

Industry Research Report on Refractory Materials

13th December 2024

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Table of Contents

1. Economic Outlook.....	7
1.1 Global Economy.....	7
1.2 Indian Economic Outlook.....	9
1.2.1 GDP Growth and Outlook.....	9
1.2.2 Gross Value Added (GVA).....	10
1.2.3 Investment Trend in Infrastructure.....	11
1.2.4 Industrial Growth.....	12
1.2.5 Consumer Price Index.....	12
1.2.6 Overview on Key Demographic Parameters.....	14
1.2.7 Concluding Remarks.....	17
2. Global Ferro Alloys Markets.....	18
2.1 Global Ferro Alloy Industry Market Size.....	19
2.2 Global Ferro Alloy Industry - Demand by Regions.....	20
2.2.1 North America – Ferro Alloys Demand.....	20
2.2.2 Middle East – Ferro Alloys Demand.....	21
2.2.3 Africa – Ferro Alloys Demand.....	22
2.2.4 Asia – Ferro Alloys Demand.....	23
2.3 Global Ferro Alloy Industry – Production by Regions.....	24
2.3.1 North America- Ferro Alloys Production.....	24
2.3.2 Middle East- Ferro Alloys Production.....	25
2.3.3 Africa- Ferro Alloys Production.....	25
2.3.4 Asia- Ferro Alloys Production.....	26
2.3.4.1 India- Ferro Alloys Production.....	27
2.3.4.2 India- Ferro Alloys Exports Destination.....	28
2.4 Government Policies for Global Ferro Alloys Market in Africa.....	29
3. Global Silica Ramming Mass Market.....	30
3.1 Global Silica Ramming Mass Market Size.....	30
3.2 Global Silica Ramming Mass –Demand by Regions.....	31
3.2.1 North America –Demand for Silica Ramming Mass.....	31
3.2.2 Middle East –Demand for Silica Ramming Mass.....	32
3.2.3 Africa –Demand for Silica Ramming Mass.....	33
3.2.4 Asia –Demand for Silica Ramming Mass.....	34
3.3 Global Silica Ramming Mass Industry - Region-Wise Production.....	35
3.3.1 North America – Silica Ramming Mass Production.....	35
3.3.2 Middle East – Silica Ramming Mass Production.....	36
3.3.3 Africa– Silica Ramming Mass Production.....	36
3.3.4 Asia – Silica Ramming Mass Production.....	37
3.3.4.1 India – Silica Ramming Mass Market.....	38
3.3.4.2 India – Silica Ramming Mass Top 5 Exports Destination.....	39
3.4 Government Policies in Africa.....	39
4. Global Calcined Petroleum Coke Market.....	41
4.1 Global Calcined Petroleum Coke Industry Market Size.....	41
4.2 Global Calcined Petroleum Coke Industry - Demand by Regions.....	42

4.2.1 North America – Calcined Petroleum Coke Demand	43
4.2.2 Middle East – Calcined Petroleum Coke Demand	44
4.2.3 Asia-Pacific – Calcined Petroleum Coke Demand	44
4.2.4 Africa – Calcined Petroleum Coke Demand	45
4.3 Global Calcined Petroleum Coke Industry – Production by Regions.....	46
4.3.1 North America- Calcined Petroleum Coke Production.....	47
4.3.2 Middle East- Calcined Petroleum Coke Production	48
4.3.3 Africa- Calcined Petroleum Coke Production	48
4.3.4 Asia-Pacific - Calcined Petroleum Coke Production	49
4.3.4.1 India- Calcined Petroleum Coke Production.....	50
4.3.4.2 India- Calcined Petroleum Coke Exports Destination.....	51
4.4 Government Policies for Global Calcined Petroleum Coke Market in Africa.....	51
5. Steel Industry	53
5.1 Overview of the Global Steel Industry	53
5.2 Global Steel Production	54
5.3 Global Steel Consumption.....	56
5.4 Outlook of Global Steel Consumption	57
5.5 Overview on Indian Steel Industry	58
5.6 Domestic Crude Steel Production	58
5.7 Domestic Finished Steel Production and Consumption	59
5.8 Key Demand Drivers for Steel Industry.....	60
5.9 Outlook of Indian Steel Consumption	65
6. Key Growth Drivers for Refractory Materials	67
7. Threats and Challenges.....	70
8. Competitive Landscape	74

List of Tables

Table 1: GDP growth trend comparison - India v/s Other Economies (Real GDP, Y-o-Y change in %).....	7
Table 2: RBI's GDP Growth Outlook (Y-o-Y %).....	10
Table 3: Sectoral Growth (Y-o-Y % Growth) - at Constant Prices.....	11
Table 4: Types of Ferro Alloys.....	18
Table 5: Country-Wise Demand in Africa (in '000 tonnes)	23
Table 6: Production of Ferro Alloys across Africa Regions (in '000 tonnes)	26
Table 7: Top 5 Export Destinations from India (In USD million)	28
Table 8: Country-Wise Demand in Africa (in '000 tonnes)	34
Table 9: Production Volume across African Region (in '000 tonnes).....	37
Table 10: Top 5 Export Destinations of India (In USD million).....	39
Table 11: Types of Calcined Petroleum Coke.....	41
Table 12: Consumption of calcined petroleum coke across African Regions (in '000 tonnes).....	46
Table 13: Production of Calcined Petroleum Coke across African Regions.....	49
Table 14: Top 5 Export Destinations from India (In USD million).....	51
Table 15: Raghav Productivity Enhancers Limited– Company Profile.....	74
Table 16: Raghav Productivity Enhancers Limited – Financial Information (Consolidated)	74
Table 17: Maithan Alloys Limited – Company Profile	75

Table 18: Maithan Alloys Limited- Financial Information (Consolidated)	75
Table 19: Eloquent Steel Private Limited – Company Profile	75
Table 20: Eloquent Steel Private Limited - Financial Information (Consolidated)	75
Table 21: Jainam Ferro Alloys Limited – Company Profile.....	76
Table 22: Jainam Ferro Alloys Limited - Financial Information (Standalone)	76
Table 23: Jajoo Rashmi Refractories Limited – Company Profile	76
Table 24: Jajoo Rashmi Refractories Limited - Financial Information (Consolidated)	77

List of Charts

Chart 1: Global Growth Outlook Projections (Real GDP, Y-o-Y change in %)	7
Chart 2: Trend in Real Indian GDP growth rate	9
Chart 3: Gross Fixed Capital Formation (GFCF) as % of GDP (At constant prices).....	11
Chart 4: Y-o-Y growth in IIP (in %).....	12
Chart 5: Retail Price Inflation in terms of index and Y-o-Y Growth in % (Base: 2011-12=100)	13
Chart 6: RBI historical Repo Rate	14
Chart 7: Trend of India Population vis-à-vis dependency ratio.....	15
Chart 8: Age-Wise Break Up of Indian population.....	15
Chart 9: Urbanization Trend in India.....	16
Chart 10: Trend of Per Capita GNDI and Per Capita PFCE (Current Price)	16
Chart 11: Global Ferro Alloy Market Size	19
Chart 12: Region Wise Global Ferro Alloy - Consumption Market Share in 2023.....	20
Chart 13: North America Ferro Alloy Demand.....	21
Chart 14: Middle East Ferro Alloy Demand	21
Chart 15: Africa Market Ferro Alloy Demand	22
Chart 16: Asia Market Ferro Alloy Demand.....	23
Chart 17: North America Market Ferro Alloy Production	24
Chart 18: Middle East Market Ferro Alloy Production.....	25
Chart 19: Africa Market Ferro Alloy Production	26
Chart 20: Asia Market Ferro Alloy Production	27
Chart 21: India Market Ferro Alloy Production	28
Chart 22: Global Silica Ramming Mass Market.....	31
Chart 23: Global Region-Wise Silica Ramming Mass - Consumption Share in 2023.....	31
Chart 24: North America –Demand for Silica Ramming Mass.....	32
Chart 25: Middle East –Demand for Silica Ramming Mass	32
Chart 26: Africa –Demand for Silica Ramming Mass.....	33
Chart 27: Country-Wise Demand in Africa - Consumption Share in 2023	34
Chart 28: Asia –Demand for Silica Ramming Mass.....	35
Chart 29: North America - Silica Ramming Mass Production	35
Chart 30: Middle East - Silica Ramming Mass Production	36
Chart 31: Africa - Silica Ramming Mass Production	37
Chart 32: Asia - Silica Ramming Mass Production	38
Chart 33: India - Silica Ramming Mass Production.....	39
Chart 34: Global Calcined Petroleum Coke Market Size	42
Chart 35: Region Wise Global Calcined Petroleum Coke - Consumption Market Share in 2023	43
Chart 36: North America Calcined Petroleum Coke Demand	43

