



Research Report

Copper Industry in India

September 2024

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## Executive Summary

Copper is a vital metal across various industries due to its excellent conductivity, malleability, corrosion resistance, and antimicrobial properties. It is essential in electrical systems, construction (plumbing, roofing), transportation (automotive parts, wiring), and healthcare equipment (medical devices, antimicrobial surfaces). However, India's insufficient copper ore deposits necessitate reliance on domestic production, import of virgin copper, and recycling of both imported and domestically available copper.

From FY 2021 to FY 2024, copper ore production increased from 32.73 lakh tonnes to 37.82 lakh tonnes, reflecting a CAGR of 4.94%. Despite some fluctuations, the overall trend shows steady growth, with production rebounding in FY 2024 after a brief dip in FY 2023.

India faces a significant gap between supply and demand for copper ores and concentrates, with a shortfall of 10.95 lakh tonnes in FY 2024, creating a significant opportunity. Copper consumption reached an estimated 1,820 kilo tonnes in FY 2024, marking a nearly 20% increase over the previous year. Copper rods constitute the largest share of consumption, primarily due to their extensive use in electrical wiring and cable production. Annual imports of copper ore and concentrate surged at a CAGR of 31.5%, rising from INR 86.7 billion in FY 2020 to INR 259.5 billion in FY 2024. This is due to the varied applications of copper in India. Copper is indispensable in electrical wiring systems, transformers, generators, and motors due to its high conductivity and durability. The renewable energy sector, particularly solar and wind power, heavily relies on copper, with the Indian government significantly increasing budgetary allocations for solar projects, thus driving up copper demand.

The industrial sector, including manufacturing, power generation, and heavy machinery, drives substantial copper demand. Copper consumption in this sector grew at a CAGR of 13%, reaching an estimated 248 KT in FY 2024. Its applications span electrical wiring, industrial machinery, heat exchangers, and various components due to its excellent conductivity and durability. The transportation sector has seen a notable increase in copper consumption, driven by the adoption of electric vehicles (EVs). The EV sales in India, growing at a CAGR of 76.4% between FY 2020 and FY 2024, is expected to significantly boost copper demand due to its critical role in EV components such as traction motors, battery packs, and onboard chargers.

Copper demand in India is projected to grow from an estimated 1,689 kilo tonnes in CY 2023 to 2,546 kilo tonnes by CY 2028, at a CAGR of 8.6%. The building and construction sector is expected to remain a major driver, with copper's extensive use in electrical wiring, plumbing, HVAC (Heating, Ventilation, and Air Conditioning) systems, and structural applications supporting steady demand amidst ongoing urbanization and infrastructure projects.



## India Macroeconomic Analysis

### GDP Growth Scenario

India's economy showed resilience with GDP growing at 8.2% in CY 2023. The GDP growth in CY 2023 represents a return to pre pandemic era growth path. Even amidst geopolitical uncertainties, particularly those affecting global energy and commodity markets, India continues to remain one of the fastest growing economies in the world.

Country	Real GDP Growth (CY 2023)	Projected GDP Growth (CY 2024)	Projected GDP Growth (CY 2025)
India	8.20%	7.00%	6.50%
China	5.20%	5.00%	4.50%
Russia	3.60%	3.20%	1.50%
Brazil	2.90%	2.10%	2.40%
United States	2.50%	2.60%	1.90%
Japan	1.90%	0.70%	1.00%
Canada	1.20%	1.30%	2.40%
Italy	0.90%	0.70%	0.90%
France	1.10%	0.90%	1.30%
South Africa	0.70%	0.90%	1.20%
United Kingdom	0.10%	0.70%	1.50%
Germany	-0.20%	0.20%	1.30%

Source: World Economic Outlook, July 2024

Countries considered include - Largest Developed Economies and BRICS (Brazil, Russia, India, China and South Africa)  
(Countries have been arranged in descending order of GDP growth in 2023)

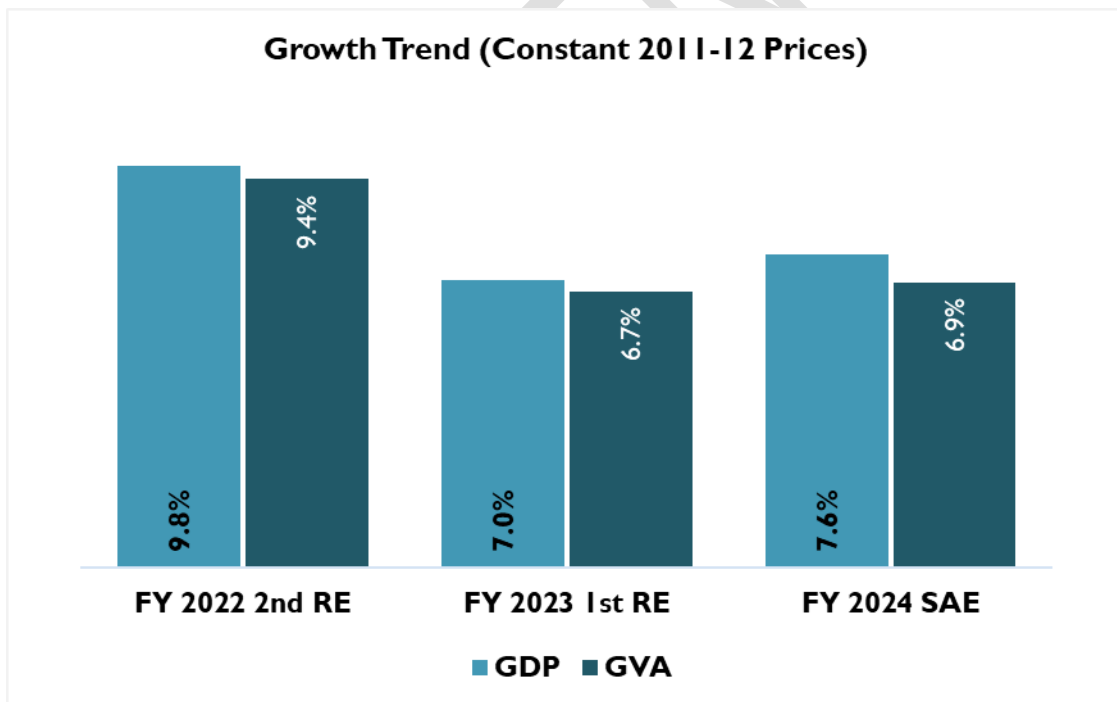
There are few factors aiding India's economic recovery – notably its resilience to external shocks and rebound in private consumption. This rebound in private consumption is bringing back the focus on improvements in domestic demand, which together with revival in export demand is a precursor to higher industrial activity. Already the capacity utilization rates in Indian manufacturing sector are recovering as industries have stepped up their production volumes. As this momentum sustains, the country may enter a new capex (capital expenditure) cycle. The universal vaccination program by the Government has played a big part in reinstating confidence among the population, in turn helped to revive private consumption.

Realizing the need to impart external stimuli, the Government stepped up its spending on infrastructure projects which in turn had a positive impact on economic growth. The capital expenditure of the central government increased by 37.4% (budget estimates), to the tune of INR 10 trillion in the Union Budget 2023-2024. The announcement also included a 30% increase in financial assistance to states at INR 1.3 trillion for

capex. The improvement was accentuated further as the Budget 2024-2025 announced an 11.1% increase in the capital expenditure outlay at INR 11.11 trillion, constituting 3.4% of the GDP. This has provided much-needed confidence to the private sector, and in turn, attracted private investment.

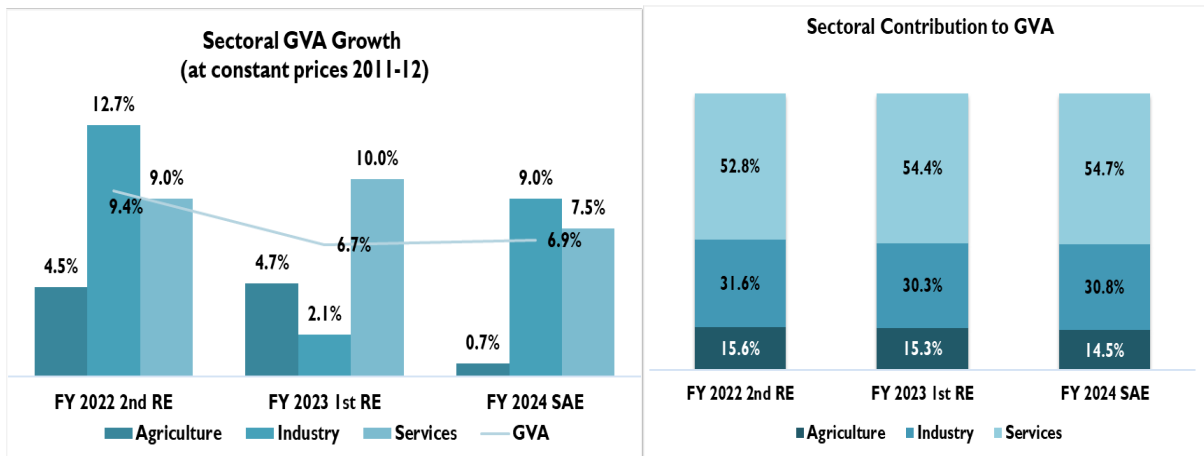
On the lending side, the financial health of major banks has witnessed an improvement which has helped in improving the credit supply. With capacity utilization improving, there would be demand for credit from the corporate sector to fund the next round of expansion plans. The banking industry is well poised to address that demand. Underlining the improving credit scenario is the credit growth to the micro, small, and medium enterprise (MSME) sector as the credit outstanding to the MSME sector by scheduled commercial banks in the fiscal year 2024 grew by 14% to INR 10.31 trillion compared to INR 9.02 trillion as on 24 March 2023. The extended Emergency Credit Linked Guarantee Scheme (ECLGS) by the Union Government has played a major role in improving this credit supply.

As per the second advance estimates 2023-24, India's GDP in FY 2024 grew by 7.6% compared to 7.0% in the previous fiscal on the back of solid performances in manufacturing, mining, and construction sectors. The year-on-year increase in growth rate is also partly due to by a strong growth in investment demand led by public capital expenditure.



Source: Ministry of Statistics & Programme Implementation (MOSPI), National Account Statistics, 2023-24  
 RE stands for Revised Estimates and SAE stands for Second Advance Estimates

### Sectoral Contribution to GVA and annual growth trend



Source: Ministry of Statistics & Programme Implementation (MOSPI)

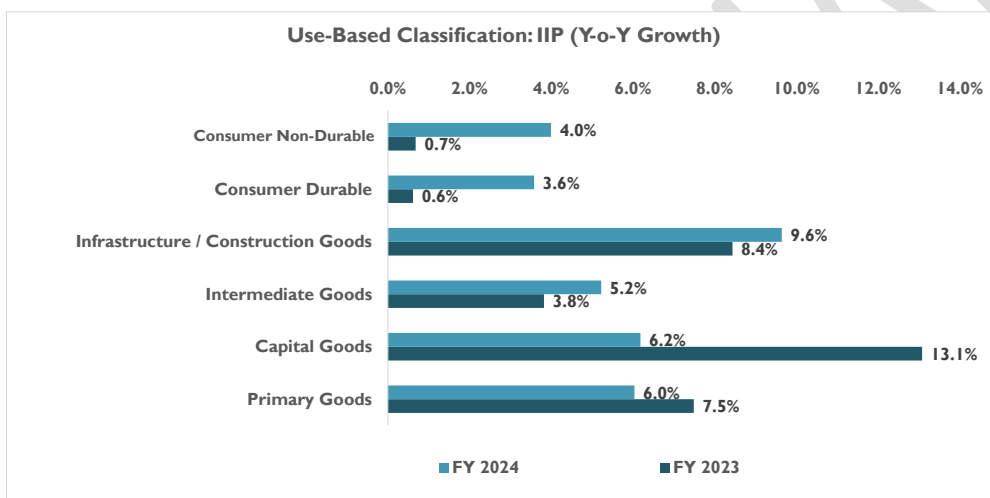
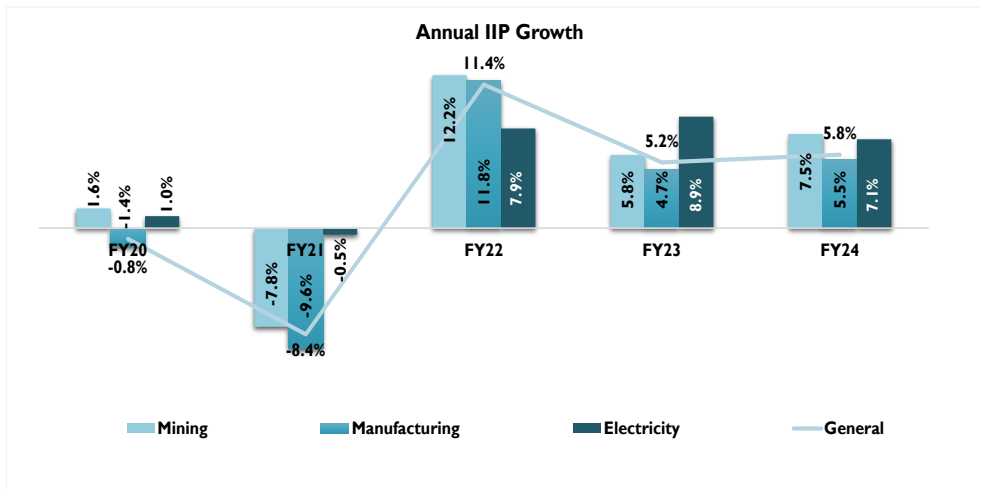
Sectoral analysis of GVA reveals industrial sector recovered sharply registering 9.0% y-o-y increase in FY 2024 against 2.1% in the previous fiscal. In the industrial sector, growth across major economic activity such as mining, manufacturing and construction sector rose significantly and it registered a growth of 7.1%, 9.9% and 9.9% in FY 2024 against a y-o-y change of 1.9%, -2.20%, and 9.44% in FY 2023, respectively. Utilities sector observed a marginal moderation in y-o-y growth to 7.5% in FY 2024 against 9.44% in the previous year (FY 2023).

Talking about the services sector's performance, with major relaxation in covid restriction, progress on COVID-19 vaccination and living with virus attitude, business in the service sector gradually returned to normalcy in FY 2023. Economic recovery was supported by the service sector as individual mobility returned to the pre-pandemic level. The trade, hotel, transport, communication, and broadcasting segment continued to strengthen in FY 2023 and grow in FY 2024, although the growth hasn't shown substantial increases. In FY 2024, services sector grew by 7.5% against 10% y-o-y growth in the previous year.

### Index of Industrial Production (IIP) Growth

Industrial sector performance as measured by the IIP index; in FY 2024, it is growing at 5.8% (against 5.2% in FY 2023). Previously IIP index exhibited temporary recovery in FY 2022 from the low of Covid induced slowdown in industrial growth during FY 2020 and FY 2021. Manufacturing index, with 77.6% weightage in overall index, grew by 5.5% in FY 2024 against 4.7% y-o-y growth in FY 2023 while mining sector index too growth by 7.5% in FY 2024 against 5.8% in the previous year. Mining & manufacturing both showed improvement in FY 2024 with reference to the previous year except the electricity sector index which witnessed an improvement of 7.1% in FY 2024 against 8.9% in the previous year.

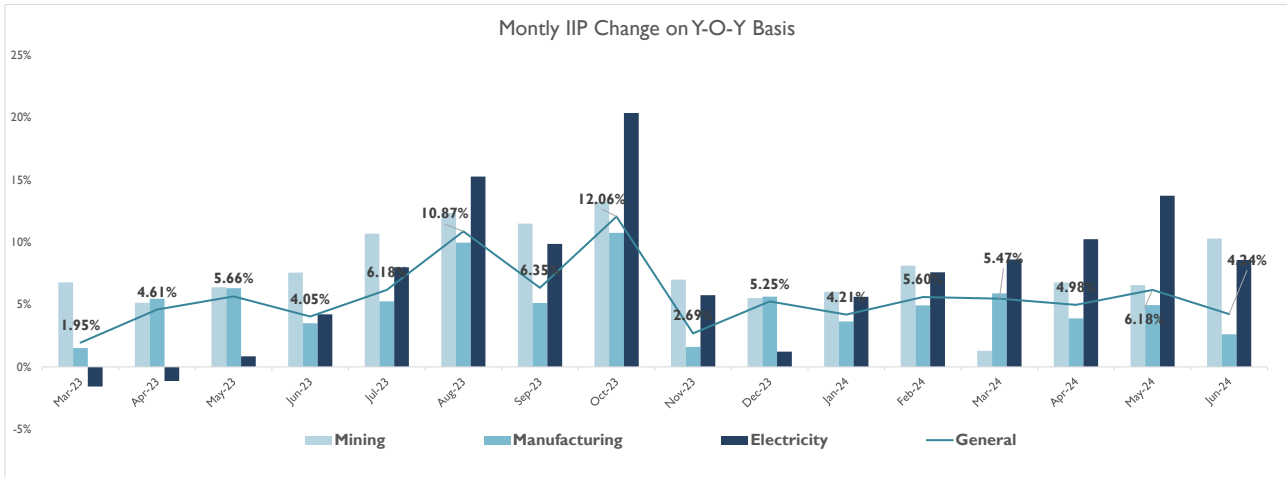




Source: Ministry of Statistics & Programme Implementation (MOSPI)

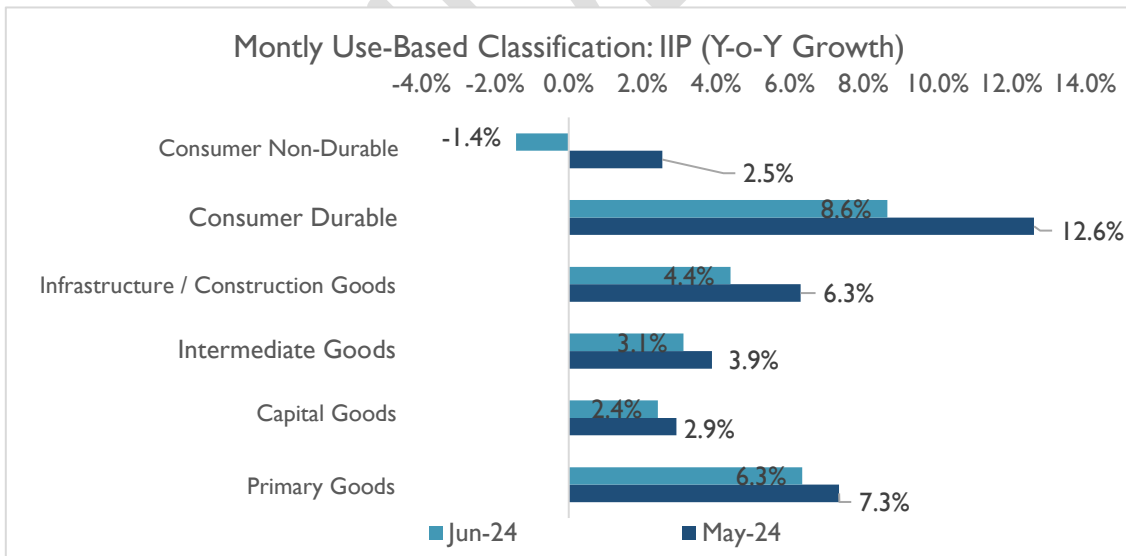
As per the use-based classification, most of the segments have shown growth for FY 2024 as compared to FY 2023. Capital goods and primary goods were segments which faced less growth in FY 2024 as compared to the previous year. The contracting IIP data points towards adverse operating business climate as global headwinds, high inflation, and monetary tightening cumulatively impacted the broader industrial sector performance. In contrast, all the segments except capital goods and primary goods have shown growth.

### Monthly IIP Growth Trend



Source: Ministry of Statistics & Programme Implementation (MOSPI)

The IIP index slowed to a 5-month low and just grew by 4.24% in June 2024 against 6.18% in the previous month on the back of slowing growth in the manufacturing section. In June 2024, the General Index of Industrial Production recorded around 4.24%, slightly down from earlier months. The performance has been steady, with the index at 5.47% in March 2024 and maintaining moderate growth, fluctuating around 5% throughout the first half of 2024. This reflects a stable and consistent industrial performance in 2024 without significant volatility.

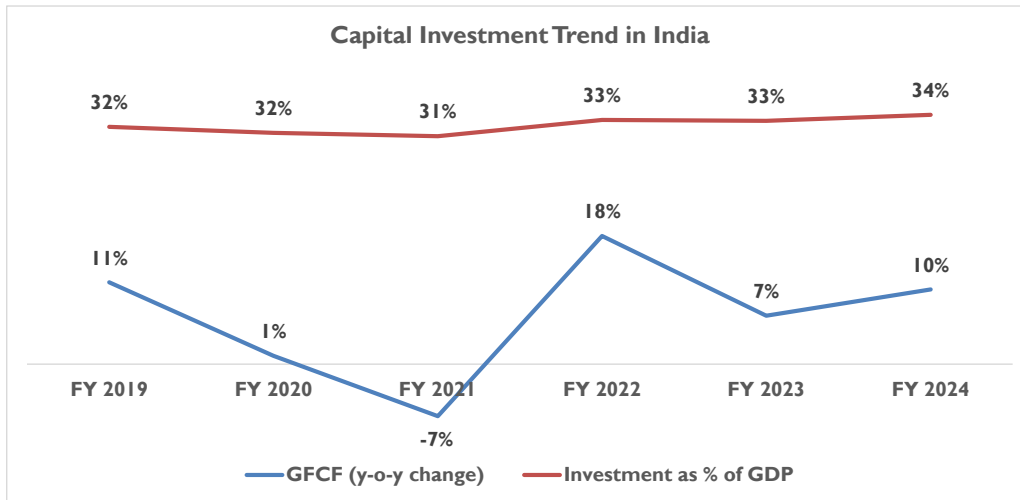


Sources: MOSPI

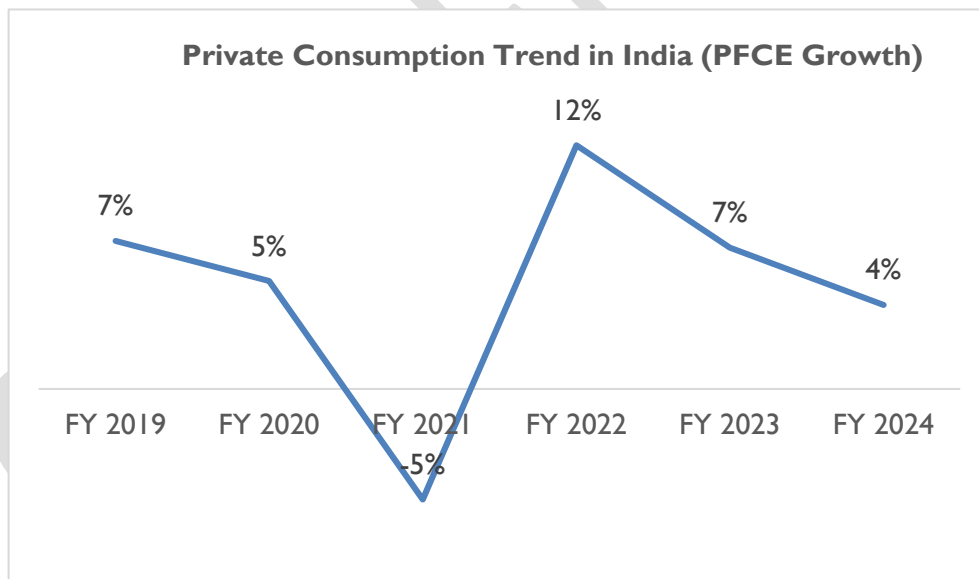
As per the monthly use-based classification, growth in all segments slowed in June 2024 as compared to the previous month. Consumer non-durable declined by 1.4% in June 2024 against 2.5% increase in the previous month. In May 2024, all segments showed a substantial increase in growth.

