever EL auction covering 13 blocks that include copper, spread across several states. The EL framework is highly significant for copper. First, it encourages broad-based private participation, more junior miners, specialized explorers, and global players are now able to invest in early-stage exploration. Second, EL holders share in future mining-lease auction premiums for 50 years, giving them long-term upside if exploration succeeds. Third, by assigning exploration responsibility to private firms, the government aims to more efficiently map copper resources, especially deep-seated deposits that are otherwise capital-intensive and risky to explore.

- **Duty Rationalisation on Imports & Scrap**

The removal of basic customs duty on copper concentrate and copper scrap directly strengthens India's copper value chain at a time when copper is increasingly classified as a critical mineral for energy transition technologies. Since domestic copper ore availability is limited, refiners rely heavily on imported concentrate. Eliminating duty lowers raw material costs, improves refining margins, and supports higher capacity utilisation for smelters. This enhances the global competitiveness of Indian refined copper, which is vital as demand rises in sectors such as EVs, renewable power, power transmission and electronics manufacturing.

Cheaper scrap imports also encourage the expansion of secondary copper production, which is strategically important because recycling plays a major role in ensuring long-term supply security for critical minerals. As global copper supply tightens and ore grades decline, cost-efficient access to scrap becomes a key buffer against supply volatility. Overall, duty rationalisation helps reduce dependence on high-cost primary imports, supports value addition within India, and aligns with the government's push to build resilient supply chains for critical minerals.

3.7 Impact of Tariffs on the Indian Non-Ferrous Metals Industry

Recent global tariff actions, particularly by the U.S., have significant implications for India's non-ferrous metals industry. The imposition of a 25% U.S. tariff on aluminium imports in 2025, framed as a national security measure, has directly impacted Indian exporters, given the U.S. is one of India's largest aluminium export markets. This move has made Indian

aluminium less competitive, forcing producers to reroute volumes to alternate regions such as Europe and Southeast Asia. However, such realignments take time, leading to short-term disruptions in trade and margin pressures for Indian firms. This reflects weakening overseas demand amid tariff uncertainty. As international buyers turn protectionist, Indian producers may face inventory buildup and localized price softening, even as domestic demand holds strong, especially from infrastructure and renewable energy sectors.

Despite external headwinds, India's domestic production of aluminium, zinc, and copper has remained resilient, backed by growing internal consumption. However, prolonged export challenges could reduce profitability and investment appetite in the sector. Over the longer term, sustained tariffs may shift strategic focus toward import substitution, value-added product development, and expanding domestic downstream capacity. Tariff barriers could also deter FDI in export-led segments while encouraging inward-looking capacity expansion. Overall, trade friction underscores the need for India's non-ferrous metals sector to diversify markets, add value domestically, and strengthen global trade negotiations to preserve competitiveness.

4 Non-Ferrous Metal and Alloy Products

4.1 Copper Cathode

Overview

Copper cathodes are high-purity copper plates (typically 99.95–99.99% Copper) produced through electrorefining or solvent extraction–electrowinning (SX-EW). In electrorefining, impure blister copper is cast into anodes and suspended in an electrolyte bath containing copper sulfate and sulfuric acid. When electric current passes through, pure copper dissolves from the anode and deposits onto stainless steel starter sheets, forming cathodes with uniform purity and low impurity levels (As, Sb, Bi, Pb, Fe). SX-EW, used mainly for oxide ores, extracts copper into an organic solvent and plates it directly as cathode through electrowinning.

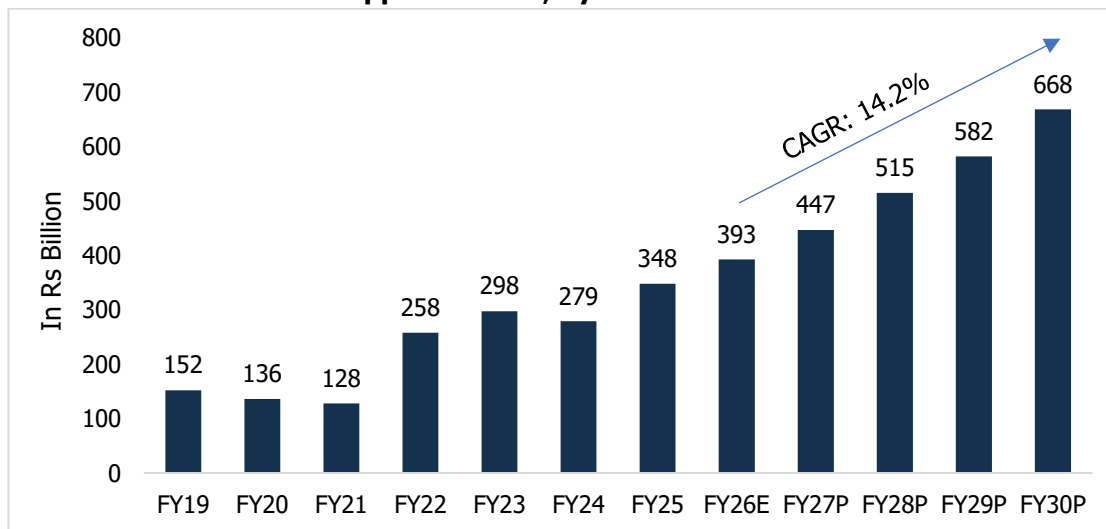
Cathodes are the base material for almost all downstream copper products rods, wires, tubes, sheets, strips, and alloys. They are valued for excellent electrical conductivity, corrosion resistance, and formability. High purity ensures consistent performance in electrical and electronics applications. Cathodes also offer standardized dimensions and quality, enabling easy handling, inventory control, and global trade. Their consistent chemical composition makes them ideal input for continuous casting and rolling processes.

Production

Copper cathode production depends largely on the availability of mined ore, smelting capacity, and refined production infrastructure. Historically, production has grown due to rising ore extraction, expansion of smelting-refining capacities, and increased use of SX-EW in low-grade deposits. Indian producers rely on both domestic mines and imported concentrates, with periodic capacity additions supporting output. Upgrades in smelting technology, better energy efficiency, and stricter impurity control have improved recovery rates and refined copper quality.

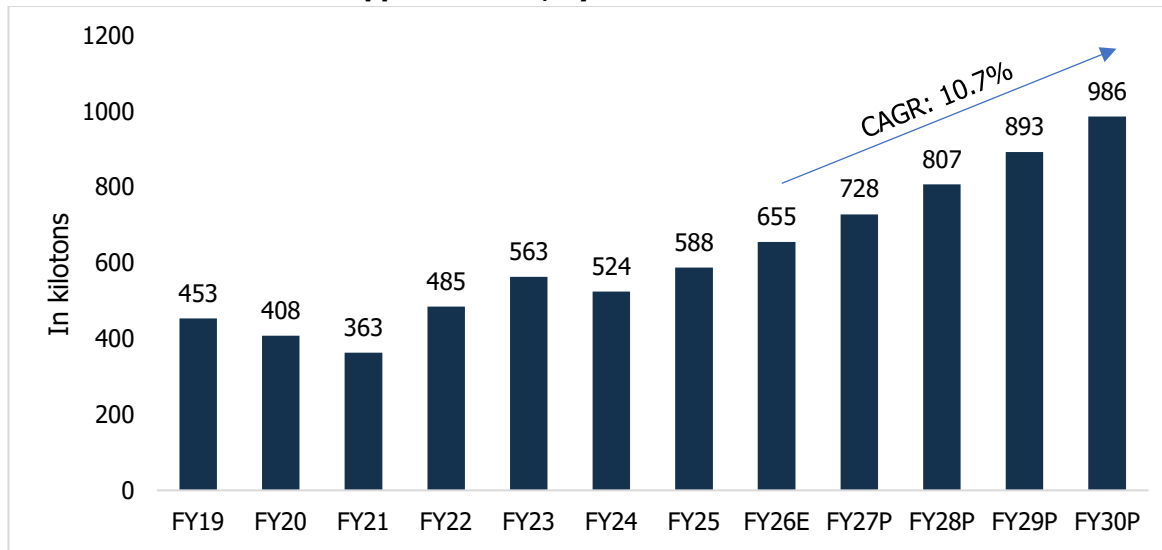
Future production growth will be driven by increasing investments in deep-seated ore exploration, improved mine-smelter integration, expansion of refining lines, and more digitalization in process control. The global move toward clean energy will encourage capacity additions to meet rising copper demand for electrification. Scrutiny around environmental compliance and the need for lower-carbon processes will push adoption of advanced emission-control systems and energy-efficient electrorefining.

Chart 55: Production of Copper Cathode, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 56: Production of Copper Cathode, By Volume



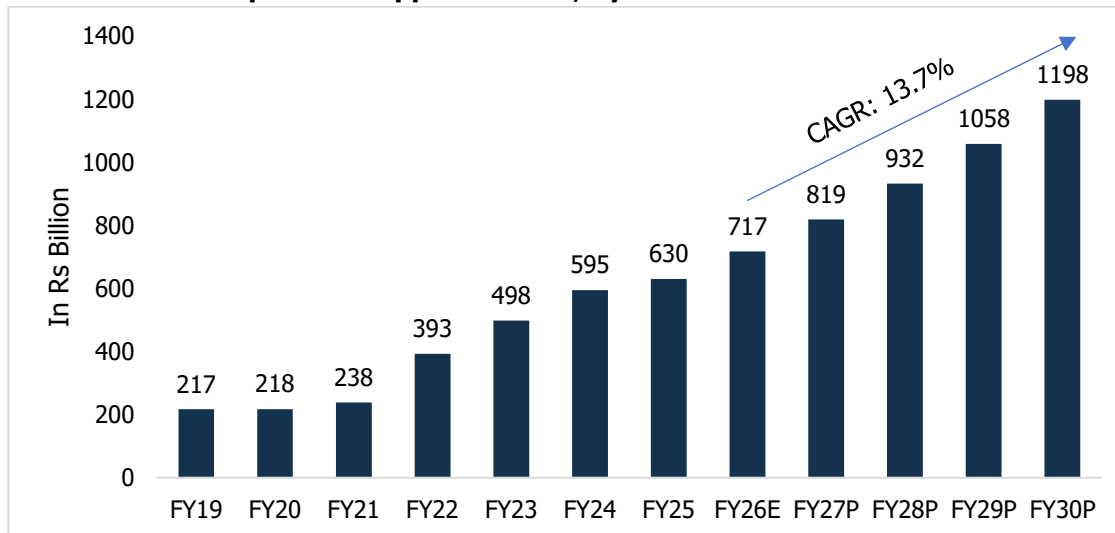
Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Consumption

Copper cathodes are consumed by wire rod mills, tube manufacturers, sheet/strip producers, alloy makers, and fabricators. Historically, demand has been driven by expansion in power infrastructure, construction, industrial machinery, and automotive wiring harnesses. In India and globally, wire rod manufacturing has been the largest consumer due to extensive use in cables, conductors, and electrical equipment. Increased urbanization, telecom expansion, and renewable energy installations (solar, wind) have further supported consumption.

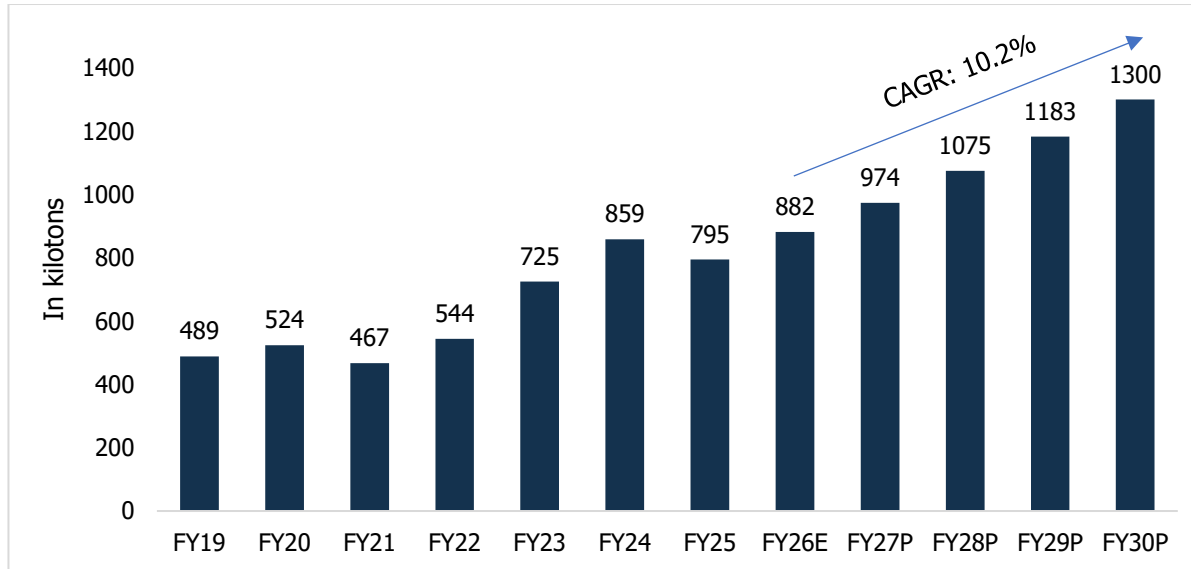
Looking forward, cathode consumption is set to rise due to rapid electrification, EV penetration, renewable power capacity addition, and smart grid modernization. Emerging sectors like charging infrastructure, data centers, 5G networks, and industrial automation will further accelerate downstream demand. Additionally, the shift toward higher-performance copper alloys and increased substitution of aluminum with copper in premium applications will keep consumption on an upward trajectory.

Chart 57: Consumption of Copper Cathode, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 58: Consumption of Copper Cathode, By Volume



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Consumption of Copper Cathodes by top 10 Indian States (In value terms) (Rs Billion)

State Analysis	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26E	FY27P	FY28P	FY29P	FY30P
Maharashtra	29.1	28.7	30.8	49.9	62.1	72.8	77.3	88.4	101.3	115.7	131.8	149.8
Uttar Pradesh	20.9	20.9	22.8	37.5	47.4	56.3	61.1	71.3	83.3	97.1	112.9	130.9
Gujarat	18.0	17.9	19.3	31.6	39.5	46.7	50.1	57.9	67.0	77.3	89.0	102.2
Tamil Nadu	15.6	15.6	17.0	28.1	35.5	42.3	46.0	53.8	63.1	73.7	85.9	99.9
Karnataka	12.9	12.8	14.0	22.9	28.9	34.3	37.1	43.2	50.3	58.5	67.9	78.5
Telangana	11.8	11.7	12.7	20.8	26.1	30.8	33.2	38.4	44.6	51.6	59.5	68.5
West Bengal	14.1	13.7	14.6	23.4	28.8	33.4	35.0	39.5	44.6	50.2	56.4	63.2
Andhra Pradesh	12.0	11.9	12.9	20.9	26.2	30.8	32.9	37.9	43.7	50.3	57.6	65.9
Madhya Pradesh	12.6	12.4	13.3	21.5	26.7	31.2	33.0	37.6	42.9	48.8	55.3	62.6
Rajasthan	11.9	11.7	12.6	20.5	25.6	30.1	32.1	36.9	42.4	48.6	55.6	63.4
Others	57.9	60.2	68.1	116.0	151.5	186.2	192.0	212.7	235.8	260.4	286.1	313.0

Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

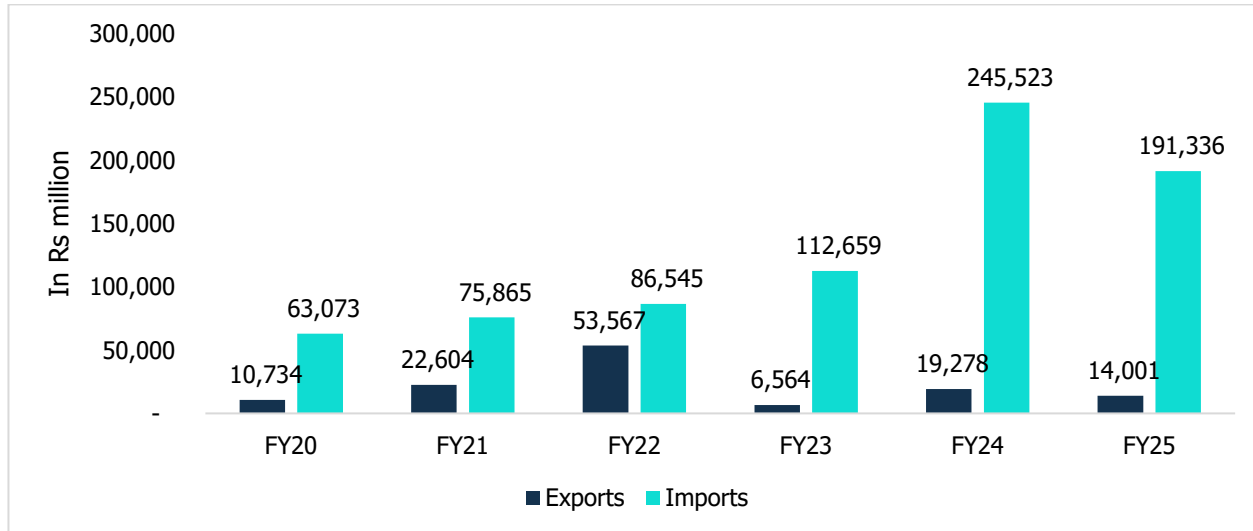
Trade Data

The data indicates a persistent and widening gap between imports and exports of copper cathodes over the period. Imports show a clear upward trend, rising steadily from FY20 and accelerating sharply in FY24, before moderating slightly in FY25 while remaining materially higher than earlier years. This reflects strong and growing domestic demand for refined copper, driven by downstream sectors such as power, infrastructure, electronics, and manufacturing, alongside limited domestic smelting and refining capacity.

Exports, in contrast, remain modest and volatile, with a temporary peak in FY22 followed by a sharp decline in FY23. Although exports recover marginally in FY24 and FY25, they continue to remain significantly lower than imports, underscoring India’s structural dependence on imported copper cathodes to meet consumption needs.

Overall, the trend highlights a net-import-oriented market, where domestic demand growth has outpaced supply additions. The sustained import reliance also suggests exposure to global price movements and supply chain risks, while reinforcing the importance of capacity expansion, recycling, and policy support for domestic copper production to improve long-term supply security.

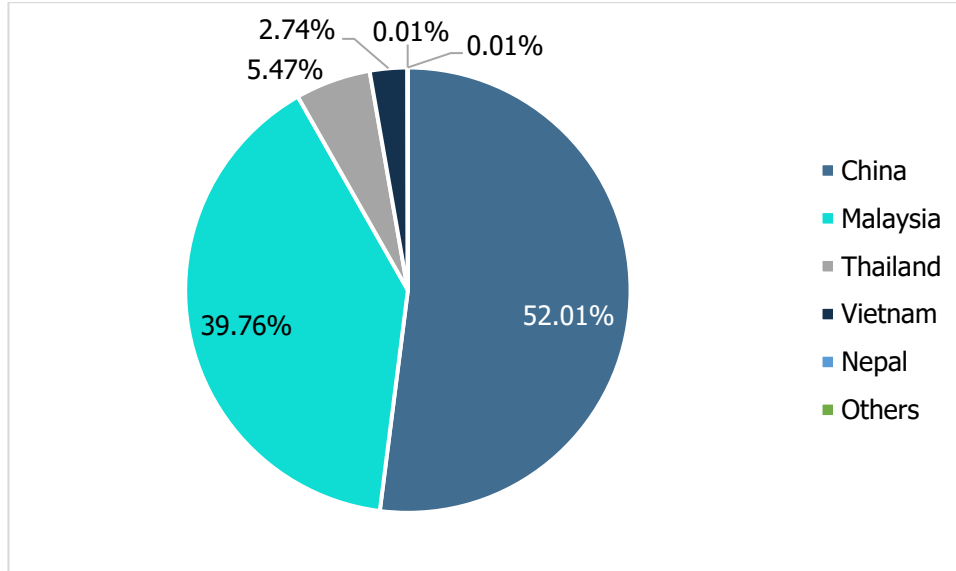
Chart 59: Trade Data of Copper Cathodes and Sections of Copper Cathodes (Refined Copper)



Source: Ministry of Commerce and Industry

Note: HSN code used is 74031100

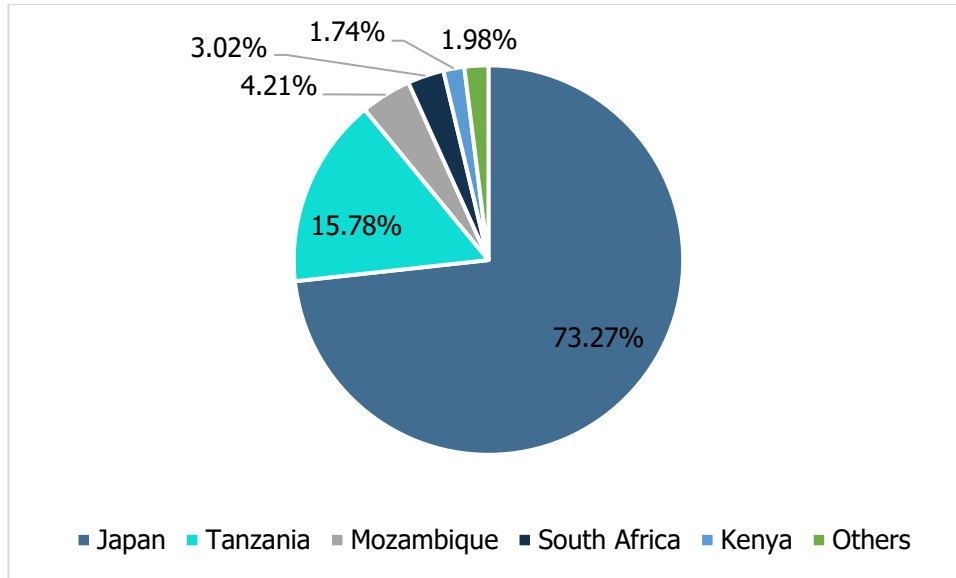
Chart 60: Top 5 Export Destinations (as of FY25)



Source: Ministry of Commerce and Industry

Note: HSN code used is 74031100

Chart 61: Top 5 Import Destinations (as of FY25)



Source: Ministry of Commerce and Industry

Note: HSN code used is 74031100

Major Trading Partners

The export landscape is highly concentrated, with China dominating as the largest destination, accounting for 52.0% of total exports in FY25, followed by Malaysia at 39.8%. Together, these two countries contribute over 90% of exports, indicating a strong reliance on a narrow set of markets. Other destinations such as Thailand (5.5%) and Vietnam (2.7%) hold relatively small shares, while Nepal and other countries contribute negligibly, reflecting limited diversification in export outreach.