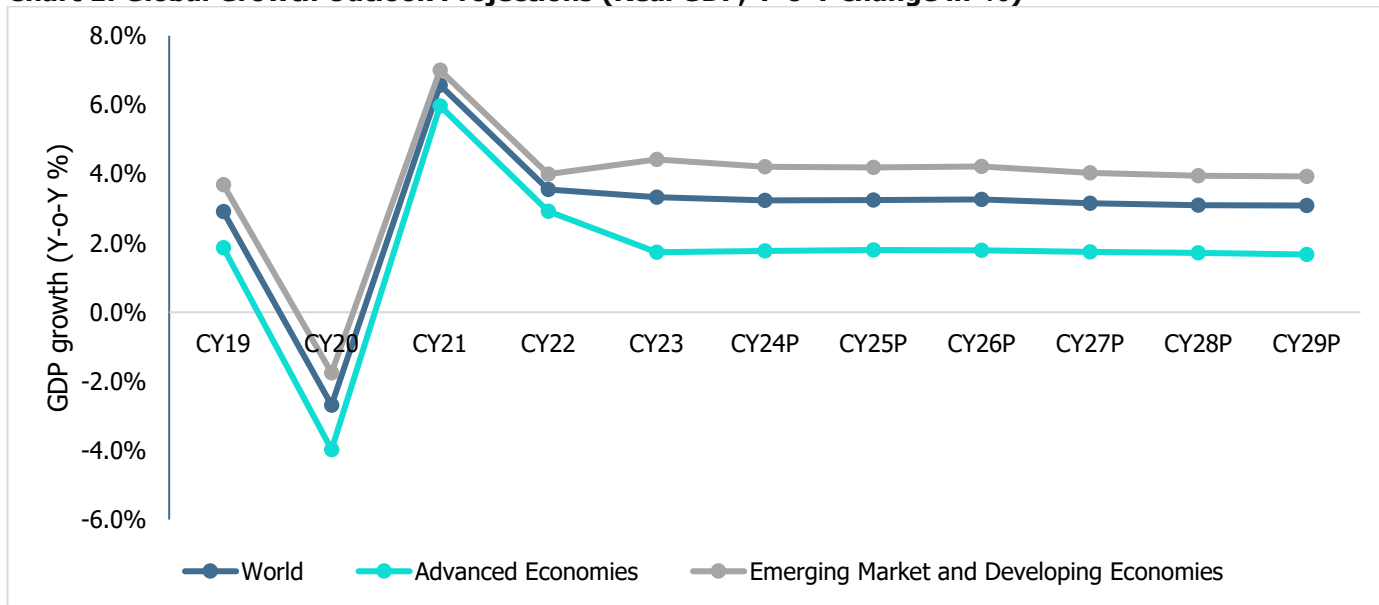
Chart 37: Middle East Calcined Petroleum Coke Demand	44
Chart 38: Asia-Pacific Calcined Petroleum Coke Demand.....	45
Chart 39: Africa Calcined Petroleum Coke Demand	46
Chart 40: North America Market Calcined Petroleum Coke Production.....	47
Chart 41: Middle East Market Calcined Petroleum Coke Production	48
Chart 42: Africa Market Calcined Petroleum Coke Production	49
Chart 43: Asia-Pacific Market Calcined Petroleum Coke Production	50
Chart 44: India Market Calcined Petroleum Coke Production	51
Chart 45 : Types of Steel Products	53
Chart 46: Global Per Capita Consumption (in kg).....	54
Chart 47: Region-wise Global Capacity in CY23 - 2,432 MT	54
Chart 48: Global Crude Steel Production	55
Chart 49: Crude Steel Production Geographical Region in CY23- 1,892.2 MT	56
Chart 50: Global Steel Demand	57
Chart 51: Steel Demand Growth Forecast	57
Chart 52: Domestic Crude Steel Production.....	59
Chart 53: India’s Finished Steel Production	59
Chart 54: India’s Finished Steel Consumption.....	60
Chart 55: Budget Allocation Towards Infrastructure	61
Chart 56: Urbanization Trend in India.....	62
Chart 57: Per Capita Gross National Disposable Income.....	62
Chart 58: Trend in Indian Automobile Industry Domestic Sales Growth	64
Chart 59: Railways- Budget Allocation over the Years	65
Chart 60: Logistics Cost as a Share of GDP	70
Chart 61: Inter-modal Mix for Freight Movement in India as of FY22	70
Chart 62: Domestic Steel Prices	71
Chart 63: Iron Ore Prices.....	72
Chart 64: Coal Prices	72

1. Economic Outlook

1.1 Global Economy

Global growth, which stood at 3.3% in CY23, is anticipated to fall and remain at 3.2% in both CY24 and CY25. The global real GDP growth outlook shows signs of improvement as cyclical imbalances ease, aligning economic activity with potential output in major economies. While global disinflation progresses, risks remain, particularly from financial market volatility and geopolitical tensions that could disrupt trade and increase commodity prices. Nonetheless, stronger public investment in advanced economies aimed at infrastructure and the green transition may stimulate private sector investment and bolster global demand. Additionally, accelerating structural reforms in both advanced and emerging markets could enhance productivity and support medium-term growth.

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



Source: IMF – World Economic Outlook Database (October 2024); Note: P-Projection

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

	Real GDP (Y-o-Y change in %)									
	CY20	CY21	CY22	CY23	CY24P	CY25P	CY26P	CY27P	CY28P	CY29P
India	-5.8	9.7	7.0	8.2	7.0	6.5	6.5	6.5	6.5	6.5
China	2.2	8.4	3.0	5.3	4.8	4.5	4.1	3.6	3.4	3.3
Indonesia	-2.1	3.7	5.3	5.0	5.0	5.1	5.1	5.1	5.1	5.1
Saudi Arabia	-3.6	5.1	7.5	-0.8	1.5	4.6	4.4	3.6	3.5	3.5
Brazil	-3.3	4.8	3.0	2.9	3.0	2.2	2.3	2.4	2.5	2.5
Euro Area	-6.1	6.2	3.3	0.4	0.8	1.2	1.5	1.4	1.3	1.2
United States	-2.2	6.1	2.5	2.9	2.8	2.2	2.0	2.1	2.1	2.1

Source: IMF - World Economic Outlook Database (October 2024); Note: P- Projection

Advanced Economies Group

Advanced economies are expected to experience a gradual increase in growth, increasing to 1.8% in CY24 and staying same for next 2 years.

The **United States** is expected to grow to 2.8% in CY24, followed by a slight slowdown to 2.2% in CY25. Growth outlook for the United States has improved due to strong consumption and non-residential investment, driven by rising real wages and wealth effects. However, growth is expected to decelerate as fiscal policies tighten and the labour market cools, leading to a gradual closure of the output gap.

The **Euro Area's** growth is anticipated to rebound from its sluggish growth in CY23 to 0.8% in CY24 and further to 1.2% in CY25. This recovery is driven by better export performance, as well as, a stronger domestic demand. The gradual loosening of the monetary policy is expected to boost investment and the rise of real wages is anticipated to improve the consumption patterns.

Emerging Market and Developing Economies Group

Emerging market and developing economies are forecasted to maintain stable growth at 4.2% in both CY24 and CY25. The economic forecast for emerging and developing Asia reveals a modest deceleration in growth, with projections indicating a decline from 5.3% in CY24 to 5% in CY25. **China's** trajectory reflects a gradual slowdown, transitioning from 4.8% in CY24 to 4.5% in CY25 due to low consumer confidence and ongoing real estate sector challenges. However, better than expected net exports have ensured that the slowdown in growth is marginal. In contrast, **India's** growth remains robust, with anticipated rates of 7% in CY24 and 6.5% in CY25. This moderation in GDP growth is expected as the surge in pent-up demand from the pandemic wanes. The economy is transitioning towards its potential, reflecting a more sustainable pace of growth as it adjusts to post-pandemic realities.

The **Indonesian** economy is expected to register growth of 5.0% in CY24 and 5.1% in CY25, an important concern for Indonesia is the trade fragmentation. **Saudi Arabia's** growth in CY24 is predicted to see a revamp in the growth rate to 1.5% on account of the extension of oil production cuts taking place in the country. Going forward, GDP is expected to grow at 4.6% in CY25. On the other hand, **Brazil's** growth is projected to be 3% in CY24 due to robust private consumption and investment driven by a strong labour market and effective government transfers. However, due to the anticipated tightening of the labour market and ongoing restrictive monetary policy, growth is expected to slowdown in CY25 to 2.2%.

Despite the turmoil in the last 2-3 years, India bears good tidings to become a USD 5 trillion economy by CY27. According to the IMF dataset on Gross Domestic Product (GDP) at current prices, the nominal GDP has been at USD 3.6 trillion for CY23 and is projected to reach USD 5.2 trillion by CY27 and USD 6.3 trillion by CY29. India's expected GDP growth rate for coming years is almost double compared to the world economy. The Indian economy shows resilience amid global inflation, supported by a stable financial sector, strong service exports, and robust investment driven by government spending and high-income consumer consumption, positioning it for better growth than other economies.