### Investment & Consumption Scenario

Other major indicators such as Gross fixed capital formation (GFCF), a measure of investments, gained strength during FY 2024 as it grew by 10% on a y-o-y basis against 7% yearly growth in the previous fiscal, while GFCF to GDP ratio measured an all-time high and settled higher at 34% in FY 2024.



Sources: MOSPI



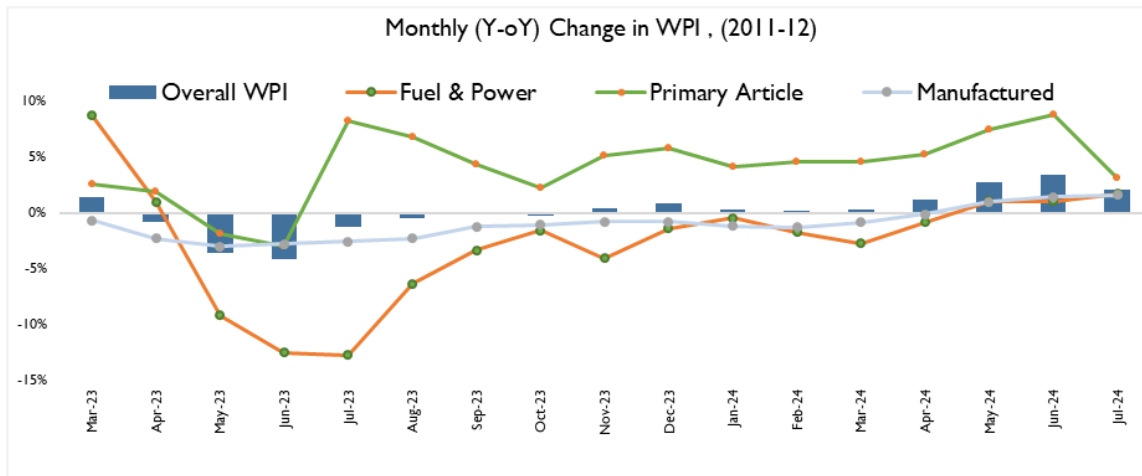
Sources: MOSPI

Private Final Consumption Expenditure (PFCE) a realistic proxy to gauge household spending, observed decelerated growth and registered 4% y-o-y growth in FY 2024 against 7% in FY 2023.

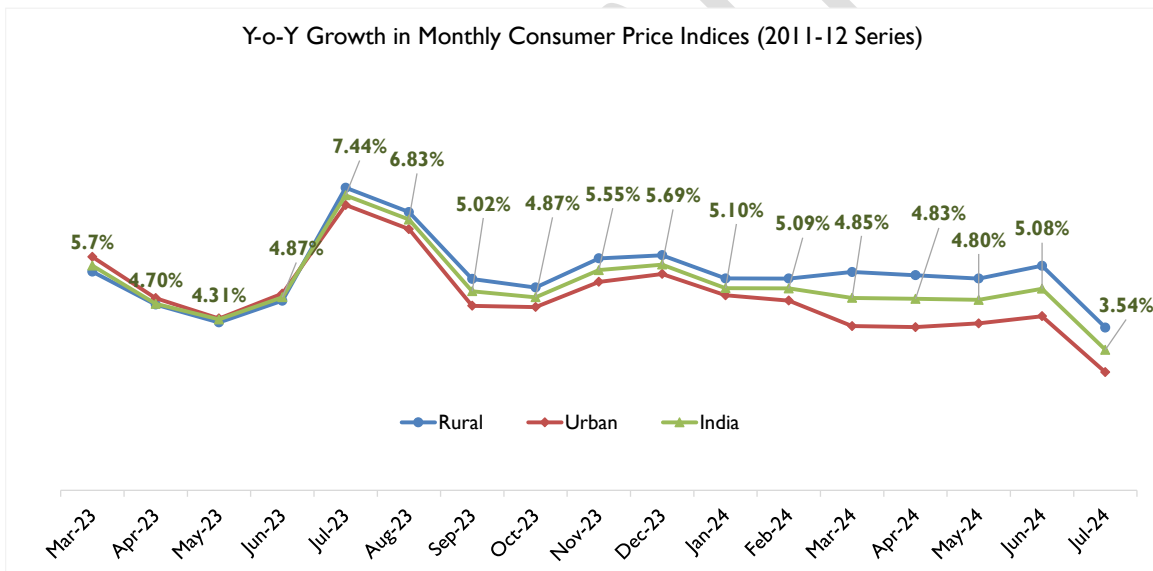
### Inflation Scenario

The inflation rate based on India's Wholesale Price Index (WPI) exhibited significant fluctuations across different sectors from March 2023 to July 2024. Overall WPI saw a sharp decline to -1.2% in July 2023, primarily driven by steep drops in fuel & power and manufactured products, reflecting reduced global demand and falling input costs. However, a recovery was noted by June 2024, with WPI reaching 3.4%, supported by

a strong rise in primary articles and a rebound in fuel & power prices. By July 2024, while primary articles growth moderated to 3.1%, the WPI remained positive at 2.0%, indicating stabilization in the market after earlier volatility.



Source: MOSPI, Office of Economic Advisor.



Source: Centre for Monitoring Indian Economy (CMIE) Economic Outlook

Retail inflation rate (as measured by the Consumer Price Index) in India showed notable fluctuations between March 2023 and July 2024. Rural CPI (Consumer Price Index) inflation peaked at 7.63% in July 2023, before declining to 4.10% in July 2024. Urban CPI inflation followed a similar trend, rising to 7.20% in July 2023 and then dropping to 2.98% in July 2024. Overall, the national CPI inflation rate increased to 7.44% in July 2023 but moderated to 3.54% by July 2024, indicating a gradual easing of inflationary pressures across both rural and urban areas over the period. Consumer Price Index measured below 6% tolerance limit of the central bank since September 2023. As a part of an anti-inflationary measure, the RBI (Reserve Bank of India) has hiked the repo rate by 250 basis points (bps) since May 2022 to the current 6.5% while it has been holding the rate at 6.5% since 8 Feb 2023.

## India's Growth Outlook

India's economy has exceeded expectations, registering a 7.6% growth in FY 2024. High-frequency indicators such as automobile sales, e-way bills, cargo traffic, and exports signal sustained growth momentum into Q2 FY 2025. However, the rural demand outlook is tied to the monsoon, where inconsistent rainfall could impact the agriculture sector and inflation. The government is proactively boosting grain storage capacity to mitigate these risks. On the credit front, the Reserve Bank of India (RBI) has kept the policy rate unchanged, with inflation expected to average around 5% in FY 2025. Despite stable policy rates, lending rates may rise due to the incomplete transmission of earlier hikes, while strong credit growth in the private sector suggests potential capacity expansion. Supply-side challenges persist, particularly in food storage infrastructure. The government has launched a massive initiative to enhance grain storage capacity by 70 million tonnes over the next five years. The recent long-term agreement for operating Iran's Chabahar Port is also set to bolster trade and supply chain resilience.

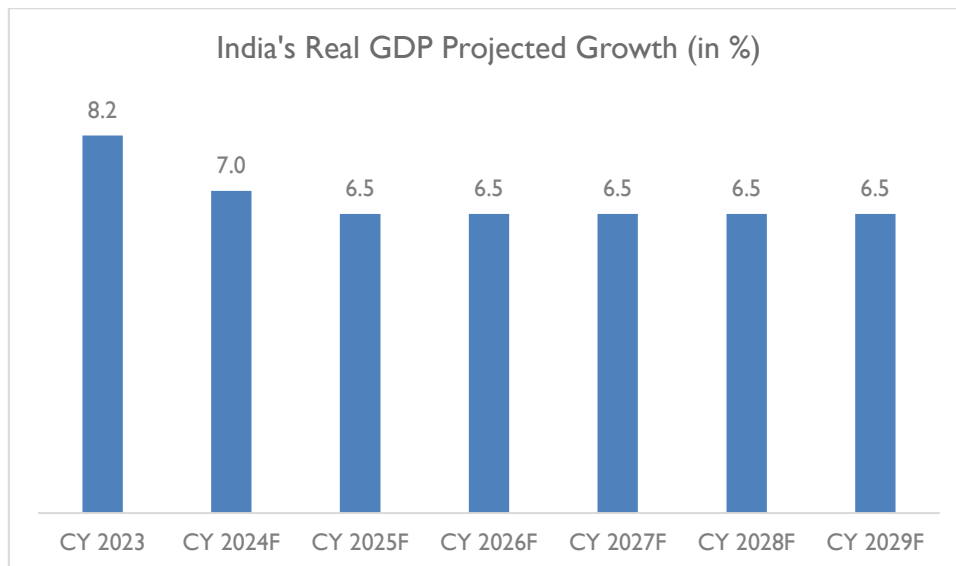
In terms of trade, India's recent agreements, particularly with the European Free Trade Association (EFTA) and Oman, are opening new markets and opportunities for exports. The proposed mega-distribution hub in the UAE (United Arab Emirates) by 2025 will further support India's global trade ambitions, particularly in Africa, Europe, and the US (United States).

The government is also taking steps to control retail inflation by managing food prices and import duties. The external environment remains cautious, with geopolitical tensions, particularly in Gaza, posing potential risks to global stability.

Overall, India's short-term growth outlook remains positive, underpinned by strong domestic demand, proactive government measures, and expanding global trade relationships, despite some challenges in the rural economy and supply chain infrastructure.

## India's Projected Economic Growth

Looking ahead to CY 2024, India's projected GDP growth of 7.0% in CY 2024 stands out as the fastest among major emerging markets, significantly outpacing China's 5.0%, and Brazil's 2.1%. This robust growth trajectory is expected to sustain at 6.5% annually from CY 2025 to CY 2029, reflecting strong economic fundamentals and continued momentum.



Source: International Monetary Fund (IMF)

This decent growth momentum in near term (CY 2024) is accompanied by a slowdown in inflation, as well as various other factors in the medium to long term that will support the economy. These include enhancements in physical infrastructure, advancements in digital and payment technology, improvements in the ease of doing business and a higher quality of fiscal expenditure to foster sustained growth.

On the demand side, improving employment conditions and moderating inflation are expected to stimulate household consumption. Further, the investment cycle is gaining traction, propelled by sustained government capital expenditure, increased capacity utilization and rising credit flow. Additionally, there are positive signs of improvement in net external demand, as reflected in the narrowing merchandise trade deficit. Despite the supply disruptions, exports clocked positive y-o-y growth in December 2023 and January 2024.

From uplifting the underprivileged to energizing the nation's infrastructure development, the Government has outlined its vision to propel India's advancement and achieve a 'Viksit Bharat' by 2047 in the interim budget announced on 1<sup>st</sup> Feb 2024. Noteworthy positives in the budget include achieving a lower-than-targeted fiscal deficit for FY 2024 and setting a lower-than expected fiscal deficit target for FY 2025, proposing dedicated commodity corridors and port connectivity corridors, providing long-term financing at low or nil interest rates to the private sector to step up R&D (Research & Development) in the sunrise sectors.

Achieving a reduced fiscal deficit of 5.8% in FY 2024 and projecting a lower than-anticipated fiscal deficit of 4.9% as announced in the interim budget in July 2024 for the current fiscal year (FY 2025) are positive credit outcomes for India. This showcases the country's capability to pursue a high-growth trajectory while adhering to the fiscal glide path. There has been a significant boost to capital expenditure for two consecutive years; capital expenditure – which is budgeted at 3.4% of GDP (INR 11.1 trillion/USD 134 billion) for fiscal year 2024-25 – is at a 21-year high (compared to 3.3% of GDP in the fiscal year 2023-



24). The enhancement of port connectivity, coupled with the establishment of dedicated commodity corridors (energy, mineral and cement), is poised to enhance manufacturing competitiveness. This strategic move aims to fulfil India's export targets and reduce logistics costs.

India's optimistic economic outlook is underpinned by its demographic dividend, which brings a substantial workforce that boosts labor participation and productivity. The burgeoning middle class and urbanization contribute to increased domestic consumption, driven by rising incomes and purchasing power. Extensive investments in infrastructure, encompassing roads, railways, ports, and digital connectivity, are enhancing productivity and efficiency, with government initiatives like the Smart Cities Mission and Prime Minister Gati Shakti creating a conducive growth environment. This digital transformation, catalyzed by initiatives such as Digital India, is fostering a tech-driven economy marked by enhanced internet penetration, digital payments, and e-governance, thereby fueling growth in sectors like fintech, e-commerce, and digital services. The push to position India as a global manufacturing hub through Make in India and PLI (Production Linked Incentive) schemes is further boosting industrial output, exports, and domestic production capabilities. Compared to other major emerging markets facing demographic and economic challenges, India's combination of demographic strengths, policy reforms, and strategic initiatives positions it as a standout performer and a significant driver of global economic growth in the foreseeable future.

[Some of the key factors that would propel India's economic growth.](#)

### **Strong Domestic Demand**

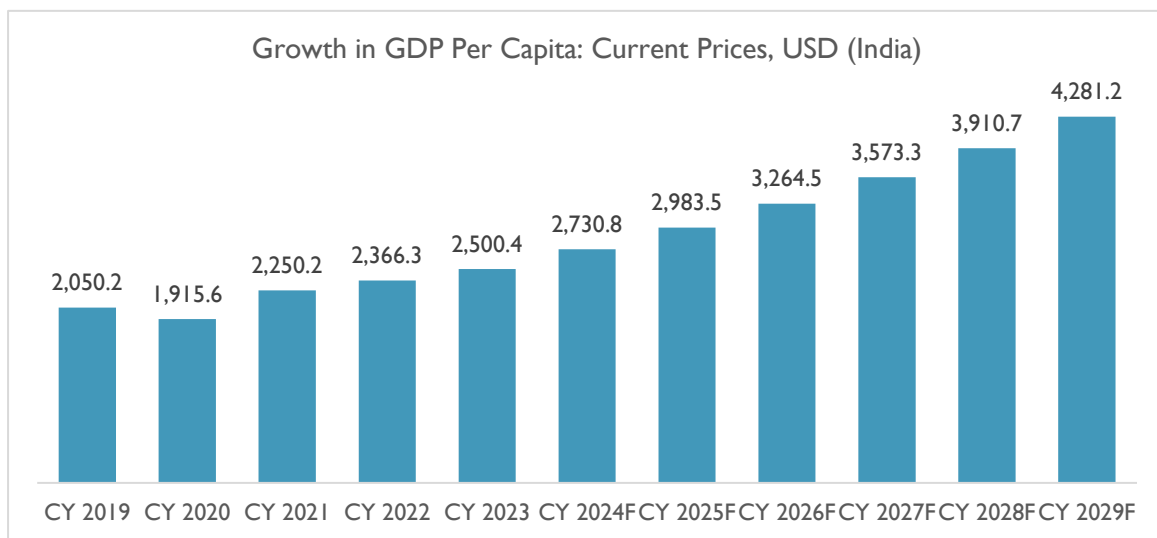
Domestic demand has traditionally been one of the strong drivers of Indian economy. After a brief lull caused by Covid-19 pandemic, the domestic demand is recovering. Consumer confidence surveys by Reserve Bank / other institutions points to an improvement in consumer confidence index, which is a precursor of improving demand. India has a strong middle-class segment which has been the major driver of domestic demand. Factors like fast paced urbanization and improving income scenario in rural markets are expected to accelerate domestic demand further. PFCE as a percentage of GDP increased to 58% during FY 2022 and FY 2023 while in FY 2024 it settled at 56%. There are two factors that are driving this domestic demand: large pool of consumers and improvement in purchasing power. As per National Statistics Office (NSO), India's per capita net national income (at constant prices) stood at INR 1.06 lakhs in FY 2024 against INR 99,404 in FY 2023 and INR 87,623 in FY 2018. This increase in per capita income has impacted the purchasing pattern as well as disposable spending pattern in the country. Consumer driven domestic demand is majorly fuelled by this growth in per capita income.

### **India's per capita GDP trends**

India is poised to become the world's third-largest economy with a projected GDP of USD 5 trillion within the next three years, driven by ongoing reforms. As one of the fastest-growing major economies, India currently holds the position of the fifth-largest economy globally, following the US, China, Japan, and Germany. By 2027-28, it is anticipated that India will surpass both Germany and Japan, reaching the third-

largest spot. This growth is bolstered by a surge in foreign investments and a wave of new trade agreements with India’s burgeoning market of 1.4 billion people. The aviation industry is witnessing unprecedented orders, global electronics manufacturers are expanding their production capabilities, and suppliers traditionally concentrated in southern China’s manufacturing hubs are now shifting towards India.

To achieve its vision of becoming the world’s third-largest economy by FY 2027-28, India will need to implement transformative industrial and governmental policies. These policies will be crucial for sustaining the consistent growth of the nation's per capita GDP over the long term.



Source: IMF

From CY 2024-29, India’s per capita GDP is projected to grow at a compound annual growth rate of 9.4%. This growth will be driven by the service sector, which now accounts for over 50% of India's GDP, marking a significant shift from agriculture to services.

**Digitization Reforms**

Ongoing digitization reforms and the resultant efficiency gains accrued would be a key economic growth driver in India in the medium to long term. Development of digital platforms has helped in the seamless roll out of initiatives like UPI (Unified Payments Interface), Aadhaar based benefit transfer programs, and streamlining of GST (Goods and Services Tax) collections. All of these have contributed to improving the economic output in the country. Some of the key factors that have supported the digitization reforms include – the growth in internet penetration in India together with drop in data tariffs, growth in smartphone penetration, favourable demographic pattern (with higher percentage of tech savvy youth population) and India’s strong IT (Information Technology) sector which was leveraged to put in place the digital ecosystem. All these factors are expected to remain supportive and continue to propel the digitization reforms in India.

Increased adoption of digital technology and innovation, inclusive and sustainable practices, business-friendly and transparent regulations, and heightened corporate research and development (R&D) investments will further bolster the country’s growth. These factors will collectively support employment growth across both private and public sectors, including micro, small, and medium enterprises (MSMEs).

## Copper: Product Overview

Copper is a crucial metal across industries due to its conductivity, malleability, corrosion resistance, and antimicrobial properties. Being easily shaped, it finds uses in intricate designs and various applications. Its resistance to corrosion ensures durability, and its antimicrobial properties make it valuable in healthcare settings. In addition, excellent alloying properties possessed by the metal has made it a popular metal for alloys. Bronze and brass are two of the popular copper alloys that have found numerous commercial applications.

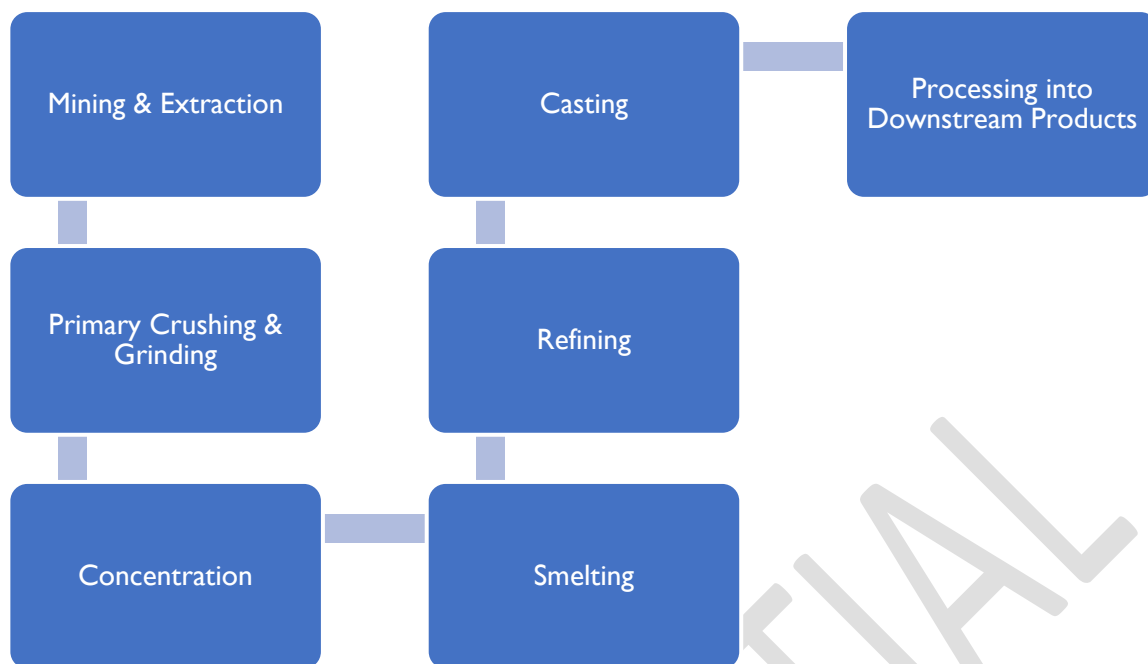
In industries, copper is used extensively. It is vital in electrical systems, construction (plumbing, roofing), transportation (automotive parts, wiring), and healthcare equipment (medical devices, antimicrobial surfaces). Products using copper range from electrical appliances and gadgets to plumbing fixtures and medical devices. Copper enhances their performance, durability, and safety, making it integral to modern infrastructure and technology.

**However, India does have not enough copper ore deposits to meet its demand. Consequently, the country depends upon a mix of domestic production, import of virgin copper, as well as recycling of imported & domestically available copper.**

### Primary Extraction Process

The process of converting raw copper ore into usable formats involves several stages, each contributing to the extraction, purification, and transformation of copper into various downstream products. This comprehensive process spans from mining the ore to refining it and eventually producing finished copper products. The first step involves recovering copper from ore followed by further processing and culminating in the production of copper cathode. The processing stage involves smelting as well as remelting process wherein copper concentrate is converted into its cathode and blister form.