On the import side, Japan emerges as the overwhelmingly dominant supplier, accounting for 73.3% of total imports, highlighting a significant dependence on a single country. Tanzania is the second-largest source at 15.8%, followed by Mozambique (4.2%), South Africa (3.0%), and Kenya (1.7%). The remaining share of 2.0% is distributed among other countries. Overall, imports are even more concentrated than exports, with a heavy reliance on Japan and select African nations, underscoring potential supply-side concentration risks.

4.2 Copper Tubes and Pipes

Overview

Copper tubes and pipes are manufactured using 99.9% pure copper, often C11000 grade, known for high thermal conductivity, corrosion resistance, and mechanical strength. Production involves casting copper into billets, which are then hot extruded into hollow forms. These are subsequently cold-drawn through precision dies to achieve final diameters and wall thicknesses. Additional processes such as annealing, pickling, and eddy-current testing ensure ductility, clean surfaces, and defect-free structure.

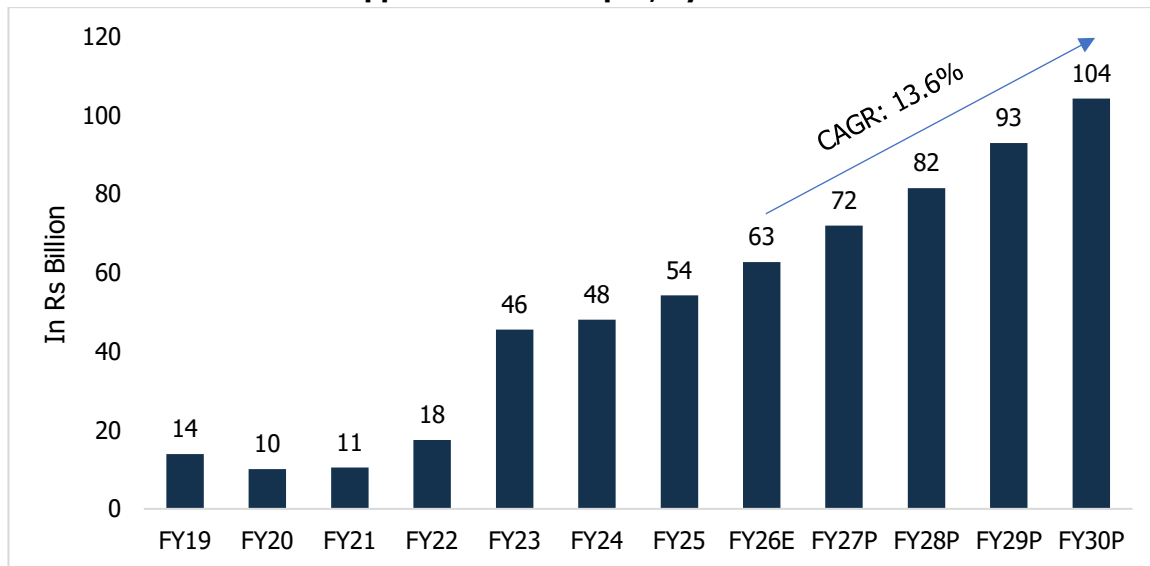
The tubes are available in straight lengths and coils, and are produced in seamless as well as welded forms, though seamless dominates in HVAC, refrigeration, plumbing, and medical gas applications. Attributes include excellent formability, tight dimensional tolerance, long service life, and strong antimicrobial properties. Their ability to withstand internal pressure and temperature variation makes them suitable for high-performance heat transfer systems and for use in corrosive environments.

Production

Copper tube production has historically grown alongside HVACR (heating, ventilation, air conditioning, refrigeration) manufacturing, plumbing demand, and emerging medical infrastructure. In India, production increased steadily with capacity additions in continuous casting lines, extrusion presses, pilger mills, and cold-drawing facilities. The shift from ferrous to non-ferrous plumbing solutions has supported domestic manufacturing expansion.

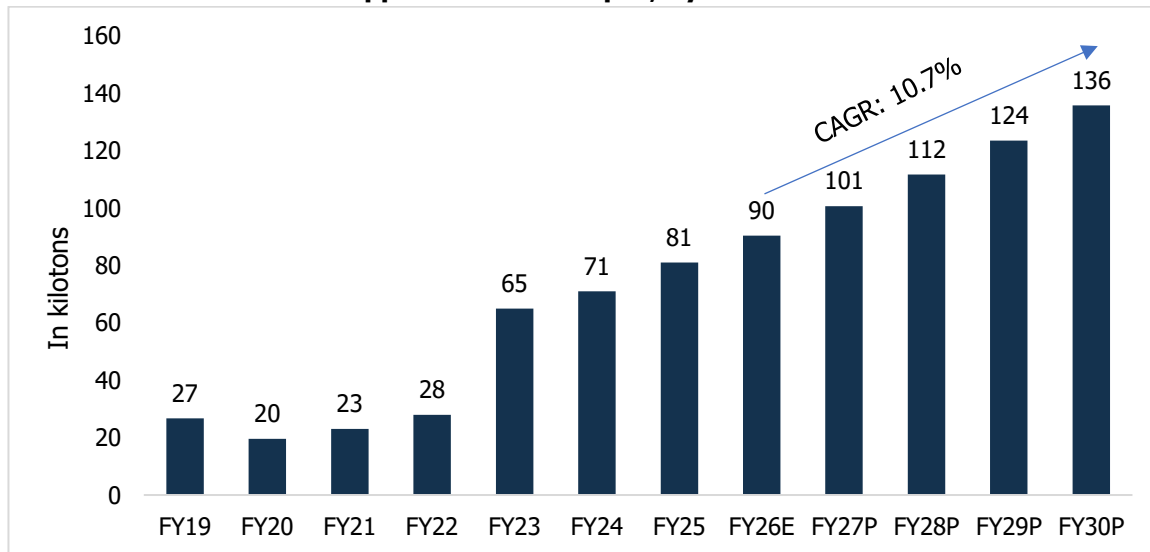
Future production drivers include rising demand from energy-efficient air conditioners, heat pumps, solar thermal systems, and refrigeration units. Growth in real estate, cold-chain development, and industrial process cooling will also boost output. Manufacturers are increasingly adopting automated drawing benches, advanced annealing furnaces, and inline NDT testing to enhance productivity and quality. Demand for small-diameter precision tubes used in HVAC especially microgroove tubes will further shape production trends.

Chart 62: Production of Copper Tubes and Pipes, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 63: Production of Copper Tubes and Pipes, By Volume



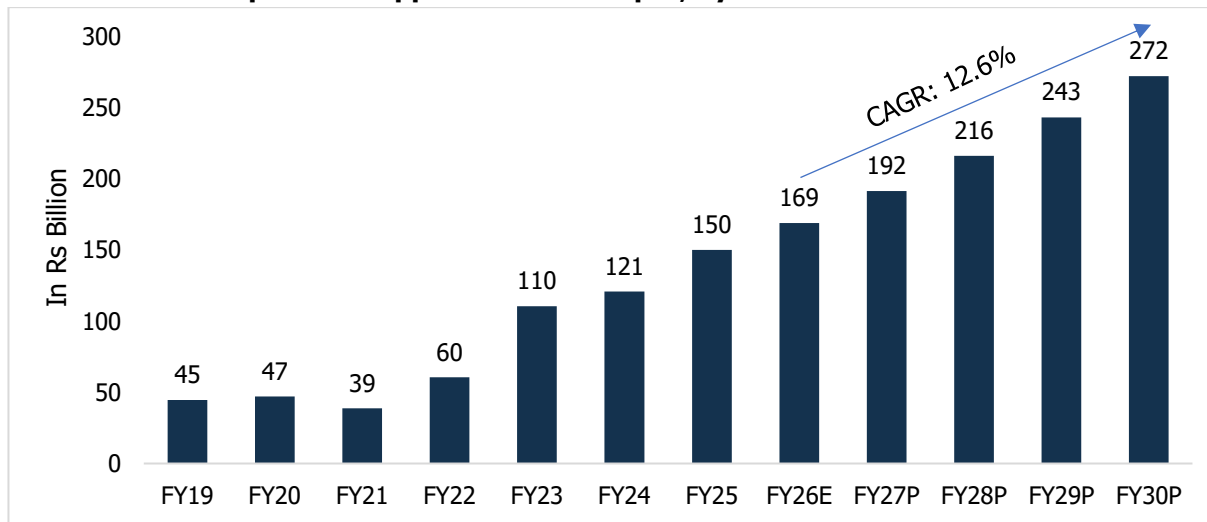
Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Consumption

Consumption of copper tubes and pipes is primarily driven by HVACR, plumbing, renewable energy, industrial cooling, and specialized medical systems. Historically, growth has been tied to rising household incomes, penetration of air conditioning, expansion of commercial real estate, and modernization of water-supply infrastructure. Healthcare investments have increased demand for high-purity medical gas copper piping.

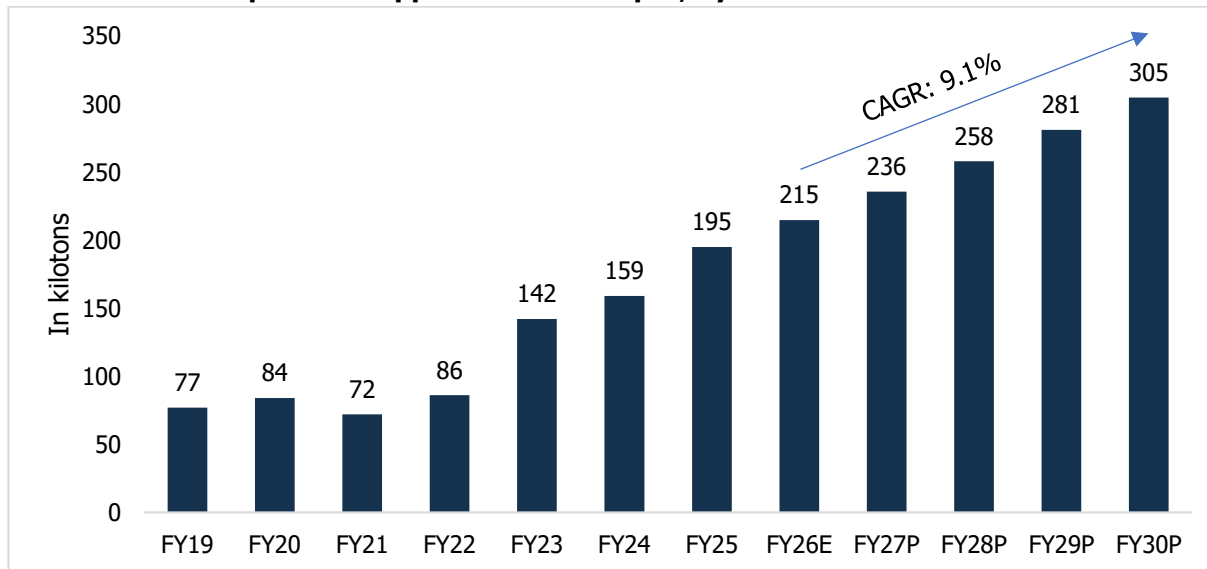
Future consumption will accelerate due to widespread installation of energy-efficient HVAC systems, the shift toward eco-friendly refrigerants that require compatible copper tubing, and expansion of cold storage networks. Renewables particularly solar water heaters and thermal systems will contribute additional demand. The push toward electrification of buildings and green infrastructure will create new uses for specialized copper tubes with improved heat-transfer capabilities, while urbanization and rising construction activity will remain core demand drivers.

Chart 64: Consumption of Copper Tubes and Pipes, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 65: Consumption of Copper Tubes and Pipes, By Volume



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Consumption of Copper Tubes and Pipes by top 10 Indian States (In value terms) (Rs Billion)

State Analysis	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26E	FY27P	FY28P	FY29P	FY30P
Maharashtra	5.9	6.2	5.0	7.6	13.7	14.7	18.3	20.7	23.5	26.7	30.1	33.8
Uttar Pradesh	4.0	4.2	3.4	5.3	9.7	10.5	13.4	15.4	17.9	20.7	23.9	27.3
Gujarat	3.9	4.1	3.4	5.2	9.4	10.1	12.8	14.6	16.7	19.2	21.8	24.8
Tamil Nadu	3.3	3.5	2.9	4.5	8.1	8.9	11.3	13.1	15.3	17.7	20.4	23.5
Andhra Pradesh	2.8	2.9	2.4	3.7	6.6	7.1	8.9	10.2	11.6	13.3	15.1	17.0
West Bengal	2.8	2.9	2.3	3.5	6.3	6.7	8.2	9.1	10.2	11.4	12.7	14.0
Telangana	2.5	2.6	2.1	3.2	5.9	6.4	8.0	9.2	10.6	12.1	13.9	15.8
Karnataka	2.2	2.3	1.9	3.0	5.4	5.9	7.4	8.6	9.9	11.4	13.1	15.0
Kerala	2.5	2.5	2.0	3.1	5.5	5.8	7.1	7.9	8.8	9.8	10.9	12.0
Rajasthan	2.3	2.3	1.9	2.9	5.2	5.6	7.1	8.0	9.1	10.4	11.8	13.3
Others	12.3	13.5	11.5	18.5	34.8	39.2	47.6	52.3	57.8	63.6	69.5	75.5

Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

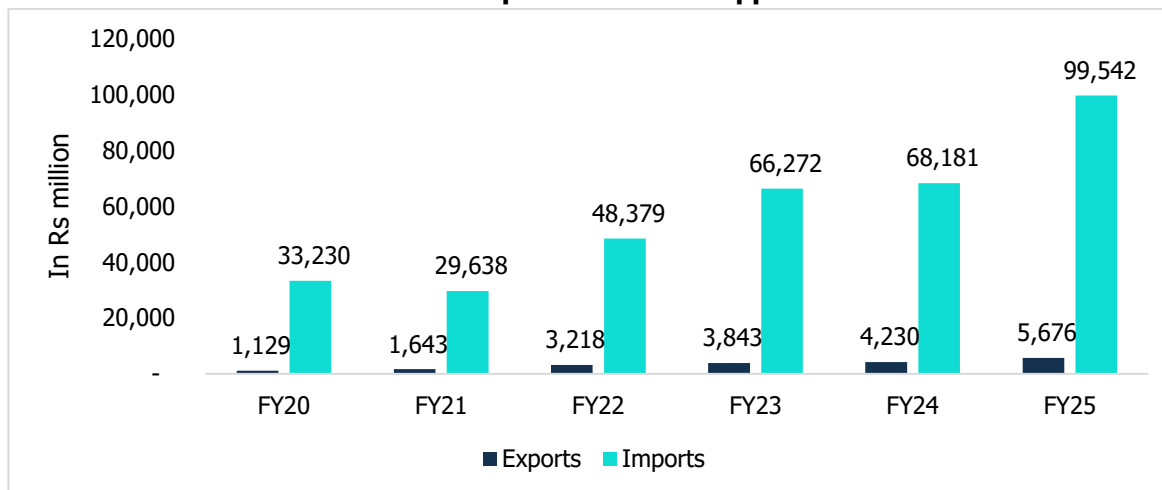
Trade Data

The trade trend for copper tubes and pipes shows a steady and pronounced increase in imports over the period, indicating rising domestic demand from end-use sectors such as air-conditioning and refrigeration, construction, plumbing, and industrial applications. After a brief dip in FY21, imports have grown consistently, with a sharp acceleration in FY23 onwards and a further step-up in FY25. This pattern reflects both expanding downstream consumption and the growing use of copper tubes in energy-efficient cooling and heating systems.

Exports, while increasing gradually, remain small in comparison to imports, highlighting India’s limited export presence in this segment. The incremental rise in exports suggests some improvement in domestic manufacturing and market outreach, but not at a pace sufficient to offset import growth.

Overall, the widening gap between imports and exports points to a structural import dependence in copper tubes and pipes. The trend underscores the opportunity for capacity expansion and value-added manufacturing within the domestic industry, particularly as demand from climate control, infrastructure, and industrial sectors continues to strengthen.

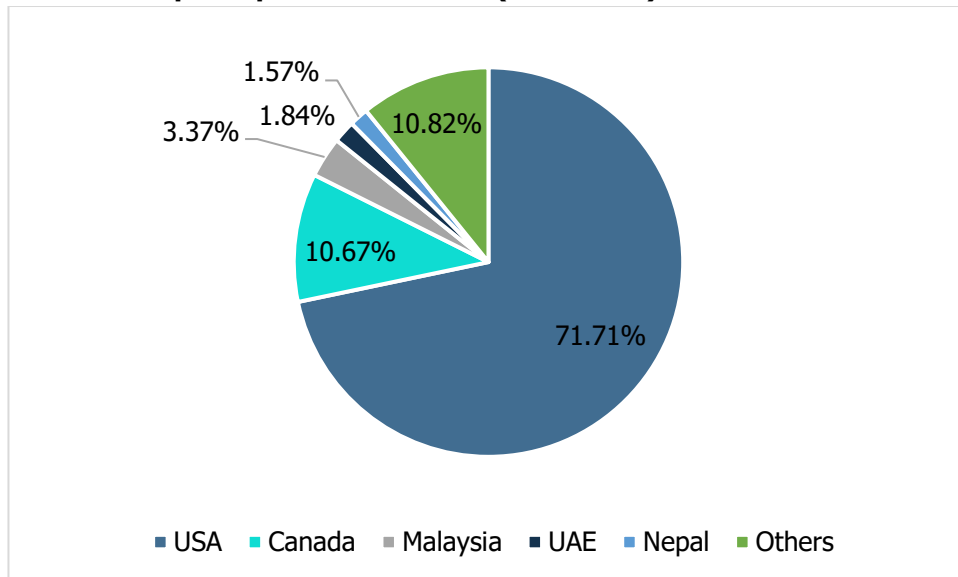
Chart 66: Trade Data of Tubes and Pipes of Refined Copper



Source: Ministry of Commerce and Industry

Note: HSN code used is 74111000

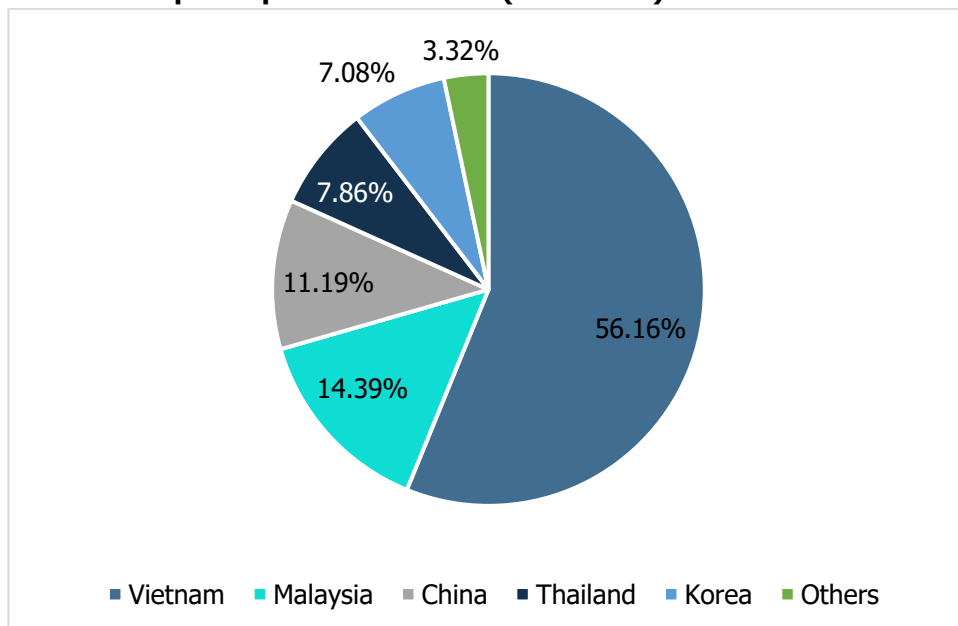
Chart 67: Top 5 Export Destinations (as of FY25)



Source: Ministry of Commerce and Industry

Note: HSN code used is 74111000

Chart 68: Top 5 Import Destinations (as of FY25)



Source: Ministry of Commerce and Industry

Note: HSN code used is 74111000

Major Trading Partners

The export market is highly concentrated, with the United States dominating as the primary destination, accounting for 71.7% of total exports in FY25. This is followed by Canada at 10.7%, indicating a strong North American focus. Other markets such as Malaysia (3.4%), UAE (1.8%), and Nepal (1.6%) contribute relatively smaller shares, while the remaining 10.8% is distributed across various countries, reflecting limited diversification beyond the top two markets.

On the import side, sourcing is comparatively more diversified but still led by a few key suppliers. Vietnam is the largest contributor, accounting for 56.2% of total imports, followed by Malaysia (14.4%) and China (11.2%). Other notable suppliers include Thailand (7.9%) and South Korea (7.1%), with the rest of the world contributing 3.3%. Overall, imports are heavily reliant on Southeast Asian countries, particularly Vietnam, while exports are strongly concentrated toward the US market, indicating geographic concentration on both demand and supply sides.

Copper Coils

Copper coils are spiral-shaped or wound copper tubes or strips widely used in heat transfer and electrical applications. They are generally manufactured from high-purity copper such as Phosphorus-Deoxidized Copper (Cu-DHP / C12200) or Electrolytic Tough Pitch Copper (C11000), containing more than 99.9% copper. These materials provide excellent thermal conductivity, corrosion resistance, and mechanical flexibility. Copper coils are produced in various diameters and wall thickness depending on application requirements and are commonly supplied in annealed condition for easy bending and installation.

Because of their superior heat transfer capability and durability, copper coils are extensively used in HVAC systems, air conditioners, refrigeration units, heat exchangers, condensers, evaporators, and industrial cooling systems. Their ability to efficiently transfer heat while maintaining structural strength makes them one of the most reliable materials for thermal and fluid transfer applications.

4.3 Copper Busbar

Overview

Copper busbars are solid conductors made using high-conductivity electrolytic tough pitch (ETP) copper or oxygen-free copper. These rectangular or square cross-section bars are produced by casting copper into billets, followed by hot rolling or extrusion. The bars are then drawn, machined, or surface-finished to achieve precise dimensions and smooth conductivity paths. Attributes include exceptional electrical conductivity (~100% IACS), high thermal dissipation, mechanical robustness, bendability, and strong corrosion resistance.