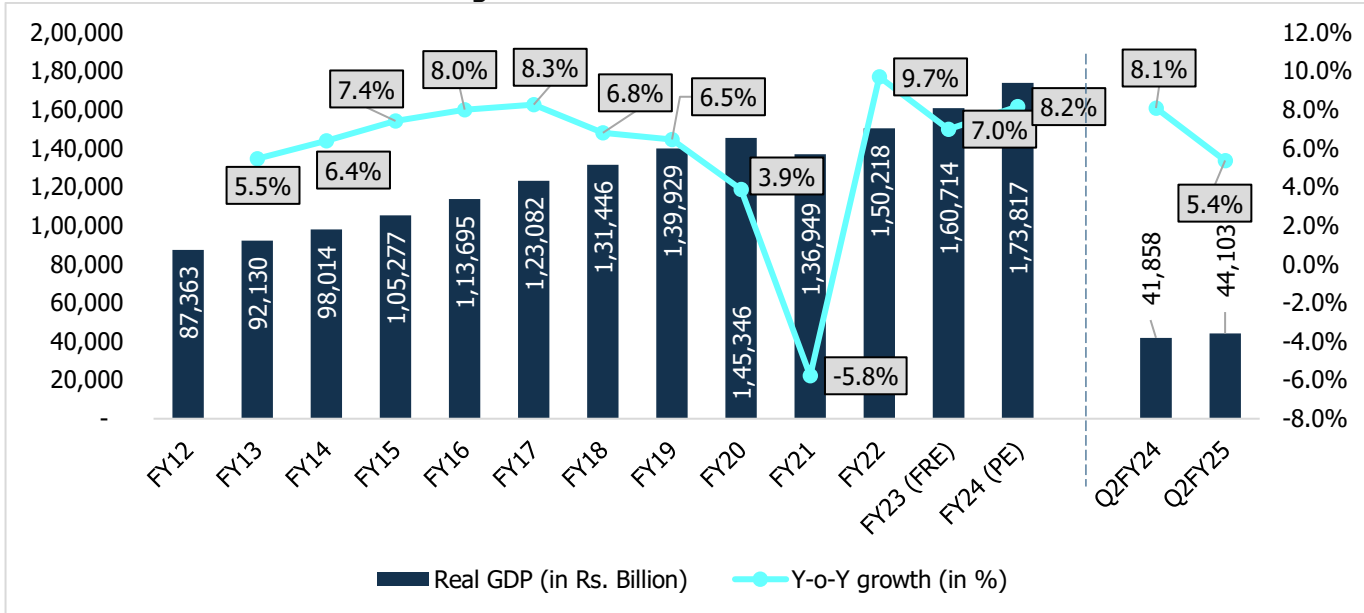
Besides, India stands out as the fastest-growing economy among the major economies. The country is expected to grow at more than 6.5% in the period of CY24-CY29, outshining China's growth rate. By CY27, the Indian economy is estimated to emerge as the third-largest economy globally, hopping over Japan and Germany. Currently, it is the third largest economy globally in terms of Purchasing Power Parity (PPP) with a ~7.9% share in the global economy, with China (~18.7%) on the top followed by the United States (~15.1%).

1.2 Indian Economic Outlook

1.2.1 GDP Growth and Outlook

Resilience to External Shocks remains Critical for Near-Term Outlook

Chart 2: Trend in Real Indian GDP growth rate



Source: MOSPI; Note: FRE – First Revised Estimates, PE – Provisional Estimate

India’s real GDP grew by 7.0% in FY23 and stood at ~Rs. 161 trillion, as per the First Revised Estimate, despite the pandemic in previous years and geopolitical Russia-Ukraine spillovers. Real GDP in the year FY24 is estimated to grow at 8.2% at Rs. 173.82 trillion as per provisional estimate of the Ministry of Statistics and Programme Implementation. It is expected that domestic demand, especially investment, to be the main driver of growth in India, amid sustained levels of business and consumer confidence.

In Q1FY25, real GDP grew by 6.7% y-o-y, hitting a 15-month low, as compared to 8.2% y-o-y in the previous quarter. Private consumption, a key driver of the GDP, showed resilience increasing by 7.45% while government spending contracted by 0.24%. This growth was largely driven by elections and extreme summer conditions, which impacted economic activities across several sectors. In Q2FY25, growth experienced a sharp slowdown to 5.4% as compared to 8.1% y-o-y in the previous quarter. This was mainly attributed to the poor performance across the manufacturing and mining sectors.

GDP Growth Outlook

- Driven by fixed investment and improving global environment, domestic economic activity continues to expand. The provisional estimates (PE) placed real GDP growth at 8.2% for FY24.
- Industrial growth experienced a significant slowdown due to weaker performance in manufacturing, mining, and lower electricity demand. However, strong performance in both the manufacturing and services sectors, as indicated by elevated purchasing managers' indices, suggests ongoing expansion.

- Domestic economic activity shows signs of recovery, with rural demand on the rise and agricultural production bolstered by favorable weather conditions. The expected pick-up in industrial activity, government capital expenditure, and post-monsoon recovery in mining and electricity are likely to contribute to growth.
- Investment activity remains strong, driven by government capital expenditure and improving business sentiment. External demand for services and merchandise exports continues to grow, supporting the overall economic outlook.

Persistent geopolitical tensions, volatility in international financial markets and geo-economic fragmentation do pose risk to this outlook. Based on these considerations, the RBI, in its December 2024 monetary policy, has projected real GDP growth at 6.6% y-o-y for FY25.

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

FY25P (complete year)	Q3FY25P	Q4FY25P	Q1FY26P	Q2FY26P
6.6%	6.8%	7.2%	6.9%	7.3%

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

1.2.2 Gross Value Added (GVA)

Gross Value Added (GVA) is the measure of the value of goods and services produced in an economy. GVA gives a picture of the supply side whereas GDP represents consumption.

Industry and Services sector leading the recovery charge

- The gap between GDP and GVA growth turned positive in FY22 (after a gap of two years) due to robust tax collections. Of the three major sector heads, the service sector has been the fastest-growing sector in the last 5 years.
- In FY23, **the agriculture sector** performed well despite weather-related disruptions, such as uneven monsoon and unseasonal rainfall, impacting yields of some major crops and clocked a growth of 4% y-o-y, garnering Rs. 22.3 trillion. The agriculture sector's growth slowed in FY24 to an estimated 1.4% rise for the year, down from 4.7% in FY23. The sector reached to Rs. 23.1 trillion for FY24 as per provisional estimate. In Q1FY25, the agriculture sector grew by only 2% y-o-y as compared to 3.7% in Q1FY24. Better monsoon conditions are expected to brighten outlook for the agriculture sector. Going forward, rising bank credit and increased exports will be the drivers for the agriculture sector.
- The **industrial sector** output in FY23 grew by only 2.1% with estimated value Rs. 44.74 trillion owing to decline in manufacturing activities. India's industrial sector experienced robust growth in FY24 supported by positive business sentiment, falling commodity prices, and government policies like production-linked incentives. The sector grew by 9.5% on y-o-y basis, reaching Rs. 48.9 trillion for FY24. In Q1FY25, the industrial sector grew by 8.3% y-o-y as compared to 6% in Q1FY24. This growth was driven mainly by sales growth in manufacturing companies, construction, and utility services. Construction grew at the highest rate of 10.5% as compared to a growth rate of 8.3% in the same quarter in previous year.
- In FY23, benefitting from the pent-up demand, the **services sector** was valued at Rs. 80.6 trillion and registered growth of 10.0% y-o-y. In FY24, India's services sector growth was driven by steady growth in various service sector indicators like air passenger traffic, port cargo traffic, GST collections, and retail credit. With this, the growth of service sector is estimated at Rs. 86.7 trillion registering 7.6% growth in FY24 overall. In Q1FY25, the services sector grew by only 7.2% y-o-y as compared to 10.7% in Q1FY24.

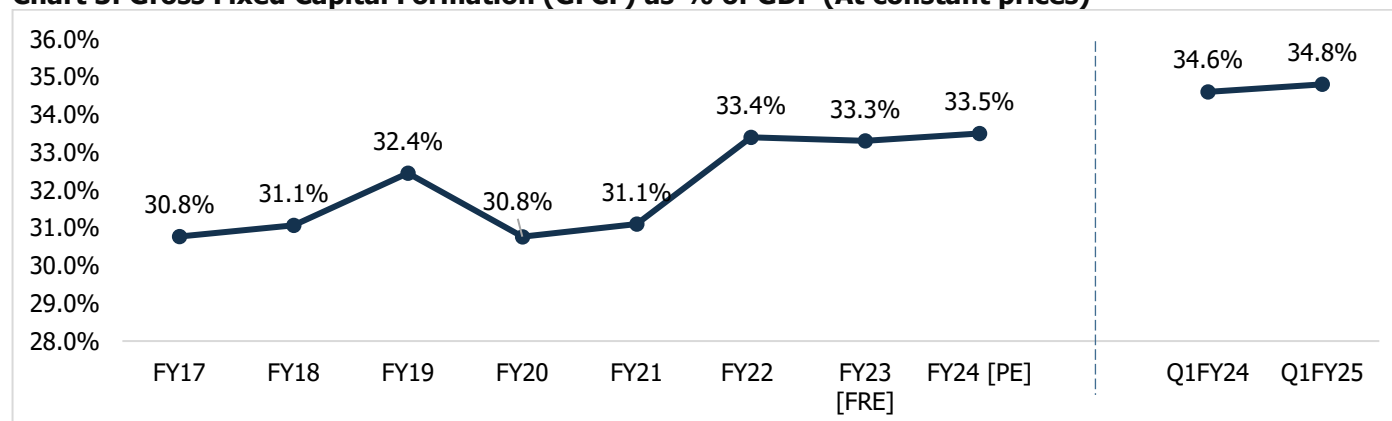
Table 3: Sectoral Growth (Y-o-Y % Growth) - at Constant Prices