- **Mining & Extraction:** The process begins with the extraction of raw copper ore from mines. These mines can be open-pit or underground, depending on the ore's depth and accessibility. In open-pit mining, large earth-moving equipment excavates the ore, while in underground mining, tunnels are used to access deeper ore deposits.
- **Primary Crushing & Grinding:** Once extracted, the ore undergoes crushing and grinding to reduce its size for further processing.



- **Concentration:** After crushing and grinding, the ore goes through a concentration process to separate the copper minerals from the gangue (unwanted materials). This typically involves flotation, where chemicals and air bubbles are used to selectively separate copper minerals from the ore. The resulting concentrate contains a higher concentration of copper minerals and is ready for further processing. This concentrate can contain 25-35% of copper, and similar levels of iron and sulphur, as well as minor percentages of other metals including gold & silver metals depending on the location of mines and nature of deposit.
- **Smelting:** The concentrated copper ore, known as copper concentrate, is then smelted in a furnace. During smelting, the concentrate is heated to high temperatures, causing it to melt and separate into two layers: a molten copper matte layer containing copper sulphide minerals and an overlaying slag layer containing impurities. The matte layer is further processed to remove impurities and transform it into blister copper, which is around 98-99% pure copper.
- **Refining:** Blister copper undergoes refining to achieve higher purity levels suitable for various applications. The two main refining methods are **electrolytic refining** and **fire refining**. In **electrolytic refining**, an electrolytic cell is used where copper ions from the impure copper anode migrate to the pure copper cathode, resulting in refined copper with a purity of over 99.9%. **Fire refining** involves further purification of blister copper through oxidation and reduction reactions to remove remaining impurities.
- **Casting:** Once refined, the copper is cast into various forms depending on its intended use. Common forms include copper cathodes, rods, billets, and ingots. These forms are produced using casting processes such as continuous casting or batch casting, where molten copper is poured into moulds and cooled to solidify into the desired shape.

- **Processing into Downstream Products:** The refined copper products are then processed into downstream products based on market demand and industry requirements. Cathode and blister are converted through smelting and remelting processes to semi-fabricated products such as copper tubes, rods, wires, rolled products that are further used in manufacturing products for various end user industries such as motors, pumps, generators, transformers, electronic components, auto electrical amongst others. It is an important part of the entire chain, from a technological and economical point of view, and its competitiveness is essential to the entire production system and its use.

### Secondary Extraction: From Scrap

Scrap copper, derived from various sources such as discarded electrical wiring, plumbing materials, and industrial machinery, undergoes a systematic extraction process to recover valuable copper content. This process not only reduces the demand for primary copper ore but also minimizes environmental impact through recycling and reuse practices.

The extraction of copper from scrap begins with collection and sorting. Scrap copper is collected from different sources, including demolition sites, electronic waste recycling centres, and manufacturing facilities. It is then sorted based on its composition and quality to ensure efficient processing. This sorting stage is vital to segregate pure copper scrap from other materials like plastic insulation or steel components.

Once sorted, the scrap copper undergoes processing to remove impurities and prepare it for smelting. The first step is shredding, where large pieces of scrap are broken down into smaller fragments for easier handling and processing. After shredding, the copper scrap is typically subjected to a series of mechanical and chemical processes to remove contaminants such as insulation, coatings, or other metals.

Mechanical processes like granulation or shearing are used to further reduce the size of scrap copper and separate it from non-copper materials. This step often involves the use of specialized equipment like crushers, granulators, and separators to achieve high purity copper fractions. Chemical methods such as leaching, or electrolysis may also be employed to dissolve or separate impurities from the copper content.

Once the scrap copper is purified and prepared, it is ready for smelting. Thus, scrap materials and residues are melted in a blast or smelting furnace to separate metals from non-metallic content. The molten metal, including copper and other metals, is cast into anode plates for electrolytic deposition. These anodes, along with lead cathodes, are placed in electrolytic tanks connected to a current source. Copper from the anodes deposit onto the cathodes, which are later replaced with thin electrolytic copper sheets. Reversing the current transfers the copper to these sheets, resulting in pure copper plates exceeding 99.97% purity.

The role of copper extraction from scrap in the global copper industry is significant due to its contribution to resource conservation by reducing the need for new copper extraction from primary ores, which can be environmentally and socially impactful. Recycling scrap copper also helps in energy conservation as it requires less energy compared to extracting copper from ores.

Further, the recycling of copper scrap supports a circular economy model where materials are reused and recycled, minimizing waste generation, and promoting sustainable practices. It also helps in meeting the growing demand for copper, especially in sectors like electronics, construction, and transportation, where copper is a critical component.

Thus, copper extraction from scrap plays a vital role in the global copper industry by promoting sustainability, resource conservation, and circular economy practices. Through efficient collection, sorting, processing, and smelting techniques, scrap copper is transformed into valuable raw material for various industries, contributing to a more sustainable and responsible copper supply chain.

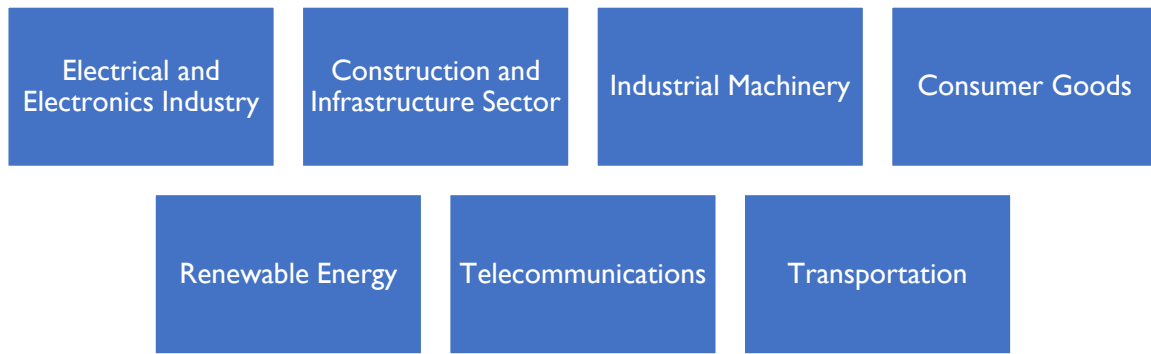
### Key Products

- **Copper Rods and Wires:** Refined copper is drawn into thin rods or wires through a process called wire drawing. These copper rods and wires are used in electrical and electronic applications.
- **Copper Tubes and Pipes:** Copper is extruded or drawn into tubes and pipes of various sizes and shapes. These are extensively used in plumbing, HVAC (heating, ventilation, and air conditioning), and refrigeration systems.
- **Copper Sheets and Plates:** Refined copper can be rolled into sheets and plates of different thicknesses. These are used in roofing, construction, and manufacturing of various industrial components.
- **Copper Alloys:** Copper is often alloyed with other metals such as zinc, tin, nickel, and aluminum to create copper alloys with specific properties like strength, corrosion resistance, and electrical conductivity. Common copper alloys include brass and bronze.
- **Copper Foils and Strips:** Thin copper foils and strips are used in electronics for printed circuit boards (PCBs), electrical components, and electromagnetic shielding.
- **Copper Components:** Refined copper is also used to manufacture a wide range of components and products such as motors, transformers, cables, connectors, and decorative items.

### Commercial Applications

Refined copper, a pure form of copper obtained through smelting and purification processes, holds a significant position in a wide array of commercial applications across various downstream products and industries. Its exceptional properties such as high electrical conductivity, thermal conductivity, corrosion resistance, malleability, and durability make it a versatile and indispensable material in modern manufacturing and infrastructure development. These broadly include:





**Electrical and Electronics Industry:** One of the primary commercial applications of refined copper lies in the electrical and electronics industry. Here, it serves as the backbone for electrical wiring and power transmission due to its excellent conductivity properties. Refined copper is extensively used in the manufacturing of power cables, electrical connectors, circuit boards, and electrical components for various devices ranging from small electronic gadgets to large-scale electrical systems like transformers and generators. Its conductivity ensures efficient energy transfer, making it an essential material for powering homes, industries, and infrastructure.

**Construction and Infrastructure Sector:** In the construction and infrastructure sector, refined copper plays a crucial role in plumbing systems, HVAC systems, roofing materials, and architectural elements. Copper's corrosion resistance and durability make it an ideal choice for plumbing pipes and fittings, ensuring long-term reliability and minimal maintenance. In HVAC systems, copper tubes and coils are commonly used for heat transfer and refrigeration due to their thermal conductivity, contributing to efficient cooling and heating processes. Moreover, copper is employed in roofing materials for its weather resistance, longevity, and aesthetic appeal, enhancing the durability and aesthetics of buildings. Architectural elements like decorative panels, facades, and sculptures also utilize refined copper for its malleability and ability to achieve intricate designs.

**Industrial Machinery:** The industrial machinery sector extensively utilizes refined copper for various applications. In manufacturing equipment, copper is used for electrical connections, conductive components, and heat transfer applications, ensuring efficient energy transmission and control in machinery. Its conductivity facilitates smooth operations and productivity in industrial processes. Precision tools and machinery parts often incorporate copper alloys for their wear resistance, corrosion resistance, and machinability, enhancing tool life and performance. Additionally, copper is employed in bearings and bushings for its self-lubricating properties, reducing friction and wear in moving parts.

**Consumer goods:** Consumer goods manufacturing relies on refined copper for a multitude of products. In appliances like air conditioners, refrigerators, washing machines, and small electronic devices, copper is used for heat exchangers, coils, wiring, and connectors due to its thermal conductivity, corrosion resistance, and electrical properties. These appliances benefit from efficient heat transfer, electrical connectivity, and

durability, ensuring reliable performance and longevity. Moreover, copper's antimicrobial properties make it suitable for applications in healthcare equipment and devices, contributing to hygiene and infection control in medical settings.

Renewable Energy: The renewable energy sector increasingly utilizes refined copper for sustainable energy solutions. Solar panels and photovoltaic cells rely on copper for electrical wiring, connectors, and conductive layers due to its conductivity and durability in outdoor environments. Wind turbines incorporate copper in generators, transformers, and electrical components for efficient energy conversion and transmission. Energy storage systems, such as batteries and capacitors, also utilize copper for its conductivity and reliability, supporting the storage and distribution of renewable energy.

Telecommunications: Telecommunications infrastructure heavily relies on refined copper for reliable data transmission and communication networks. Copper cables and wiring are fundamental components in telecommunications systems, ensuring efficient signal transmission and connectivity for voice, data, and internet services. Copper's conductivity and reliability in telecommunications equipment contribute to stable and high-speed communication networks, supporting global connectivity and digital communication.

Transportation: In the transportation sector, refined copper is vital for manufacturing vehicles and transportation infrastructure. In vehicle manufacturing, copper is used in wiring harnesses, connectors, sensors, and electrical systems for automobiles, trucks, trains, and ships. Its conductivity, durability, and corrosion resistance contribute to efficient and reliable electrical systems in vehicles. Additionally, copper alloys are utilized in bearings, bushings, and brake components for their friction properties, contributing to smooth and safe vehicle operation. Transportation infrastructure, including railway systems, electrical grids, and maritime infrastructure, also incorporates copper for electrical conductivity and reliability in transportation networks.

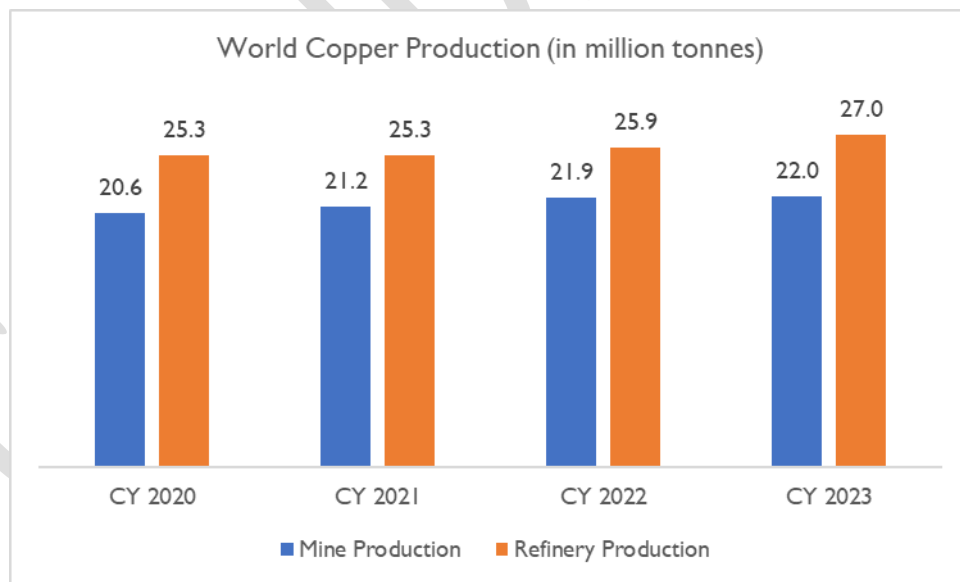
Overall, refined copper plays a vital role across a diverse range of industries and applications, contributing to technological advancement, infrastructure development, energy efficiency, and sustainable solutions. Its unique properties and versatility make it an essential material in modern manufacturing, construction, transportation, telecommunications, renewable energy, and consumer goods sectors, shaping various aspects of the daily lives and global economy.

## Global Copper Scenario

The global copper market is influenced by factors like economic growth, technological advancements, and sustainability concerns, impacting prices and consumption trends. Growing demand from emerging markets, especially in Asia, along with innovations in renewable energy and electric vehicles, highlights copper's significance. However, supply chain disruptions and geopolitical tensions pose challenges, requiring vigilant monitoring and strategic decision-making in the industry.

The growth in production in CY 2021 can be credited to post covid revival in economic activity across all major economies. Indonesia witnessed a considerable scale up in production, and this has played a major role in boosting copper output in CY 2021. However, production uncertainties plaguing copper mines in Latin America – notably Chile and Peru – due to strikes and protests continues to be a threat to global copper production. Despite this, Chile and Peru continue to be the major production hubs, along with China and Democratic Republic of Congo (DRC).

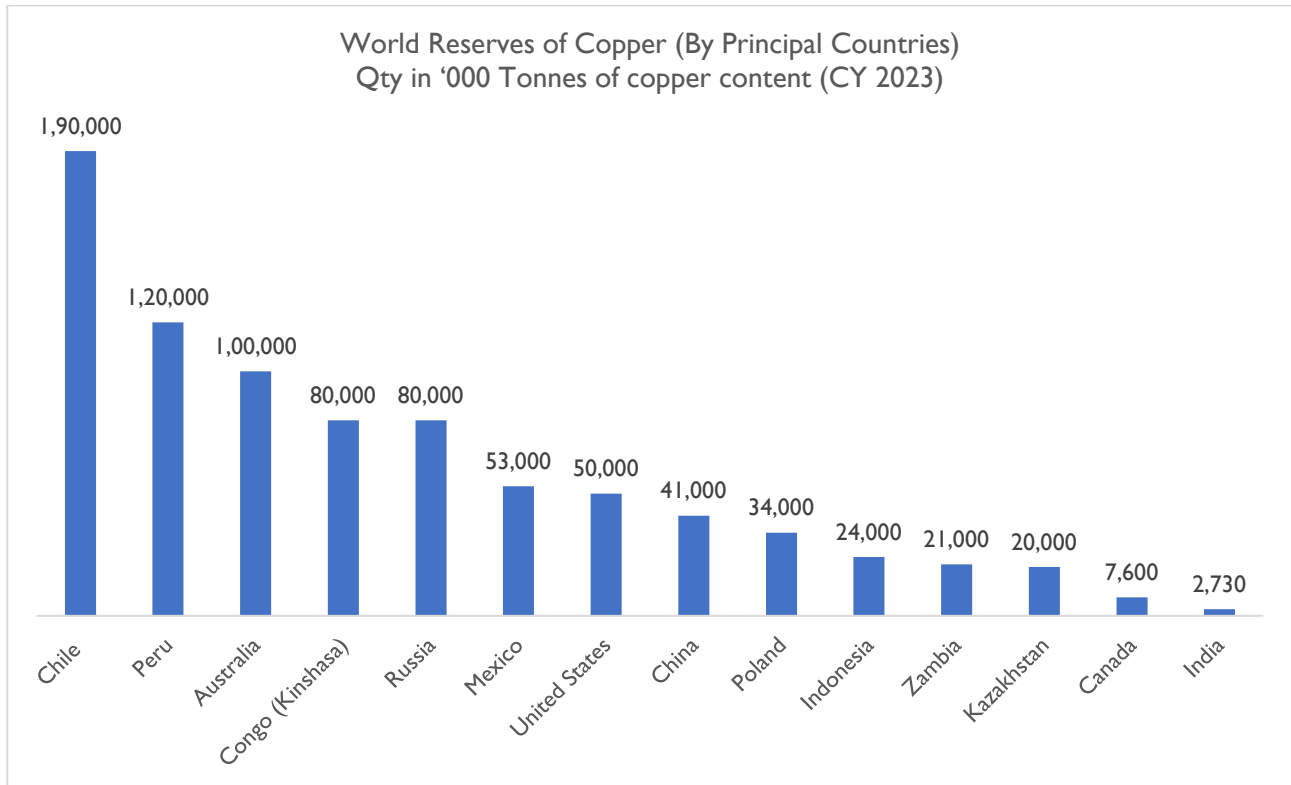
This trend continued in CY 2022 where mine production increased by 3%, whereas refinery production increased by 2% over the last year. While CY 2023 observed no significant increase in mine production, refinery production increased by 4%. Sustained growth in copper demand is expected to continue because of progressive move towards more sustainable economy, increase in population, product innovation, economic development etc. Compared to the global standards, India's refined copper production accounts for a 2% share in the global refined copper production.



Source: Mineral Commodity Summaries

The global demand for copper has been growing continuously. World refined usage has more than tripled in the last 50 years because of growing sectors such as building construction, industrial machinery and equipment, transportation equipment, and consumer and general products.

The world reserves of copper metal are assessed at 1 billion tonnes of copper content as of CY 2023. Chile has the largest share, accounting for about 19% of world reserves, followed by Peru (12%), Australia (10%), Congo & Russia (8% each) and Mexico & United States (5% each).



Source: Mineral Commodity Summaries

Compared with global markets, India has limited copper ore reserve, with India's share in world reserves standing at 2%. Further, India's per capita copper consumption currently stands at approximately 0.6 kg, significantly lower than the global average of 3.2 kg. However, with India's focus on transitioning towards clean energy systems and the rapid adoption of electric vehicles (EVs), the demand for copper is poised to surge. This surge is not only due to EVs themselves but also the associated infrastructure like charging stations and grid upgrades, all of which require substantial amounts of copper. Projections suggest that India's domestic copper demand could double by 2030, driven primarily by these transformative shifts in the energy and transportation sectors.

## Copper Production Scenario in India

India possesses limited known reserves of copper ore suitable for copper production. As per the Ministry of Mines Annual Report 2022-23, the total resources of copper ore in the country by April 1, 2015<sup>1</sup>, stand at approximately 1,511.50 million tonnes, with around 12.15 million tonnes of copper metal. Among these resources, 207.77 million tonnes (13.7%) are categorized as Reserves, containing 2.73 million tonnes of copper metal, while the remaining 1,303.73 million tonnes (86.3%) are classified as 'Remaining Resources', holding 9.42 million tonnes of copper metal.

Copper Reserves in India: Geographical Spread		
State	Ore (in Million Tonnes)	Metal (in Million Tonnes)
Rajasthan	813.3	4.5
Jharkhand	295.4	3.3
Madhya Pradesh	283.4	3.4
Rest of the Country	119.4	1.0

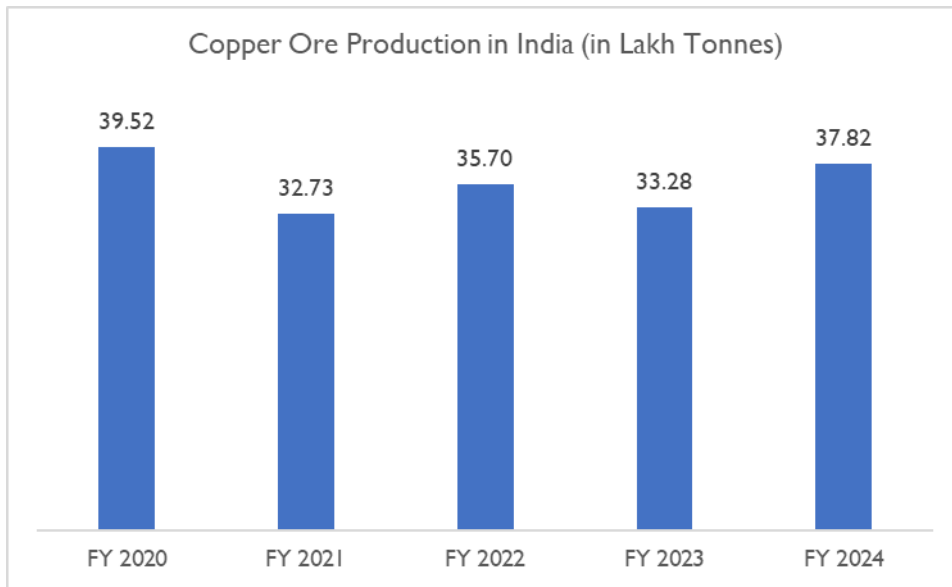
Source: Indian Bureau of Mines

## Copper Ore Production

Over the period from FY 2021 to FY 2024, copper ore production demonstrated a robust upward trend. In FY 2021, production stood at 32.73 lakh tonnes. This figure saw an increase to 35.70 lakh tonnes in FY 2022, reflecting a growth phase. Although production dipped slightly to 33.28 lakh tonnes in FY 2023, it rebounded to 37.82 lakh tonnes by FY 2024.

This overall increase represents a compound annual growth rate (CAGR) of 4.94% from FY 2021 to FY 2024. The data highlights a consistent long-term growth trajectory in copper ore production, despite some annual fluctuations. The rebound in production levels in FY 2024, following a temporary decline in the previous year, underscores a resilient and upward momentum in the sector. This growth pattern indicates a favorable outlook for the copper ore industry, driven by underlying demand and operational improvements.