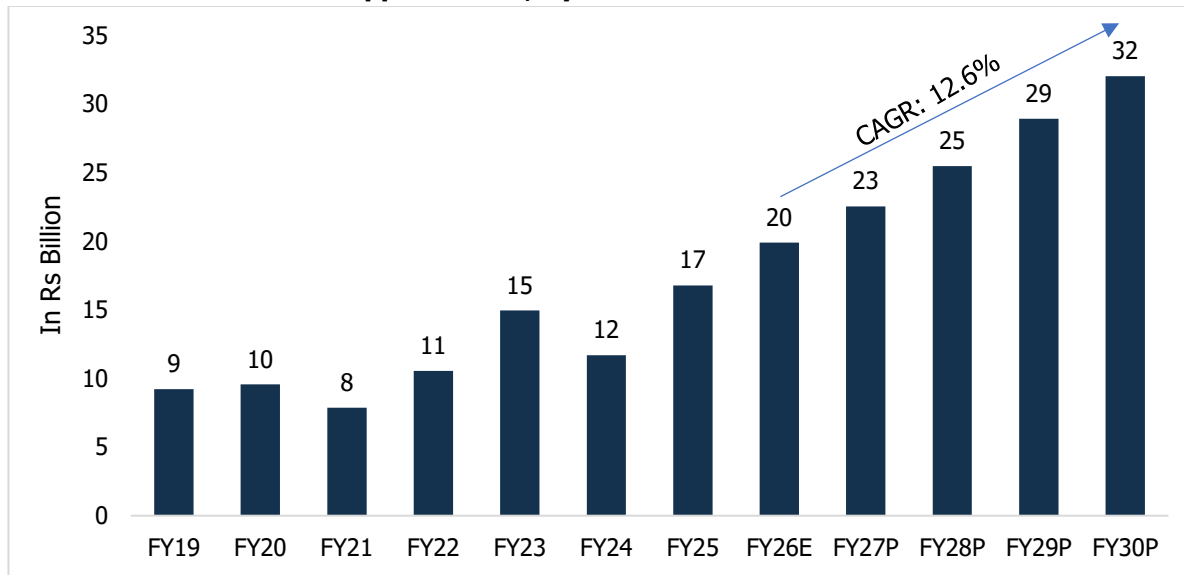
Busbars are critical components in power distribution equipment, switchgear, panel boards, substations, transformers, UPS systems, EV charging units, and renewable energy installations. Their large cross-section allows them to carry high currents with minimal power loss. Surface treatments such as tin, silver, or nickel plating enhance oxidation resistance and improve connection reliability.

Production

Busbar production grows in tandem with electrical infrastructure development. Historically, growth has been supported by expansion in power transmission & distribution networks, increased manufacturing of switchgear, and growth in industrial electrification. Manufacturers have upgraded to continuous casting and rolling (CCR) lines, precision milling machines, and automated bending systems to achieve higher dimensional accuracy and throughput.

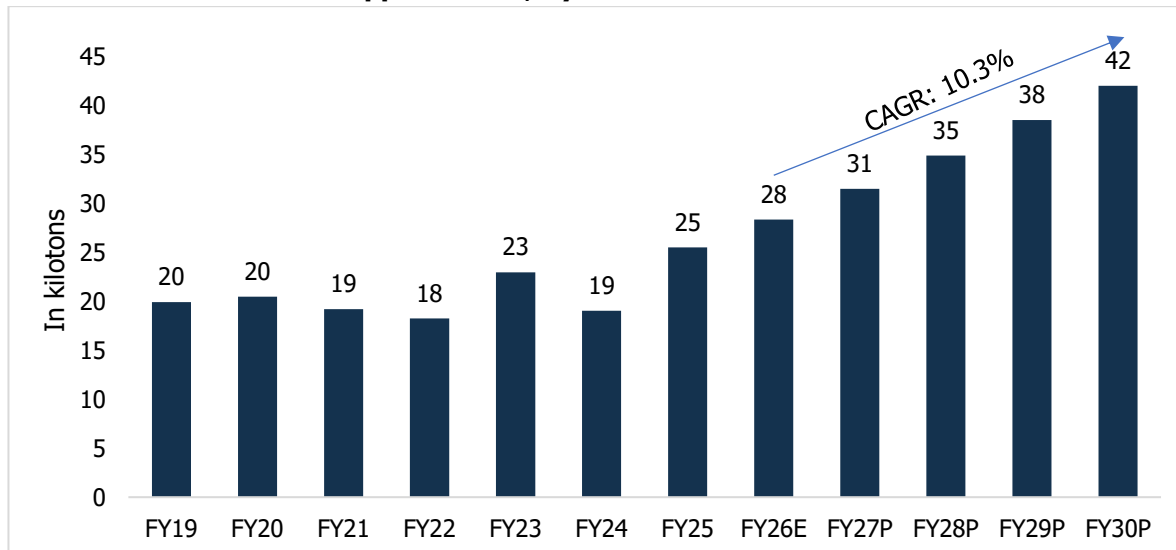
Future production will be shaped by increased investments in renewable energy integration, grid modernization, EV charging infrastructure, and smart substations. Growth in data centers, automation systems, and backup power architectures (UPS) will further increase production. Rising use of plated busbars tin or silver will push production of value-added grades.

Chart 69: Production of Copper Busbar, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 70: Production of Copper Busbar, By Volume



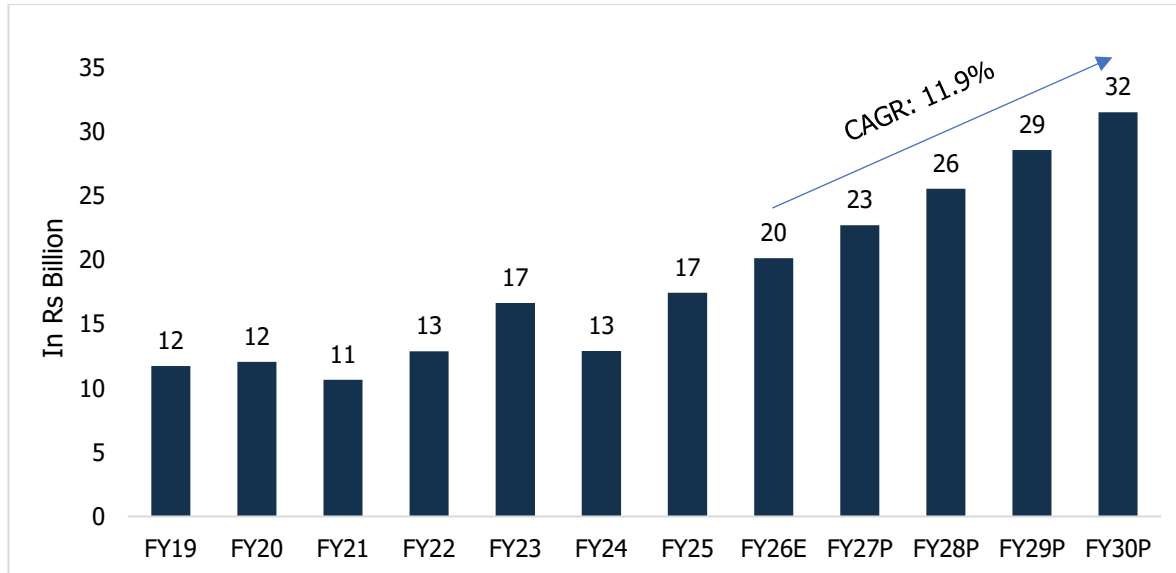
Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Consumption

Copper busbar consumption historically grew with the expansion of power infrastructure, industrial electrification, and commercial building installations. Demand from panel builders, transformer manufacturers, and control-equipment makers has been steady as industries broaden electrical automation.

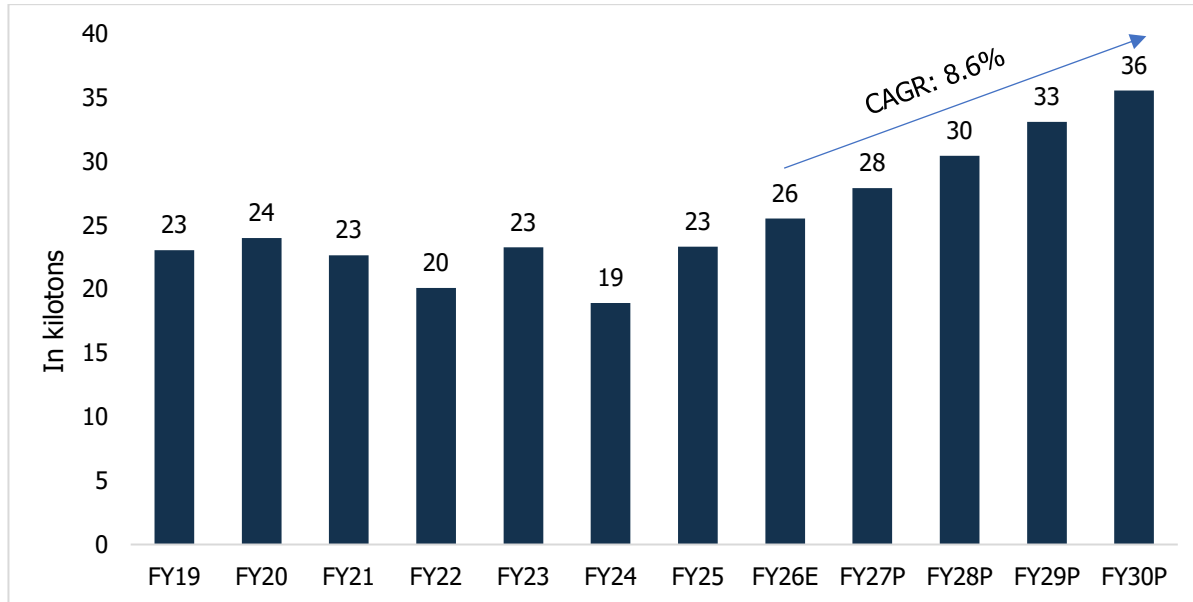
Future consumption will be driven heavily by renewable energy installations (solar/wind), energy-storage systems, EV charging networks, metro rail electrification, and data center expansion. As industries adopt smart grids and high-efficiency electrical panels, demand for premium-quality, machined, and plated busbars will rise. The shift toward higher-capacity substations and increased use of UPS systems in IT, telecom, and industrial automation will continue to strengthen consumption.

Chart 71: Consumption of Copper Busbar, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 72: Consumption of Copper Busbar, By Volume



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Consumption of Copper Busbar by top 10 Indian States (In value terms) (Rs Billion)

State Analysis	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26E	FY27P	FY28P	FY29P	FY30P
Maharashtra	1.47	1.50	1.33	1.60	2.07	1.60	2.14	2.45	2.73	3.04	3.36	3.67
Uttar Pradesh	1.03	1.06	0.94	1.14	1.48	1.15	1.59	1.88	2.17	2.50	2.86	3.22
Gujarat	0.97	1.00	0.88	1.07	1.38	1.07	1.46	1.69	1.92	2.18	2.45	2.72
Tamil Nadu	0.76	0.78	0.70	0.84	1.09	0.85	1.18	1.40	1.63	1.88	2.16	2.45
Karnataka	0.67	0.69	0.61	0.74	0.96	0.75	1.03	1.21	1.40	1.60	1.82	2.05
Telangana	0.65	0.67	0.59	0.72	0.93	0.72	0.99	1.15	1.31	1.49	1.69	1.88

West Bengal	0.65	0.66	0.58	0.70	0.90	0.70	0.91	1.01	1.11	1.20	1.30	1.38
Andhra Pradesh	0.60	0.62	0.54	0.66	0.85	0.66	0.89	1.03	1.16	1.30	1.46	1.61
Madhya Pradesh	0.57	0.58	0.52	0.62	0.80	0.62	0.82	0.93	1.04	1.15	1.26	1.37
Rajasthan	0.54	0.56	0.49	0.59	0.77	0.59	0.80	0.92	1.03	1.16	1.29	1.41
Others	3.83	3.93	3.47	4.19	5.42	4.20	5.64	6.46	7.23	8.07	8.95	9.77

Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

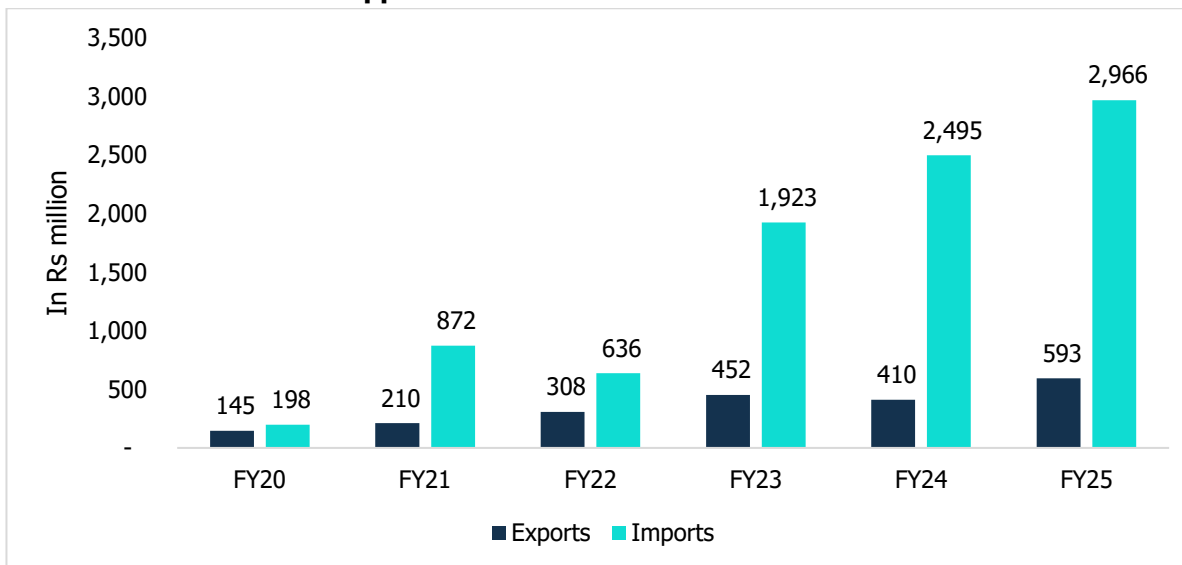
Trade Data

Trade trends for copper busbar indicate a sharp expansion in overall market activity over FY20–FY25, with imports growing at a significantly faster pace than exports. Exports have shown a steady upward trajectory across the period, reflecting gradual strengthening of India’s presence in overseas markets. While export volumes increased consistently, minor moderation in the middle of the period suggests sensitivity to global demand conditions and pricing cycles. The rebound and subsequent rise toward the end of the period indicate improved order inflows and sustained relevance of Indian producers in select export markets.

In contrast, imports have expanded very rapidly, accelerating sharply after FY21 and continuing to rise through FY25. This pronounced growth points to strong domestic demand for electrolytic and black copper rods, driven by expanding consumption in power transmission, electrical equipment, infrastructure, and manufacturing sectors. The faster growth in imports relative to exports suggests that domestic production capacity has not kept pace with demand, resulting in higher reliance on overseas suppliers. It may also reflect preferences for specific grades, specifications, or cost advantages offered by imported material.

Overall, the widening gap between imports and exports indicates increasing import dependence in this product segment despite improving export performance. The trend highlights a structurally strong domestic demand environment, alongside potential opportunities for capacity expansion, technology upgrades, and backward integration within India to reduce reliance on imports and better align domestic supply with growing market requirements.

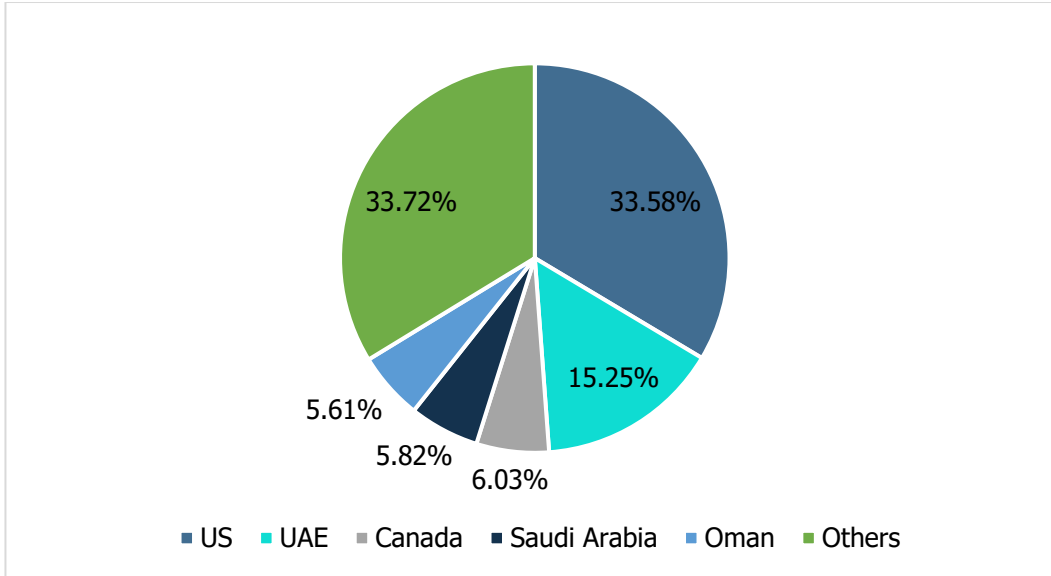
Chart 73: Trade Data of Copper Busbar



Source: Ministry of Commerce and Industry

Note: HSN code used is 7407; Includes copper busbar, copper rods, and copper alloy rods

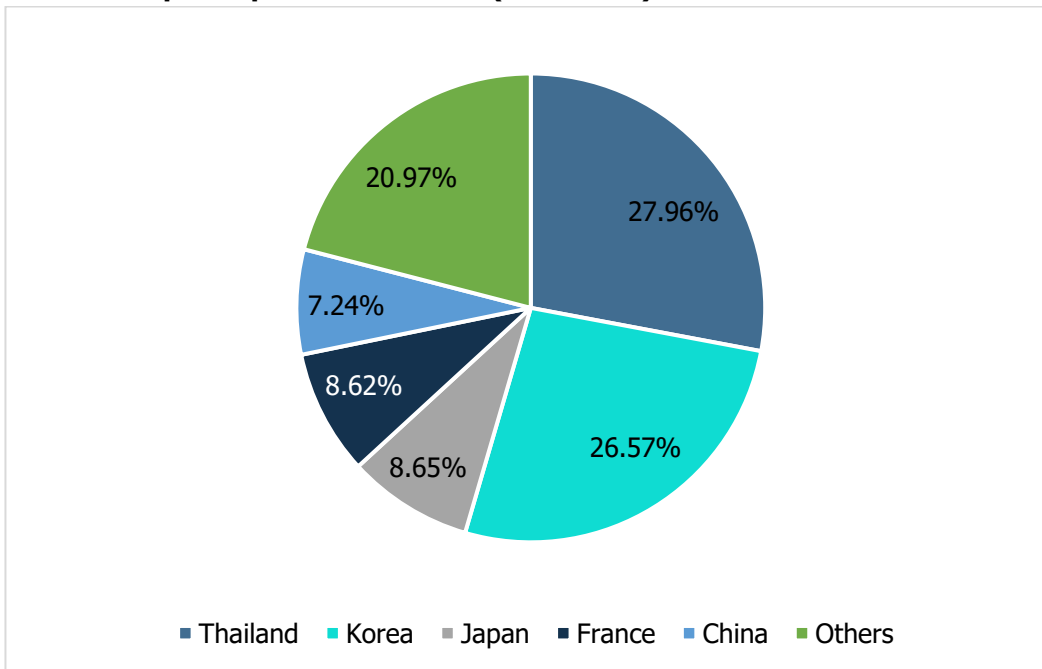
Chart 74: Top 5 Export Destinations (as of FY25)



Source: Ministry of Commerce and Industry

Note: HSN code used is 7407; Includes copper busbar, copper rods, and copper alloy rods

Chart 75: Top 5 Import Destinations (as of FY25)



Source: Ministry of Commerce and Industry

Note: HSN code used is 7407; Includes copper busbar, copper rods, and copper alloy rods

Major Trading Partners

The export profile as of FY25 is relatively diversified, with the United States emerging as the largest destination, accounting for 33.6% of total exports. This is followed by the UAE at 15.3%, highlighting strong demand from both North America and the Middle East. Other key markets include Canada (6.0%), Saudi Arabia (5.8%), and Oman (5.6%),

while a significant 33.7% share is distributed across various other countries, indicating a broad and well-spread export base without excessive dependence on a single region.

On the import side, sourcing is comparatively more concentrated, with Thailand (28.0%) and South Korea (26.6%) being the dominant suppliers, together accounting for over half of total imports. Additional contributions come from Japan (8.7%), France (8.6%), and China (7.2%), while the remaining 21.0% is sourced from other countries. Overall, imports exhibit a moderate concentration among key Asian and European suppliers, whereas exports are more geographically diversified across major global markets.

4.4 Copper Ingots

Overview

Copper ingots are cast blocks of refined copper produced either from primary smelting/refining or secondary (scrap-based) melting. Ingots typically have a purity of 99.5–99.9%, depending on production route. Manufacturing involves melting copper cathodes or scrap in induction or reverberatory furnaces, deoxidizing, removing impurities through fluxing/slagging, and casting into molds.

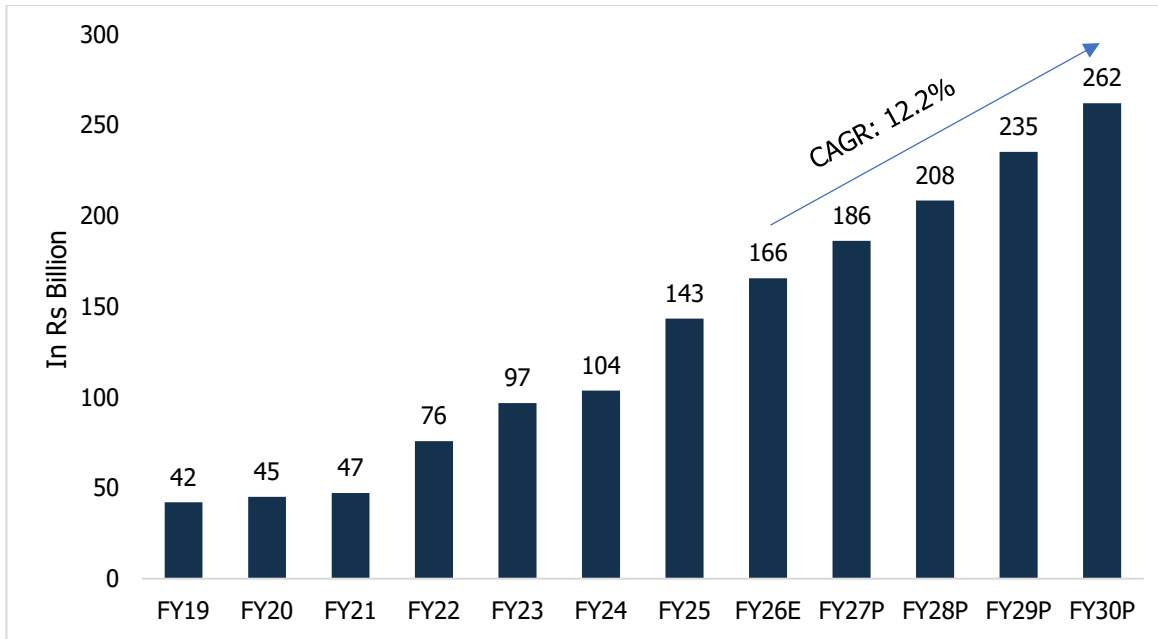
Ingots serve as intermediate feedstock for extrusion, forging, rolling, and alloying operations. They provide consistent chemical composition and controlled impurity levels suitable for production of rods, bars, pipes, sheets, and a wide range of brass/bronze alloys. Their attributes include high purity, good castability, uniform density, and suitability for remelting and downstream forming.