At constant Prices	FY19	FY20	FY21	FY22	FY23 (FRE)	FY24 (PE)	Q1FY24	Q1FY25
Agriculture, Forestry & Fishing	2.1	6.2	4.1	3.5	4.7	1.4	3.7	2.0
Industry	5.3	-1.4	-0.9	11.6	2.1	9.5	6	8.3
Mining & Quarrying	-0.9	-3.0	-8.6	7.1	1.9	7.1	7.0	7.2
Manufacturing	5.4	-3.0	2.9	11.1	-2.2	9.9	5.0	7.0
Electricity, Gas, Water Supply & Other Utility Services	7.9	2.3	-4.3	9.9	9.4	7.5	3.2	10.4
Construction	6.5	1.6	-5.7	14.8	9.4	9.9	8.6	10.5
Services	7.2	6.4	-8.2	8.8	10.0	7.6	10.7	7.2
Trade, Hotels, Transport, Communication & Broadcasting	7.2	6.0	-19.7	13.8	12.0	6.4	9.7	5.7
Financial, Real Estate & Professional Services	7.0	6.8	2.1	4.7	9.1	8.4	12.6	7.1
Public Administration, Defence and Other Services	7.5	6.6	-7.6	9.7	8.9	7.8	8.3	9.5
GVA at Basic Price	5.8	3.9	-4.2	8.8	6.7	7.2	8.3	6.8

Source: MOSPI; Note: FRE – First Revised Estimates, PE – Provisional Estimate

1.2.3 Investment Trend in Infrastructure

Gross Fixed Capital Formation (GFCF) is a measure of the net increase in physical assets. In FY23, the ratio of investment (GFCF) to GDP remained flat, as compared to FY22, at 33.3%. Continuing in its growth trend, this ratio has reached 33.5% in FY24. In Q1FY25, GFCF as a proportion in GDP, reached 34.8% as compared to 34.6% in Q1FY24 mainly reflecting growth in private investment.

Chart 3: Gross Fixed Capital Formation (GFCF) as % of GDP (At constant prices)


Source: MOSPI; Note: 3RE – Third Revised Estimate, 2RE – Second Revised Estimates, 1RE – First Revised Estimates, PE – Provisional Estimate, FAE-First Advance Estimate

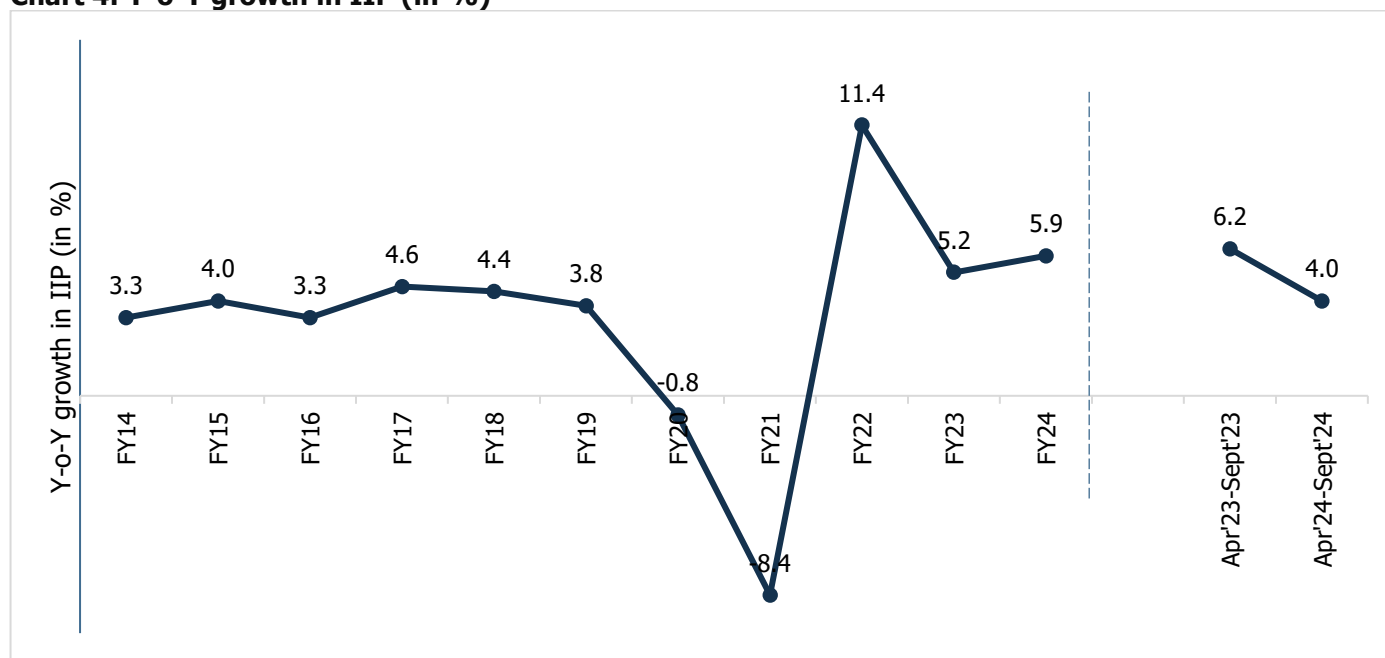
Overall, the support of public investment in infrastructure is likely to gain traction due to initiatives such as Atmanirbhar Bharat, Make in India, and Production-linked Incentive (PLI) scheme announced across various sectors.

1.2.4 Industrial Growth

Improved Core and Capital Goods Sectors helped IIP Growth Momentum

The Index of Industrial Production (IIP) is an index to track manufacturing activity in an economy. During FY23, the industrial output recorded a growth of 5.2% y-o-y supported by a favorable base and a rebound in economic activities. During FY24, the industrial output recorded a growth of 5.9% y-o-y supported by growth in manufacturing and power generation sectors. The period April 2024 – September 2024, industrial output grew by 4.0% compared to the 6.2% growth in the corresponding period last year. For the month of September 2024, the IIP growth increased by 3.1% as compared to the last year’s IIP growth of 6.4%. This increase was on account of all the used based segments witnessing a growth in their Y-o-Y growth in September 2024 compared to August 2023. The manufacturing sector also grew modestly in September 2024 by 3.9% as compared to a growth of 5.1% in September 2023. Within the growth in manufacturing, the top three positive contributors were Manufacture of basic metals, Manufacture of electrical equipment, and Manufacture of coke and refined petroleum products. So far in the current fiscal, the government’s strong infrastructure spending and rising private investment are evident, though consumer non-durables production has declined. Urban demand drives consumption, while rural demand improves, highlighting the importance of sustained consumption and investment for industrial performance.

Chart 4: Y-o-Y growth in IIP (in %)