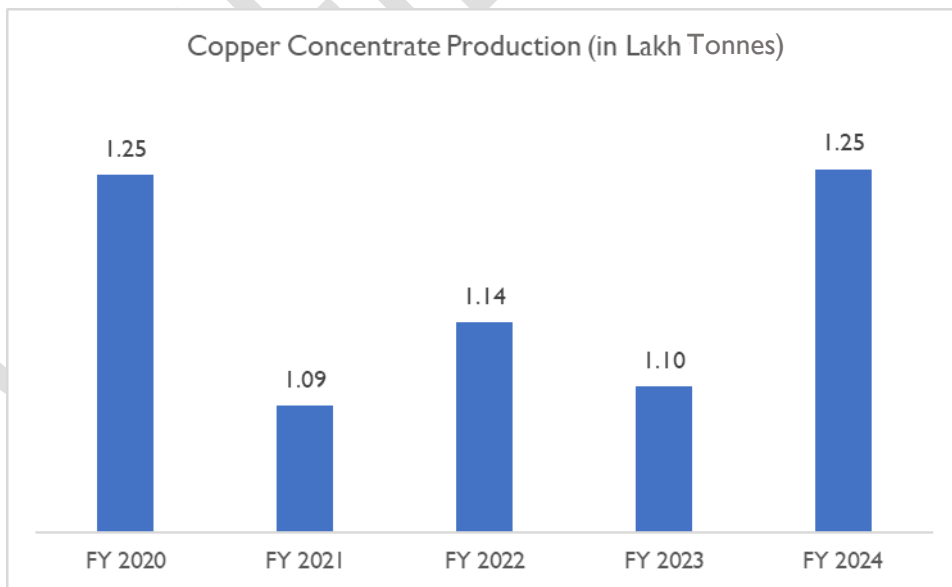
<sup>1</sup> Note: Information is as per latest available data



Source: Ministry of Mines, D&B Research

### Copper Concentrate Production

The production of copper concentrate is directly dependent on the availability and quality of copper ore. Copper concentrate is produced by processing copper ore through various methods such as crushing, grinding, flotation, and smelting, where the ore is concentrated to increase the copper content before further refining processes. Copper concentrate production demonstrated a growth, the output rising from 1.09 lakh tonnes in FY 2021 to 1.25 lakh tonnes by FY 2024, reflecting a compound annual growth rate (CAGR) of 4.7%.

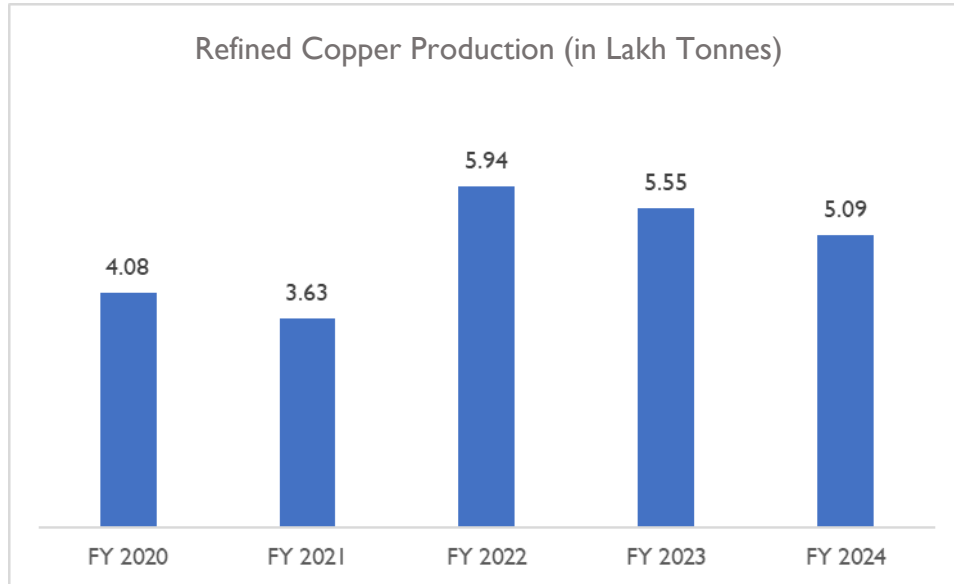


Source: Ministry of Mines, D&B Research



## Refined Copper Production

The production of refined copper in India has been seen to increase significantly between FY 2020 – FY 2022 and then experienced decline till FY 2024. Between FY 2020 – FY 2024, the refined copper production increased at a CAGR of 5.69%, growing from 4.08 Lakh Tonnes in FY 2020 to 5.09 Lakh tonnes in FY 2024.



Source: Ministry of Mines

Despite the decline of 11% observed in FY 2021 due to closure of plants and covid-19, the production increased drastically in FY 2022, recording an annual growth of 64% over the previous fiscal.

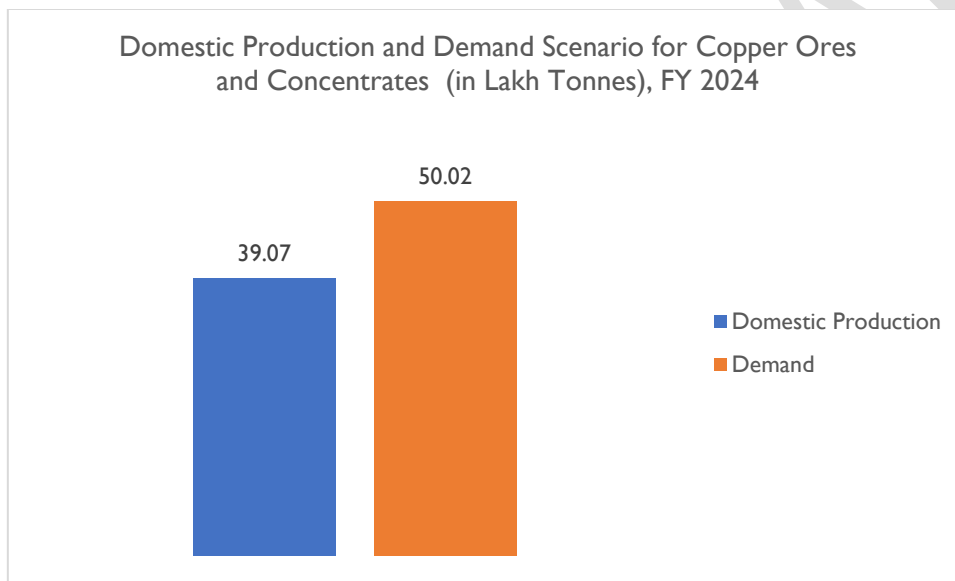
This growth in the production of refined copper is increasing in India due to several factors such as growing demand from sectors like infrastructure, construction, and electronics, advancements in technology leading to more efficient extraction and refining processes, increased investment in the mining and metallurgy sectors, government initiatives to promote domestic production, and favourable market conditions driving expansion and capacity utilization in copper refining facilities.

## Market Comparative Analysis

### Domestic Production & Demand for Copper Ores and Concentrates

The current demand-supply scenario for copper ores and concentrates presents a significant opportunity for growth and investment. With a domestic demand of 50.02 lakh tonnes and a production level of 39.07 lakh tonnes, there is a substantial gap of 10.95 lakh tonnes in FY 2024.

The domestic production of copper ores and concentrates, currently at 39.07 lakh tonnes, reflects the existing mining capacities and output. However, there is ample room for expansion and improvement. Factors such as technological advancements, increased mining efficiency, and investments in new projects can significantly boost production.



Source: Directorate General of Foreign Trade (DGFT), D&B Research

The demand for copper ores and concentrates is driven by various industries, including electrical wiring, electronics, construction, and industrial machinery. The growing industrial sector, infrastructure development, and technological advancements are major contributors to this demand. The increasing adoption of electric vehicles, renewable energy systems, and advanced electronics further amplifies the demand for copper.

The existing gap between supply and demand offers a promising opportunity for investors and businesses. Investing in mining operations, exploration projects, and technological innovations can help bridge the gap and capitalize on the growing demand for copper. Additionally, the high copper prices driven by the supply-demand imbalance can provide attractive returns on investment.

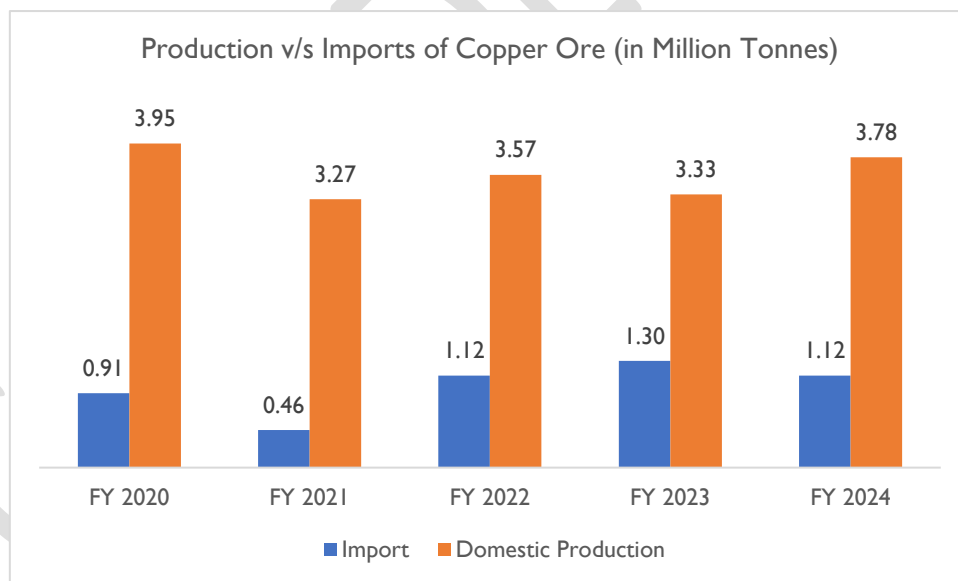
The significant shortfall between the supply and demand of copper ores and concentrates in India presents a substantial opportunity for domestic copper producers. As the country strives to bridge this gap, there is a growing demand for domestically produced copper products. This presents a favorable market environment for copper producers to expand their operations, increase production, and capture a larger share of the

market. By investing in new technologies, improving mining efficiency, and exploring new deposits, copper producers can position themselves to benefit from the increasing demand for their products and potentially realize significant profits.

By addressing the production shortfall and expanding domestic capabilities, the country can not only meet its domestic demand but also become a significant player in the global copper market. This will create jobs, stimulate economic growth, and strengthen the country's industrial base.

### Production v/s Imports of Copper Ore

The trends in copper ore imports and domestic production in India from FY 2020 to FY 2024 present a compelling comparative analysis of the factors influencing these dynamics. Initially, copper ore imports saw a significant decline from 0.91 million tonnes in FY 2020 to 0.46 million tonnes in FY 2021, primarily due to the COVID-19 pandemic, which disrupted global supply chains and reduced industrial demand. Aligning with this trend, domestic production also decreased from 3.95 million tonnes to 3.27 million tonnes during the same period, impacted by labor shortages and operational challenges due to the pandemic. As the economy started to recover, imports surged to 1.12 million tonnes in FY 2022, driven by a rebound in industrial activities and pent-up demand from sectors such as construction, automotive and electronics. Similarly, domestic production saw a modest recovery to 3.57 million tonnes, reflecting the resumption of mining activities and improved logistics.

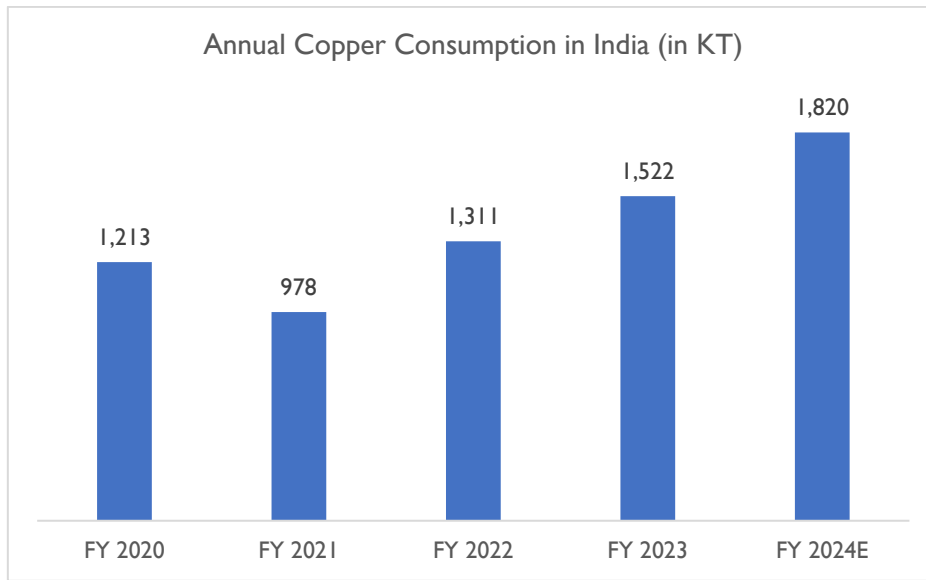


Source: DGFT, Ministry of Mines, D&B Research

However, FY 2023 showed a divergence, with imports increasing further to 1.30 million tonnes, while domestic production experienced a slight decline to 3.33 million tonnes. By FY 2024, imports stabilized at 1.12 million tonnes, indicating a recalibration of supply chain strategies and stable global copper prices. Meanwhile, domestic production saw a significant increase to 3.78 million tonnes. While global disruptions and economic recovery phases influenced import levels, domestic production was more directly impacted by internal challenges and strategic investments.

## Copper Consumption Scenario in India

An estimated 1,820 kilo tonnes of copper was consumed in India in FY 2024, increasing by nearly 20% over previous year. Barring FY 2021, when the consumption dipped on account of the spread of Covid-19 pandemic, the annual consumption of copper has been steadily increasing. Between FY 2020 and 2024, the volume of copper consumed in India has increased by a CAGR of approximately 10.68%. On a general basis, primary copper accounts for nearly two third of the total annual consumption in the country while the remaining is met through secondary / recycled copper.



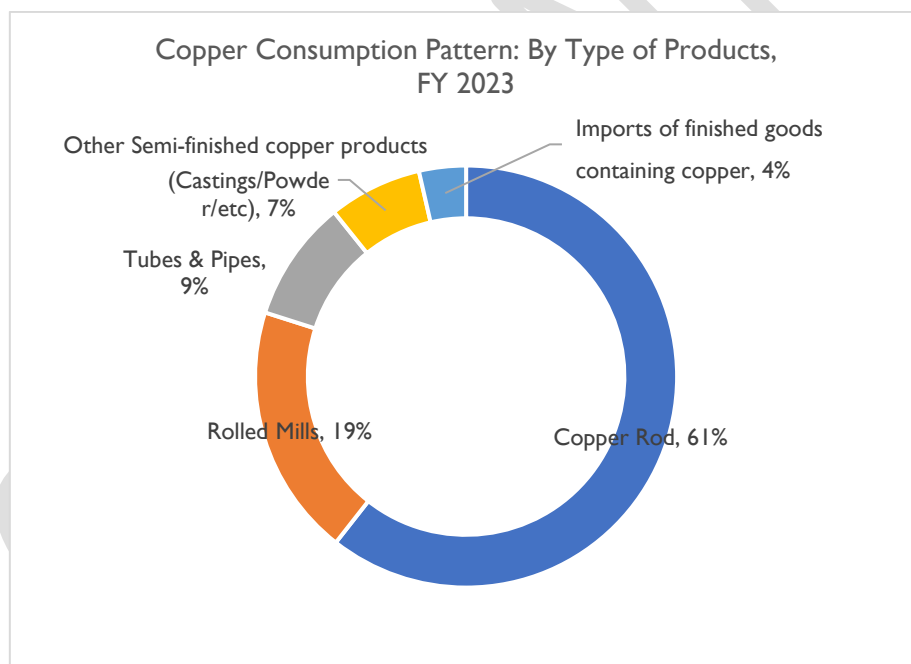
Source: International Copper Association of India, D&B Research and Estimates

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### Copper Consumption: By Product Type

Copper consumption in downstream products encompasses various essential sectors, showcasing the versatility and indispensability of this metal in numerous applications. In FY 2023, copper rods (including wires) constitute the largest share of copper consumption, accounting for 61% of the total usage. This dominance is primarily due to their extensive application in electrical wiring and cable production. Copper's excellent electrical conductivity makes it the preferred choice for these products, which are essential for residential, commercial, and industrial electrical infrastructure. Additionally, copper rods are used in the manufacturing of magnet wires, which are critical components in motors, transformers, and generators.

Rolled mills, which include copper sheets, strips, and foils, represent 19% of copper consumption. These products are crucial in the construction, automotive, and electronics industries. Copper sheets and strips are widely used in architectural applications, roofing, and cladding due to their durability and aesthetic appeal. In the automotive sector, rolled copper is used for radiators, heat exchangers, and various electrical components. The electronics industry relies on copper foils for the production of printed circuit boards (PCBs), essential for nearly all electronic devices.



Source: D&B Research

Copper tubes and pipes account for 9% of copper consumption. These products are essential in plumbing and HVAC systems due to copper's excellent thermal conductivity and resistance to corrosion. Copper pipes are also widely used in refrigeration systems and in various industrial applications where reliable and durable piping solutions are required.

Other semi-finished copper products, including castings and powder, make up 7% of the consumption. Copper castings are used in a variety of industries for producing intricate and durable components such as

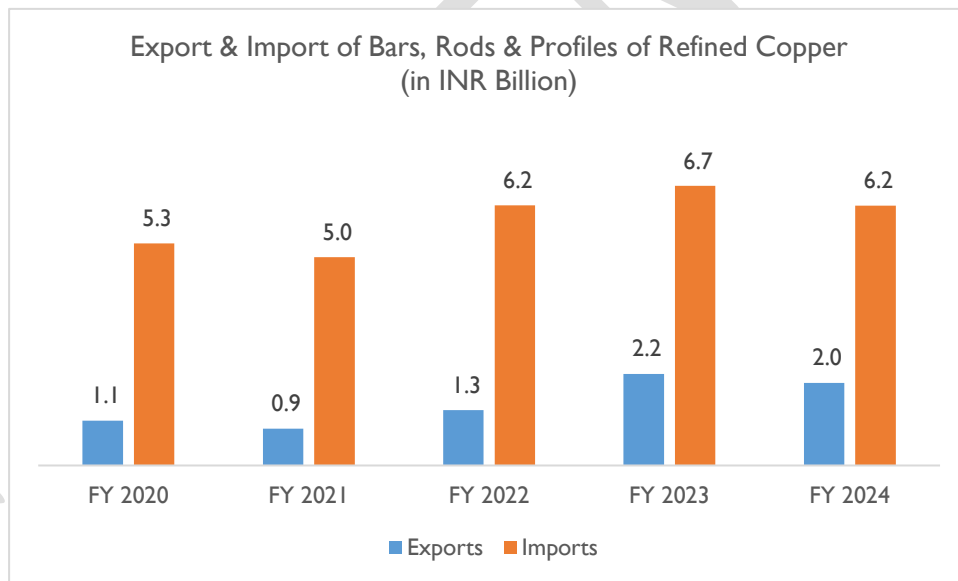
valves, fittings, and pump parts. Copper powder is utilized in metallurgy for creating sintered parts, which are used in high-precision applications like aerospace and automotive components.

Imports of finished goods containing copper represent 4% of the total consumption. This category includes a wide range of products such as electronics, appliances, and machinery that incorporate copper components. The relatively lower percentage reflects the significant domestic production of copper-based goods and the strategic import of only high-value or specialized items.

**Copper Rods**

Copper rods / copper bar rods account for nearly 61% of total domestic consumption. The dominance is on account of the versatility of this shape, which has numerous applications. Copper rod finds major application in electrical industry, where it is used to make earthing rods, electrical wiring, as well as in electrical equipments like motors, transformers, and generators.

India is a net importer of copper rods, bars and profiles. In FY 2024, India imported approximately INR 6.2 billion worth of copper rods, bars & profiles as against an export of INR 2.0 billion. Thailand, followed by France are the two leading exporters of copper rods, bars and profiles to India.



Source: Ministry of Commerce, Products listed under HS (Harmonized System) code 740710 is considered

Going ahead, the demand for copper bars, rods & profiles is expected to remain strong. This assumption is based on the ongoing capacity expansion activities happening in sectors as varied as building, construction, automobiles, power transmission & distribution infrastructure etc, all of which use copper bars & rods.

**Tubes and Pipes of Refined copper**

When talking about copper demand specifically from downstream product point, tubes and pipes of refined copper has specific applications in industrial sector like transformer, heat exchanger etc. and has a volume share of around 9% of total consumption.



India is a net importer of copper tubes & pipes, where approximately 97% of demand is met by imports from Vietnam, Malaysia, Thailand, South Korea and China with negligible domestic manufacturing. Many Indian manufacturers manufacture copper tubes & pipes in various shapes & sizes (such as round, square, rectangular, hexagonal etc.) as per international standards like BS, EN, ASTM, JIS, IS<sup>2</sup>.

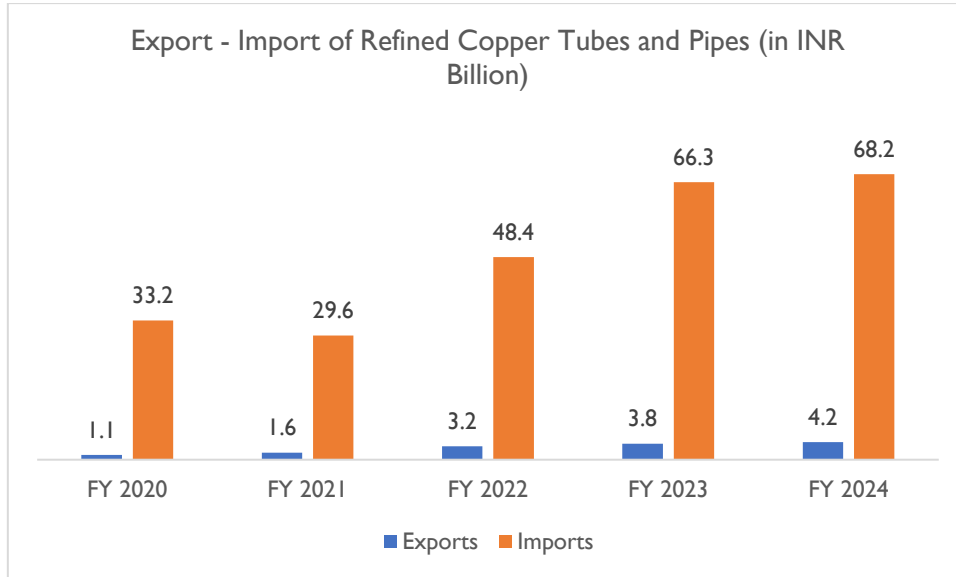
Types of Copper Tubes & Pipes	
<b>Plain Copper</b>	These are standard copper tubes that are used in a wide range of applications, including plumbing, heating, and air conditioning systems.
<b>Copper Capillary</b>	These tubes are small diameter tubes used in applications where a precise and narrow flow of fluid is required, such as in medical instruments and refrigeration systems.
<b>Copper Coated</b>	These tubes have a thin layer of copper coating on their surface, which provides additional corrosion resistance and enhances heat transfer. They are used in heat exchangers, condensers, and other applications where corrosion resistance is critical.
<b>Copper Alloy</b>	These tubes are made from copper alloys, such as brass or bronze, and offer enhanced mechanical properties and corrosion resistance compared to standard copper tubes. They are used in a wide range of applications, including plumbing, electrical wiring, and marine engineering.
<b>LWC (Laminar Wound Copper)</b>	These tubes are made by winding a flat copper strip into a helical shape, which creates a tube with excellent thermal conductivity and high strength. They are used in heat exchangers and other applications where high thermal conductivity is required.