Production

Historically, production of copper ingots has been linked to scrap availability, downstream demand from extrusion/rolling mills, and domestic recycling infrastructure. Secondary producers play a large role in India, enabling cost-effective production of ingots from industrial scrap, obsolete scrap, and process reverts.

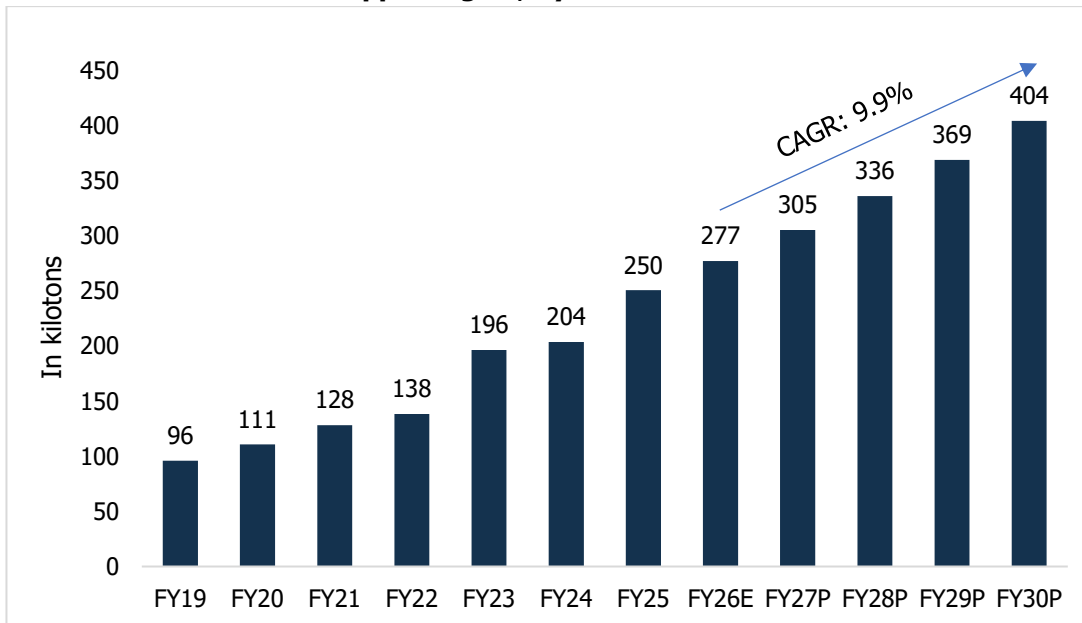
Future production growth will be driven by higher recycling rates, expansion of casting and extrusion facilities, and increased emphasis on circular economy policies. Government initiatives promoting scrap-based manufacturing and EPR regulations for non-ferrous metals will strengthen the secondary copper ingot industry. Rising copper demand in automobiles, electrical equipment, and renewable energy will indirectly support ingot production for alloying and forging applications.

Chart 76: Production of Copper Ingots, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 77: Production of Copper Ingots, By Volume



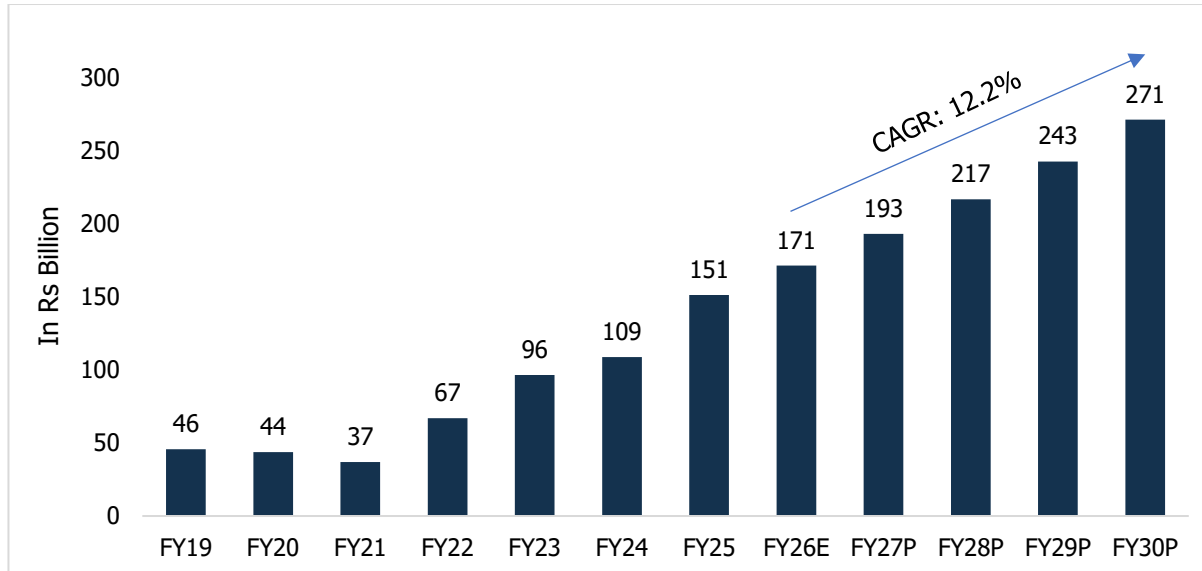
Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Consumption

Copper ingots are consumed by extrusion units, forging shops, rolling mills, and alloy manufacturers. Historically, consumption has been stable due to continuous demand for rods, profiles, brass/bronze alloys, and industrial castings. Their ease of handling and re-melting makes them ideal for small and medium non-ferrous foundries.

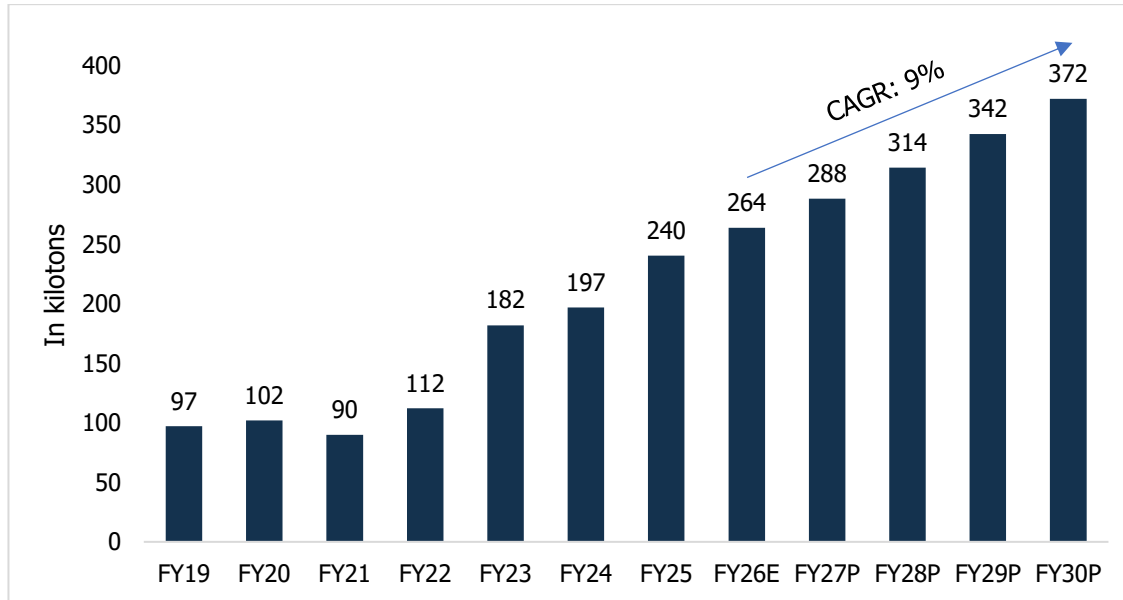
Looking ahead, consumption will increase with growth in key sectors such as electrical components, plumbing hardware, general engineering, and automotive parts. Expansion of alloy manufacturing especially brass and bronze will drive demand for ingots as a base feedstock. Higher demand for machined components, connectors, terminals, and fittings in EVs, power equipment, and electronics will also support consumption.

Chart 78: Consumption of Copper Ingots, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 79: Consumption of Copper Ingots, By Volume



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Consumption of Copper Ingots by top 10 Indian States (In value terms) (Rs Billion)

State Analysis	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26E	FY27P	FY28P	FY29P	FY30P
Maharashtra	6.3	5.9	4.9	8.7	12.3	13.6	19.0	21.6	24.4	27.5	30.9	34.6

Gujarat	4.6	4.4	3.7	6.6	9.4	10.4	14.7	16.9	19.3	22.0	25.0	28.3
Uttar Pradesh	3.8	3.6	3.0	5.5	7.8	8.8	12.5	14.6	16.8	19.3	22.2	25.4
Tamil Nadu	3.9	3.8	3.2	5.7	8.2	9.2	13.2	15.4	17.8	20.5	23.5	27.0
Andhra Pradesh	2.7	2.5	2.1	3.8	5.4	6.0	8.4	9.6	10.9	12.4	14.0	15.8
West Bengal	2.7	2.6	2.1	3.7	5.2	5.7	7.8	8.7	9.7	10.8	12.0	13.2
Telangana	2.3	2.2	1.9	3.3	4.8	5.3	7.5	8.7	9.9	11.3	12.9	14.7
Karnataka	2.2	2.1	1.7	3.1	4.5	5.0	7.1	8.2	9.5	10.9	12.4	14.2
Rajasthan	2.5	2.4	2.0	3.5	5.0	5.5	7.8	8.9	10.1	11.4	12.8	14.5
Madhya Pradesh	2.9	2.8	2.3	4.0	5.7	6.3	8.8	9.9	11.2	12.6	14.1	15.7
Others	11.7	11.6	10.1	19.0	28.3	32.9	44.4	48.9	53.4	58.1	62.9	67.8

Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

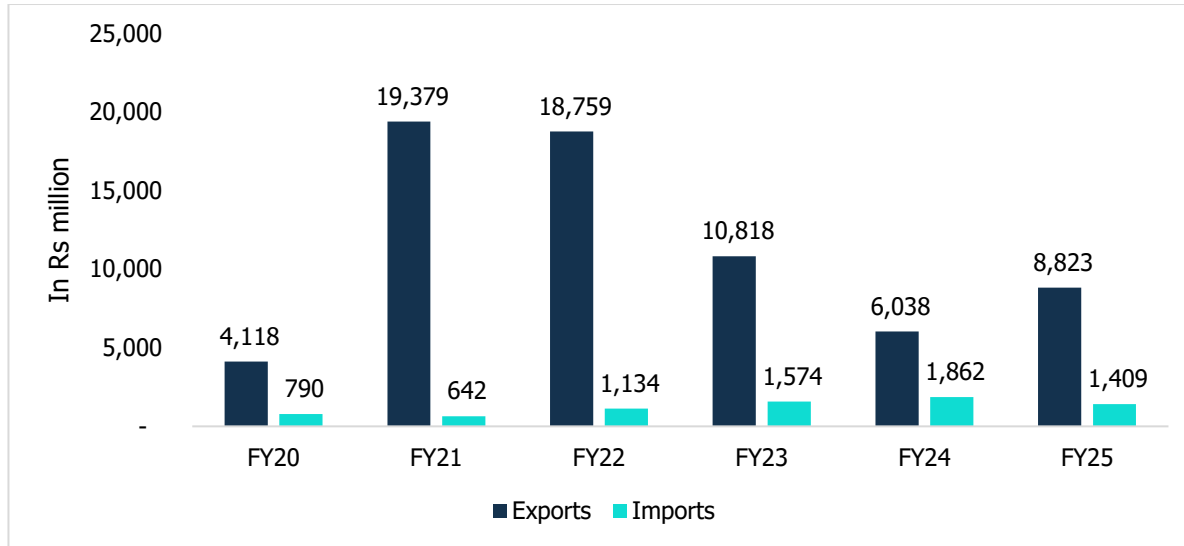
Trade Data

India's trade in copper ingots has exhibited a mixed trend over FY20–FY25, reflecting shifts in both export orientation and domestic demand dynamics. Exports surged sharply in the early part of the period, reaching a peak in the immediate years thereafter, which indicates strong overseas demand and ample exportable surplus during that phase. However, exports moderated in the subsequent years, suggesting a rebalancing of supply toward the domestic market, softer global demand conditions, or increased competition in international markets. The partial recovery toward the end of the period points to some stabilization, though export volumes remain below earlier highs.

Imports, on the other hand, have shown a gradual upward trend with intermittent fluctuations. The steady rise in imports over the period indicates increasing domestic consumption of refined copper billets, driven by downstream industries such as wire rods, conductors, and industrial components. The relatively consistent growth in imports, despite declining exports in the middle years, suggests that domestic demand absorption has strengthened, potentially limiting export availability.

Overall, the trade pattern reflects a transition from an export-led phase toward a more balanced market structure. While India continues to maintain an export presence in refined copper billets, rising imports highlight growing domestic requirements and underscore the need for capacity optimization and efficiency improvements to better align production with evolving demand conditions.

Chart 80: Trade Data of Copper Ingots

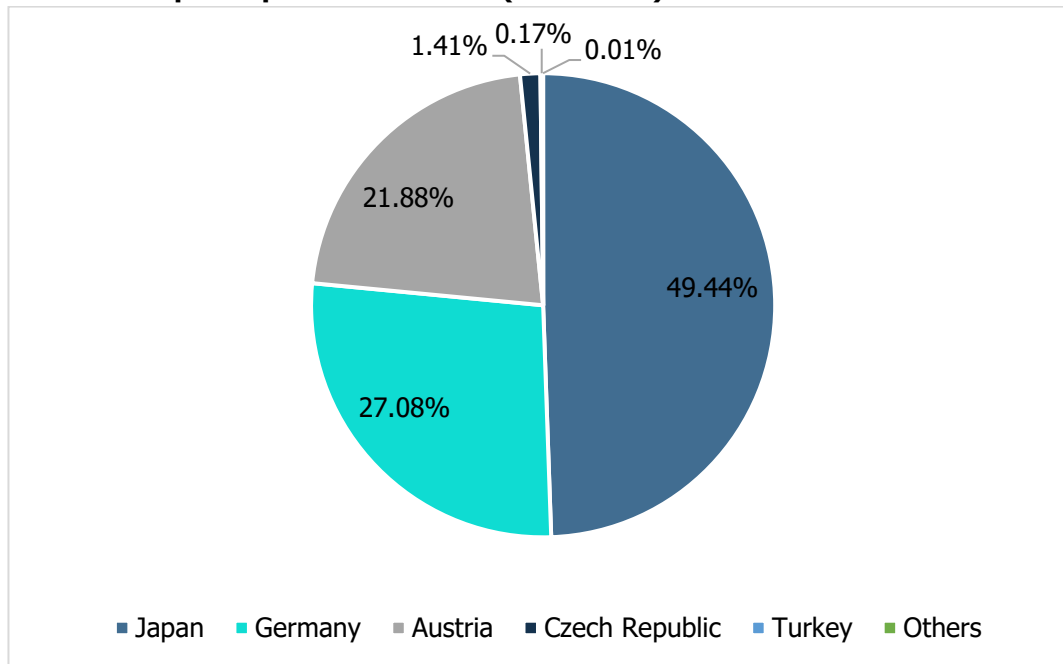


Source: Ministry of Commerce and Industry

Note: HSN code used is 74031300

The top exporter destinations are China and USA with China holding close to 100% of the share.

Chart 81: Top 5 Import Destinations (as of FY25)



Source: Ministry of Commerce and Industry

Note: HSN code used is 74031300

Major Trading Partners

The export market is concentrated, with China dominating as the primary destination, accounting for nearly 100% of total exports, while the United States holds only a marginal share. This indicates an extreme dependence on a single export market, exposing trade flows to significant concentration risk and demand-side fluctuations from China.

On the import side, sourcing is relatively concentrated among a few key developed economies. Japan is the largest supplier, contributing 49.4% of total imports, followed by Germany at 27.1% and Austria at 21.9%. Together, these three countries account for over 98% of total imports, highlighting a very high supplier concentration. Minor contributions come from the Czech Republic (1.4%) and Turkey (0.2%), while other countries have a negligible share. Overall, both exports and imports exhibit high concentration, with exports heavily reliant on China and imports dependent on a few advanced manufacturing economies.

4.5 Copper Rods

Overview

Copper rods are semi-finished long products manufactured primarily from high-purity ETP copper (C11000), with some applications requiring oxygen-free grades. They are typically produced through continuous casting and rolling (CCR), where molten copper is cast into billets or continuously cast into strands, which are then hot-rolled into rods of 8 mm or higher diameters. The rods may undergo additional processes such as cleaning, straightening, and surface finish improvements.

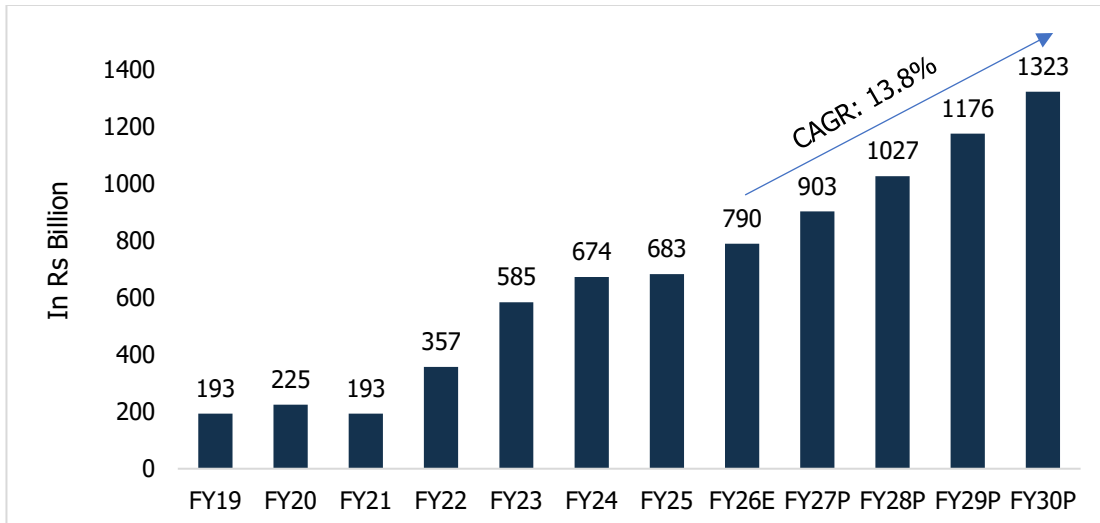
Copper rods offer exceptional electrical conductivity, good thermal conductivity, ductility, corrosion resistance, and uniform grain structure. Their consistent mechanical properties make them suitable for downstream drawing into wires, busbars, and profiles. They are also used directly in grounding applications, fasteners, transformer components, connectors, and engineering parts.

Production

Historically, production of copper rods has been shaped by rising demand for power cables, transformer windings, and industrial wiring. The adoption of CCR plants has enabled high-efficiency production with lower energy use and improved product uniformity, supporting scale-up among major manufacturers. Secondary producers using scrap-based melting-casting routes have also contributed to supply.

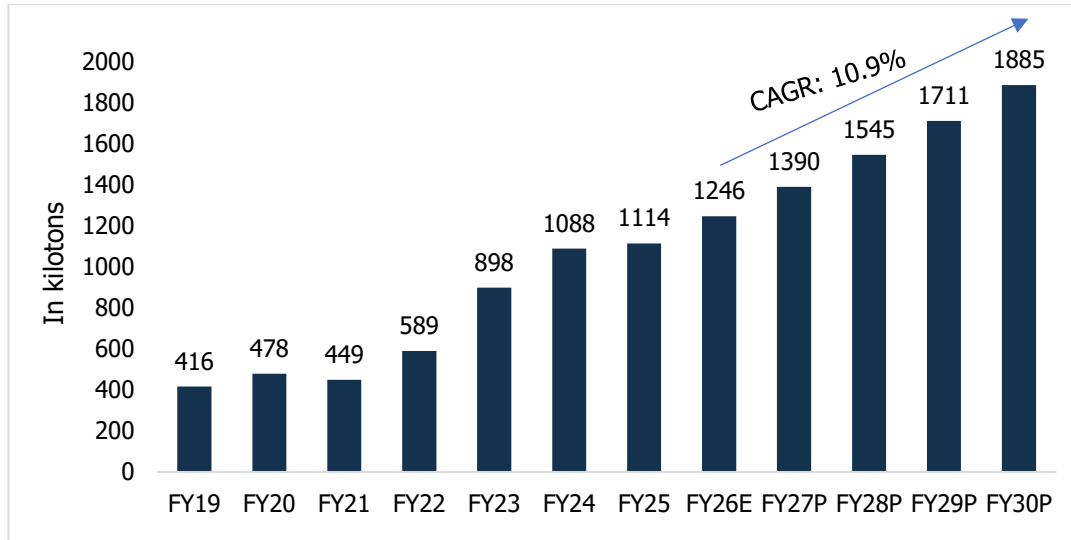
Looking ahead, copper rod production is expected to expand due to growth in renewable energy, grid modernization, housing, and electric mobility. Higher demand for drawn wires, magnet wires, and EV harness wires will indirectly drive rod production. Increasing domestic manufacturing of appliances, electronics, motors, and charging infrastructure will also boost output. Scrap availability and clean-energy policies promoting recycling will support additional capacity expansion.