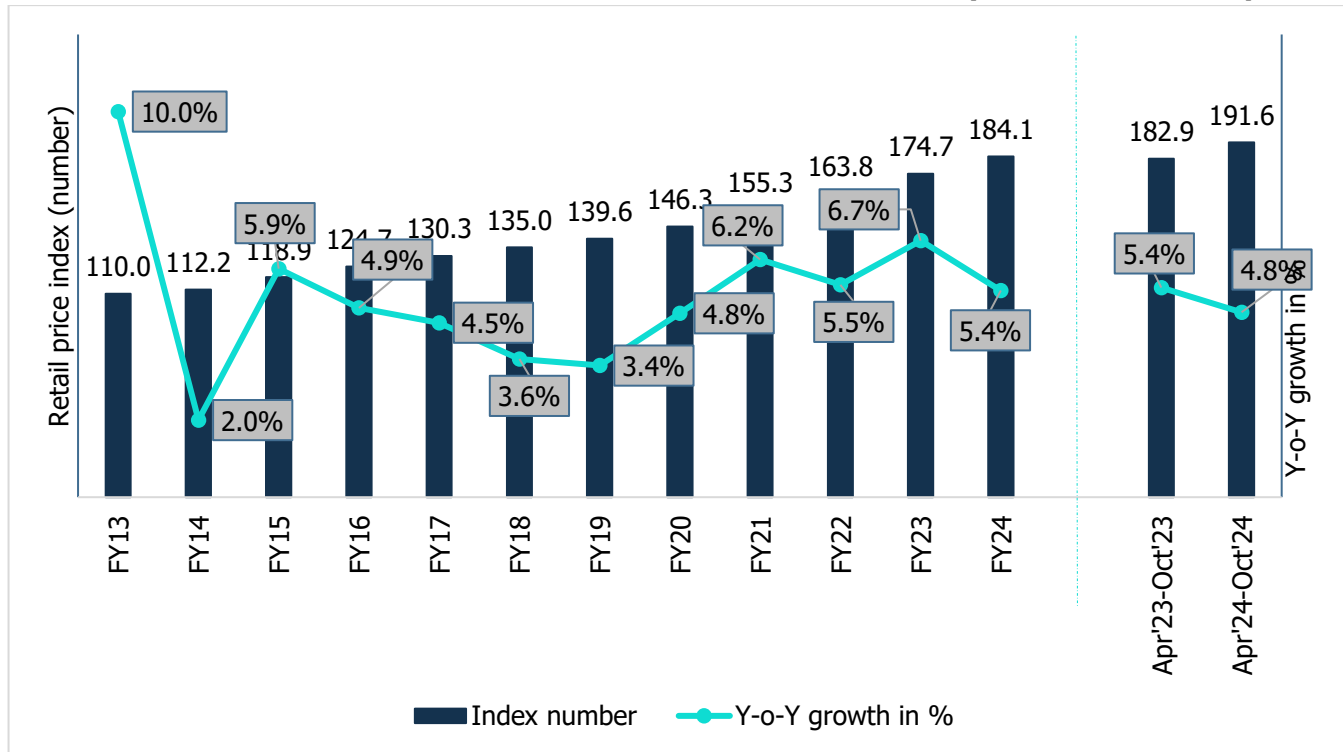
Source: MOSPI

1.2.5 Consumer Price Index

India’s consumer price index (CPI) tracks retail price inflation in the economy. During FY23, CPI remained elevated at an average of 6.7%, above the RBI’s tolerance level. In FY24, the Consumer Price Index (CPI) showed fluctuations, starting with a moderation to 4.3% in May 2023, followed by a spike to 7.4% in July 2023 due to rising food prices. Overall,

inflation moderated to 5.4% for the year, remaining within the RBI's target range of 2% to 6%, despite volatility in food prices throughout the months. High inflation in specific food items poses inflation risk, even though an improvement in south-west monsoon and better kharif sowing are improving the food inflation outlook. The numbers for April 2024-October 2024 show a decline in inflation growth y-o-y to 4.8% as compared to inflation growth y-o-y of 5.4% in April 2023-October 2023 period. For October 2024, CPI inflation stood at 6.2% which has been the highest retail inflation since December 2023. There was a decline in inflation observed among the subgroups pulses & products, eggs, sugar & confectionery and spices subgroup.

Chart 5: Retail Price Inflation in terms of index and Y-o-Y Growth in % (Base: 2011-12=100)

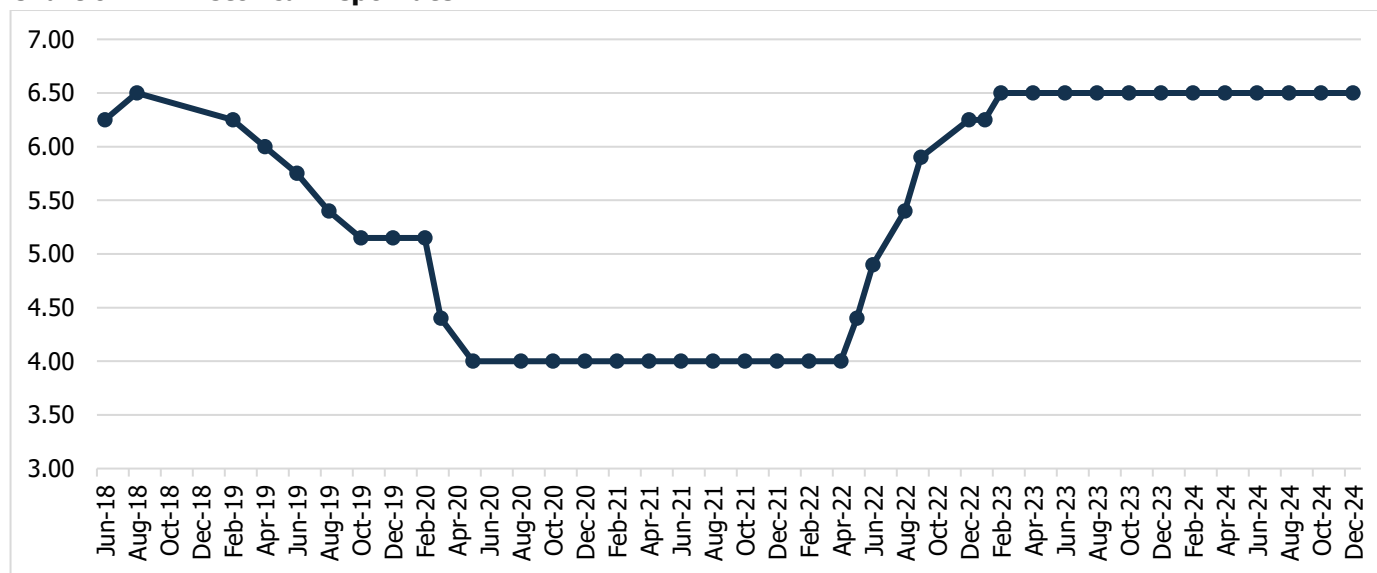


Source: MOSPI

The CPI is primarily factored in by RBI while preparing their bi-monthly monetary policy. At the bi-monthly meeting held in December 2024, RBI projected inflation at 4.8% for FY25 with inflation during Q3FY25 at 5.7%, Q4FY25 at 4.5%, Q1FY26 at 4.6%, and Q2FY26 at 4%.

Considering the current inflation situation, RBI has kept the repo rate unchanged at 6.5% again in the December 2024 meeting of the Monetary Policy Committee.

Chart 6: RBI historical Repo Rate



Source: RBI

The MPC decided to keep the policy repo rate unchanged and maintain a neutral stance, given the recent slowdown in growth and the persistent inflationary pressures, particularly from food prices. While inflation is expected to ease in the second half of the year, risks from adverse weather, geopolitical uncertainties, and market volatility continue to pose challenges. With growth showing resilience, especially from agricultural and rural demand, the MPC remains focused on achieving price stability to support sustainable growth. The neutral stance provides the necessary flexibility to assess the evolving inflation and growth outlook and respond appropriately.

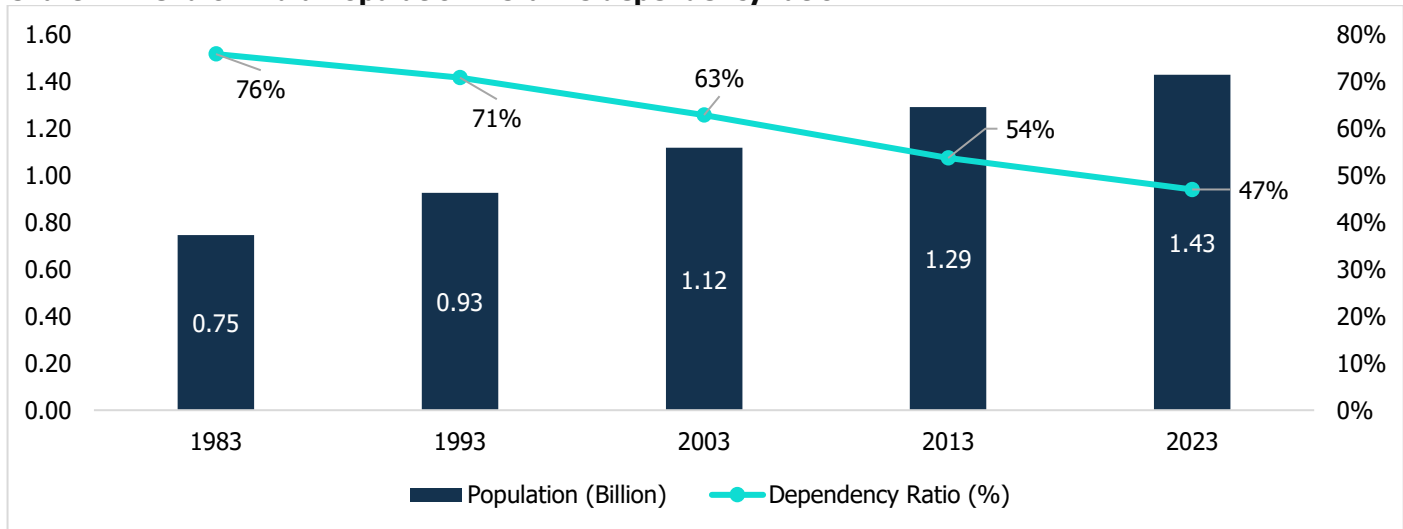
1.2.6 Overview on Key Demographic Parameters

- **Population growth and Urbanization**

The trajectory of economic growth of India and private consumption is driven by socio-economic factors such as demographics and urbanization. According to the world bank, India’s population in 2022 surpassed 1.42 billion slightly higher than China’s population 1.41 billion and became the most populous country in the world.

Age Dependency Ratio is the ratio of dependents to the working age population, i.e., 15 to 64 years, wherein dependents are population younger than 15 and older than 64. This ratio has been on a declining trend. It was as high as 76% in 1983, which has reduced to 47% in 2023. Declining dependency means the country has an improving share of working-age population generating income, which is a good sign for the economy.