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<sup>2</sup> BS: British Standard  
 EN: European Norm  
 ASTM: American Society for Testing and Materials  
 JIS: Japanese Industrial Standard  
 IS: Indian Standard

Trade Scenario

Demand for tubes & pipes of refined copper is dependent on imports as not many manufacturers are offering this downstream product in India. Imports are largely from Vietnam, Malaysia, China and Thailand, while exports are largely to the U.S, Canada, Malaysia, Nepal and UAE.

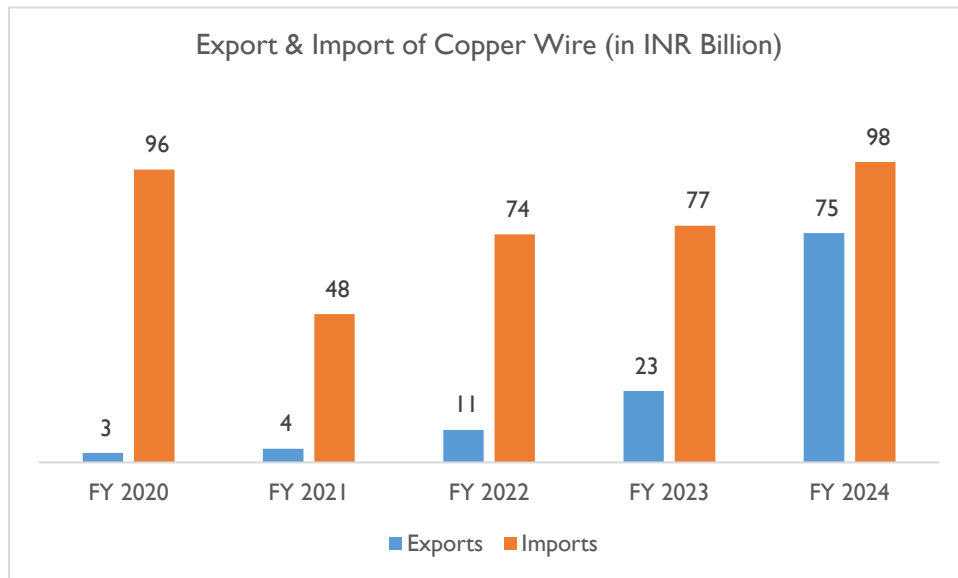


Source: Directorate General of Foreign Trade (DGFT)

**Copper Wire**

Copper wire is extensively used in power sector, finding application in power generation, distribution & transmission. In addition, it also finds application in telecom equipments, electronic circuitry as well as electrical equipments. In short, copper wire is an integral component across a wide range of industries. This varied consumer base as well as the critical nature has made copper wire an indispensable product, and its demand has remained stable. Going ahead, the demand for copper wire is expected to remain strong – given the widespread construction projects happening across power, telecom and manufacturing sectors.

India is a net importer of copper wire, with annual imports touching approximately INR 98 billion in FY 2024. As against this the overall exports of copper wire stood at INR 75 billion during the same year. Imports have witnessed a fluctuating trend in the last 3 – 4 years, as it followed a cyclic trend. Meanwhile exports have seen a consistent growth during the same time period.

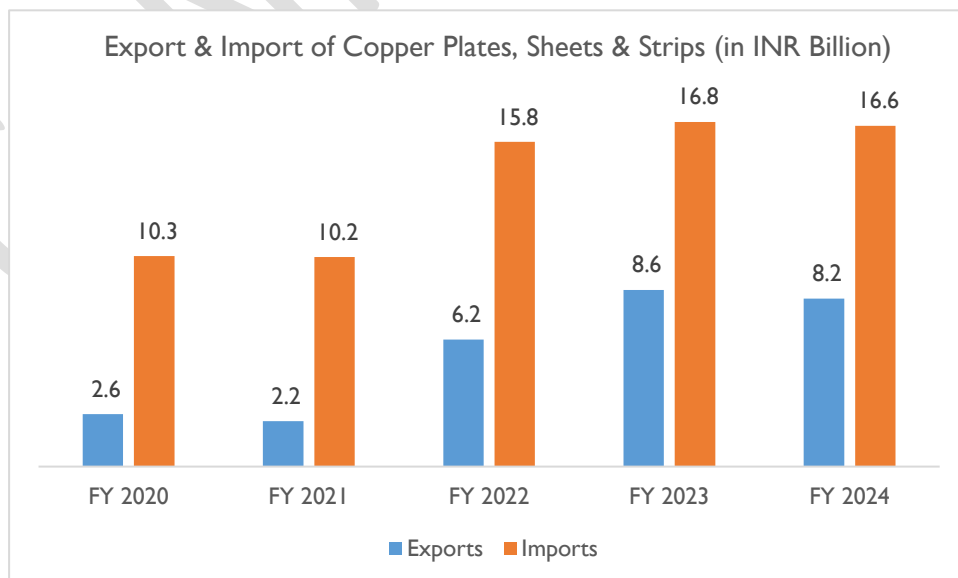


Source: Ministry of Commerce, Products listed under HS code 7408 is considered

### Copper Plates, Sheets and Strips

Copper plates and sheets have wide range of uses, finding applications in construction, automobile manufacturing, electrical equipments, HVAC (Heating, Ventilation, and Air Conditioning) systems, and more. The excellent thermal conductivity of the metal along with its strength, malleability and corrosion resistances has helped copper plates & sheets to find acceptance across various industries.

India is a net importer of copper plates, sheets and strips, with annual imports reaching approximately INR 16.6 billion in FY 2024. Between FY 2020-24, the value of copper plates, sheets & strips imported in India has increased by a CAGR of nearly 12.7%. Meanwhile the total value of export of the commodity stood at INR 8.2 billion in FY 2024.



Source: Ministry of Commerce, Products listed under HS code 7409 is considered

## Electrical Applications

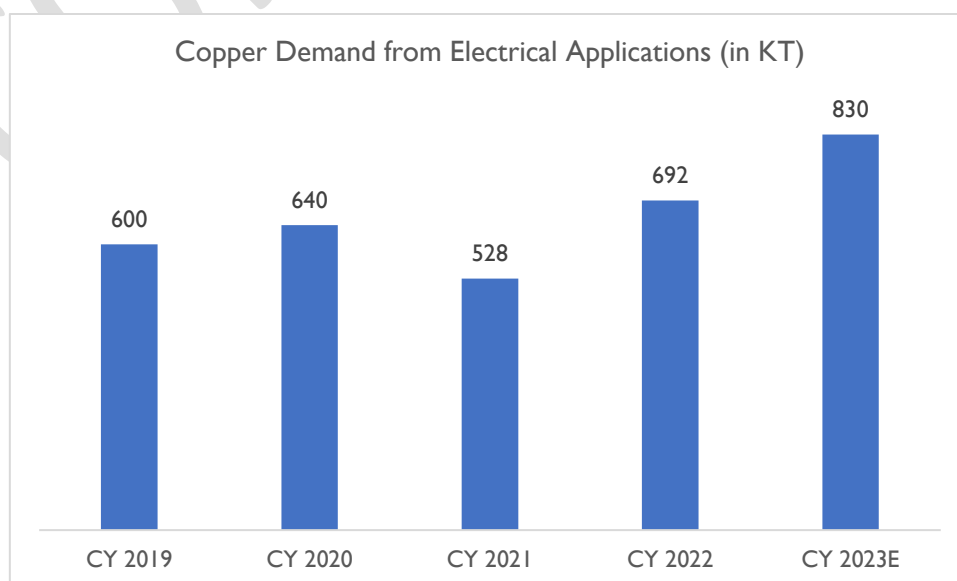
Based on application, electrical applications account to around 45-50% of copper demand due to its high thermal properties (FY 2023). This includes wires & cables, switchgears, motors, transformers, alternators, connectors, bus bar, shielding foils, earthing systems etc.

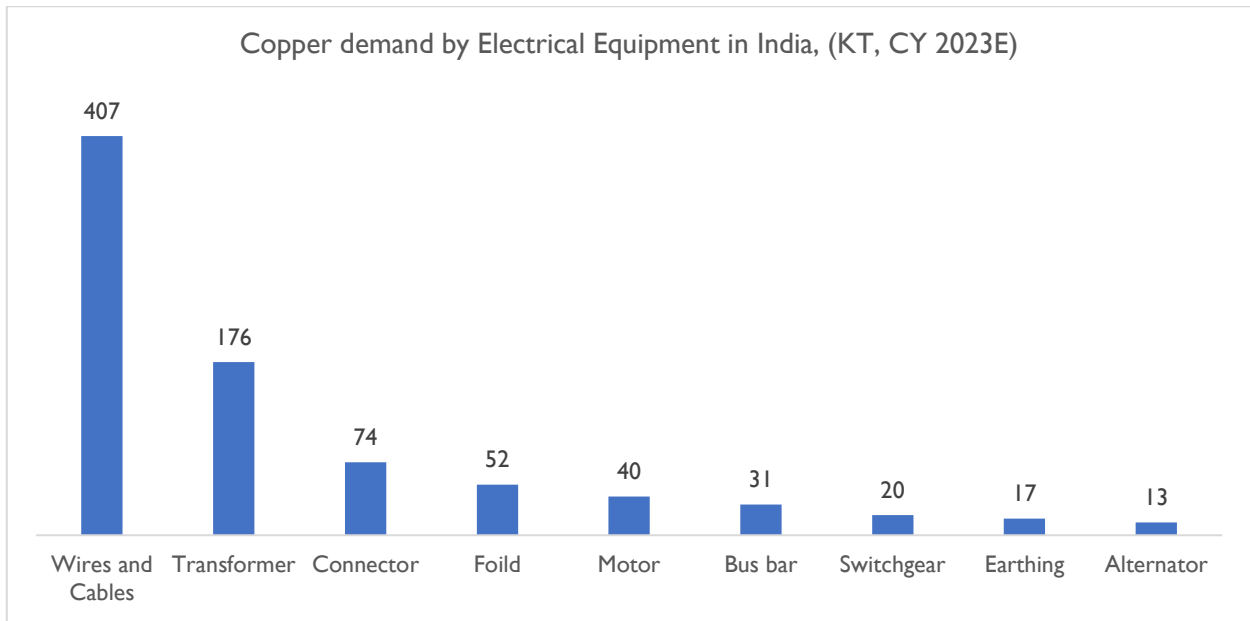
### Copper Demand for Electrical Sector - Mapping Applications with Products

Downstream Product	Application
<b>Copper Foil</b>	Power Cables, Switchgear, Transformers, Alternators, Connectors, Shielding Foils.
<b>Tubes &amp; Pipes of Refined Copper</b>	Connector, Generator, Busbar, Earthing Systems, Heat Exchanger.
<b>Copper Alloys (Tubes &amp; Pipes)</b>	Generator, Busbar, Earthing Systems; (Wires & cables are a part of copper alloy).
<b>Oxygen Free Copper</b>	Transformers, Switchgear, Busbars.

### Scenario

In India, electrical applications constitute 45-50% of the total copper demand. Copper is essential in various electrical components, including power cables, motors, switchgears, transformers, alternators, connectors, generators, bus bars, and earthing systems, where it is utilized in forms such as wire, tube, pipe, and coil. Notably, wires and cables make up 49% of the electrical sector's copper usage, with transformers accounting for 21%. Copper's widespread use in electrical applications is due to its excellent electrical conductivity, low resistance, durability, and resistance to corrosion, even when exposed to atmospheric conditions.





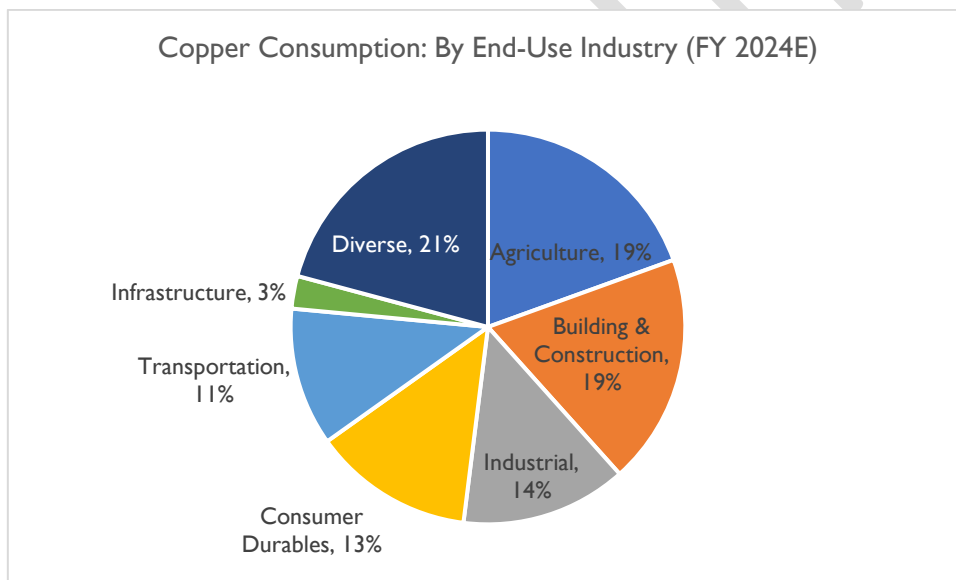
Source: D&B Research, Third party data sources

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### Copper Consumption: By End Use Application

Agriculture accounts for 19% of copper consumption. Copper is vital in this sector primarily for its use in fungicides, fertilizers, and animal feed additives. It helps protect crops from fungal infections, supports plant growth, and improves soil health. Additionally, copper is used in irrigation systems and machinery, where its corrosion resistance and durability are essential for efficient and long-lasting equipment.

The building and construction industry also represents 19% of copper consumption. Copper's excellent conductivity, durability, and malleability make it a preferred material for electrical wiring, plumbing, and roofing. It is also used in heating, ventilation, and air conditioning (HVAC) systems. Here, electrical application is the single biggest end use application of copper, where it finds applications in wires & cables, switchgear, motors, transformers and other electrical equipment. The growth in construction (real estate / industrial & infrastructure) is creating high demand for electrical system as well as HVAC systems – avenues where copper finds widespread usage. Thus, the ongoing urbanization and infrastructure development in many regions is driving substantial demand for copper in this industry.



Source: D&B Research and Estimates

Industrial applications consume 14% of copper. The metal is crucial in manufacturing various industrial machinery and equipment due to its thermal and electrical conductivity. Industries such as power generation, petrochemicals, and renewable energy sectors (especially wind and solar power) rely heavily on copper. Its use in industrial motors, transformers, and other electrical components underpins the sector's demand.

Consumer durables account for 13% of copper consumption. This category includes a wide range of products like home appliances, electronics, and electrical equipment. The growing consumer demand for smart devices, energy-efficient appliances, and advanced electronics continues to fuel copper usage in this sector.

The transportation sector accounted for 11% of copper consumption. Copper is essential in the automotive industry for electrical systems, batteries, and wiring harnesses. The rise of EVs has significantly increased

copper demand due to its extensive use in electric motors, charging infrastructure, and battery components. Additionally, copper is used in aerospace, marine, and rail industries for various electrical and mechanical applications.

Infrastructure development accounts for 3% of copper consumption. This includes public works such as railways, bridges, airports, and utility grids. Copper's role in power transmission and distribution, as well as in communication networks, underlines its importance in infrastructure projects. Although a smaller percentage compared to other sectors, infrastructure investment is crucial for supporting broader economic growth and development.

Lastly, a diverse range of applications collectively consumes 21% of copper. This category includes sectors such as healthcare, telecommunications, and renewable energy. In healthcare, copper is used for medical equipment and hospital infrastructure due to its antimicrobial properties. The telecommunications industry relies on copper for wiring and networking components. The renewable energy sector, particularly solar and wind power, also contributes to copper demand, given its use in solar panels, wind turbines, and associated electrical systems.

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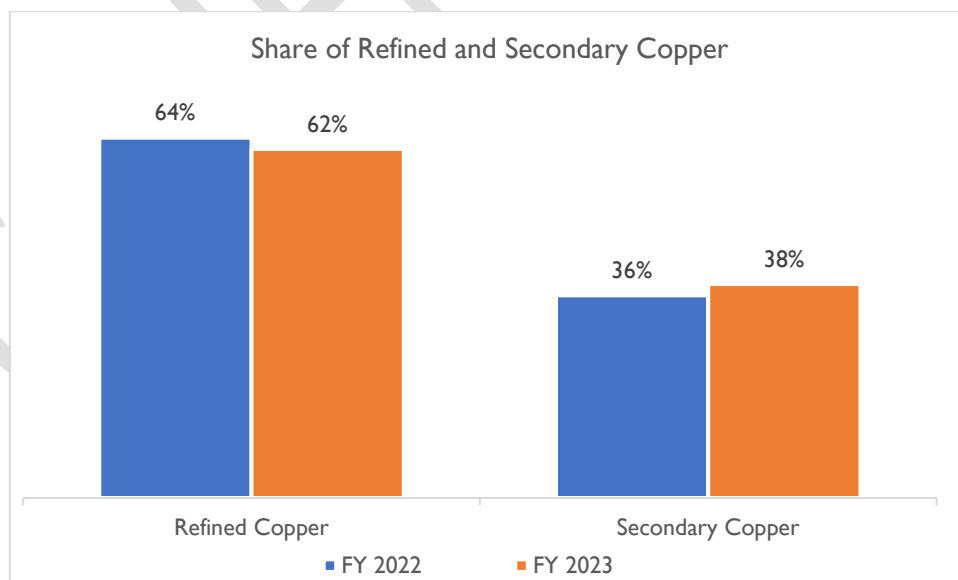
## Role of Recycled Copper

Recycled copper, also known as secondary copper, is derived from scrap sources such as discarded electrical wires, cables, plumbing fixtures, and industrial machinery containing copper components. Recycling copper involves processes like sorting, shredding, melting, purification, and casting into reusable forms. Companies engaged in copper recycling play a crucial role in the circular economy by reducing waste, conserving resources, and minimizing environmental impact.

Recycled copper complements primary copper in meeting domestic demand by providing a sustainable and environmentally friendly source of raw material. The recycling industry contributes significantly to the supply chain by recovering copper from end-of-life products, industrial scrap, and manufacturing waste. Recycled copper finds applications in a wide range of industries, including automotive, electronics, telecommunications, and infrastructure development. It is used in manufacturing components such as copper rods, tubes, pipes, fittings, and fabricated products.

The synergy between primary copper production and copper recycling is essential for maintaining a balanced supply chain and meeting dynamic market demands. While primary copper ensures a consistent supply of high-quality copper for critical applications and new infrastructure projects, recycled copper offers a sustainable solution by conserving energy, reducing carbon emissions, and minimizing the need for virgin materials.

In FY 2023, share of recycled copper produced in India increased by 2%, while that of refined copper decreased by 2%. The copper industry's transition towards a circular economy model, where recycled copper plays a pivotal role, aligns with global sustainability goals and environmental initiatives.



Source: D&B Research, International Copper Association of India

Domestic production of primary copper and recycling of copper scrap are integral to reducing dependence on imports, promoting self-sufficiency, and supporting indigenous industries. By enhancing domestic



production capacities and investing in advanced recycling technologies, India can strengthen its position as a leading copper producer and supplier in the global market. Moreover, promoting a culture of responsible consumption, waste segregation, and recycling awareness among industries and consumers is crucial for maximizing the potential of recycled copper in meeting domestic demand sustainably.

Thus, primary copper and recycled copper play a crucial role in meeting domestic demand and are indispensable for the economy's growth and sustainability. Primary copper production ensures a robust supply of high-quality copper for essential sectors like construction, electrical, and manufacturing, while recycled copper contributes to resource conservation, waste reduction, and environmental protection. A harmonious integration of primary and recycled copper sources is essential for fostering a resilient and sustainable copper ecosystem that meets the evolving needs of India's diverse industries and consumers.

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## Demand Drivers

### **Demand from electrical and power segment**

Copper plays a crucial role in the electrical and power segments, serving as a fundamental material due to its exceptional conductivity, corrosion resistance, ductility, and affordability. These properties make copper indispensable in various applications across the electrical and power industries.

In the electrical sector, copper is extensively used in wiring systems for residential, commercial, and industrial buildings. Its high conductivity allows for efficient transmission of electricity with minimal energy loss, making it ideal for power distribution and transmission lines. Copper wiring is preferred over alternatives like aluminium due to its superior conductivity, lower electrical resistance, and better ability to handle higher temperatures without degradation, ensuring reliable and safe electrical connections.

Moreover, copper's ductility enables it to be easily formed into wires of different gauges and shapes, catering to diverse electrical needs. This versatility extends to electrical components such as switches, connectors, and terminals, where copper's conductivity ensures optimal performance and minimal power loss. The use of copper in these components contributes to the overall efficiency and reliability of electrical systems.

In the power generation and distribution segments, copper plays a vital role in transformers, generators, and motors. Transformers, essential for voltage regulation and power distribution, contain copper windings that facilitate the transformation of electrical energy between different voltage levels. Similarly, generators and motors rely on copper coils in their stator and rotor components to generate electromagnetic fields and facilitate mechanical energy conversion.

The renewable energy sector also heavily relies on copper, especially in solar photovoltaic (PV) systems and wind turbines. Solar panels utilize copper in their wiring and interconnections to efficiently transport the generated electricity to inverters and grid connections. Copper's conductivity ensures minimal energy loss during this transmission, maximizing the system's overall efficiency.