Chart 82: Production of Copper Rods, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 83: Production of Copper Rods, By Volume



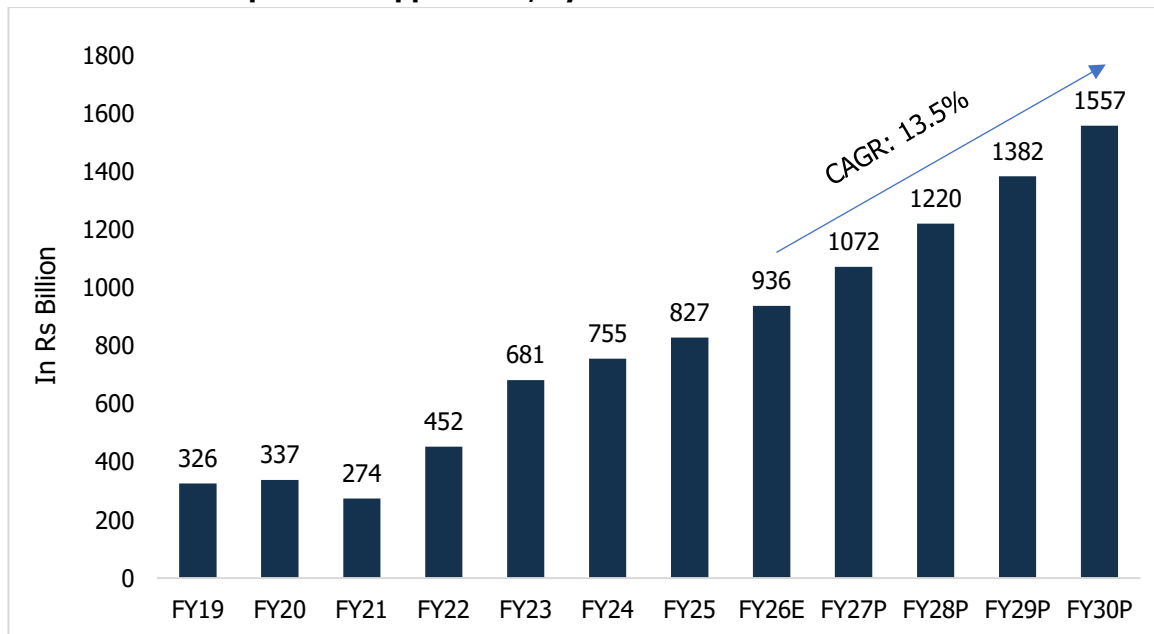
Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Consumption

Copper rods are consumed primarily by wire drawing units, cable manufacturers, and electrical machinery makers. Historically, consumption has grown due to power sector expansion, rural electrification, construction activity, and telecom wiring needs.

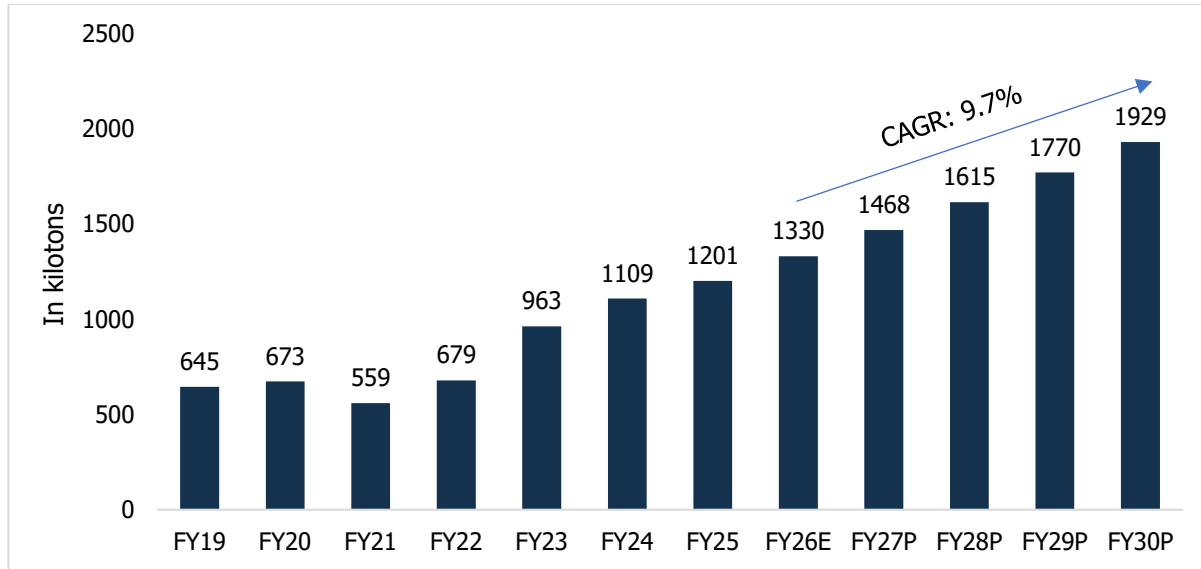
Future consumption growth will come from EVs, renewable-energy installations, smart grid technologies, and automation. The shift toward energy-efficient motors and equipment, along with rising demand for building wiring, communication cables, and industrial connectors, will further strengthen rod consumption. Expansion of EV charging networks, transformers, and data centers will add to demand for high-quality copper rod feedstock.

Chart 84: Consumption of Copper Rods, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 85: Consumption of Copper Rods, By Volume



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Consumption of Copper Rods by top 10 Indian States (In value terms) (Rs Billion)

State Analysis	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26E	FY27P	FY28P	FY29P	FY30P
Maharashtra	43.22	44.24	35.46	57.89	86.20	94.33	102.52	115.01	130.46	147.23	165.39	184.59
Gujarat	29.86	31.15	25.45	42.35	64.28	71.69	79.01	89.89	103.40	118.34	134.82	152.60
Uttar Pradesh	24.61	26.17	21.78	36.93	57.11	64.90	72.52	83.65	97.57	113.22	130.78	150.08
Tamil Nadu	20.98	22.40	18.73	31.91	49.57	56.60	63.46	73.46	85.97	100.10	116.02	133.61
Karnataka	17.58	18.60	15.41	26.01	40.03	45.28	50.42	57.96	67.37	77.91	89.69	102.57
Telangana	17.19	18.02	14.79	24.73	37.71	42.26	46.74	53.36	61.59	70.74	80.86	91.85
Andhra Pradesh	17.26	17.88	14.51	23.97	36.12	40.00	43.85	49.63	56.79	64.66	73.27	82.50
West Bengal	19.77	19.70	15.37	24.43	35.42	37.73	40.21	44.23	49.20	54.45	59.98	65.65
Madhya Pradesh	17.21	17.49	13.92	22.56	33.34	36.22	39.16	43.70	49.30	55.35	61.85	68.66
Rajasthan	15.01	15.48	12.49	20.54	30.81	33.96	37.10	41.84	47.71	54.13	61.13	68.59

Others	103.0 0	106.2 6	85.77	140.8 7	210.8 4	231.6 8	252.3 7	283.6 3	322.1 3	363.7 9	408.7 0	455.9 4
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Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

4.6 Copper Alloy Rods

Overview

Copper alloy rods include brass rods (copper–zinc alloys), bronze rods (copper–tin or copper–phosphorus alloys), and other specialty alloys containing aluminum, nickel, or silicon. They are produced by melting alloying elements in precise proportions, followed by casting into billets or direct continuous casting. These billets are then extruded, hot-rolled, or drawn into rods of various diameters.

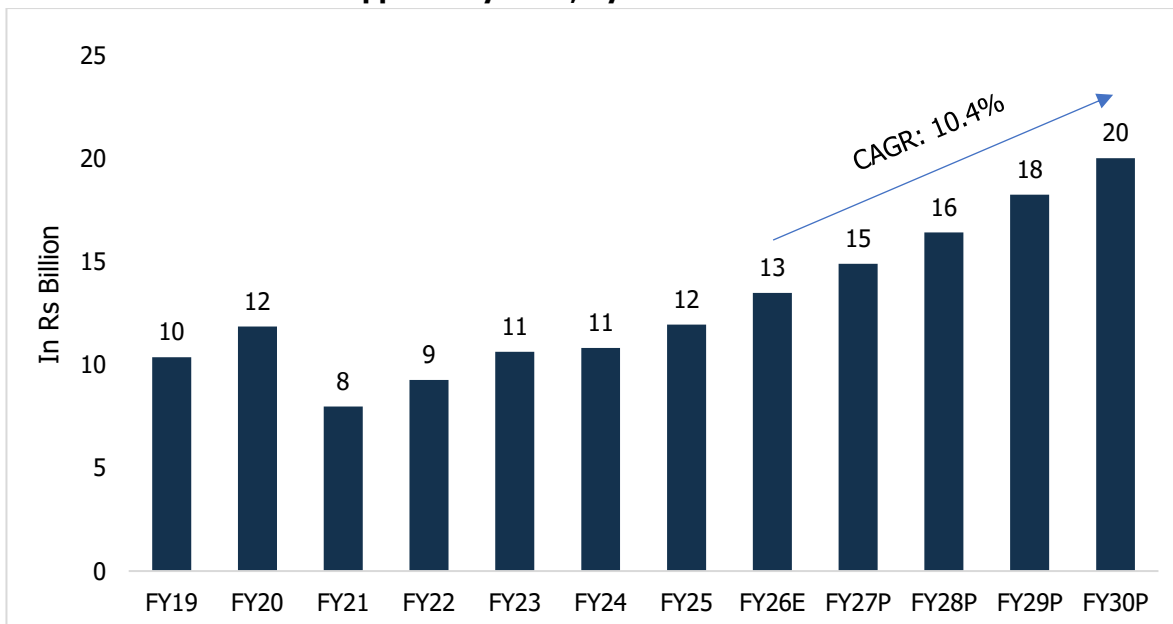
Their attributes include higher strength than pure copper, excellent machinability (especially free-cutting brass), good corrosion resistance, and suitability for precision components. These rods are used to manufacture valves, fittings, fasteners, electrical connectors, bearings, bushings, decorative items, and marine hardware. Alloy selection is based on conductivity, tensile strength, corrosion resistance, and machining behavior.

Production

Historically, alloy rod production has followed demand from plumbing fittings, electrical components, hardware manufacturing, and auto parts. Foundries and extrusion units rely heavily on secondary metals such as copper scrap, zinc scrap, and alloying materials. Upgrades to continuous casting and induction melting have improved yield and surface quality.

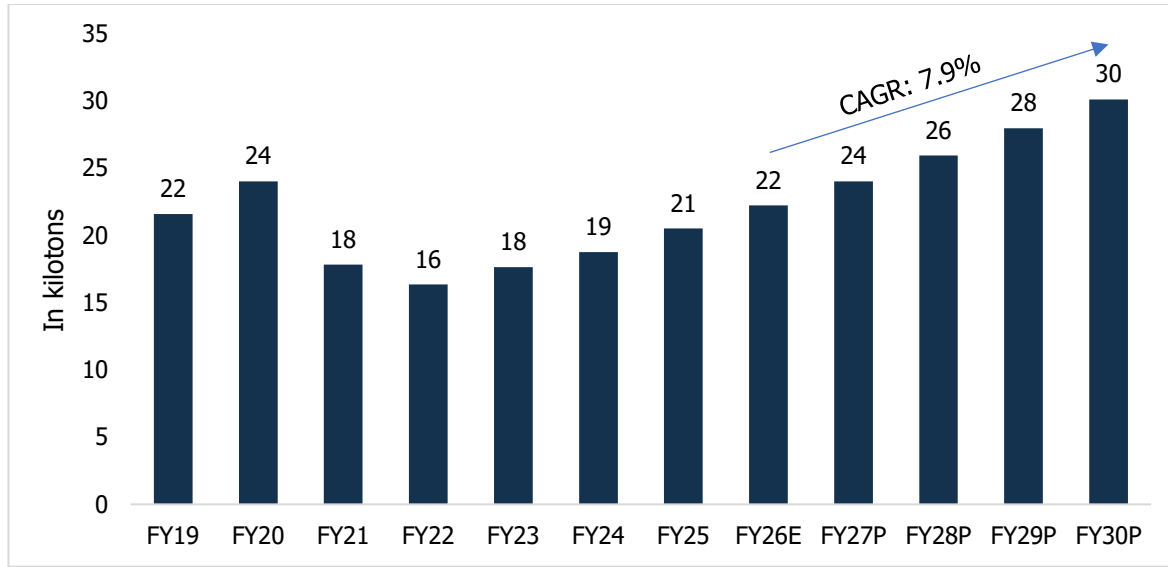
In the future, production will be driven by industrial hardware, automotive connectors, EV components, and precision-machined parts. Regulations encouraging recycling and the use of secondary metals will also support alloy rod production. Growth in the pump, valve, and sanitation industries especially under infrastructure expansion will sustain production of brass rods and bronze rods.

Chart 86: Production of Copper Alloy Rods, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 87: Production of Copper Alloy Rods, By Volume



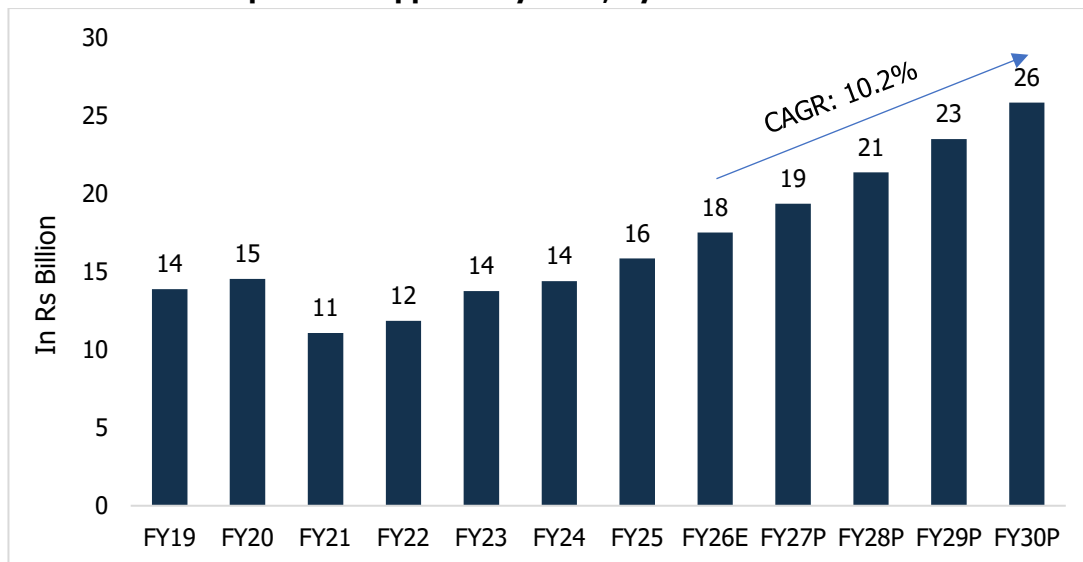
Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Consumption

Consumption of copper alloy rods historically increased due to demand for plumbing hardware, electrical connectors, fasteners, and industrial equipment. Brass rods dominate because of their machinability, making them preferred for high-speed turning components in large-volume manufacturing.

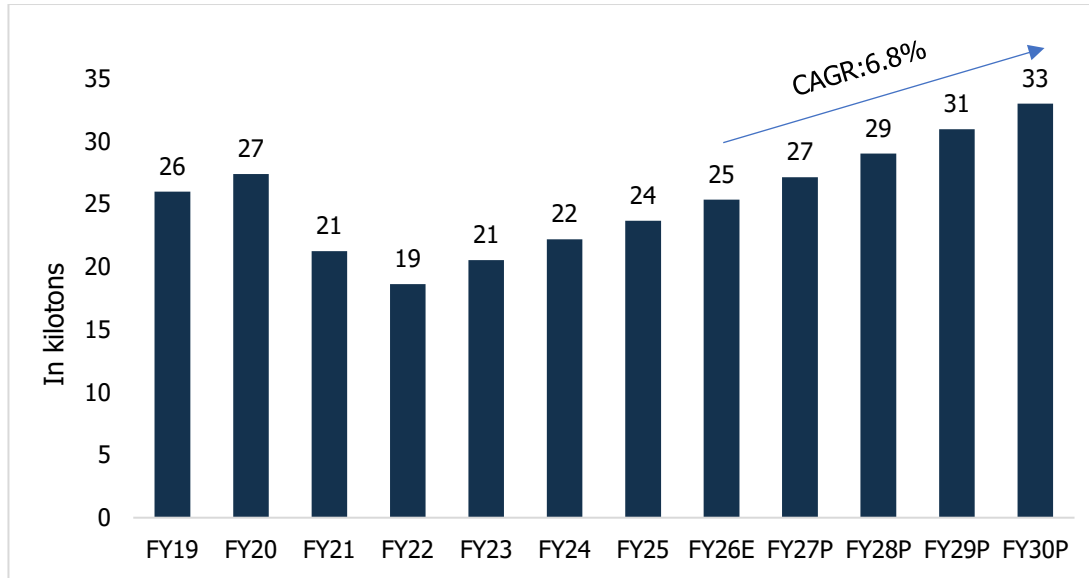
Future consumption will grow with expansion in automotive electronics, EV charging systems, industrial valves, water infrastructure, and electrical components. Rising demand for precision components, smart meters, renewable-energy hardware, and miniaturized electronic parts will also support consumption. Growth in construction and urban water supply projects will continue driving use of brass fittings and valves.

Chart 88: Consumption of Copper Alloy Rods, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 89: Consumption of Copper Alloy Rods, By Volume



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Consumption of Copper Alloy Rods by top 10 Indian States (In value terms) (Rs Billion)

State Analysis	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26E	FY27P	FY28P	FY29P	FY30P
Maharashtra	1.78	1.86	1.41	1.51	1.76	1.84	2.01	2.20	2.42	2.65	2.89	3.15
Gujarat	1.34	1.41	1.07	1.15	1.33	1.40	1.54	1.71	1.90	2.11	2.33	2.57
Uttar Pradesh	1.21	1.27	0.97	1.04	1.21	1.26	1.41	1.58	1.78	1.99	2.23	2.49
Tamil Nadu	1.05	1.11	0.84	0.90	1.05	1.10	1.23	1.39	1.57	1.76	1.97	2.21
Karnataka	0.85	0.89	0.67	0.72	0.84	0.88	0.98	1.10	1.23	1.38	1.53	1.71
Telangana	0.79	0.83	0.63	0.68	0.79	0.82	0.91	1.01	1.13	1.26	1.39	1.54
Andhra Pradesh	0.75	0.79	0.60	0.64	0.74	0.78	0.86	0.95	1.05	1.15	1.27	1.40
West Bengal	0.71	0.75	0.57	0.61	0.70	0.73	0.79	0.85	0.92	0.99	1.07	1.15
Madhya Pradesh	0.68	0.71	0.54	0.58	0.67	0.70	0.77	0.84	0.92	1.00	1.09	1.18
Rajasthan	0.64	0.67	0.51	0.54	0.63	0.66	0.73	0.80	0.88	0.97	1.06	1.17
Others	4.07	4.27	3.24	3.47	4.03	4.22	4.61	5.07	5.57	6.10	6.66	7.27

Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

4.7 Brass Tubes and Pipes

Overview

Brass tubes and pipes are manufactured from copper–zinc alloys with zinc content typically between 5–40%. Common grades include admiralty brass, naval brass, and dezincification-resistant (DZR) brass. Production involves casting brass billets, followed by hot extrusion, cold drawing, straightening, annealing, and surface finishing. Seamless brass tubes are produced using solid billets, while welded tubes use brass strips formed and welded.

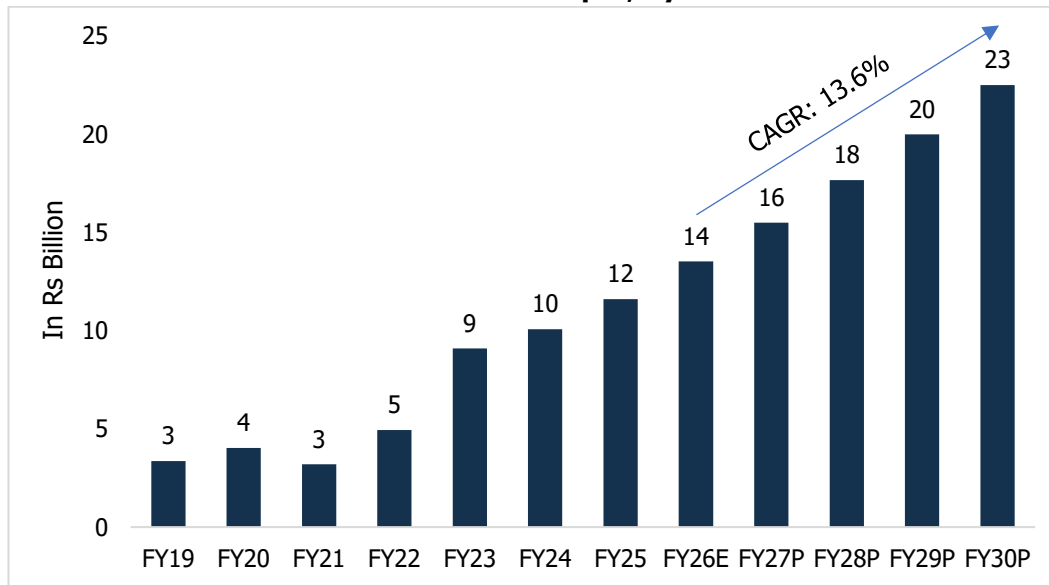
Brass tubes offer excellent corrosion resistance, good thermal conductivity, strength, and formability. They are widely used in heat exchangers, condensers, plumbing systems, bathroom fittings, refrigeration units, instrumentation lines, and decorative applications. Their resistance to seawater corrosion makes them suitable for marine and condenser applications.

Production

Historically, brass tube production has grown with refrigeration, plumbing, heat exchanger manufacturing, and industrial equipment sectors. The adoption of extrusion presses and multi-stage cold-drawing lines improved dimensional accuracy and mechanical properties. Availability of brass scrap and alloying materials supported consistent production.

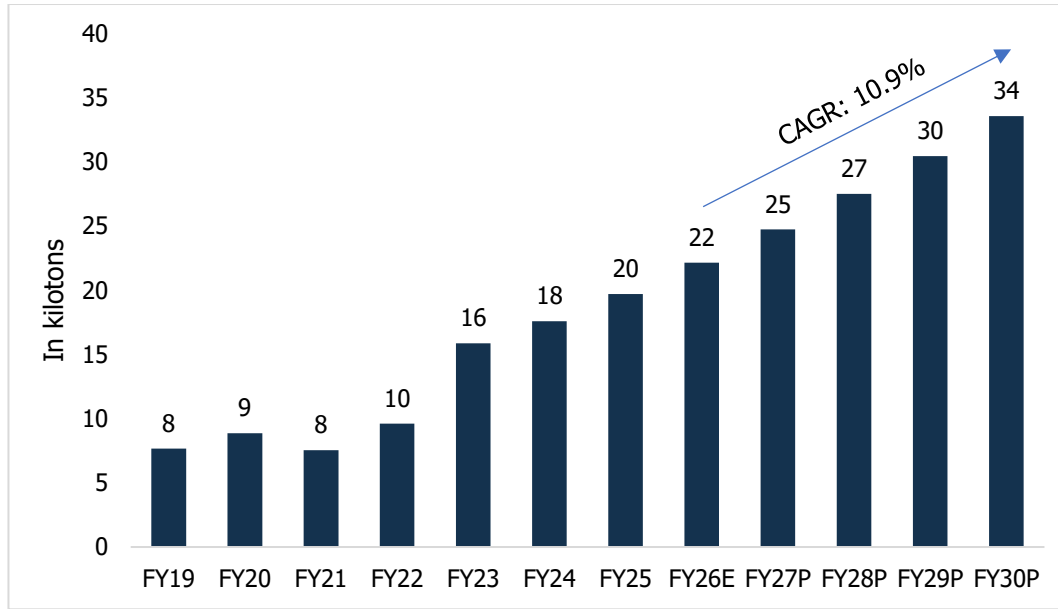
Future production will rise due to growth in HVAC systems, marine equipment, renewable-energy cooling systems, and industrial heat exchangers. The push for energy-efficient refrigeration, expansion of water infrastructure, and replacement of old plumbing systems will support additional capacity. Rising exports of condenser tubes and instrumentation tubes from India will further incentivize investment.