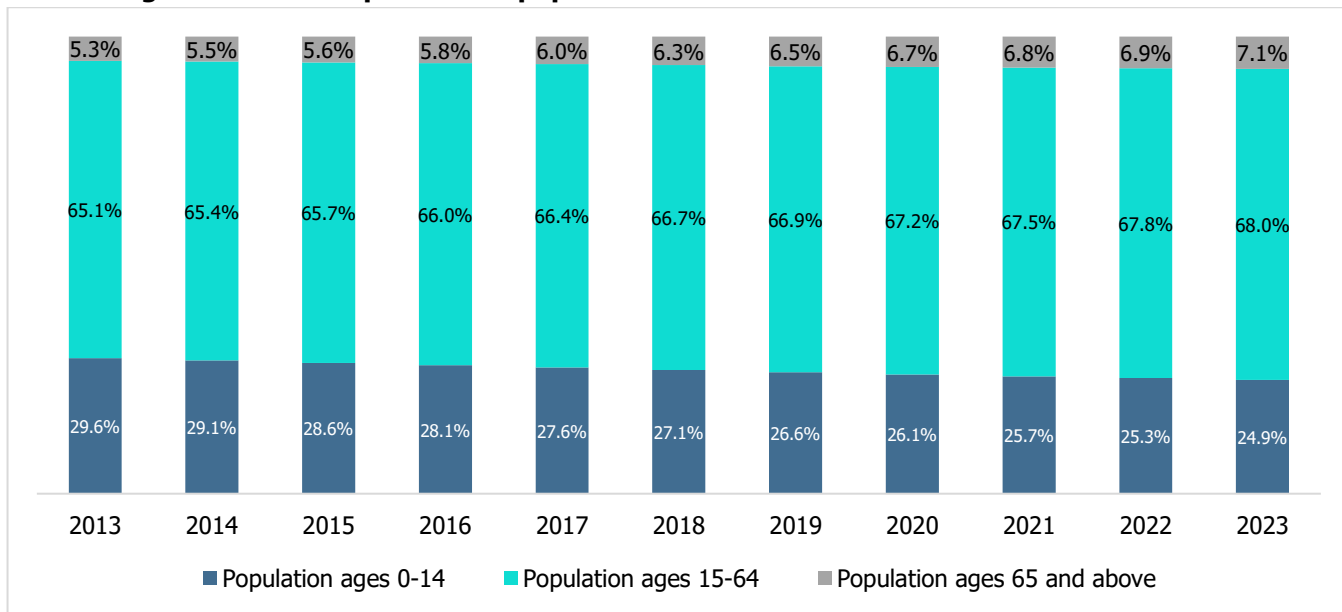
Chart 7: Trend of India Population vis-à-vis dependency ratio



Source: World Bank Database

With an average age of 29, India has one of the youngest populations globally. With vast resources of young citizens entering the workforce every year, it is expected to create a 'demographic dividend'. India is home to a fifth of the world's youth demographic and this population advantage will play a critical role in economic growth.

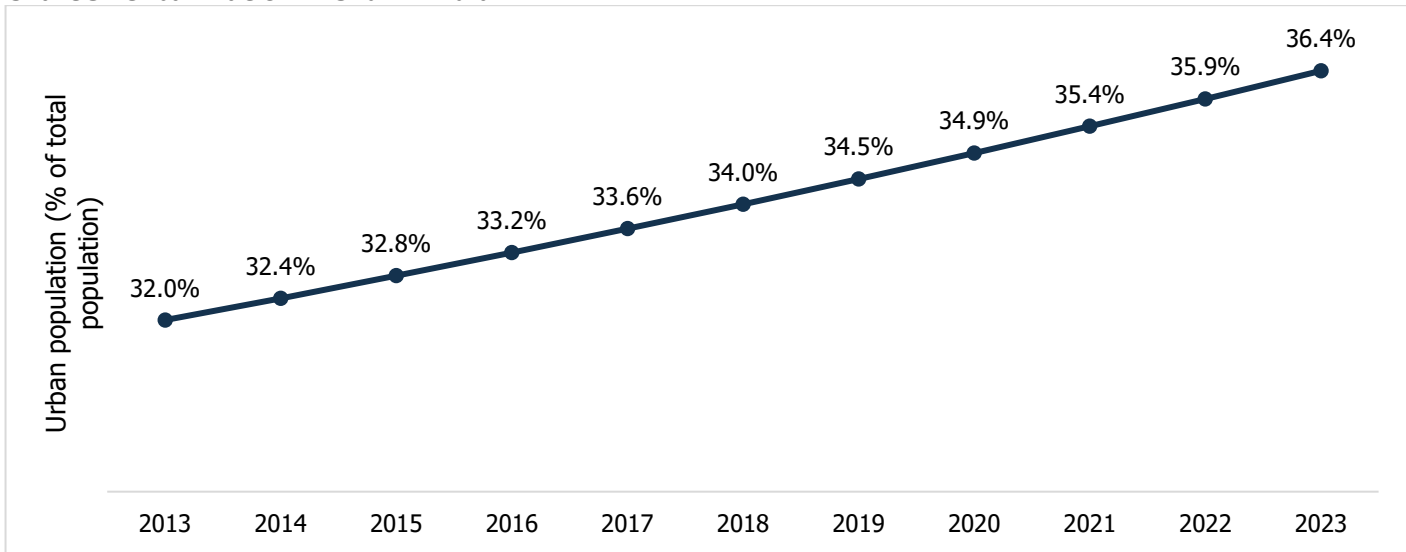
Chart 8: Age-Wise Break Up of Indian population



Source: World Bank Database

The urban population is significantly growing in India. The urban population in India is estimated to have increased from 413 million (32% of total population) in 2013 to 519.5 million (36.4% of total population) in the year 2023.

Chart 9: Urbanization Trend in India



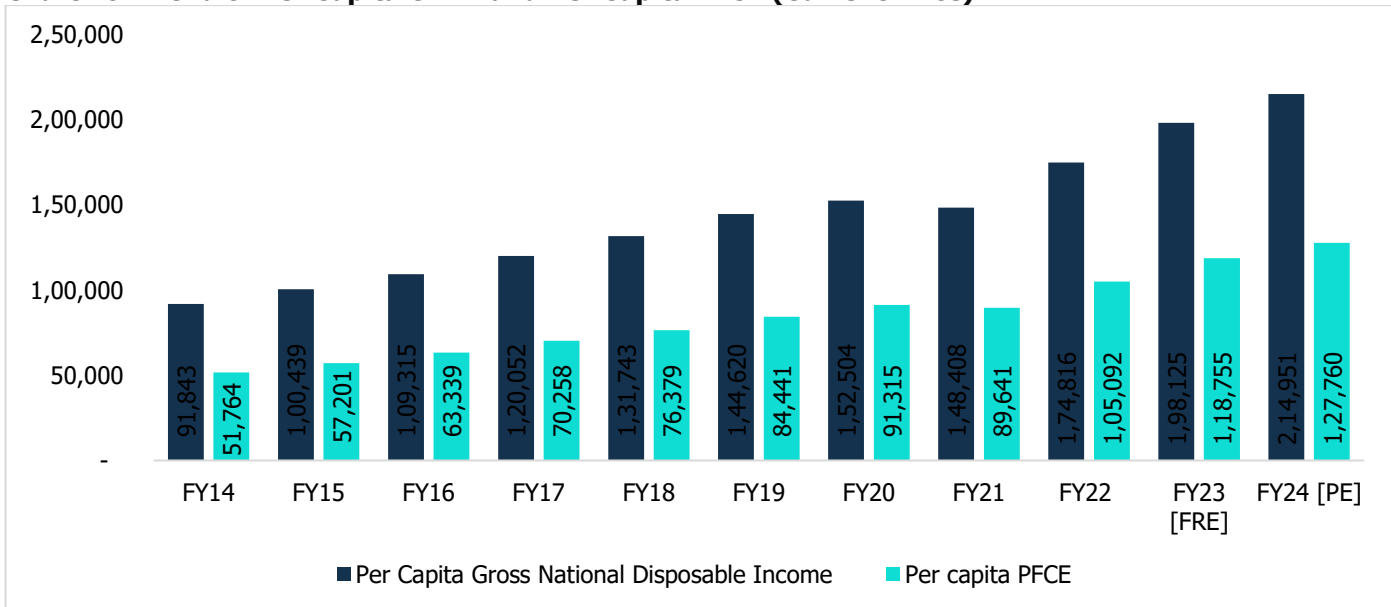
Source: World Bank Database

• **Increasing Disposable Income and Consumer Spending**

Gross National Disposable Income (GNDI) is a measure of the income available to the nation for final consumption and gross savings. Between the period FY14 to FY24, per capita GNDI at current prices registered a CAGR of 8.88%. More disposable income drives more consumption, thereby driving economic growth.

With increase in disposable income, there has been a gradual change in consumer spending behaviour as well. Private Final Consumption Expenditure (PFCE) which is measure of consumer spending has also showcased significant growth in the past decade at a CAGR of 9.46%.