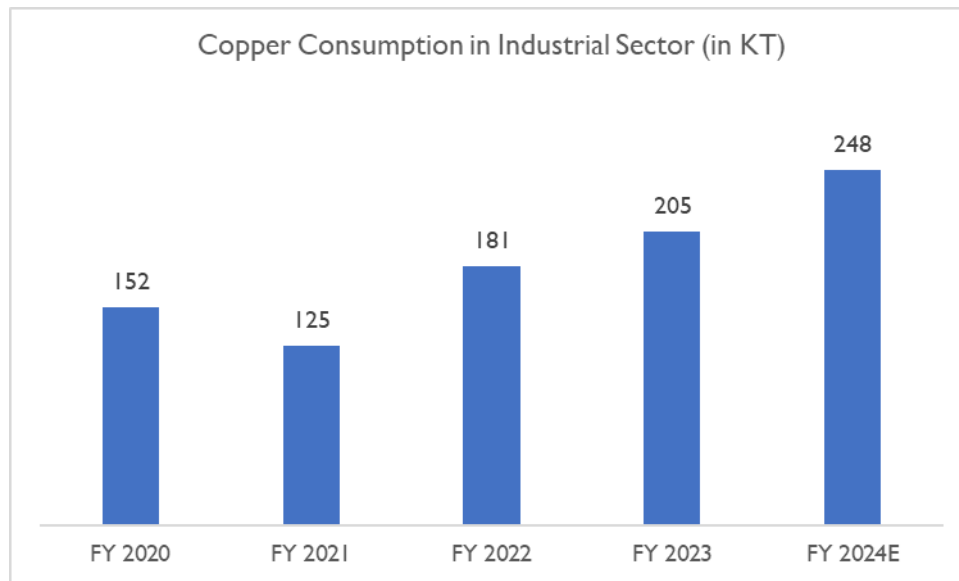
The 2024-25 Interim Budget provided for a budgetary allocation of INR 10,140 crore to total solar energy projects in FY 2025 BE (Budget Estimates), which is a massive 75% increase from INR 5,786 crore allocated in FY 2023 Actuals. This heightened investment shows a strong government commitment to promoting renewable energy leading to increased installations of solar PV systems and associated copper-based components like wiring, interconnections, and busbars. The surge in budgetary support is expected to drive technological advancements and innovations in solar energy technologies, further driving up copper demand as solar power becomes more competitive and widely adopted.

In wind turbines, copper is used in the generator coils and power cables, where its conductivity and durability are essential for harnessing wind energy and transmitting it to the grid. As the demand for renewable energy sources continues to grow, so does the demand for copper in these applications, highlighting its integral role in sustainable power generation.

## Demand from Industrial sector

The industrial sector in India encompasses a wide range of industries and plays a pivotal role in driving the demand for copper, with a consistent increase in consumption over the years. Copper is a versatile and indispensable metal used across various industries, making it a crucial component of economic growth and infrastructure development.

Copper consumption within the industrial sector increased at a CAGR of 13% between FY 2020 – FY 2024, reaching an estimated consumption level of 248 KT in FY 2024, from 152 KT in FY 2020.



Source: International Copper Association of India, D&B Estimates

One of the primary drivers of copper demand in the industrial sector is the manufacturing sector. This sector, which includes automotive, electronics, machinery, and appliances, is a major consumer of copper. Copper is used in electrical wiring, motors, generators, heat exchangers, and various components due to its excellent conductivity and durability. With the growth of manufacturing activities and the modernization of industrial processes, the demand for copper continues to rise.

Next within the industrial sector, the energy sector, including power generation and distribution, is a major consumer of copper. Copper is extensively used in power transmission lines, electrical equipment, generators, and motors due to its high electrical conductivity and durability. With India's focus on renewable energy sources like solar and wind power, the demand for copper in infrastructure components such as solar panels, wind turbines, and electrical connections has increased significantly. Copper plays a crucial role in converting and transmitting renewable energy efficiently.

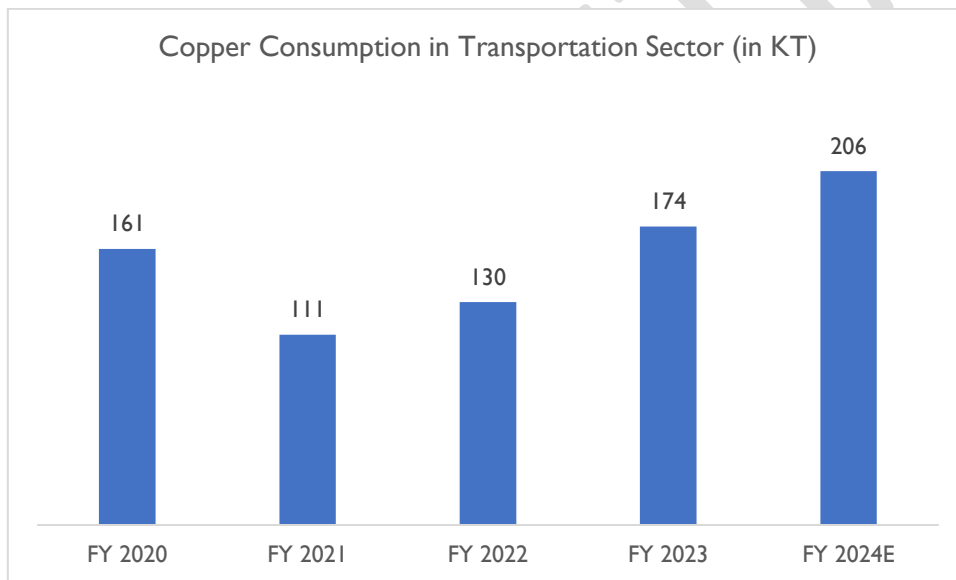
Additionally, copper is an essential material in manufacturing processes and industrial machinery. It is used in heat exchangers, cooling systems, pumps, valves, and various industrial equipment due to its thermal conductivity and resistance to corrosion. Further, industries dealing with heavy machinery and equipment, such as mining, construction, and manufacturing, rely on copper for components like bearings, gears, valves,

and hydraulic systems. Copper's strength, corrosion resistance, and thermal properties make it suitable for demanding industrial applications.

Overall, the industrial sector's diverse segments drive the demand for copper across a spectrum of applications, from electrical and electronic components to energy and industrial machinery. As industrial activities continue to expand and evolve, the demand for copper is expected to remain robust, supporting India's industrial growth and technological advancements.

**Emerging demand avenues: Electric Vehicle / other applications**

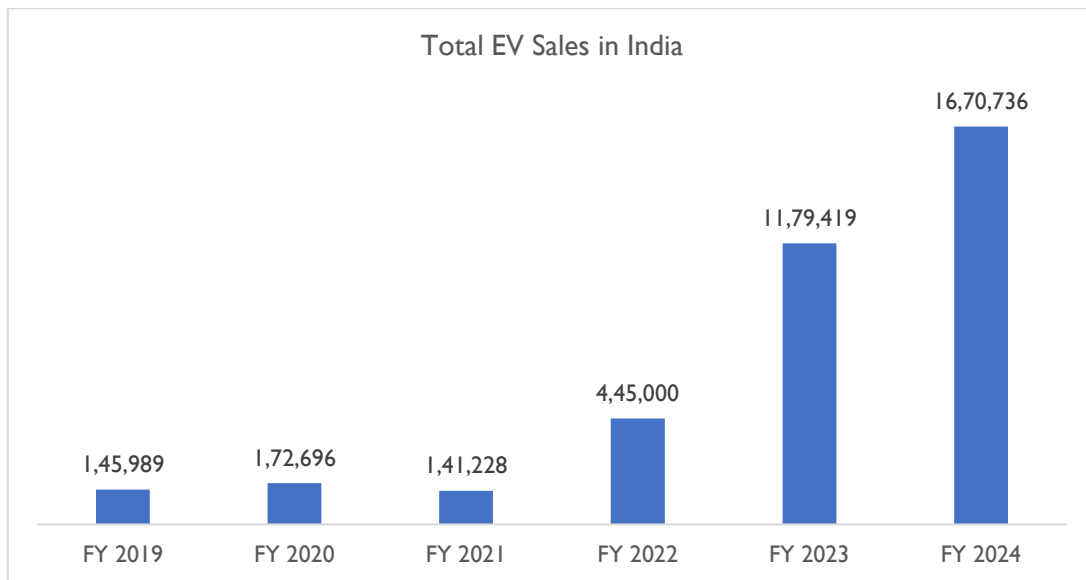
The transportation sector in India has been witnessing a significant increase in the share of copper consumption, particularly at a CAGR of 6.36% between FY 2020 and FY 2024. This trend is driven by various factors, including the expansion of infrastructure, modernization of vehicles, and the rising adoption of EVs across the country. The shift towards EVs, in particular, is expected to have a substantial impact on the demand for copper in India, contributing to a higher demand in the coming years.



Source: International Copper Association of India, D&B Estimates

Electric vehicles, including hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs), and battery electric vehicles (BEVs), are transforming the automotive industry globally. In India, the EV market is gaining momentum, driven by factors such as government incentives, environmental concerns, and technological advancements. This rise in sales of EVs in India, growing at a CAGR of 76.4% between FY 2020 – FY 2024 is expected to significantly impact demand for copper.

As EVs become more prevalent on Indian roads, the demand for copper is poised to increase significantly due to the key components and systems in EVs that rely heavily on copper or copper alloy products.



Source: Society of Manufacturers of Electric Vehicles (SMEV)

As the demand of electric vehicles increases, so does the demand for copper. Components such as traction motors, switchgears, battery packs, vehicle control units, onboard chargers, and telematics systems all rely on copper or copper alloys for their electrical conductivity, durability, and heat dissipation properties. The expansion of the EV market directly translates to a higher requirement for copper-based components.

Further, different types of EV batteries use varying amounts of copper. For instance, lithium-ion batteries, including Lithium Iron Phosphate (LFP), Lithium Nickel Manganese Oxide (LNMO), Nickel Manganese Cobalt (NMC) variants, and Nickel Cobalt Aluminium (NCA) batteries, all require copper in their construction. The shift towards higher energy density and faster charging capabilities in batteries often results in increased copper content per kilowatt-hour (kWh) of battery capacity.

EV Battery Type	Copper Used
Lithium Iron Phosphate (LFP)	1.05 kg/kwh
Lithium Nickel Manganese Oxide (LNMO)	1.00 kg/kwh
Nickel Manganese Cobalt 622	0.65 kg/kwh
Nickel Manganese Cobalt 811	0.64 kg/kwh
Nickel Cobalt Aluminium	0.60 kg/kwh

EV Charger Type	Copper Used
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Level 2 and Mode 3*	1.05 kg/charger (7KW)
Level 3 and Mode 4**	4.48 kg/charger (80KW)
	5.84 kg/charger (125KW)

\* Charger power to increase progressively from 7 KW to 11 KW

\*\* Charger power to increase from 125KW to 250 KW

Similarly, the growth of EV charging infrastructure, including Level 2, Level 3, and Mode 3 and Mode 4 chargers, contributes significantly to copper demand. Level 2 chargers typically used for residential and commercial charging, and Mode 3 chargers for public charging, require substantial amounts of copper wiring and components to handle power delivery efficiently. Level 3 and Mode 4 chargers, commonly known as fast chargers, have higher power ratings and, consequently, a more significant copper requirement per charger unit.

The linear relationship between charger power increase and copper requirement shows the direct correlation between charging speed and copper usage. As charging power increases, such as with Level 3 and Mode 4 fast chargers, the copper content in the charging infrastructure also rises proportionally. This relationship emphasizes the critical role of copper in enabling faster and more efficient charging solutions for EVs.

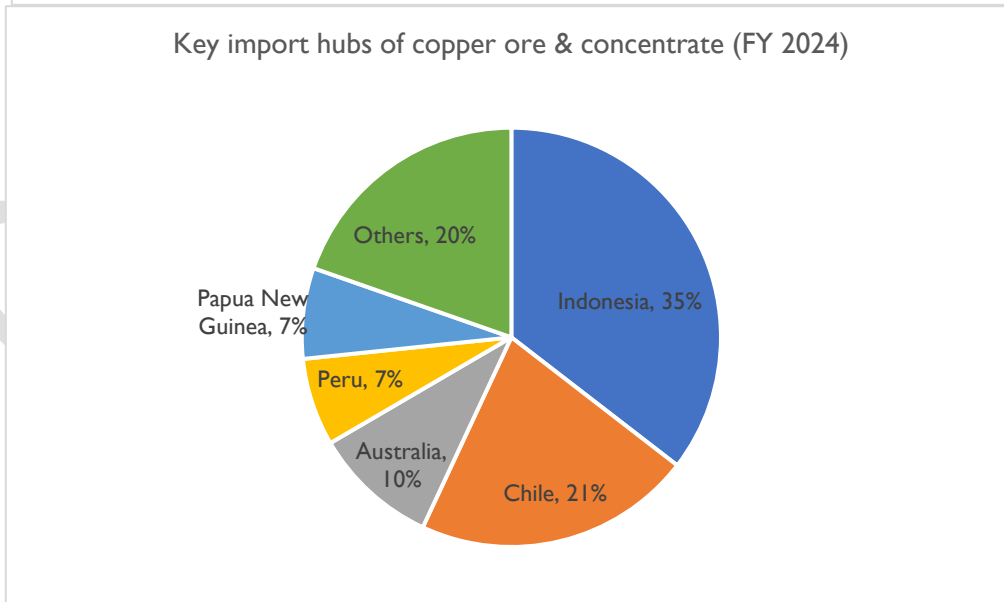
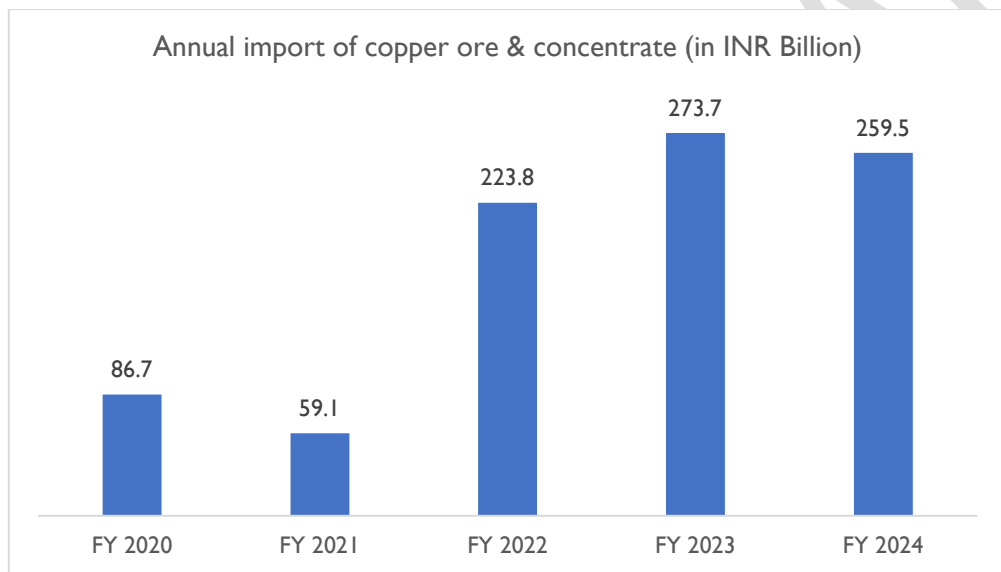
Thus, the rising EV adoption and the development of charging infrastructure will play a significant role in rising the demand for copper. With the automotive industry's shift towards electrification and the push for sustainable transportation solutions, copper's importance in EVs, batteries, and charging systems is set to grow significantly. This trend not only reflects technological advancements in the automotive sector but also underscores copper's crucial role in enabling cleaner and more energy-efficient mobility solutions.

## Copper Imports to India

### Import of Copper Ore & Concentrate

Annual import of copper ore and concentrate increased at a CAGR of 31.5% between FY 2020 – FY 2024, growing from INR 86.7 billion in FY 2020 to INR 259.5 billion in FY 2024. A significant decline of 32% was observed in FY 2021. This decline can be because of low production due to the covid-19 pandemic induced lockdowns and supply chain issues.

However, by FY 2022, imports for copper ore and concentrate bounced back at a phenomenal annual growth rate of 279%, reaching INR 223.8 billion. This trend of growth was further continued in FY 2023 with 22% annual increase, but further subsided in FY 2024, reaching INR 259.5 billion.



Source: Directorate General of Commercial Intelligence and Statistics (DGCI&S)

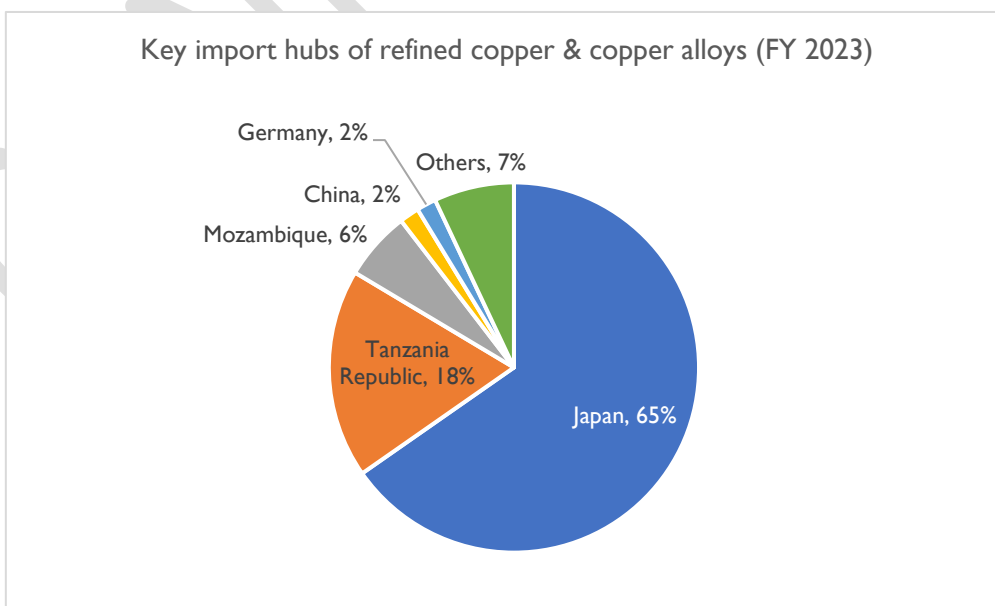
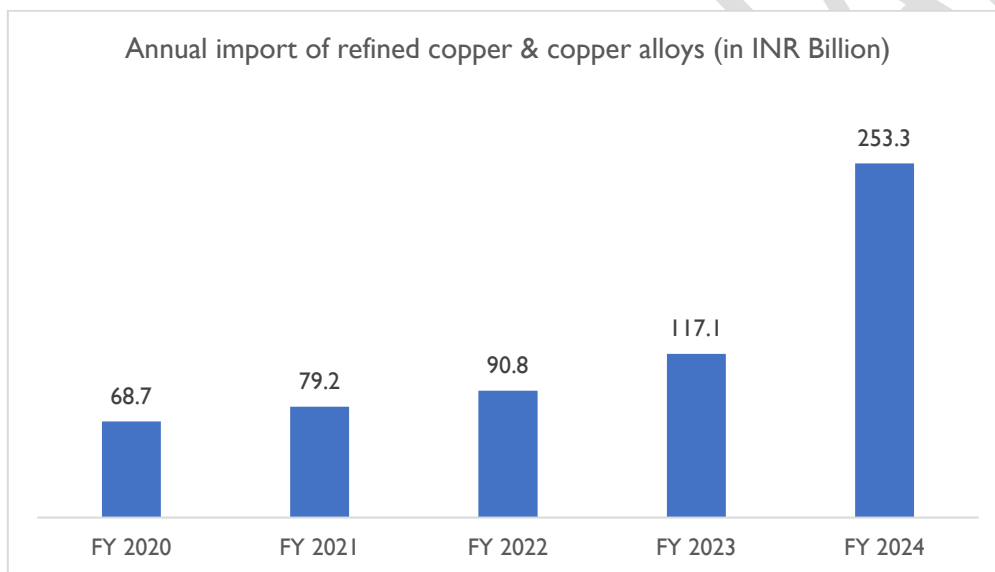
Key import partners include Indonesia, Chile, Australia, Peru, and Papua New Guinea. Indonesia accounts for the largest share (35%), followed by Chile (21%), Australia (10%), Peru (7%), and Papua New Guinea (7%).

Together, these top 5 countries account for a share of 80%, while other countries make up 20% of the remaining import market.

### Import of Refined Copper & Copper Alloys

Annual import of refined copper and copper alloys has been steadily increasing in India. These imports have grown at a CAGR of 38.6% between FY 2020 – FY 2024, where FY 2020 recorded imports worth INR 68.7 billion, whereas FY 2024 recorded imports worth INR 253.3 billion.

This steady increase in imports comes on the back of rising consumption in India across industries such as construction, electrical and electronics, automotive, infrastructure development, manufacturing, and renewable energy, for applications including wiring, plumbing, electrical components, machinery parts, heat exchangers and renewable energy infrastructure.

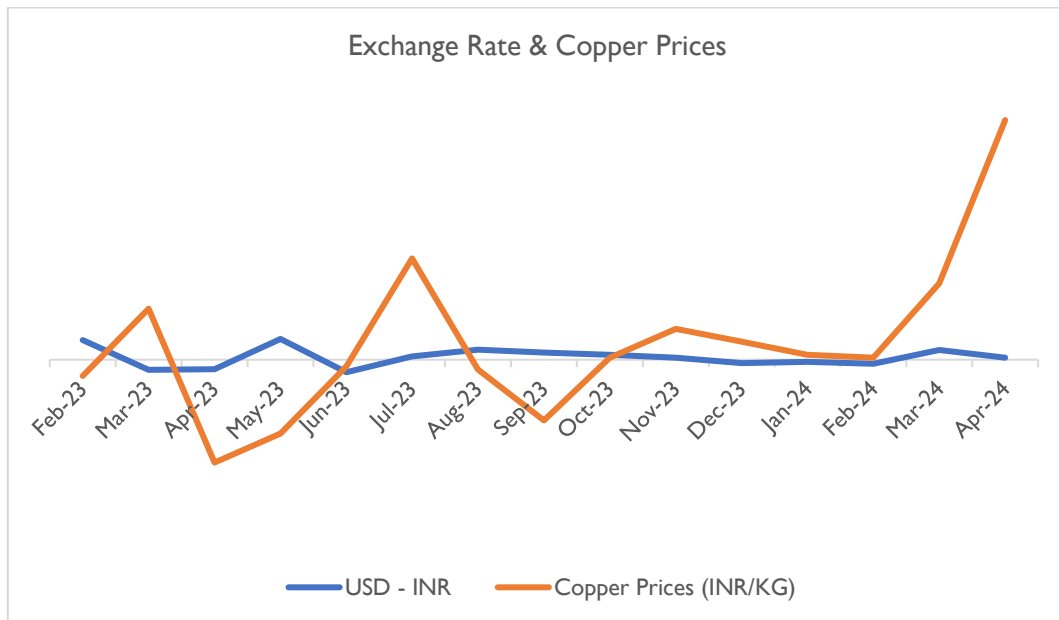


Source: Directorate General of Commercial Intelligence and Statistics (DGCI&S)



Japan was the largest source for imports of refined copper and copper alloys to India, accounting for a share of 65% in the total imports. Tanzania Republic accounted for the second highest share of 18%, followed by Mozambique with 6%. China and Germany followed behind with a share of 2% each in FY 2023. Together, these top 5 countries account for 93% of the total imports, while the remaining 7% is taken by other countries.