Chart 90: Production of Brass Tubes and Pipes, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 91: Production of Brass Tubes and Pipes, By Volume



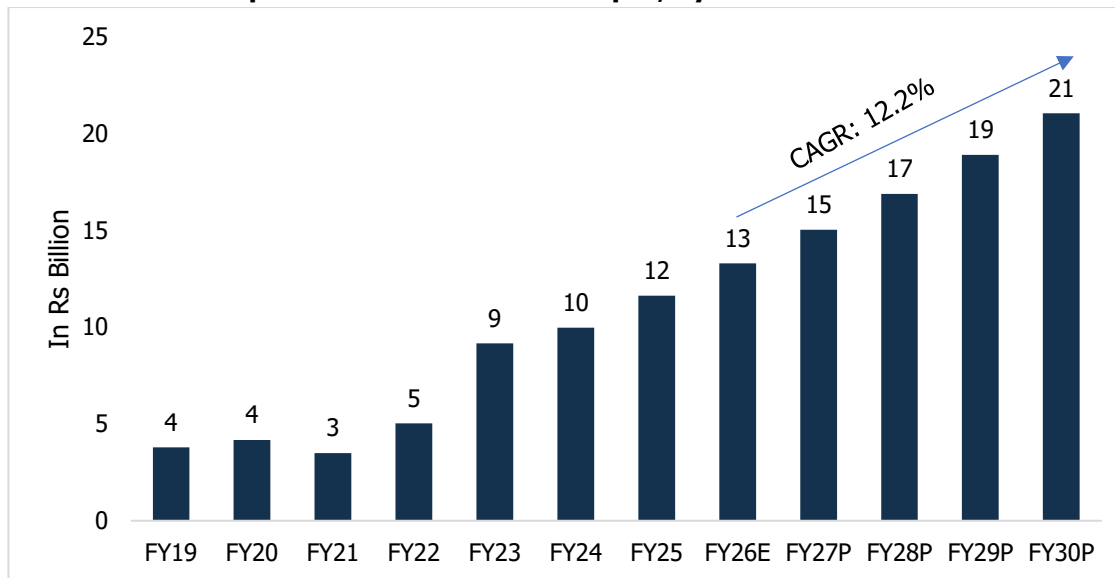
Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Consumption

Brass tubes and pipes are extensively consumed by plumbing hardware makers, HVAC and refrigeration manufacturers, heat exchanger fabricators, and automobile component makers. Historically, consumption has grown with construction, sanitary fittings, refinery equipment, and industrial cooling systems.

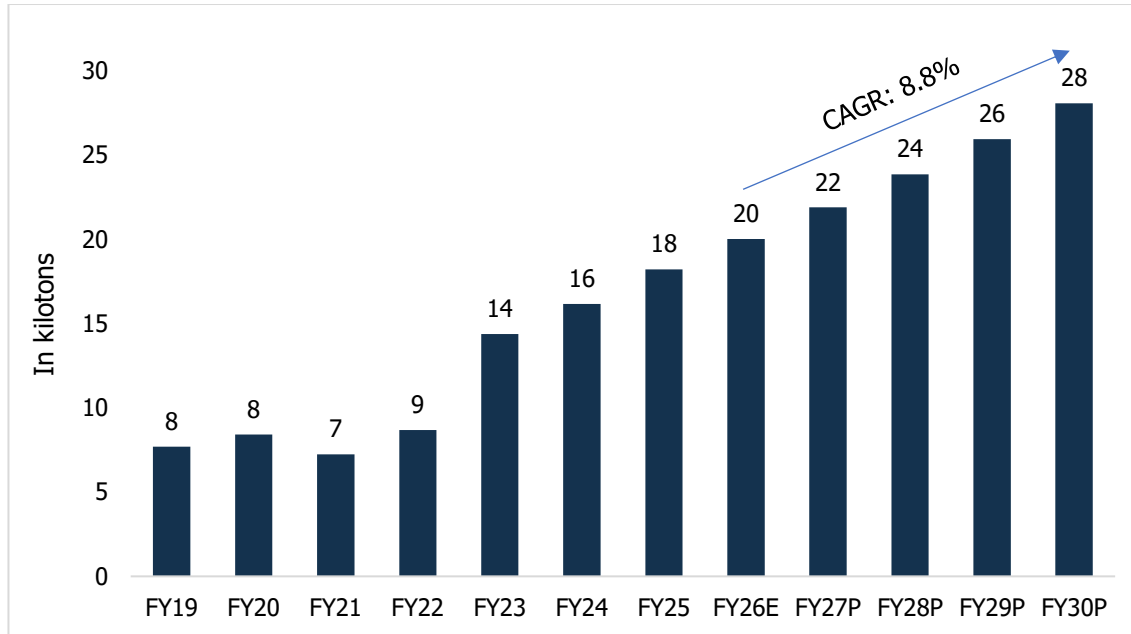
Going forward, consumption will be driven by increased urbanization, rising HVAC penetration, industrial expansion, marine equipment demand, and infrastructure upgrades. The shift toward energy-efficient cooling, expansion of petrochemical and power plants, and growth in automotive radiators and heat exchangers will further boost consumption. Decorative and architectural applications will also support steady demand.

Chart 92: Consumption of Brass Tubes and Pipes, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 93: Consumption of Brass Tubes and Pipes, By Volume



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Consumption of Brass Tubes and Pipes by top 10 Indian States (In value terms) (Rs Billion)

State Analysis	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26E	FY27P	FY28P	FY29P	FY30P
Maharashtra	0.51	0.55	0.46	0.65	1.17	1.25	1.45	1.64	1.84	2.05	2.27	2.51
Uttar Pradesh	0.30	0.34	0.29	0.43	0.81	0.91	1.08	1.26	1.45	1.66	1.90	2.15
Gujarat	0.30	0.33	0.28	0.41	0.74	0.82	0.96	1.10	1.25	1.41	1.59	1.78
Tamil Nadu	0.23	0.26	0.22	0.33	0.63	0.71	0.84	0.99	1.14	1.31	1.51	1.72
West Bengal	0.27	0.29	0.23	0.32	0.56	0.58	0.65	0.73	0.80	0.87	0.95	1.02
Andhra Pradesh	0.22	0.24	0.20	0.29	0.52	0.57	0.66	0.76	0.86	0.96	1.08	1.20
Telangana	0.18	0.21	0.17	0.25	0.47	0.52	0.61	0.70	0.80	0.91	1.03	1.15
Haryana	0.22	0.24	0.19	0.27	0.47	0.50	0.57	0.64	0.70	0.77	0.85	0.92
Karnataka	0.16	0.18	0.15	0.23	0.42	0.47	0.55	0.64	0.74	0.85	0.96	1.09
Rajasthan	0.17	0.19	0.16	0.22	0.41	0.44	0.51	0.58	0.65	0.73	0.82	0.91
Others	1.23	1.35	1.13	1.63	2.96	3.21	3.73	4.25	4.78	5.34	5.95	6.58

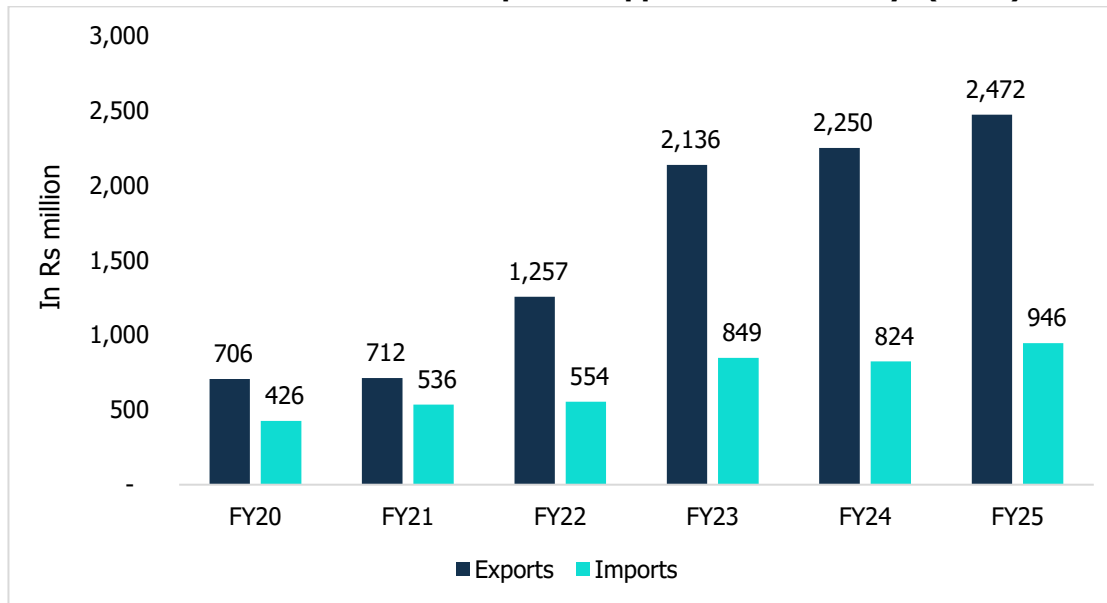
Trade Data

India’s trade in tubes and pipes of copper–zinc base alloys (brass) has shown a clear growth trend over FY20–FY25, supported by expanding demand across industrial, construction, plumbing, and engineering applications. Exports have increased steadily over the period, with a marked acceleration from the middle years onward. The consistent rise and sustained momentum in the later years indicate strengthening global demand for Indian brass tubes and pipes, aided by competitive manufacturing costs, product acceptance in export markets, and growth in downstream industries such as HVAC, automotive components, and general engineering.

Imports have also trended upward, though at a comparatively moderate pace. The gradual increase in imports suggests rising domestic consumption, reflecting growth in end-use sectors that require specialized grades or dimensions. However, the slower growth in imports relative to exports indicates improving domestic production capabilities and a growing ability of Indian manufacturers to cater to both local and international markets.

Overall, the parallel growth in exports and imports points to a structurally expanding market for brass tubes and pipes. The faster expansion in exports highlights India’s increasing integration into global value chains for copper alloy products, while the continued, but contained, rise in imports underscores ongoing domestic demand growth alongside improving self-sufficiency in this segment.

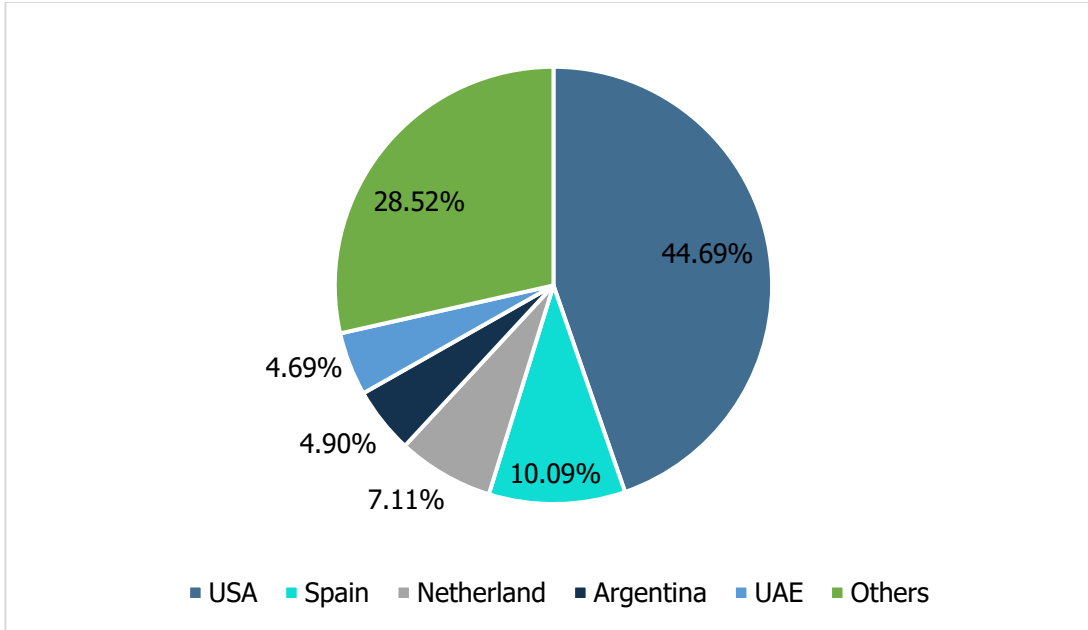
Chart 94: Trade Data of Tubes and Pipes of Copper–Zinc Base Alloys (Brass)



Source: Ministry of Commerce and Industry

Note: HSN code used is 74112100

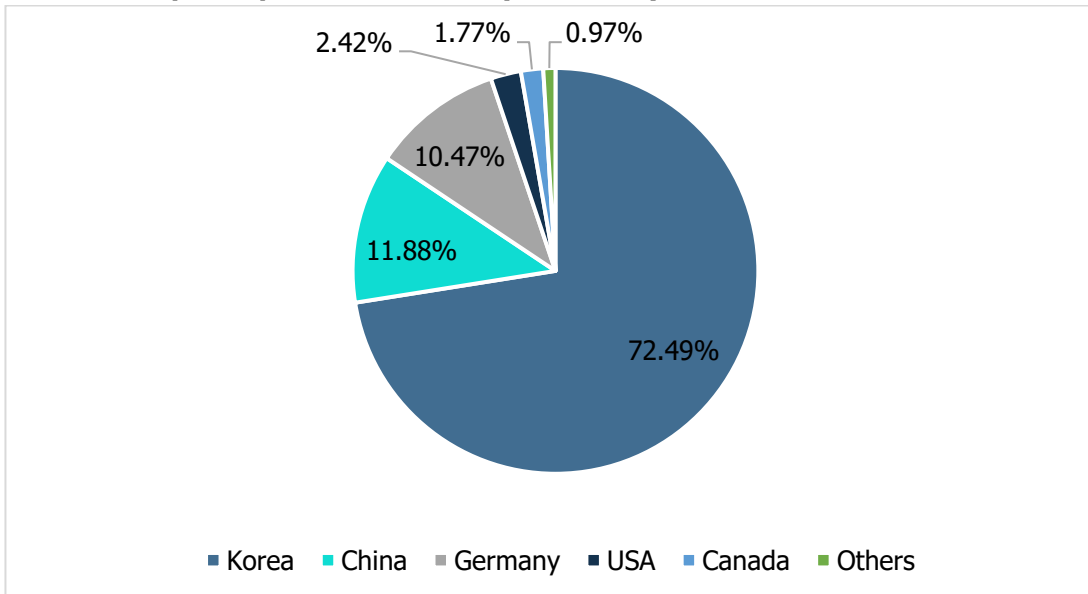
Chart 95: Top 5 Export Destinations (as of FY25)



Source: Ministry of Commerce and Industry

Note: HSN code used is 74112100

Chart 96: Top 5 Import Destinations (as of FY25)



Source: Ministry of Commerce and Industry

Note: HSN code used is 74112100

Major Trading Partners

The export profile is moderately diversified, with the United States emerging as the largest destination, accounting for 44.7% of total exports in FY25. Other key markets include Spain (10.1%), the Netherlands (7.1%), Argentina (4.9%), and the UAE (4.7%), while a substantial 28.5% share is distributed across various other countries. This indicates a strong presence in North America and Europe, with a reasonably broad export base beyond the top destination.

On the import side, sourcing is highly concentrated, with South Korea dominating at 72.5% of total imports, reflecting significant reliance on a single supplier. Other contributors include China (11.9%) and Germany (10.5%), while USA (2.4%) and Canada (1.8%) hold relatively minor shares. The remaining 1.0% is sourced from other countries. Overall, imports show a high degree of concentration, particularly toward South Korea, whereas exports are comparatively more diversified across multiple regions.

4.8 Master Alloys of Copper

Overview

Copper master alloys are highly concentrated alloying mixtures created by combining copper with elements such as chromium, zirconium, boron, phosphorus, manganese, or aluminum. These alloys are used as controlled additive carriers in the production of final copper-based or aluminum-based alloys. Master alloys ensure precise composition control, improve melting efficiency, and enhance mechanical and electrical properties of the finished product.

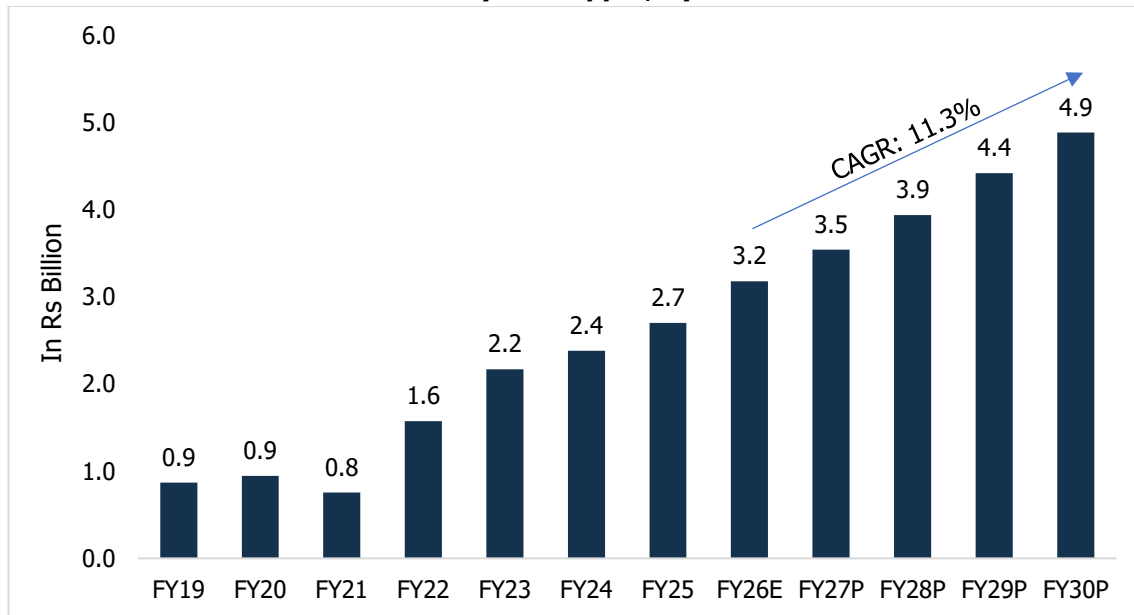
Manufacturing involves melting copper with alloying elements in controlled furnaces, casting the melt into ingots, waffle plates, notched bars, or granules, and ensuring uniform distribution of alloying elements. Their attributes include high purity, stable chemistry, improved deoxidation capability, enhanced grain structure, and compatibility with modern casting systems. They play an essential role in creating specialized copper alloys for electrical, mechanical, and high-temperature applications.

Production

Historically, production of copper master alloys has been driven by growth in downstream industries such as electrical components, high-performance copper alloys, brass/bronze foundries, and specialized engineering applications. Producers invested in advanced induction furnaces and refining processes to maintain strict metallurgical quality, as even small deviations in composition affect final alloy performance.

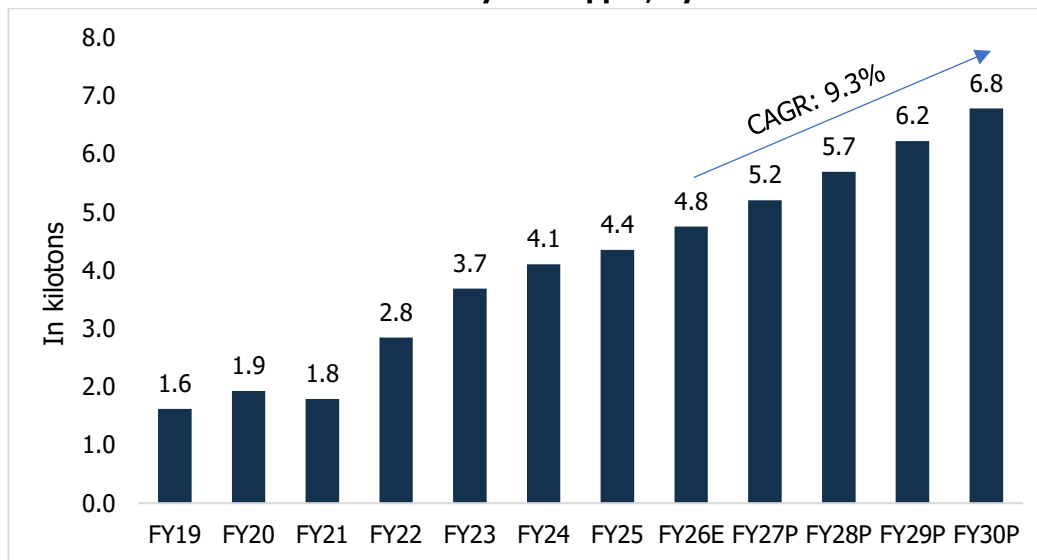
Future production growth will be supported by rising adoption of high-conductivity alloys for EV components, advanced electronics, renewable energy systems, and industrial equipment. The push for lighter, stronger materials in transportation and aerospace industries will also increase demand for specialty copper alloys and consequently for master alloys. Recycling and clean-metal initiatives will further contribute to stable production streams.

Chart 97: Production of Master Alloys of Copper, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 98: Production of Master Alloys of Copper, By Volume



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

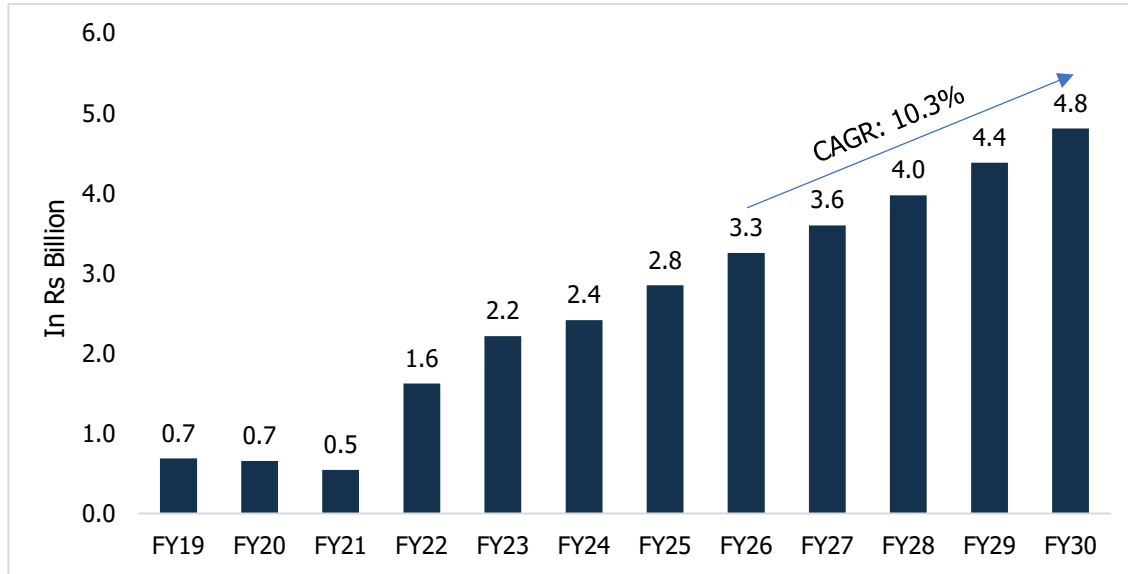
Consumption

Master alloys are consumed by copper and aluminum alloy manufacturers, foundries, precision component makers, and industries requiring high-performance metal compositions. Historically, consumption increased with wider use of bronze, brass, and high-strength copper alloys in mechanical components, connectors, and engineering hardware. Electronics miniaturization and industrial modernization also contributed to sustained demand.