Chart 10: Trend of Per Capita GNDI and Per Capita PFCE (Current Price)



Source: MOSPI; Note: FRE – First Revised Estimates, PE – Provisional Estimate

1.2.7 Concluding Remarks

The major headwinds to global economic growth are escalating geopolitical tensions, volatile global commodity prices, high interest rates, inflation woes, volatility in international financial markets, climate change, rising public debt, and new technologies. Despite the global economic growth uncertainties, the Indian economy is relatively better placed in terms of GDP growth compared to other emerging economies. According to IMF's forecast, it is expected to be 7% in CY24 compared to the world GDP growth projection of 3.2%. The bright spots for the economy are continued healthy domestic demand, support from the government towards capital expenditure, moderating inflation, investments in technology and improving business confidence.

India's strategic positioning as a manufacturing hub, bolstered by government initiatives, a skilled workforce, and a burgeoning startup ecosystem, enhances this outlook. Ongoing reforms and a focus on innovation position the country to capitalize on emerging opportunities, strengthening its role in the global manufacturing landscape. Likewise, several high-frequency growth indicators including the purchasing managers index, E-way bills, bank credit, toll collections and GST collections have shown improvement in FY24. Moreover, normalizing the employment situation after the opening up of the economy is expected to improve and provide support to consumption expenditure.

At the same time, public investment is expected to exhibit healthy growth as the government has allocated a strong capital expenditure of about Rs. 11.11 lakh crores for FY25. The private sector's intent to invest is also showing improvement as per the data announced on new project investments and resilience shown by the import of capital goods. Additionally, improvement in rural demand owing to healthy sowing, improving reservoir levels, and progress in south-west monsoon along with government's thrust on capex and other policy support will aid the investment cycle in gaining further traction.

2. Global Ferro Alloys Markets

Ferroalloys are metallic compounds that consist of iron and at least one other element, such as manganese, chromium, nickel, molybdenum, vanadium, titanium, or others. They are employed as additives in the production of steel and other alloys to enhance their mechanical properties, corrosion resistance, and aesthetic appeal. The most prevalent ferroalloys include silicon manganese, ferrochrome, ferronickel, ferromolybdenum, ferrovanadium, and ferrotitanium. Ferroalloys are primarily utilized as deoxidizers, desulfurizers, and alloying element additives in steelmaking. Blast furnaces, electric furnaces, and smelting are the primary methods used to produce ferroalloys. The automotive, aerospace, energy, construction, consumer goods, and other industries are the main end-users of ferroalloys.

Ferroalloys are used in steelmaking to enhance the specific characteristics of steel products. The addition of ferroalloys improves properties such as fatigue strength, tensile strength, corrosion resistance, and ductility. Ferroalloys are crucial raw materials in the iron and steel smelting industry, and they are one or more types of metal or non-metallic elements that have been fused together into an alloy. Their primary use is as a deoxidizer and alloying agent in steelmaking. Consequently, the expansion of downstream demand in the steel industry will drive growth in the ferroalloy industry.

Figure 1: Ferro Alloys

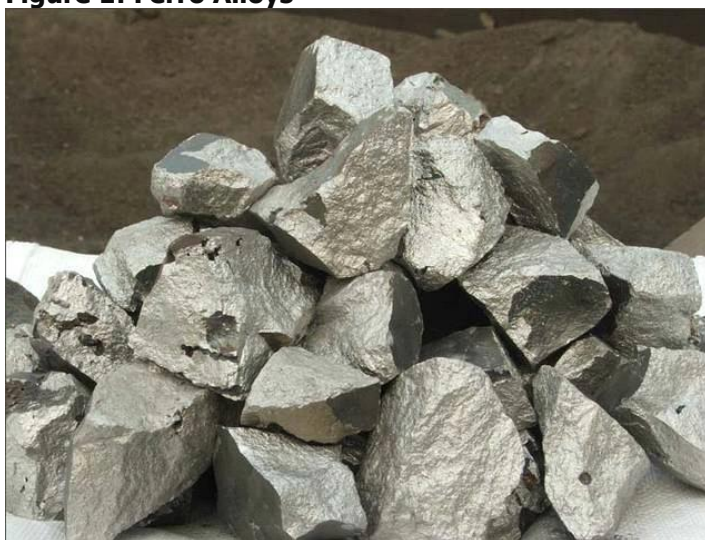


Table 4: Types of Ferro Alloys

Parts	Description
Ferro Chrome	Ferro chrome is an alloy of iron and chromium. Due to its high chromium content, it is used in the production of stainless steel and other corrosion resistant materials.
Ferro Silicon	Ferro silicon is an alloy of iron and silicon. It is used in the manufacturing of stainless steel, alloy steel, cast steel, electrical steel, and cast iron and also used to reduce the metals from their oxides such as deoxidization and desulfurization of steel. It also provides corrosion resistance, improves the quality strength of iron and steel products.
Ferro Manganese	Ferro manganese is an alloy of iron and manganese. It is used in the production of steel to improve its strength and wear resistance. Ferromanganese finds primary application in steelmaking and foundry industries.
Silicon Manganese	Silicon manganese is an alloy of iron, silicon and manganese. Used for. Silicomanganese is used to add manganese and silicon as ladle addition during steelmaking owing to its lower carbon content. steel deoxidation desulfurization and is also used in the production of low carbon steel.

Source: Maia Research

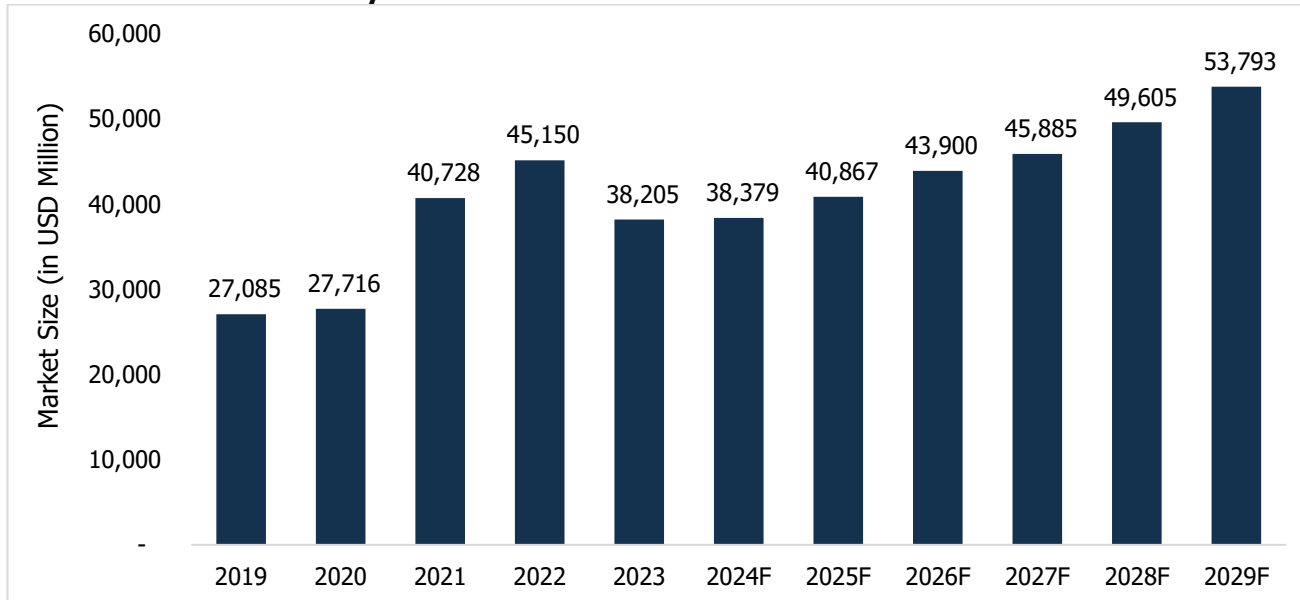
2.1 Global Ferro Alloy Industry Market Size

The global ferroalloys market is a significant and expanding industry as they are critical components in steel production, and their demand is propelled by the growth of the steel industry, particularly in emerging markets. This market is anticipated to expand at a compound annual growth rate (CAGR) of 5.9% over the period of 2023-2029. The primary factors propelling market growth are the rising demand for steel from various end-use industries, such as automotive, aerospace, energy, construction, and consumer goods, as well as the availability of low-cost raw materials and labor in developing countries. The COVID-19 pandemic had a significant impact on the global ferroalloys market, resulting in a decline in demand for steel and ferroalloys.

However, the market has recuperated in recent months, and demand is projected to continue to grow in the coming years. A few of the key players in the global ferroalloys market are China, India, Russia, South Africa, Brazil, Kazakhstan, Ukraine, and Japan. The Asia Pacific region is the largest market for ferroalloys owing to the region's robust steel production industry. China is the world's leading producer and consumer of ferroalloys. Europe is the second-largest market for ferroalloys, followed by North America. The growth of the ferroalloys market in these regions is being driven by the automotive and construction industries.

The demand for steel is anticipated to rise steadily in the coming years, driven by factors such as urbanization, infrastructure development, and population growth. This will result in increased demand for ferroalloys, which are crucial components in steel production. Emerging markets such as China, India, and Southeast Asia are experiencing rapid economic growth, which will lead to increased demand for steel and ferroalloys. Technological advancements will also lead to the development of new ferroalloys with enhanced properties, such as greater strength and corrosion resistance. This is creating new possibilities for the ferroalloys market.