### Impact of Exchange Rate Increases on Copper and Copper Products



Source: D&B Research

The exchange rate between two currencies significantly influences international trade. In the context of India, which imports a substantial amount of copper and copper products, changes in the USD/INR exchange rate can have profound effects on import costs and prices.

When the exchange rate rises, it means the domestic currency (INR) depreciates relative to the foreign currency (USD). As a result, Indian importers need more INR to buy the same amount of USD. Since copper is traded globally in USD, a higher exchange rate directly increases the cost of importing copper when converted to INR. The import bill represents the total cost a country incurs to import goods and services. As the exchange rate rises, the cost per unit of imported copper increases, thus raising the overall import bill. For a country like India, which relies on substantial copper imports for various industries, this can lead to significant financial outlays.

Increased costs can strain national finances, widen trade deficits, and lead to higher prices for consumers and businesses. Sectors such as construction, electrical, and electronics, which heavily depend on copper, may experience increased production costs, ultimately affecting the broader economy.

## Regulatory Landscape

### **National Mineral Policy 2019**

The National Mineral Policy (NMP) 2019, introduced in February 2019, recognizes minerals as vital natural resources essential for the core sectors of the economy. This policy is designed to align the exploration, extraction, and management of minerals with national economic development goals. A key focus of the NMP 2019 is to promote domestic industry by encouraging value addition and reducing import dependency, thereby contributing significantly to the Make in India initiative.

Furthermore, the policy emphasizes fair and transparent allocation of mineral resources to ensure equitable distribution of mineral wealth for the collective benefit. It also places a strong emphasis on environmentally sustainable mining practices, actively involving stakeholders in decision-making processes. Additionally, the NMP 2019 aims to channel benefits from mining to areas and individuals affected by mining activities, fostering trust among stakeholders, and creating a conducive regulatory environment that facilitates ease of doing business in the sector.

Simplified, transparent, and time-bound procedures for obtaining mining clearances are also part of the policy's framework, streamlining operations and fostering responsible mineral resource utilization.

### **Mines and Minerals (Development and Regulation) (MMDR) Amendment Act, 2023**

The Mines and Minerals (Development and Regulation) (MMDR) Amendment Act, 2023, plays a crucial role in boosting copper production in India by identifying copper as one of the 30 critical minerals. This designation enables focused policy interventions to enhance domestic availability and achieve self-sufficiency in copper mineral resources. One significant aspect of the amendment is the introduction of the exploration license for deep-seated and critical minerals, including copper. This license empowers licensees to conduct reconnaissance and prospecting operations for these challenging-to-explore minerals, encouraging private agencies to bring advanced technology, finance, and expertise into the exploration process.

Additionally, the amendment allows accredited private exploration agencies, as notified under the MMDR Act, to undertake exploration without a prospecting license. Moreover, these agencies become eligible for funding under the National Mineral Exploration Trust, further incentivizing private sector participation in critical mineral exploration, including copper. These measures collectively aim to boost domestic copper production and reduce dependency on imports.

Furthermore, the Mineral Conservation and Development Rules (MCDR), 2017, framed under the MMDR Act, emphasize sustainable development and environmental protection in mining operations. Rule 12(1) of MCDR (amendment) 2017 ensure systematic mineral development, conservation, and environmental protection during prospecting and mining activities. These new rules specifically focus on Sustainable Mining, aligning with the Sustainable Development Framework (SDF) outlined in the National Mineral Policy 2019

(NMP 2019). To implement the SDF effectively, the Ministry has introduced a system of Star Rating of Mines, emphasizing sustainable development practices in mining areas.

### Copper Products (Quality Control) Order, 2023

The Copper Products (Quality Control) Order, 2023, issued by the central government, marks a significant step towards ensuring high-quality copper products in India while reducing the influx of sub-standard goods through imports.

This order, administered by the Department for Promotion of Industry and Internal Trade (DPIIT) under the Ministry of Commerce & Industry, in consultation with the Bureau of Indian Standards (BIS) and stakeholders, establishes mandatory quality norms for copper products. Published on October 20, 2023, this order aims to elevate the standards of domestically manufactured copper products and safeguard consumers' interests. This has led to the initiation of development of more than 60 new QCOs<sup>3</sup> covering 318 product standards. It includes 9 standards of Copper Products.

Copper, known for its conductivity, durability, corrosion resistance, and precision in casting, finds extensive use in various sectors such as electrical, plumbing, industrial machinery, construction materials, power generation, telecommunications, and appliances. Given its crucial applications, maintaining the purity and quality of copper products is paramount. DPIIT has notified QCO Copper Products (Quality Control) Order, 2023 on 20th October 2023, it includes the following:

S. No.	Indian Standard (IS)	Title of Indian Standard
1	12444:2020	Copper wire rods for electrical applications.
2	613:2000	Copper rods and bars for electrical purposes.
3	1897:2008	Copper strip for electrical purposes.
4	4171:1983	Copper rods and bars for general purposes.
5	1545:1994	Solid drawn copper & copper tubes for condensers and heat exchangers.
6	2501:1995	Solid drawn copper tubes for general engineering purposes.
7	14810:2000	Copper tubes for plumbing- specification.

<sup>3</sup> Quality Control Orders

8	10773:1995	Wrought copper tubes for refrigeration and air-conditioning purposes.
9	4412:1981	Copper wires for general engineering purposes.

Under the Quality Control Order framework, initiated through the BIS Conformity Assessment Regulations, 2018, the central government mandates compliance with specified quality standards for copper products. The objective is multifaceted, aiming to enhance the quality of domestically manufactured goods, restrict the entry of sub-standard imports, and ensure consumer safety and environmental protection.

Upon notification in the E-Gazette<sup>4</sup>, the QCO becomes enforceable after a six-month period. Recognizing the diverse landscape of industries, especially small and micro enterprises, the government has provided relaxations in implementation timelines. Small industries receive an additional three months, while micro industries are granted six months beyond the notification date for QCO implementation.

Non-compliance with the BIS Act, 2016, post-QCO implementation, carries penalties such as imprisonment up to two years or fines starting from INR 2 lakh for initial offences, escalating for subsequent violations. This stringent enforcement underscores the government's commitment to quality assurance and consumer protection.

The implementation of QCOs not only safeguards consumers but also elevates manufacturing standards, fosters a quality-driven ecosystem, and aligns with the vision of an "Atmanirbhar Bharat". These initiatives, complemented by quality testing labs and product manuals, signify a concerted effort towards developing world-class, high-quality products within the country's borders.

### **Non-Ferrous Metal Import Monitoring System (NFMIMS)**

The Ministry of Mines introduced the Non-Ferrous Metal Import Monitoring System (NFMIMS) for copper and aluminium. Launched in 2021, NFMIMS is an online platform mandated for all importers of these metals, aimed at enhancing transparency and regulatory oversight in the importation process. The primary objective of NFMIMS is to facilitate the collection of real-time and accurate data concerning the import of covered non-ferrous metals like copper and aluminium. This data collection enables valuable insights into trade patterns and market dynamics, supporting informed policymaking by the government.

Moreover, NFMIMS plays a pivotal role in shaping effective import regulations, tariff adjustments, domestic production strategies, and price stabilization measures. By providing comprehensive data, the system empowers policymakers to make informed decisions that benefit both the industry and consumers.

<sup>4</sup> E-Gazette is an electronic version of the Official Gazette, a government publication used to publish official notifications, orders, and rules. It provides a digital and accessible platform for citizens to access government information.

Additionally, NFMIMS promotes transparency and compliance within the import sector, ensuring that importers adhere to established guidelines.

The scope of NFMIMS currently encompasses only aluminium and copper imports. This system's implementation creates a conducive environment for the domestic industry while maintaining regulatory oversight and transparency in the importation of key metals essential for various sectors of the economy.

**Non-Ferrous Metal Scrap Recycling Framework**

The Non-Ferrous Metal Scrap Recycling Framework is a strategic initiative focused on establishing a sustainable ecosystem for recycling non-ferrous metal scrap, thereby promoting the recycling of scrap metal. The framework aims to create economic wealth, generate employment opportunities, and increase the contribution to GDP through metal recycling. Additionally, it seeks to foster a formal and well-organized recycling ecosystem by adopting energy-efficient processes, thereby minimizing the impact of end-of-life products on landfills and environmental pollution.

One of the key goals of the Recycling Framework is to evolve a responsive ecosystem by engaging all stakeholders. To achieve these objectives, the framework envisions the establishment of a central Metal Recycling Authority to facilitate and regulate metal recycling activities. The government will also focus on setting quality standards for scrap used in recycling, developing a registration mechanism for recyclers and related entities, and creating urban mines as centralized locations for collecting and storing recyclable materials.

Furthermore, the framework proposes the development of an online market platform for recycled metal, encouraging recyclers to enter into collection contracts with industrial and commercial establishments. The roles and responsibilities of stakeholders are clearly defined within this framework. Manufacturers are tasked with adhering to Extended Producer Responsibility (EPR) guidelines and designing products that are easily recyclable and reusable in an environmentally sound manner.

The public is also encouraged to responsibly dispose of scrap at designated collection centres, while the government aims to streamline regulatory requirements for recycling units. The Recycling Authority will develop technical, safety, and environmental norms for handling and processing scrap materials, collaborating with relevant bodies like the Ministry of Environment, Forest, and Climate Change (MoEF&CC), Central Pollution Control Board (CPCB), and Bureau of Indian Standards (BIS).

**Customs Duty**

Description	Standard Rate of Duty
Copper ores and concentrates	2.5%
Refined copper and copper alloys, unwrought	5%

Copper waste and scrap	2.5%
Master alloys of copper	5%
Copper bars, rods and profiles	5%
Copper wire	5%
Copper tubes and pipes	7.5%

Exemption of duty:

- The India government exempts copper concentrates (tariff item 26030000) from customs duty equivalent to the gold and silver content. This exemption requires an assay certificate from the mining company showing the gold and silver value separately. For example, if the copper concentrate is valued at INR 100 with INR 40 worth of gold and silver, customs duty is calculated on INR 60 only, but the total value of INR 100 is considered for additional customs duties under section 3 of the Customs Tariff Act, 1975.
- The India government exempts copper cathodes, wire bars, and wire rods from customs duty when produced from copper reverts exported for toll smelting or toll processing, provided they are imported within one year of export and sufficient evidence is provided of their origin. This exemption covers basic customs duty, additional duty, and special additional duty, based on the costs of toll smelting or toll processing, insurance, and freight charges.

## Competitive Landscape

The Indian copper industry boasts a significant presence in the global market, ranking amongst the top 20 copper producers. This industry is witnessing a dynamic transformation, driven by various factors. In early days, the industry primarily focused on mining and refining, with limited downstream manufacturing. Now, India has steadily ramped up copper production capacity to meet growing domestic and international demand. Increased government support, infrastructural development, and private sector participation led to the establishment of major players like Hindalco Industries Limited and Hindustan Copper Limited (HCL). The industry witnessed a shift towards manufacturing value-added copper products like wires, rods, and tubes. Adoption of modern technologies like electrorefining and continuous casting has improved efficiency and product quality. Indian copper manufacturers are now actively exporting their products, contributing to the nation's foreign exchange earnings.

This dynamic market boasts a diverse range of players, from established giants to growing mid-sized competitors. A subsidiary of the Aditya Birla Group, Hindalco Industries Limited is the largest copper producer in India and amongst the biggest globally. They possess the world's largest copper smelter and are known for their high-quality products. Hindustan Copper Limited is the government-owned company and is India's first vertically integrated copper producer, handling mining, smelting, and manufacturing of copper products. They specialize in copper rods, wires, and various cable accessories.

Several key factors determine success in the competitive arena of the Indian copper industry:

Key Factors	
Pricing	<ul style="list-style-type: none"> <li>Global market forces dictate copper prices. However, domestic players strive for production efficiency and cost optimization to offer competitive pricing.</li> </ul>
Service Offerings	<ul style="list-style-type: none"> <li>Building customer loyalty provides exceptional customer service, including timely deliveries and comprehensive technical support, is crucial for building strong customer loyalty.</li> </ul>
Product Quality and Innovation	<ul style="list-style-type: none"> <li>Delivering high-quality products that meet stringent international standards is paramount. Additionally, companies are placing greater emphasis on developing new copper alloys and exploring innovative applications for copper.</li> </ul>
Sustainability	<ul style="list-style-type: none"> <li>A responsibility for the future, environmentally conscious practices such as waste reduction and energy efficiency are gaining traction, attracting environmentally responsible customers.</li> </ul>

The Indian copper market is expected to witness significant growth in the coming years. Increased investments in infrastructure development across various sectors will act as a major catalyst for copper demand. Upgrading and expanding power grids will necessitate a significant amount of copper wires and cables for transmission and distribution. Investments in railway networks, high-speed corridors, and metro projects will drive demand for copper for electrification and signaling systems. The growing focus on renewable energy sources like solar and wind power will create demand for copper in electrical components and power transmission infrastructure. Rapid urbanization in India is leading to the development of new cities and the expansion of existing ones. Copper wiring is essential for electrical systems in buildings, along with copper pipes for plumbing.

The Indian government is actively promoting the domestic copper industry through various initiatives such as "Make in India" Program which incentivizes the manufacturing of copper products within India, fostering self-reliance and boosting domestic production. Government policies promoting renewable energy will indirectly benefit the copper industry due to the requirement for copper in these projects.

Key Player Profiles: Primary Copper Manufacturers

Company Name	Profile
Hindalco Industries Limited	<p>Hindalco Industries Limited, the metals flagship company of the Aditya Birla Group, is a prominent player in the copper industry, in addition to its expertise in aluminium. With a state-of-the-art copper facility comprising a top-tier copper smelter, fertiliser plant, and captive jetty, Hindalco's copper division stands out as one of Asia's largest custom copper smelters at a single location.</p> <p>The Birla Copper unit, integral to Hindalco, focuses on producing high-quality copper cathodes, continuous cast copper rods, and valuable by-products like gold, silver, and Diammonium Phosphate (DAP) fertilisers. As India's largest private producer of gold, Birla Copper's operations are distinguished by their scale and efficiency. It is an ISO<sup>5</sup> 9001, 14001, 27001, 50001 and OHSAS<sup>6</sup> 18001 certified company.</p> <p>Hindalco's copper products cater to diverse markets and applications, including agrochemicals, automotive, consumer durables, electrical equipment, railways, and wire and cable industries. The company has a manufacturing capacity of 0.54 million MT copper rods (including 0.42 Million Metric Tonnes (MMT) copper cathode). Their copper offerings</p>

<sup>5</sup> International Organization for Standardization

<sup>6</sup> Occupational Health and Safety Assessment Series



	<p>are known for their high purity and consistent quality, backed by certifications such as ISO and London Metal Exchange registrations.</p> <p>Operating one of the largest single-location custom copper smelters globally, Hindalco's copper division plays a crucial role in the production of LME<sup>7</sup> grade copper cathodes, continuous cast copper rods, and sulphuric acid used in the manufacturing of phosphoric acid and DAP fertilisers. The company's commitment to excellence and innovation in the copper sector has established it as a key player in the global metals industry.</p>
<p>Hindustan Copper Limited (HCL)</p>	<p>Hindustan Copper Limited (HCL), classified as a Mini Ratna Category-I, operates under the Government of India (GoI) and falls under the Ministry of Mines' administrative jurisdiction. Established on November 9th, 1967, under the Companies Act, 1956, HCL was formed to manage all aspects related to copper exploration and exploitation, taking over from the National Mineral Development Corporation Ltd.</p> <p>As the sole entity in India dedicated to copper ore mining, HCL holds all operational mining leases for copper ore and stands as the country's sole integrated producer of refined copper, making it a vertically integrated company. The company's operations encompass the production and marketing of copper concentrate, copper cathodes, continuous cast copper rod, and by-products like anode slime containing gold and silver, copper sulphate, and sulphuric acid.</p> <p>HCL focuses on mining and beneficiation operations, primarily selling copper concentrate as its main product. With an installed capacity of 68,500 MT for copper cathodes, HCL's operations span five units across Rajasthan, Madhya Pradesh, Jharkhand, Maharashtra, and Gujarat, including Malakand Copper Project, Khetri Copper Complex, Indian Copper Complex, Taloja Copper Project, and Gujarat Copper Project.</p>
<p>Sterlite Copper</p>	<p>Sterlite Copper, a Business Unit of Vedanta Limited, represents the Copper business of Vedanta Limited, which was formed through the Scheme of Amalgamation and Arrangement (Group Simplification Scheme) of Sterlite Industries (India) Limited, The Madras Aluminium Company Limited (MALCO), Sterlite Energy Limited (SEL), and Vedanta</p>

<sup>7</sup> London Metal Exchange

	<p>Aluminium Limited (VAL) with Sesa Goa Limited (SGL). Positioned within key core sector industries, Sterlite Copper boasts a robust performance track record.</p> <p>Operating a 4,00,000 Metric Tonnes Per Annum (MTPA) Copper Smelter in Thoothukudi, Tamilnadu, Sterlite Copper's facilities include a refinery, copper rod plant, sulphuric acid plant with a capacity exceeding 12,00,000 MTPA, and a phosphoric acid plant producing 2,20,000 MTPA. Additionally, they operate a 160 MW coal-based power plant in Thoothkudi.</p> <p>With an installed capacity of 4,00,000 TPA of copper anode, 4,00,000 TPA of copper cathode, and 2,50,000 TPA of copper rod, Sterlite Copper's operations are centred around smelting. They utilize the IsaProcess™<sup>8</sup> technology from MIM (Mount Isa Mines), Australia, known for energy efficiency and environmental friendliness. This vertical shaft furnace converts copper concentrate into matte and slag, further processed to obtain blister copper of high purity.</p> <p>Sterlite Copper's refined products include electrolytic grade copper cathodes, meeting 99.99% purity standards and used in various applications such as power cables, transformers, magnet wires, and alloys like brass and bronze. Their continuous cast copper rods are acclaimed for meeting international quality standards, serving diverse industries from telecommunications to automotive sectors.</p>
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### Comparative Metrics

Company Name	Average Share Price in INR (52-week average) <sup>9</sup>	Revenue from operations in INR crores (FY 2024)	Market Share (by value, for refined copper/ cathode)
<b>Hindalco Industries Limited</b>	677.4	2,15,962	54%

<sup>8</sup> IsaProcess™: This refers to the Isa smelting process, a metallurgical process used for the smelting of sulfide concentrate

<sup>9</sup> April 2023 to March 2024

<b>Hindustan Copper Limited (HCL)</b>	345.4	1,717	0%
<b>Sterlite Copper</b>	NA	19,730 <sup>10</sup>	22%

Source: Ministry of Mines, DGFT, Bombay Stock Exchange (BSE), National Stock Exchange (NSE), Annual Reports of companies, Third-Party Sources, D&B Research and Estimates

Note: Market share has been derived from the refined copper segment values of the given companies + imports – exports of commodity. HCL does not have an evident market share in refined copper due to the negligible production by the company for the given commodity.

### Notable Other Players

Company Name	Profile
Rachna Metal Industries Private Limited	<p>Established in 1978, Rachna Metal Industries Pvt. Ltd.<sup>11</sup> (India) specialises in semi-finished copper and copper alloy products such as rods, tubes, bus bars, strips, plates, wires, pipes, sheet and circles and more, they cater to various engineering industries with tailored solutions and precise specifications.</p> <p>Their list of products includes copper cold rolled sheets, brass cold rolled sheets, copper hot rolled sheets, brass hot rolled sheets, copper circles, copper flange / ring, copper strip / flats / bus bars, tin plated bus bars, copper rods. At a production capacity of 500 MT per month, their products conform to the I.S. and B.S. standards<sup>12</sup>.</p> <p>Their advanced manufacturing facilities and a skilled team ensure high-quality standards and meet diverse customer demands. With a history spanning over 25 years, they have excelled in producing semi-finished copper, copper alloy, and brass products.</p> <p>As an approved vendor for Power Grid Corporation of India Limited &amp; BHEL<sup>13</sup> Rudrapur, they supply essential items like copper flats, sheets, tubes, and rods, reflecting their commitment to quality and service excellence.</p>
Mehta Tubes Limited	Established in 1988, Mehta Tubes Limited stands as one of the leading manufacturers of top-quality copper and copper alloy products

<sup>10</sup> The revenue given is the copper segment revenue of Vedanta Ltd.