Looking ahead, consumption will grow due to expansion in EVs, renewable energy infrastructure, semiconductor components, power electronics, and high-strength industrial parts. The need for consistent alloy quality in casting, extrusion, and rolling operations will further drive master alloy usage. Engineering applications requiring enhanced

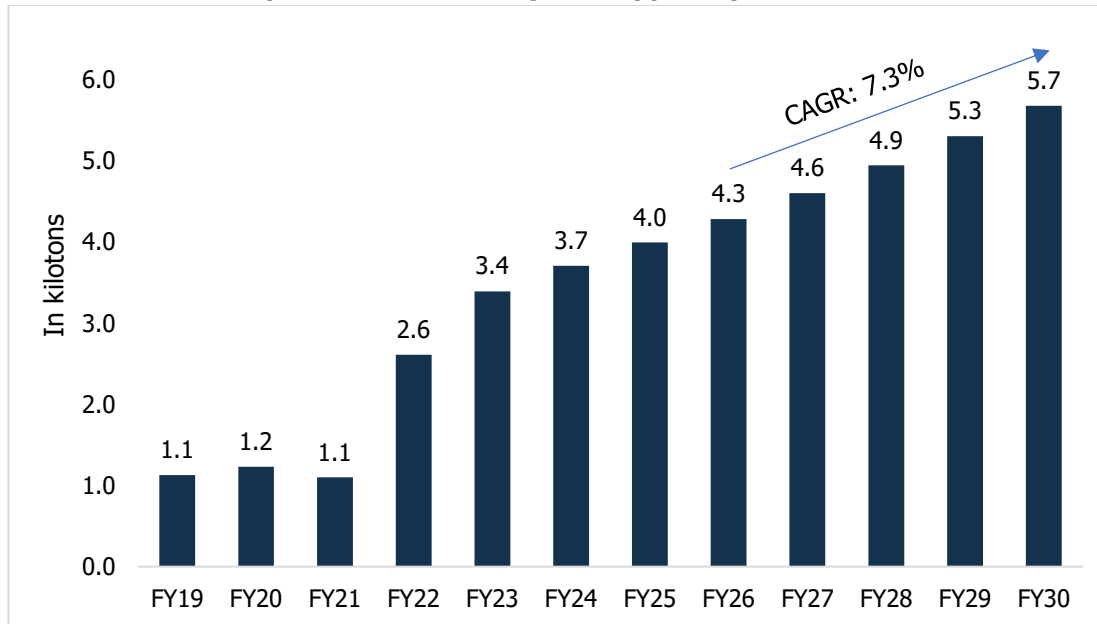
strength, fatigue resistance, and conductivity such as motors, transformers, and heat exchangers will remain strong consumers.

Chart 99: Consumption of Master Alloys of Copper, By Value



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Chart 100: Consumption of Master Alloys of Copper, By Volume



Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

Consumption of Master Alloys of Copper by top 10 Indian States (In value terms) (Rs Billion)

State Analysis	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26E	FY27P	FY28P	FY29P	FY30P
Maharashtra	0.09	0.09	0.07	0.21	0.28	0.30	0.35	0.39	0.43	0.47	0.52	0.56

Uttar Pradesh	0.07	0.06	0.06	0.17	0.24	0.28	0.33	0.39	0.43	0.49	0.55	0.61
Gujarat	0.05	0.04	0.04	0.11	0.15	0.17	0.20	0.23	0.26	0.28	0.31	0.35
Tamil Nadu	0.04	0.04	0.03	0.11	0.15	0.17	0.21	0.24	0.27	0.31	0.35	0.39
Karnataka	0.04	0.04	0.03	0.10	0.14	0.15	0.18	0.21	0.24	0.27	0.30	0.34
Madhya Pradesh	0.04	0.04	0.03	0.09	0.12	0.13	0.15	0.17	0.18	0.20	0.22	0.23
Rajasthan	0.04	0.03	0.03	0.08	0.11	0.12	0.15	0.17	0.18	0.20	0.22	0.24
West Bengal	0.05	0.04	0.03	0.09	0.12	0.12	0.14	0.16	0.17	0.18	0.19	0.21
Andhra Pradesh	0.03	0.03	0.03	0.08	0.10	0.11	0.13	0.15	0.17	0.19	0.21	0.23
Telangana	0.03	0.03	0.02	0.07	0.10	0.11	0.13	0.15	0.16	0.18	0.20	0.22
Others	0.22	0.21	0.18	0.52	0.70	0.75	0.88	1.00	1.10	1.21	1.32	1.43

Source: IMARC, CareEdge Research; Note: E-Estimates, P-Projections

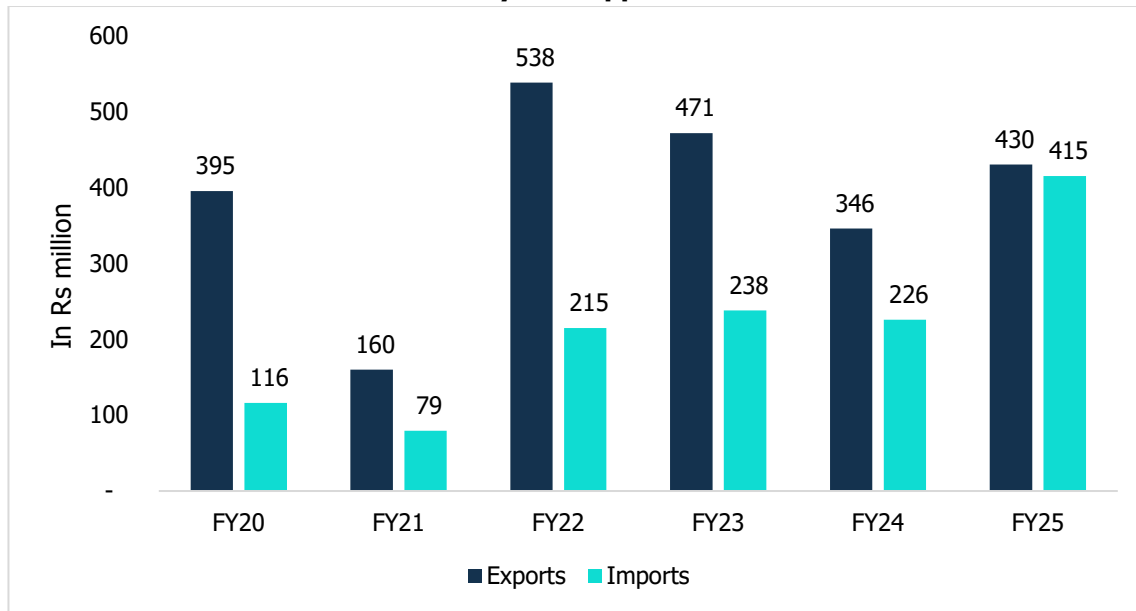
Trade Data

India’s trade in master alloys of copper over FY20–FY25 reflects contrasting trends between exports and imports, indicating changing domestic and international demand dynamics. Exports have remained relatively volatile throughout the period, with no clear long-term upward trajectory. After an initial decline, exports experienced intermittent recoveries but largely hovered within a narrow range, suggesting stable but limited competitiveness in export markets. The subdued overall growth indicates that Indian producers have maintained their presence abroad, but without significant expansion, possibly due to niche demand, pricing pressures, or stronger competition from established global suppliers.

In contrast, imports of copper master alloys have increased steadily over the period, particularly in the later years. The strong upward trend in imports points to rising domestic demand from downstream industries such as alloy manufacturing, foundries, electrical components, and specialized engineering applications. The growing reliance on imports also suggests that domestic production may be insufficient in terms of capacity, consistency, or availability of specific alloy compositions required by end users.

Overall, the widening gap between relatively flat exports and rising imports indicates increasing import dependence in the copper master alloys segment. This trend highlights opportunities for domestic manufacturers to expand capacity, diversify alloy grades, and enhance technical capabilities to better meet evolving domestic requirements and reduce reliance on imported material.

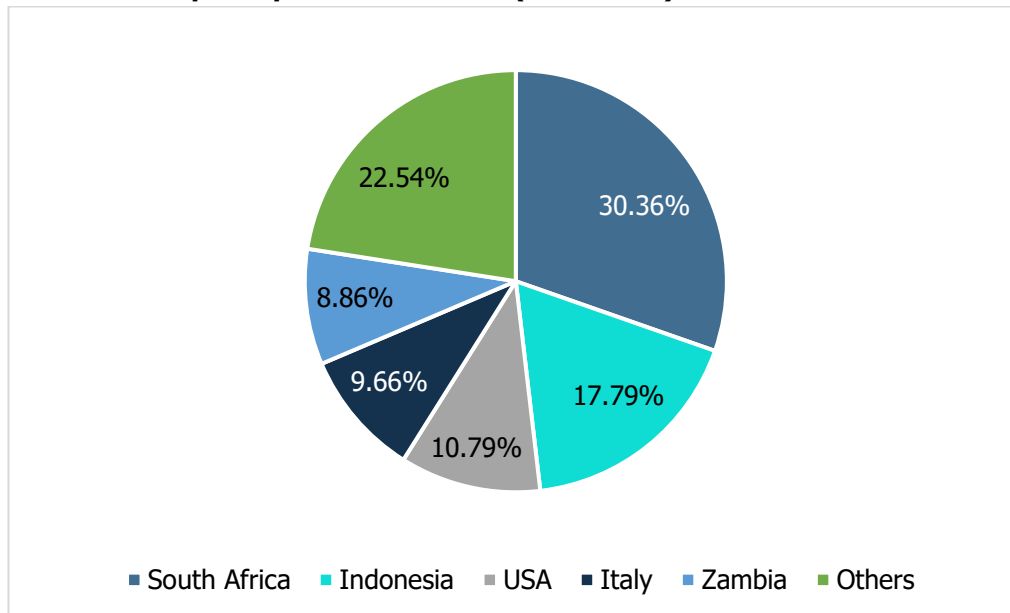
Chart 101: Trade Data of Master Alloys of Copper



Source: Ministry of Commerce and Industry

Note: HSN code used is 7405

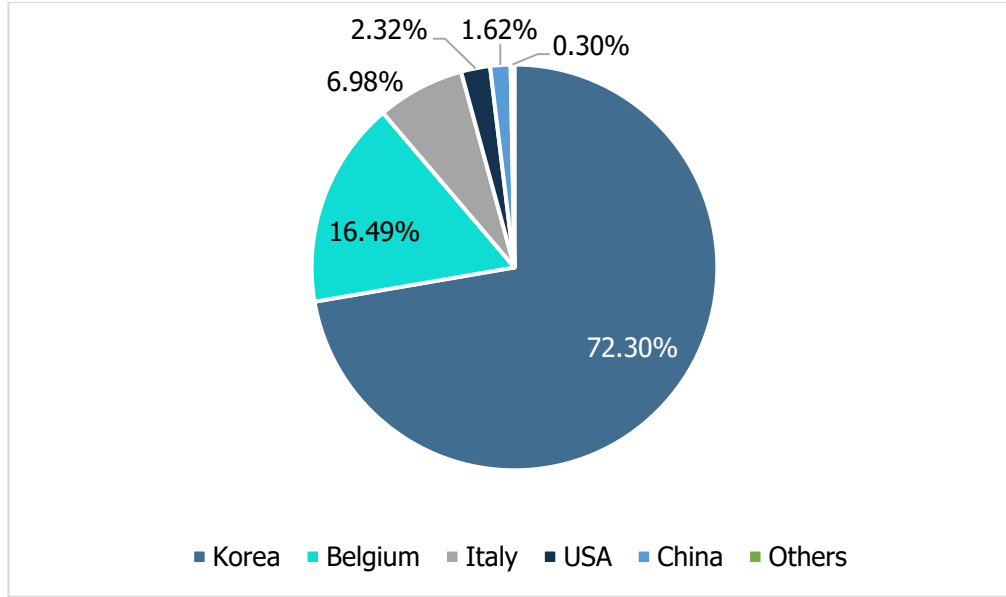
Chart 102: Top 5 Export Destinations (as of FY25)



Source: Ministry of Commerce and Industry

Note: HSN code used is 7405

Chart 103: Top 5 Import Destinations (as of FY25)



Source: Ministry of Commerce and Industry

Note: HSN code used is 7405

Major Trading Partners

The export base is relatively diversified, with South Africa emerging as the largest destination, accounting for 30.4% of total exports in FY25. Other key markets include Indonesia (17.8%), the United States (10.8%), Italy (9.7%), and Zambia (8.9%), while the remaining 22.5% is spread across various countries. This indicates a balanced export distribution with presence across Africa, Asia, Europe, and North America, reducing overdependence on a single market.

On the import side, sourcing is highly concentrated, with South Korea dominating as the primary supplier at 72.3% of total imports. This is followed by Belgium (16.5%) and Italy (7.0%), while other countries such as the United States (2.3%) and China (1.6%) contribute marginally. The rest of the world accounts for just 0.3%. Overall, imports are heavily reliant on a few key suppliers—particularly South Korea—indicating a concentrated sourcing structure compared to the more diversified export profile.

5 Application of Copper and Related Products in Past and Future in India

• Power Infrastructure

In India's power infrastructure sector, copper plays a foundational role in transmission and distribution cables, transformers, switchgear, sub-stations and other grid equipment. Its superior electrical conductivity and corrosion resistance make it the material of choice for efficient power transfer and minimal losses. As India accelerates grid modernisation and expands non-fossil generation, copper usage in this sector is expected to rise significantly.

Key applications include Power Cables, Transformer Windings, Busbars, Switchgear and Distribution Boards.

• Automotive (ICE + EV)

In both internal-combustion-engine (ICE) and electric vehicles (EVs), copper is becoming ever more essential, especially as the Indian auto industry shifts toward electrification. For EVs, copper is used in electric motors, wiring harnesses, charge connectors, inverters and battery systems. In ICE vehicles it still plays a major role in wiring, electronics and heat exchange systems.

Key applications include Motor windings, Battery current collectors, High-voltage cables, and Charging infrastructure cables/connectors.

• Construction & Real Estate

Within construction and real-estate, copper supports wiring systems, plumbing, heating, ventilation & air-conditioning (HVAC) systems, architectural fittings and smart-building infrastructure. In India, with rapid building growth and adoption of green and smart buildings, copper's role is growing.

Key applications include House-wiring, Cable trays, Air-conditioning Refrigerant tubes, Copper piping, and Building automation wiring.

• Industrial Machinery

In industrial machinery motors, pumps, heat-exchangers, automation systems copper is relied on for both electrical and thermal conductivity. Its durability and reliability make it suited for heavy-duty use in manufacturing plants.

Key applications include Motor windings, Copper rod/bar for structural parts, Heat-exchanger tubing, and Control-panel wiring.

• Electronics

The electronics industry uses copper extensively in printed circuit boards (PCBs), connectors, wiring, signal-transmission cables and cooling infrastructure. As India increases its electronics manufacturing and embraces IoT, 5G and smart devices, copper's usage climbs.

Key applications include PCB traces, Shielded cabling, Server-room busbars, Interconnects and Board-level wiring.

• Renewable Energy & Storage

Renewable-energy systems (solar, wind) and energy-storage installations are highly copper-intensive due to the dispersed architecture and extensive wiring/cabling required. In India's green-energy push, copper underpins generation, storage, grid-integration and transmission.

Key applications include Inverter and Transformer windings, Cabling from generation to grid, Storage-system wiring, and Grounding systems.

• Transport (Rail, Marine, Aero)

In rail, marine and aerospace transport, the trend toward electrification and more advanced propulsion means more copper is needed. Overhead contact lines for rail, power cables in ships/boats and wiring in aircraft all benefit from copper's performance.

Key applications include Overhead catenary wires, Onboard power cables, Marine switchgear wiring, and Aircraft wiring harnesses.

• **Consumer Durables**

In consumer durables appliances, HVAC equipment, lighting and electronics for homes copper remains a staple because of its efficiency, reliability and recyclability. As household penetration and efficiency standards increase in India, copper content goes up.

Key applications include Internal wiring of appliances, Heat-exchanger tubing, and Motor windings in chillers/fans, power-cables.

• **Data Centers & Digital Infrastructure**

Data-centres and digital-infrastructure require high performance power and cooling systems copper is crucial for power-distribution busbars, connectors, cabling, cooling-loop tubes and signal transmission. As India’s digital economy expands, this segment is becoming a major growth driver for copper.

Key applications include Server-room busbars, Power cabling to racks, High-speed networking connectors, and Copper cooling tubing.

• **Hydrogen Economy**

Though currently smaller in scale, the hydrogen economy is emerging as a future growth sector for copper: in electrolysis rigs, hydrogen-compression systems, power-distribution networks for hydrogen production sites and infrastructure. Copper’s conductivity, durability and recyclability make it well-placed for this sector.

Key applications include Electrolysis system wiring, Hydrogen-plant power cables, and Monitoring/Control sensor cables.

Industry	FY24–FY25 Status	FY26–FY30 Outlook
Power Infrastructure	Strong	Very Strong (Smart, Renewable)
Automotive (ICE & EV)	Growing EV share	Hypergrowth (EVs, Charging Infra)
Construction & Real Estate	Stable recovery	Green + Smart Buildings
Industrial Machinery	Steady	Automation-led growth
Electronics	High	Very High (AI, IoT, 5G)
Renewable Energy & Storage	Growing	Accelerated (Wind, Solar, Storage)
Transport (Rail, Marine, Aero)	Moderate	Electrification of fleets
Consumer Durables	Stable	Energy-Efficient Expansion
Data Centers & Digital Infra	Emerging	Major Growth Driver
Hydrogen Economy	Niche	Emerging Niche

6 Key Demand Drivers and Challenges faced by Copper and Related Products in India

Key Demand Drivers

Industry	Key Demand Drivers	Description
Power Infrastructure	Grid upgrades, Renewable energy (RE) integration	India's push toward renewable energy and modern transmission networks is driving large-scale upgrades in substations, smart grids, and distribution systems, boosting copper demand for transformers, cabling, and switchgear.
EV & Automotive	EV growth, Charging infrastructure	Rising EV adoption is fueling demand for high-conductivity copper components in motors, batteries, and charging stations, while hybrid vehicles continue to use copper-intensive electrical systems.
Construction & Real Estate	Urbanization, Green buildings	Rapid urban expansion and the adoption of energy-efficient, smart building designs are increasing copper consumption in electrical wiring, HVAC, and plumbing systems.
Industrial Machinery	Automation, Efficient motors	The shift toward automated manufacturing and energy-efficient motors increases copper use in robotics, control panels, and high-efficiency motor windings.
Electronics	AI, 5G, Appliances, Copper foils	The expansion of AI, 5G networks, and smart appliances requires high-performance copper foils and conductors for circuit boards, chips, and interconnects.
Renewable Energy & Storage	Solar, Wind, Storage boom	Large-scale renewable installations and grid-connected battery storage systems are highly copper-intensive, supporting wiring, inverters, and transformers.
Transportation (Rail & Marine)	Electrification, Smart ports	Electrification of railway lines and modern port infrastructure upgrades are major copper consumption drivers in signaling, wiring, and propulsion systems.
Consumer Durables	Inverter technology, Energy efficiency	Energy-efficient air conditioners, refrigerators, and appliances require copper windings, tubing, and wiring to enhance thermal and electrical performance.
Data Centers & Digital Infrastructure	AI/Cloud growth, Copper cabling	Rapid data center expansion and digital transformation initiatives demand copper busbars, cabling, and connectors for high-capacity power and data transfer.
Green Hydrogen	Electrolyzers, Infrastructure buildout	Early-stage investments in electrolyzers and hydrogen production infrastructure are creating emerging demand for copper in power systems and control units.

Key Challenges

Industry	Major Challenges	Description
Power Infrastructure	Substitution, Copper theft, Price volatility	Fluctuating copper prices and theft risks impact project economics, while emerging substitutes like aluminum pose a long-term threat.
EV & Automotive	Tech shifts, High cost, Substitution risk	Rapid technology evolution and potential shift toward lightweight alternatives challenge copper demand consistency in EV manufacturing.
Construction & Real Estate	Real estate cycles, Plastic pipe substitution	Market cyclicalities and use of cheaper materials like plastic piping reduce copper intensity in some applications.
Industrial Machinery	SME fragmentation, Capex cycles	Capital constraints among SMEs and dependence on industrial investment cycles affect copper usage consistency.
Electronics	Miniaturization, Substitutes	Miniaturization trends and experimentation with new conductive materials reduce per-unit copper content in devices.
Renewable Energy & Storage	Delays, Land issues, Aluminum use	Project delays, land acquisition hurdles, and the shift to aluminum in cabling and modules pose challenges to copper demand growth.
Transportation (Rail & Marine)	Funding, Long lead times	Large infrastructure projects face long gestation periods and high funding requirements, delaying copper consumption realization.
Consumer Durables	Price sensitivity, Aluminum motors	Cost-conscious consumers and OEMs' efforts to lower prices drive the use of aluminum-based components instead of copper.
Data Centers & Digital Infrastructure	Fiber substitution, ESG scrutiny	Fiber-optic technology and growing sustainability concerns may limit copper's long-term growth in digital networks.
Green Hydrogen	Nascent stage, Unclear copper usage	The hydrogen economy remains in its infancy, with uncertain material intensity and technology pathways for copper demand.

7 Growth Scenario

Analysis of Emerging Growth pattern in India

India is entering a pivotal phase of structural transformation, where growth is increasingly driven by domestic demand, rising investment, demographic dividend and policy-led reforms. According to government figures, India's real GDP grew by 6.5% in 2024-25. The economy continues to stand out globally. India's share of global GDP in purchasing power terms rose from about 1.6 % in 2000 to around 3.4 % in 2023. Foreign direct investment inflows and export growth reinforce the quantitative story.

Qualitatively, several deep-seated forces are shaping India's emerging growth pattern. First, the demographic dividend: India's relatively young workforce and improving labour participation are generating a base for sustained consumption and services growth. Second, urbanisation and rising household incomes are expanding the middle class and creating demand for housing, mobility (automobiles, public transport), consumer goods, digital services and infrastructure. Third, the government's emphasis on infrastructure and "capex"-driven growth (road, rail, renewable energy, manufacturing parks) is creating capacity, connectivity and productivity gains for the economy. Fourth, structural reforms including liberalised FDI norms, tax-simplification, logistics and supply-chain enhancements are raising India's attractiveness for manufacturing and global supply-chains. Fifth, the digital economy and services boom (IT, telecom, fintech) are helping India leverage its comparative strengths and move up the value chain.

Looking ahead, this dual momentum strong domestic drivers plus expanding global integration suggests India is well-positioned to maintain robust growth over the medium term. While challenges such as investment bottlenecks, regional disparities, infrastructure gaps and global headwinds remain but the emergence of a more self-sustaining, investment-led growth model marks a significant shift in India's growth story.

In sum, the emerging pattern in India is one of more balanced growth, less reliant purely on consumption or export booms, and more grounded in structural transformation, investment, and value-added activities. Quantitative indicators support this trend, while qualitative forces underscore its durability and evolving character.

Factors and Trends impacting Copper manufacturing growth in India

Manufacturing of copper in India is being shaped by a combination of strong demand-side trends, supply-chain pressures and manufacturing cost dynamics. A significant driver is the infrastructure and construction boom. Another powerful trend is the energy transition and electrification wave. The growth of renewables, electric vehicles (EVs) and digital infrastructure is increasing the required content of copper manufacturing wiring, busbars, foil, conductors all require high-quality copper. For instance, the transportation segment (automotive, rail, metros) saw a steep uptick in copper demand as EV adoption and infrastructure modernisation accelerated. On the manufacturing/supply side, India faces both constraints and opportunities. Domestic refined copper production has been flat or declining, partly because of closures of major smelters and capacity maintenance activity. This has meant India's reliance on imports of cathodes, scrap and concentrate has risen.

Emerging manufacturing trends include the push for higher purity and specialised copper products, greater use of recycled copper/scrap, and closer alignment with government-policy initiatives such as the "Make in India" manufacturing drive, Production-Linked Incentive (PLI) schemes and critical minerals classification (copper is now designated a "critical mineral").

Cost and input-material pressures also impact manufacturing growth: energy intensity of smelters, raw-material quality and availability of copper concentrate all influence competitiveness; global commodity price volatility and supply chain constraints (for example dependence on imports) both matter. On the positive side, domestic localisation of activity, vertical integration across mining, smelting, refining and fabrication present opportunities to capture value locally.

In summary, India's copper manufacturing growth is underpinned by robust end-use demand (infrastructure, electrification, construction, electronics) while constrained by supply-side and manufacturing-cost challenges. The interplay of these trends means that while demand is moving strongly upward, capturing that growth through domestic manufacturing requires concerted investment, technology upgrading, recycling infrastructure and supply-chain resilience.

8 SWOT Analysis of Non-Ferrous Metals Industry in India

Strengths	Weaknesses
<ul style="list-style-type: none"> • Diverse resource base with significant reserves of aluminium, zinc, and copper. • Presence of large integrated players with established domestic and export networks. • Strong demand from key sectors such as power, transport, construction, and renewables. • Government focus on infrastructure, electrification, and Make in India initiatives. 	<ul style="list-style-type: none"> • High import dependence for critical raw materials like copper concentrate and bauxite. • Energy-intensive production processes leading to cost pressures. • Limited R&D and technology adoption compared to global peers. • Environmental and compliance challenges in mining and smelting operations.
Opportunities	Threats
<ul style="list-style-type: none"> • Growing demand from EVs, renewable energy, and digital infrastructure. • Policy push for recycling, circular economy, and green manufacturing. • Rising investment in downstream products such as wires, foils, and extrusions. • Export opportunities under trade agreements and shifting global supply chains. 	<ul style="list-style-type: none"> • Price volatility in global commodity markets impacting margins. • Substitution risk from materials like composites, plastics, or alternative alloys. • Global trade barriers, carbon border taxes, and geopolitical uncertainties. • Competition from low-cost imports and smuggled secondary metals. • Increasing substitution of copper with aluminium in select electrical and electrification applications, driven by aluminium’s lower cost and lighter weight, may moderate copper demand growth, particularly in cost-sensitive sectors such as power infrastructure, EVs, and data centers.

9 Threats and Challenges for the Issuer Company and its Products

- **Raw material price volatility**

GVFL's core products (copper cathodes, busbars, tubes, alloys) are heavily dependent on non-ferrous metal prices, which can fluctuate significantly and squeeze margins.

- **Import reliance and supply-chain risk**

As a manufacturer of copper and alloy products in India, GVFL may face challenges sourcing high-purity raw materials, spare parts or advanced alloy inputs, which could lead to disruptions or cost escalation.

- **Technology and product substitution risk**

Advances in materials (e.g., aluminium alternatives, composites, lower-cost alloys) and changes in application design (less copper content per product) could reduce demand for some of GVFL's traditional offerings.

- **Environmental and regulatory compliance**

Non-ferrous metals manufacturing is energy intensive and subject to environmental regulations (emissions, waste handling, energy efficiency). Compliance costs and regulatory uncertainty are potential burdens.

- **Competition and margin pressure from global peers**

Expansion of global flows of non-ferrous products and imports from low-cost regions could put pricing pressure on GVFL's domestic manufacturing operations.

- **Market and demand-cycle vulnerability**

GVFL's business appears tied to sectors like EV, infrastructure, electronics and export markets. Slowdowns or delays in these sectors (e.g., due to project gestation, regulatory changes or macroeconomic slowdown) could impact order flows.

- **Capacity expansion and execution risk**

GVFL notes plans to expand its business domestically and abroad. Scaling up manufacturing, ensuring quality control, managing capital expenditure and integrating new product lines (e.g., metals/salts for EV batteries) all pose execution risks.

10 Competitive Benchmarking Players in the Non-Ferrous Metals Industry

10.1 Analysis of key factors shaping competition

- **Feedstock & input security**

Access to mined ore, refined metal, and scrap (and the cost/quality of those inputs) is a primary competitive lever. Firms with long-term offtake, captive supplies, or efficient scrap sourcing can sustain margins and shield themselves from spot volatility.

- **Energy intensity & cost management**

Electricity, gas, and fuel are large cost components. Producers with captive power, energy-efficient processes, or hedging strategies gain material cost advantage versus peers exposed to volatile tariffs and transmission bottlenecks.

- **Technology, scale and product mix**

Advanced smelting/refining tech, downstream value-addition (alloys, foils, specialty grades) and scale deliver lower unit costs, higher yields and differentiated products enabling pricing power and entry into premium end-markets (electronics, aerospace).

- **Regulation, environment & ESG**

Stricter emissions norms, waste disposal, water regulations and ESG expectations increase compliance costs but also create barriers to entry. Firms that invest early in cleaner tech and transparent reporting can win premium customers and lower financing costs.

- **Trade policy, logistics & end-market dynamics**

Import duties, anti-dumping actions, currency swings, port/logistics efficiency and demand from autos, electronics, renewable energy and construction shape competitive positioning. Flexible exporters and firms with diversified end-use exposure manage cyclical shocks better.

10.2 Brief profile of Company and its Peers

Gujarat Victory Forgings Limited

Gujarat Victory Forging Ltd. (GVFL) is a public Indian metals manufacturer incorporated in 1990 and registered office in Vadodara, Gujarat. The company was founded by Mr. Vijendra Kumar Gupta, with a focus on copper extruded products and master alloys and expanded in the early 2000s. GVFL's product portfolio centres around non-ferrous metals and alloys, including copper cathodes (from 99.96% to 99.99%), copper busbars, copper tubes, various copper and alloy ingots, and related master alloys used in electrical and industrial applications. These products cater to a broad spectrum of industries that depend on high-conductivity and high-purity non-ferrous metal inputs.

The company operates two manufacturing units across Manjusar, Savli, Vadodara, with strategic capacity enhancements over the years. Units such as the Manjusar facilities incorporate advanced recycling and refining technologies, including spent catalyst recycling and electro-refining processes, to produce high-quality materials like LME-grade A copper cathodes, positioning GVFL in both domestic and international markets.

The distance to nearby landmark from the proposed unit is presented in the table below:

Description	Landmark (Distance)
Nearest Highway	National Highway – 48 (NH-48) (80-90 KM)

Nearest Railway Station	Vadodara Railway Junction (4-5 KM)
Nearest Town	Vadodara (8 KM)
Nearest Airport	Vadodara Airport (14 KM)

Source: CAAPL

The area has established industrial infrastructure with road connectivity to NH-8, nearby railway links, and proximity to Vadodara city, facilitating logistics and supply chains. It hosts multiple manufacturing units and engineering firms, indicating ready utilities and industrial support services. The location also benefits from access to basic amenities and workforce availability in the surrounding region.

GVFL has built a global customer base, supplying to markets in Africa, the Middle East, Southeast Asia, East Asia, and Australia. The company has articulated plans to expand production capacity significantly while targeting both domestic and export growth, with ambitious turnover objectives over the medium term.

Beyond core metal products, the company emphasises sustainability and circular economy principles, integrating waste recycling and environmentally considerate processes into its operations. Its vision highlights competitive, environmentally friendly methods to contribute to broader industrial growth and green initiatives.

The company plans to expand the company's manufacturing capabilities within the copper products sector. The project focuses on enhancing the existing production capacity by establishing an additional 350 TPM manufacturing capacity for copper cathode, thereby increasing the overall capacity from 450 TPM to 800 TPM. This expansion aligns with GVFL's long-term objective of scaling its operations, improving supply reliability, and serving a broader customer base across domestic and export markets. By augmenting capacity, the company aims to meet rising demand for copper cathodes and downstream copper products used across electrical, industrial, and engineering applications. The project is proposed to be set up in Vadodara.

Competitive Strengths and Business Overview

Focused Presence in the Non-Ferrous Metals Segment

GVFL operates in the non-ferrous metals industry with a focused presence in copper cathodes, copper extrusions, and copper alloy products. Its operations span both upstream refining activities, including the production of copper cathodes, and downstream value-added products such as tubes, busbars, and alloy products. This product range enables it to participate across multiple stages of the copper value chain.

Recycling-Led Refining and Electro-Processing Capabilities

GVFL's manufacturing operations are primarily based on recycling-led refining and electro-processing, which allows it to utilise secondary raw materials in their production processes. It believes this approach is consistent with broader industry trends toward resource efficiency and circular economy practices. However, its ability to sustain or scale these capabilities is subject to the continued availability of secondary raw materials at commercially viable prices, as well as applicable regulatory requirements.

Operational Efficiency and Financial Profile

GVFL's financial performance during the period covered reflects improvement in certain operational metrics, including operating margins and return ratios, which it attributes to cost rationalisation measures and changes in our product mix. The company maintains a relatively low-leverage capital structure, which it believes provides them with financial

flexibility. However, their current scale of operations is smaller relative to certain established peers in the non-ferrous metals industry, and there can be no assurance that it will be able to sustain historical trends in margins, return ratios, or operational efficiency in future periods.

Demand Tailwinds from Domestic End-Use Sectors

The copper industry in India is expected to benefit from growing demand across sectors including electric vehicles, renewable energy, and power transmission infrastructure, driven by policy initiatives and domestic consumption trends. GVFL believes their product portfolio positions them to potentially address demand from these end-use sectors. However, its ability to benefit from such sectoral tailwinds is subject to, among other things, successful completion of planned capacity additions, availability of funding on acceptable terms, regulatory approvals, and market conditions, each of which involve uncertainty and risks.

Geographic Diversification Through Export Markets

In addition to their domestic operations, they have supplied products to customers in markets including Africa, the Middle East, and Southeast Asia. While this provides them with exposure to multiple geographies, their export operations are subject to risks including currency fluctuations, geopolitical developments, changes in trade regulations, and varying demand conditions in international markets.

Planned Capacity Expansion in Copper Cathodes

GVFL has undertaken plans to expand their copper cathode production capacity, which they believe will enhance their degree of backward integration and improve raw material supply reliability for their downstream operations. The proposed capacity addition is subject to various execution, regulatory, and financing risks, and there can be no assurance that such expansion will be completed within the projected timelines or at the estimated costs, or that it will result in the anticipated operational or financial benefits.

Summary

GVFL is a growing participant in the copper value chain with operations across refining and value-added product segments. Their business is characterised by recycling-based manufacturing processes, a relatively low-leverage balance sheet, and improving financial metrics over recent periods. They currently operate at a smaller scale than certain established peers in the non-ferrous metals industry, and their future growth is contingent upon the successful execution of their expansion plans and prevailing market and regulatory conditions.

Bhagyanagar India Limited

Bhagyanagar India Limited (BIL), founded in 1985 and headquartered in Secunderabad, is one of India's oldest and largest copper product manufacturers, with a legacy built on precision engineering, quality, and reliability across diverse industrial applications. The company's product portfolio includes copper bus bars, wires, rods, foils, sheets, tubes, and specialized conductors, serving sectors such as power transmission, automotive, railways, electronics, renewables, and infrastructure OEMs. BIL operates advanced manufacturing facilities and maintains stringent quality controls to meet global performance standards.

Over the years, Bhagyanagar has evolved its strategic focus toward value-added, high-performance copper solutions while embedding sustainability and circular economy principles into its operations, including in-house scrap recycling. The company also has a broader business footprint with interests in renewable energy and other industrial verticals through its diversified group structure. Its long-standing market presence and multigenerational family leadership underpin its role as a trusted supplier to both domestic and export markets.

BIL's corporate philosophy emphasises responsible growth, operational integrity, and community engagement, reflecting a commitment to quality, environmental stewardship, and stakeholder value. The company's strategic roadmap includes

scaling value-added capacities, leveraging technology, and strengthening its competitive position in evolving industrial supply chains.

Jain Resource Recycling Limited

Jain Resource Recycling Limited (JRRL), formerly part of the Jain Metal Group, is a leading non-ferrous metal recycling and manufacturing company headquartered in Chennai, India. With roots stretching back over seven decades, the company specialises in the recycling and production of high-quality non-ferrous metal products including lead and lead alloy ingots, copper and copper ingots, and aluminum and aluminum alloys—derived from scrap inputs. Its operations span multiple state-of-the-art recycling facilities capable of processing diversified scrap streams.

JRRL's products adhere to international quality standards, with its lead ingot brand registered on the London Metal Exchange (LME)—a distinguishing factor that broadens its global market access and supports pricing transparency. The company also engages in trading of non-ferrous metal commodities, complementing its manufacturing portfolio and enhancing market reach.

The firm's vertical integration from raw material procurement to refined metal output enables efficient supply chain management and cost-effective production. The company has expanded its reach through strategic facility placements and global sourcing networks. JRRL continues to build on its legacy of quality, reliability, and sustainability, positioning itself as a key player in India's non-ferrous metal recycling ecosystem with a strong presence in both domestic and international markets.

10.3 Competitive Benchmarking across Operational Parameters

Table 4: Competitive Benchmarking across Parameters

	GVFL	Bhagyanagar India Ltd.	Jain Resource Recycling Ltd.
Product Mix	Copper Cathode, Copper Tubes and Pipes, Copper Busbar, Copper Ingots, Copper Rods, Copper Alloy Rods, Brass Tubes and Pipes, Master alloys of Copper, Copper Coils	Copper Busbars, Copper wires and Rods, Copper Foils, Copper Related Products, Solar InterConnect Wires, Field Coils and Armature Pins, Solar Fins, Solar Flat Plate Collectors	Lead and lead alloy ingots, Copper and copper ingots, Aluminium and aluminium alloys
Installed Capacity	9,360 MT	30,000 MT	1,36,082 MT
Plant Location	Vadodara, Zambia	Hyderabad, Karnataka	Tamil Nadu

Source: Company Documents

Table 5: Competitive Benchmarking across Operational Parameters

Parameters	GVFL				Jain Resource Recycling Ltd				Bhagyanagar India Limited			
	FY23	FY24	FY25	H1FY26	FY23	FY24	FY25	H1FY26	FY23	FY24	FY25	H1FY26
Number of customers	89	81	91	78	317	342	371	NA	NA	NA	NA	NA
Average vintage of top 10 clients (in years)	3.3	4.5	5.6	6.3	NA	NA	NA	NA	NA	NA	NA	NA
Number of employees	33	35	34	39	378	408	405	NA	NA	NA	NA	NA
Inventory Turnover Ratio#	19.05	18.50	11.47	4.39	8.97	9.93	11.63	0.23	14.77	12.52	13.51	2.38
Manufacturing Capacity (MTPA)*	8,616	8,616	8,160	9360	83,040	83,042	83,042	NA	24,000	30,000	30,000	30,000
No. of Manufacturing Units	3	3	2	2	3	3	3	3	2	2	1	1

Source: Company Documents

Note: *Only for copper and other copper related products

#Inventory Turnover Ratio: Total Revenue/Average Inventory for the period

10.4 Competitive Benchmarking across Financial Parameters

Table 6: Competitive Benchmarking across Financial Parameters

	GVFL				Bhagyanagar India Ltd.				Jain Resource Recycling Ltd.			
	FY23	FY24	FY25	H1FY26	FY23	FY24	FY25	H1FY26	FY23	FY24	FY25	H1FY26
Revenue from Operations (in Rs millions)	5,453.85	5,111.51	6,076.50	3,445.73	18,465.91	14,293.11	16,256.05	10,659.74	30,640.71	44,284.18	71,257.68	36,629.56
EBITDA (in Rs millions)	120.04	153.39	283.79	206.03	346.95	304.22	370.24	414.00	1,241.76	2,272.19	3,688.25	2,501.06
EBITDA Margins(%)	2.20	3.00	4.67	5.98	1.88	2.13	2.28	3.88	4.05%	5.13%	5.18%	6.83%
PAT (in Rs millions)	60.94	93.05	203.75	223.74	101.30	457.22	140.18	188.44	918.10	1,638.27	2,232.87	1,567.13
PAT Margins(%)	1.12	1.82	3.35	6.49	0.55	3.20	0.86	1.77	3.00	3.70	3.13	4.28
Net Worth (in Rs millions)	541.85	643.24	870.09	1,092.68	1,476.43	1,933.67	2,073.85	2,262.29	1,990.88	3,691.60	7,260.65	13,666.17
ROCE (%)	17.71	18.00	27.01	19.16	8.07	23.50	7.37	6.95	16.33	20.85	23.44	9.64
ROE (%)	11.37	15.72	25.97	20.39	6.86	23.65	6.76	8.33	46.12	44.38	30.90	11.47
Debt/Equity(x)	0.21	0.40	0.32	0.34	1.49	0.52	1.33	1.63	3.71	2.48	1.28	0.95
Operating Cash Flows	374.57	193.62	185.03	(308.78)	(395.28)	961.11	(1,435.30)	(873.82)	108.66	333.62	35.82	(4,032.14)

Source: Ace Equity, CareEdge Research

Note: ROE and ROCE for H1FY26 are not annualized

	GVFL				Bhagyanagar India Ltd.				Jain Resource Recycling Ltd.			
	FY23	FY24	FY25	H1FY26	FY23	FY24	FY25	H1FY26	FY23	FY24	FY25	H1FY26
Revenue from Operations (in Rs millions)	5,453.85	5,111.51	6,076.50	3,445.73	18,465.91	14,293.11	16,256.05	10,659.74	30,640.71	44,284.18	71,257.68	36,629.56
EBITDA (in Rs millions)	120.04	153.39	283.79	206.03	346.95	304.22	370.24	414.00	1,241.76	2,272.19	3,688.25	2,501.06
EBITDA Margins (%)	2.20	3.00	4.67	5.98	1.88	2.13	2.28	3.88	4.05%	5.13%	5.18%	6.83%

PAT (in Rs millions)	60.94	93.05	203.75	223.74	101.30	457.22	140.18	188.44	918.10	1,638.27	2,232.87	1,567.13
PAT Margins (%)	1.12	1.82	3.35	6.49	0.55	3.20	0.86	1.77	3.00	3.70	3.13	4.28
Net Worth (in Rs millions)	541.85	643.24	870.09	1,092.68	1,476.43	1,933.67	2,073.85	2,262.29	1,990.88	3,691.60	7,260.65	13,666.17
ROCE (%)	17.71	18.00	27.01	38.32	8.07	23.50	7.37	13.90	16.33	20.85	23.44	19.28
ROE (%)	11.37	15.72	25.97	40.78	6.86	23.65	6.76	16.66	46.12	44.38	30.90	22.93
Debt/Equity(x)	0.21	0.40	0.32	0.34	1.49	0.52	1.33	1.63	3.71	2.48	1.28	0.95
Operating Cash Flows	374.57	193.62	185.03	(308.78)	(395.28)	961.11	(1,435.30)	(873.82)	108.66	333.62	35.82	(4,032.14)

Source: Ace Equity, CareEdge Research

Note: ROE and ROCE for H1FY26 are annualized

Compared to its peers, GVFPL operates at a significantly smaller scale, with revenues much lower than both Bhagyanagar India Ltd. and Jain Resource Recycling Ltd., the latter having scaled rapidly on the back of a globally integrated scrap-based recycling model with sourcing from over 120 countries and strong export presence. Despite this scale disadvantage, GVFPL has demonstrated consistent improvement in EBITDA and PAT margins, now outperforming Bhagyanagar, whose margins remain relatively lower due to its traditional copper manufacturing model and exposure to commodity price cycles, even as it transitions toward value-added products. In contrast, Jain Resource benefits from cost efficiencies and better margin resilience inherent in recycling-based operations, resulting in superior profitability and strong growth. Additionally, in FY25, the company has achieved the highest PAT margin amongst its peers.

On return ratios, GVFPL shows a sharp improvement in ROCE and ROE, indicating efficient capital deployment, while Bhagyanagar’s returns remain volatile and Jain Resource’s returns, though strong, have moderated due to rapid expansion and capital deployment.

From a leverage perspective, GVFPL maintains a conservative capital structure, significantly stronger than peers, whereas Bhagyanagar and Jain Resource exhibit higher leverage driven by working capital-intensive operations, particularly due to raw material procurement cycles.

Cash flow performance remains volatile across all players, with GVFPL and Jain Resource facing pressures due to inventory-heavy and import-dependent models, especially in recycling where upfront procurement is critical. Overall, GVFPL stands out for its improving profitability and low leverage but remains constrained by scale compared to Bhagyanagar’s established presence and Jain Resource’s high-growth, globally integrated recycling platform.

Table 7: Formula Table

Ratio	Formula
EBITDA Margin	Operating Profit/Total Revenue from Operations
PAT Margin	Profits after Tax/Total Revenue from Operations
Interest Coverage	(Profit before Tax + Interest) /Interest
Return on Capital Employed	EBIT/Capital Employed
Return on Equity	Profit after Tax Attributable to the owners of the company/ Shareholders Fund (Net Worth)
Debt/Equity	Total Debt/Total Equity

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