<sup>11</sup> Private Limited

<sup>12</sup> I.S.: Indian Standard | B.S.: British Standard

<sup>13</sup> Bharat Heavy Electricals Limited

	<p>including tubes, bars, pipes, rods, and strips. Their products find extensive applications in electrical systems, heat exchangers, condensers, and automobiles.</p> <p>Over the years, Mehta Tubes Limited have expanded their product range and accumulated profound industry knowledge and market insight. The company specializes in electrical accessories, heat exchangers, condensers, and automobile parts, with a state-of-the-art production facility in Gujarat.</p> <p>They have lasting partnerships with clients globally, including renowned Original Equipment Manufacturers (OEMs) like Rolls-Royce, Daikin, Carrier, Samsung, Toshiba, Siemens, Reliance Industries Limited, Essar, and Hitachi. Their client base also extends to government sectors such as ONGC (Oil and Natural Gas Corporation Limited), L&amp;T (Larsen &amp; Toubro Limited), SAIL (Steel Authority of India Limited), Bharat Petroleum, BHEL, Indian Oil, GSECL (Gujarat State Electricity Corporation Limited), and GAIL (Gas Authority of India Limited), among others.</p>
<p>Sunlite Recycling Industries Limited</p>	<p>Founded in 2012, Sunlite Recycling Industries Limited specializes in the manufacturing of copper products, primarily sourced from recycled copper scrap. The company’s product portfolio includes copper rods, components, wires, conductors, sections, earthing strips, earthing wires, and submersible wires. These products serve a broad spectrum of applications, including electrical transmission and distribution, power generation, and electronics.</p> <p>Sunlite initially focused on the production of Oxygen Free Copper (OFC) rods, with a capacity of 250 metric tons per month. Over time, the company expanded their operations through the acquisition of advanced machinery from Germany and China. This expansion increased their manufacturing capacity to 2,000 metric tons per month, facilitating the production of a broader range of copper products, including rods, wires, conductors, and earthing components.</p> <p>Key Business Insights:</p> <ul style="list-style-type: none"> <li>• Market Position: Sunlite Recycling Industries is recognized as the second-largest importer of copper scrap in India, underscoring its strong presence in the copper recycling industry.</li> </ul>

	<ul style="list-style-type: none"> <li>• <b>Sustainability Commitment:</b> The company is dedicated to sustainable and ethical business practices, focusing on high-quality standards while reducing their environmental impact through responsible sourcing and manufacturing.</li> <li>• <b>Corporate Social Responsibility (CSR):</b> Sunlite is committed to positively impacting the community and the environment by integrating CSR initiatives into their core business strategy.</li> </ul> <p>This focus on sustainability, coupled with its technological advancements, has positioned Sunlite Recycling Industries as a key player in the copper recycling and manufacturing sector.</p>
<p>Baroda Extrusion Limited</p>	<p>Baroda Extrusion Limited, the first copper extrusion plant in India, boasts a well-established infrastructure and in-house manufacturing facilities. Located in Garadiya Village, Savli Taluka, Vadodara District, the company operates on a 22,118 square meter site with a built-up factory shed spanning 4,882 square meters. The plant is fully equipped with advanced machinery, including a 900 MT extrusion press, a 1 MT per hour induction furnace, and 25 heavy, medium, and light draw benches. Additionally, it features a bright annealing furnace for copper coils. The facility has an installed production capacity of 6,000 MT annually.</p> <p>Baroda Extrusion Limited primarily serves the air conditioning, refrigeration, power, and electrical industries. The company's product portfolio includes copper flats, bus bars, rods, tubes, coils, sections, profiles, billets, and mother tubes.</p> <p>The company places a strong emphasis on quality assurance, with a well-equipped laboratory for chemical analysis, tensile testing, hardness, and bend tests. Each product undergoes rigorous testing at every stage of production, and the company offers third-party inspection services. Baroda Extrusion Limited is committed to enhancing customer satisfaction by continuously improving product quality, service, and timely delivery.</p>
<p>Cubex Tubings Limited</p>	<p>Cubex Tubings Limited specializes in the manufacturing of copper alloy tubes, wires, sheets, flats, and rods, catering to a diverse range of industries including boilers, condensers, heat exchangers, medical applications, infrastructure, power generation, and defence.</p>

	<p>Strategically located to facilitate efficient delivery, the company's factory ensures timely shipments to international shipping ports.</p> <p>Cubex Tubings' copper alloy tubing is primarily utilized in power plants, petroleum refineries, and nuclear facilities, while its rods and wires are widely employed by electrical and construction companies. The company also serves niche industries and small businesses, adhering to minimum order requirements.</p> <p>The company leverages the expertise of a highly skilled workforce, aiming to deliver top-quality copper alloy products with a focus on fast, efficient transactions. Cubex Tubings has a rich history of supplying its products both domestically and internationally. The founders, with extensive buy-side experience, enable the company to streamline procurement processes for customers.</p> <p>Headquartered in Patancheru, Telangana, Cubex Tubings Limited continues to serve various sectors with a comprehensive product range, including copper products, copper alloy products, and nickel-copper alloy fittings and flanges.</p>
<p>Rajnandini Metal Limited</p>	<p>Rajnandini Metal Limited is a prominent player in the metal industry, specializing in the manufacturing of a diverse range of copper and copper alloy products. The company's product line includes copper rods, annealed bare copper wire, bunched copper wire, and fine copper wire, which are critical components in sectors such as electricals, construction, and heavy engineering. Rajnandini Metal is particularly known for their submersible winding wires and flat cables, serving the power generation and agriculture sectors, where reliable copper wiring is essential for motors, pumps, and related equipment.</p> <p>In addition to their domestic market presence, Rajnandini Metal has built a strong international footprint, exporting materials like copper, zinc, and brass to over 15 countries, including the United States, the United Kingdom, Europe, and Africa. The company's copper alloy products are widely used in power generation, home appliances, and infrastructure projects. With a focus on innovation and sustainability, Rajnandini Metal has also ventured into manufacturing cables for electric vehicles and is actively contributing to the development of</p>

	<p>smart city projects in India, aiming to support environmentally friendly technologies.</p> <p>The company's strong business network connects it with major industries, including steel, petrochemicals, recycling, and construction. Rajnandini Metal ensures consistent quality and service by leveraging its skilled workforce, advanced manufacturing technologies, and efficient logistics. This commitment to excellence enables the company to meet the high standards of its global clients, delivering high-performance materials and fostering long-term partnerships across a wide range of industrial sectors.</p>
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Financial Analysis<sup>141516</sup>

Year	Raw Material Cost	Power & Fuel	Salaries & Wages	SGA Expenses	Interest Expense	PBDIT Margin	Net Margin
FY 2019	84.2%	2.8%	2.5%	0.7%	1.4%	5.6%	1.8%
FY 2020	84.4%	2.7%	2.5%	0.9%	1.4%	7.9%	1.4%
FY 2021	88.0%	2.4%	2.4%	1.0%	1.1%	5.7%	2.3%
FY 2022	91.8%	1.9%	1.6%	1.1%	0.8%	6.4%	3.0%
FY 2023	90.4%	1.7%	1.4%	1.0%	0.8%	5.8%	2.6%

Source: CMIE<sup>17</sup> Prowess IQ, Company's Annual Report, Dun & Bradstreet Research, Based on a Sample of 15 Companies<sup>18</sup>

Indian copper manufacturing industry over the past five years reveal significant trends in operational costs and profitability. Raw material costs as a percentage of revenue have increased from 84.2% in FY 2019 to 91.8% in FY 2022, indicating a growing burden due to raw material expenses. Although there was a slight decrease to 90.4% in FY 2023, material cost management remains a key challenge for the industry.

Power and fuel costs have remained relatively stable, fluctuating between 1.7% and 2.8% of revenue. This consistency suggests that while energy expenses are a persistent factor, the industry has been successful in managing their overall impact. Salaries and wages have seen a gradual decline from 2.5% in FY 2019 to 1.4% in FY 2023, reflecting improved labor cost management or changes in workforce efficiency.

Selling, General, and Administrative (SGA) expenses have varied between 0.7% and 1.1% of revenue, showing fluctuations in administrative and operational overheads. The SGA expenses peaked at 1.1% in FY 2022 but remained at 1.0% in FY 2023. Interest expenses have been relatively low, averaging around 1.4% in FY 2019 and FY 2020, and decreased to 0.8% by FY 2023, indicating a reduction in debt or interest rates.

Profit Before Depreciation, Interest, and Taxes (PBDIT) margin has fluctuated between 5.6% and 7.9%, with a peak in FY 2020. The margin decreased to 5.8% in FY 2023, suggesting some pressure on profitability despite improvements in operational efficiency. The net margin has improved from 1.8% in FY 2019 to 2.6% in FY 2023, indicating an overall enhancement in profitability despite rising raw material costs.

While the industry has managed to control certain costs and improve net margins, challenges related to raw material expenses and maintaining PBDIT margins continue. The ability to sustain profitability amidst these variables underscores the industry's adaptive strategies and operational efficiencies.

<sup>14</sup> Financial for FY 2024 is not yet available for majority players

<sup>15</sup> Sample companies taken are small enterprises including Agrawal Metal Works Pvt. Ltd., Baroda Extrusion Ltd., Bharat Insulation Co. (India) Pvt. Ltd., Cubex Tubings Ltd., Global Copper Pvt. Ltd., K S H International Pvt. Ltd., Leebo Metals Pvt. Ltd., Matod Industries Pvt. Ltd., Mehta Tubes Ltd., Metals United Alloys & Fusion Products Ltd., Multimetals Ltd., Rachna Metal Industries Pvt. Ltd., S H Haryana Wires Ltd., Sagardeep Alloys Ltd., Rajnandini Metal Limited

<sup>16</sup> Sunlite Recycling Industries Limited is excluded in the financials and key ratios as it was incorporated in August 2022

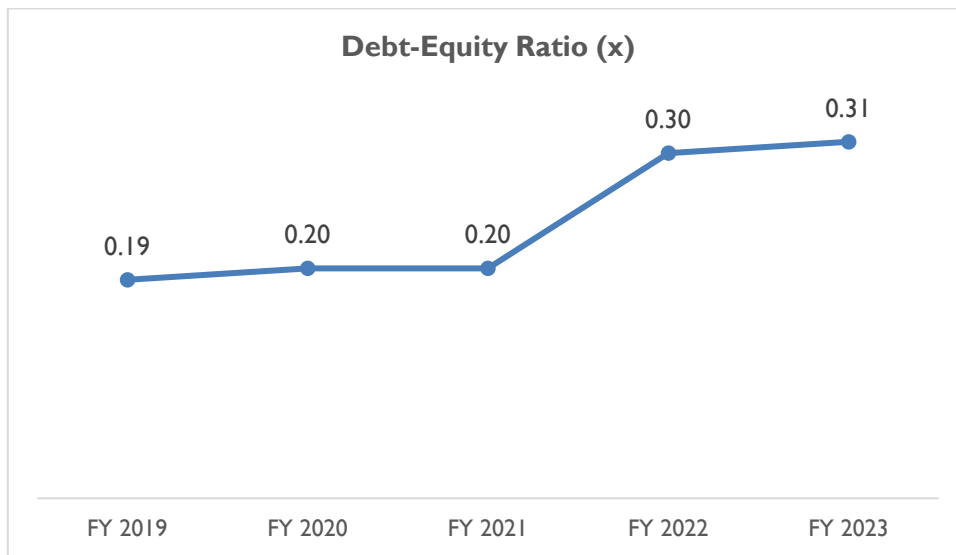
<sup>17</sup> Centre for Monitoring Indian Economy Prowess IQ

<sup>18</sup> Figures are taken as percentage of net sales



**Ratio Analysis**

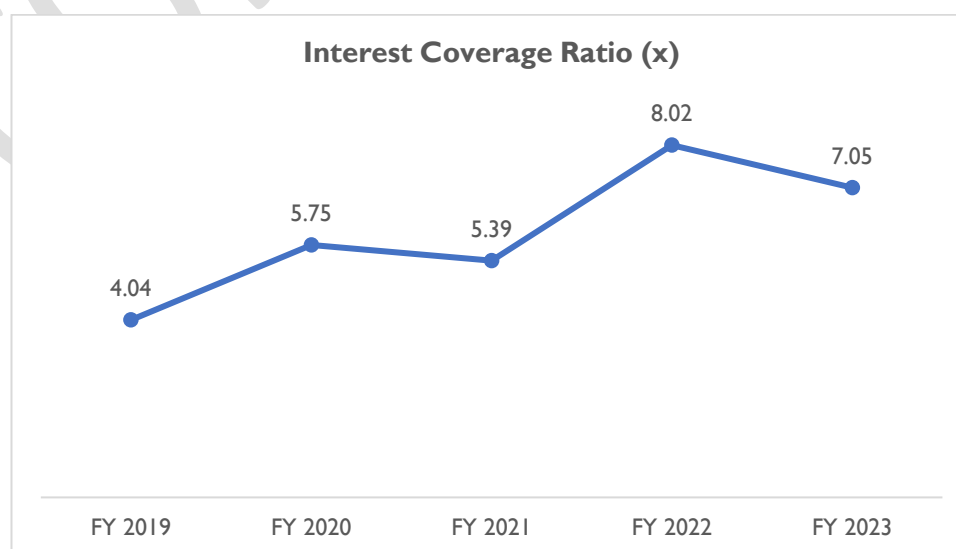
Debt Equity Ratio



Source: CMIE Prowess IQ, Company's Annual Report, Dun & Bradstreet Research, Based on a Sample of 15 Companies

The consolidated Debt-Equity Ratio for the sample companies has shown a gradual increase from 0.19 in FY 2019 to 0.31 in FY 2023, reflecting a compound annual growth rate (CAGR) of 13.02%. This upward trend suggests a higher reliance on debt relative to equity over the period, likely driven by capital expenditures or expansion needs. The notable rise to 0.30 in FY 2022 from 0.20 in FY 2021 indicates either strategic shifts or external influences on the capital structure. Despite this increase, the ratio remains relatively low, demonstrating a conservative approach to leveraging with a balanced capital structure that maintains significant equity participation.

Interest Coverage Ratio



Source: CMIE Prowess IQ, Company's Annual Report, Dun & Bradstreet Research, Based on a Sample of 15 Companies

The consolidated Interest Coverage Ratio (ICR) for the sample companies has improved from 4.04 in FY 2019 to 7.05 in FY 2023, representing a compound annual growth rate (CAGR) of 14.93%. This positive trend indicates an enhanced ability to cover interest expenses with earnings before interest and taxes (EBIT), reflecting stronger financial health and operational efficiency. The most significant improvement occurred between FY 2021 and FY 2022, with the ICR rising from 5.39 to 8.02, suggesting a substantial boost in EBIT relative to interest costs. This increase highlights better profitability and effective cost management, reinforcing the companies' capacity to meet interest obligations comfortably.

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## Key Ratio

Ratios	Average Value
Gross Margin (%)	7.2%
Net Margin (%)	2.6%
Current Ratio (x)	1.52
Quick Ratio (x)	0.86
Account Receivables Days (in days)	44
Inventory Days (in days)	48
Account Payable Days (in days)	16
Return on Net Worth (RONW) (%)	20.9%
Return on Asset (ROA) (%)	16.3%
Return on Capital Employed (ROCE) (%)	20.7%
Long-term Debt-Equity Ratio (x)	0.27
Net worth to Total Liabilities (%)	34.6%
Interest Coverage Ratio (x)	6.82
Fixed Asset Turnover Ratio (x)	14.89
Asset Turnover Ratio (x)	2.72
Working Capital Turnover Ratio (x)	13.49
Inventory Turnover Ratio (x)	8.16
Fixed Assets to Net worth Ratio (x)	0.53
Sales to Capital Employed Ratio (x)	3.46

Source: CMIE, Company's Annual Report, Dun & Bradstreet Research, based on a Sample of 15 Companies  
Average of FY 2021, 22 & 23 values

The Indian copper manufacturing industry demonstrated strong performance. The average Gross Margin stands at 7.2%, which reflects the industry's ability to retain a portion of revenue after covering the cost of goods sold. The Net Margin of 2.6% indicates a lower percentage of profit after all expenses, suggesting that while the industry maintains a reasonable gross margin, net profitability is constrained by other costs.

Liquidity ratios such as the Current Ratio at 1.52x and Quick Ratio at 0.86x suggest a relatively healthy liquidity position, with the industry having a reasonable buffer to meet short-term obligations. The Account Receivables Days of 44 days and Inventory Days of 48 days indicate moderate efficiency in managing

receivables and inventory. However, the Account Payable Days of 16 days show that the industry can settle its payables quickly, potentially affecting working capital.

Profitability metrics are strong, with Return on Net Worth (RONW) at 20.9%, Return on Assets (ROA) at 16.3%, and Return on Capital Employed (ROCE) at 20.7%. These ratios reflect effective asset utilization and capital management, contributing to robust financial performance. The Long-term Debt-Equity Ratio of 0.27x indicates a conservative approach to long-term financing, while the Net Worth to Total Liabilities ratio of 34.6% supports a stable financial structure.

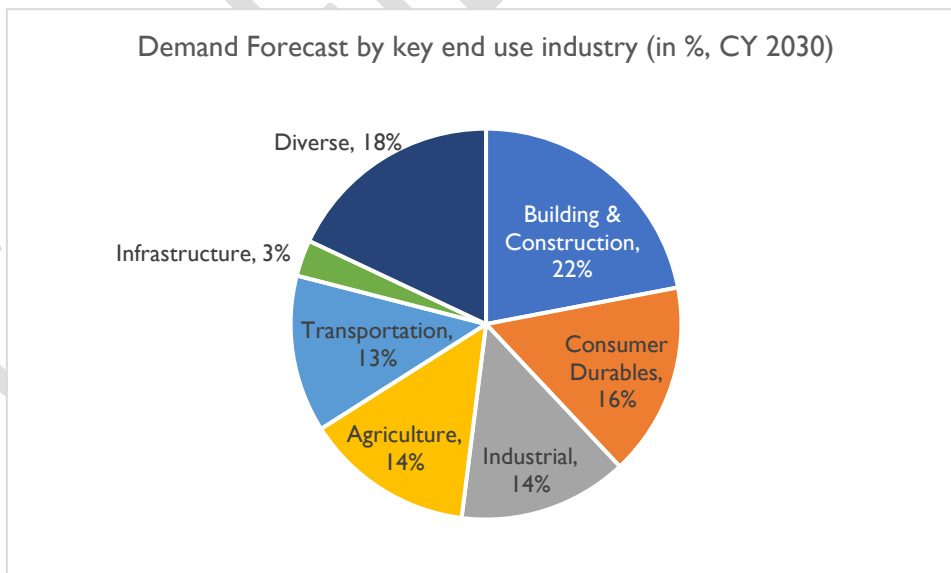
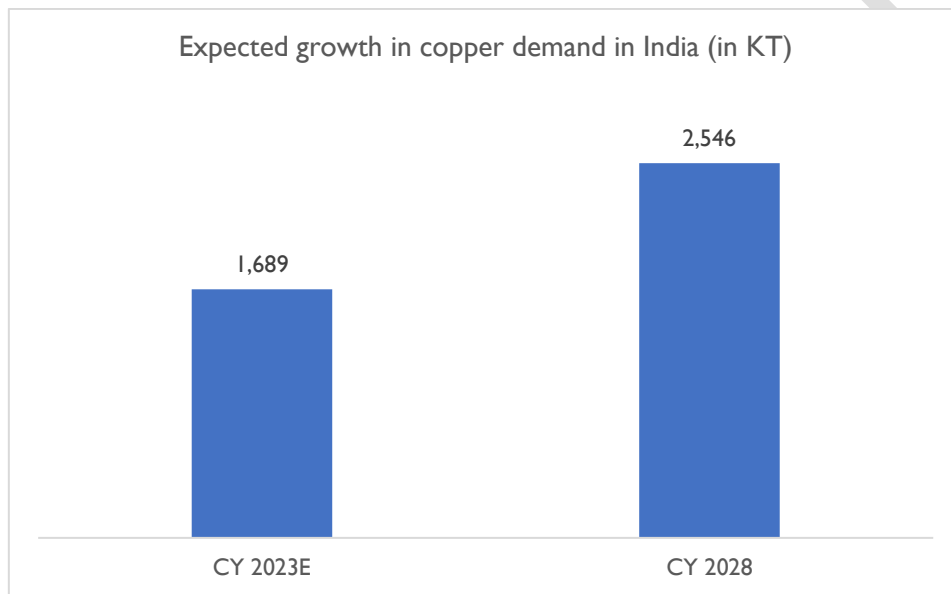
Operational efficiency is highlighted by the Interest Coverage Ratio of 6.82x, Fixed Asset Turnover Ratio of 14.89x, Asset Turnover Ratio of 2.72x, and Working Capital Turnover Ratio of 13.49x. These ratios demonstrate effective use of assets and working capital. The Inventory Turnover Ratio of 8.16x and Fixed Assets to Net Worth Ratio of 0.53x further underscore efficient asset management. Additionally, the Sales to Capital Employed Ratio of 3.46x indicates strong sales performance relative to capital investment. Overall, the financial metrics of the Indian copper manufacturing industry reflect a balanced approach to profitability, liquidity, and asset management.

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## Growth Forecast

Copper holds a rich history in India and has been an integral part of Indian civilization. The metal's versatility and durability made it prized for crafting tools, weapons, ornaments, and vessels. Today, copper continues to play a crucial role in India's development and progress across various sectors. Its conductivity, corrosion resistance, and malleability make it indispensable in industries like agriculture, construction, automotive, electronics, and industrial applications.

Copper demand in India is expected to grow from an estimated 1,689 kilotonnes in CY 2023 to reach 2,546 kilotonnes by CY 2028, growing at a CAGR of 8.6% between CY 2023 – 2028.

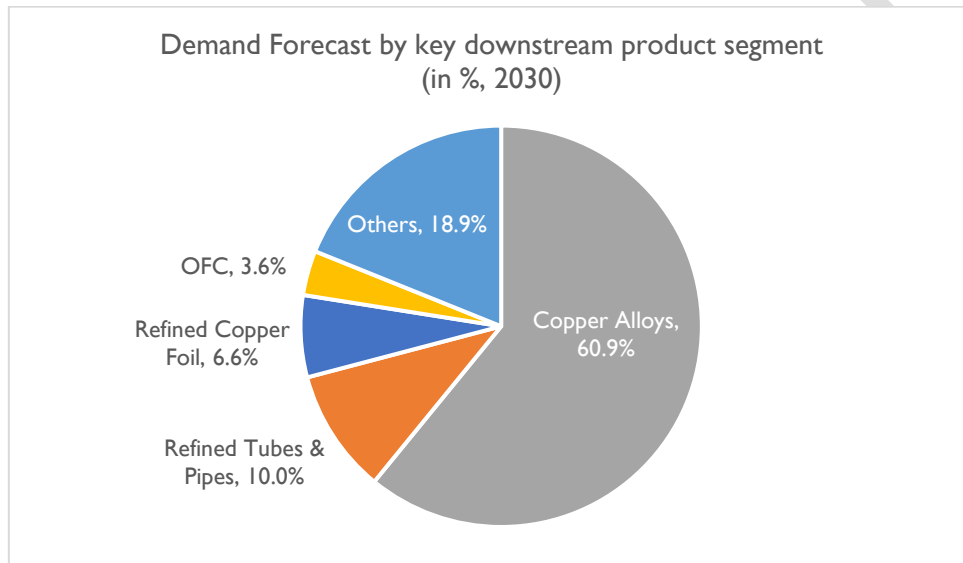


Source: D&B Research and Estimates

In terms of end-use industries, the building and construction sector is expected to remain a major driver. Copper's extensive use in electrical wiring, plumbing, HVAC systems, and structural applications ensures a steady demand as urbanization and infrastructure projects continue to expand.

The consumer electronics sector also plays a vital role in driving copper demand. The proliferation of smartphones, laptops, tablets, and other electronic devices necessitates copper for circuitry, connectors, and components, driving steady growth in this segment.

Another significant contributor to copper demand is the transportation industry. Within this, the automotive sector, particularly the electric vehicles segment, shows promising potential. With the government's focus on promoting EV adoption and the shift towards sustainable transportation solutions, the need for copper in EVs for wiring, batteries, motors, and charging infrastructure is set to increase substantially.



Source: D&B Research and Estimates

Moving to downstream product segments, copper alloys, including brass and bronze, are anticipated to experience steady demand due to their use in plumbing fixtures, electrical connectors, bearings, gears, and various industrial applications. Refined copper, crucial for electrical wiring, power distribution, and manufacturing of electrical equipment, is poised for optimistic growth driven by infrastructure projects and industrial expansion.

Copper pipes and tubes, essential in plumbing, HVAC systems, refrigeration, and industrial applications, are expected to see increased demand with ongoing construction activities and infrastructure development. Furthermore, the telecommunications sector's growth drives demand for Optical Fiber Cable (OFC), where copper is essential for its conductive elements. As India upgrades its telecommunications networks and prepares for advanced connectivity like 5G<sup>19</sup>, the demand for copper in OFC is forecasted to grow significantly.

<sup>19</sup> 5G stands for Fifth Generation mobile network technology