Chart 11: Global Ferro Alloy Market Size



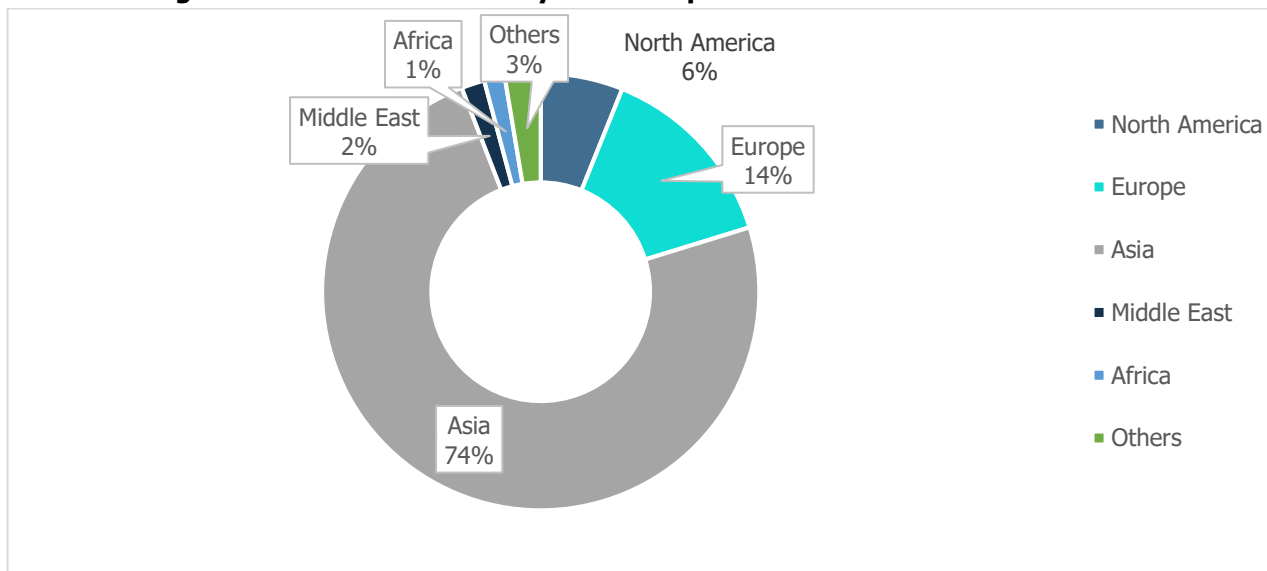
Source: CareEdge Research, Maia Research

Note: The year mentioned in this chart and subsequent sections is Calendar Year; F- Forecasted

2.2 Global Ferro Alloy Industry - Demand by Regions

The global ferroalloys market is poised for growth due to the rising steel production worldwide. The relentless consumption of steel globally is expected to fuel market expansion. The Asia region holds the maximum market share of 74% followed by Europe and North America, which stands at 14% and 6% respectively in 2023.

Chart 12: Region Wise Global Ferro Alloy - Consumption Market Share in 2023



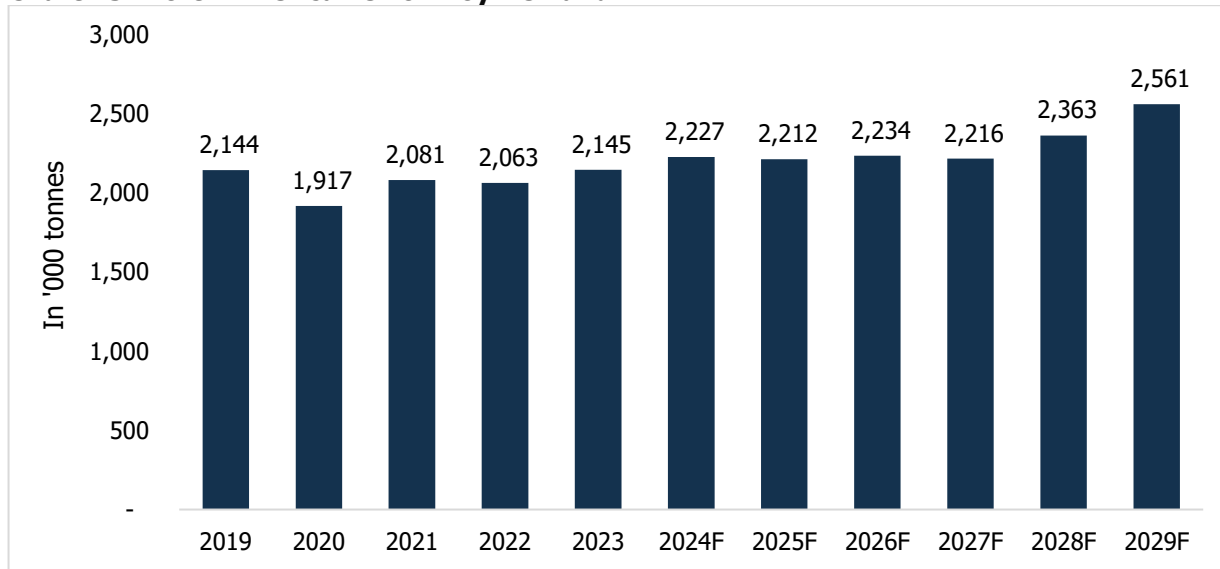
Source: CareEdge Research, Maia Research

2.2.1 North America – Ferro Alloys Demand

The North American ferro alloy consumption demand is projected to grow significantly at a CAGR of 3% over the forecast period 2023-2029. It is expected to grow by various factors, including the rising demand for ferroalloys in the steelmaking industry, advancements in technology, and the increasing focus on sustainability. The growing demand for steel in various industries, such as construction, automotive, and infrastructure, is driving the demand for ferroalloys. Also, technological advancements in the steelmaking process, such as the use of electric arc furnaces and continuous casting machines, are increasing the efficiency of ferroalloy consumption. These advancements are leading to a growing demand for higher-quality ferroalloys, providing opportunities for market growth.

The United States is the largest market for ferroalloys in North America, driven by its significant steel production industry. The growing demand for stainless steel and automotive applications is further fuelling the market's growth. Canada is also a significant market for ferroalloys, primarily due to its strong steel and mining industries. The presence of major ferroalloy producers in Canada is contributing to the market's growth. The growing focus on sustainability is driving the demand for eco-friendly ferroalloy production processes. This includes the adoption of renewable energy sources, waste minimization practices, and the use of cleaner technologies. These trends are creating new market opportunities for ferroalloy producers in North America market.

Chart 13: North America Ferro Alloy Demand

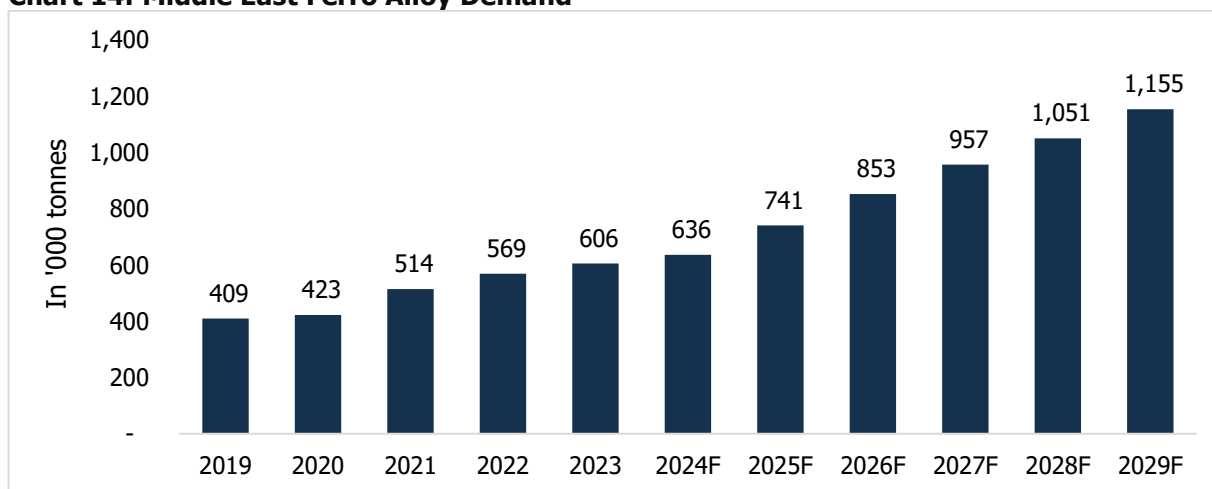


Source: CareEdge Research, Maia Research

2.2.2 Middle East – Ferro Alloys Demand

The Middle East ferro alloy consumption demand is projected to grow significantly at a CAGR of 11.3% over the forecast period 2023-2029. This growth is expected to be driven by strong economic development and increasing infrastructure projects, which have created significant demand for steel and iron products, leading to higher ferroalloy consumption. Additionally, the UAE's strategic geographic location has attracted significant foreign investment, stimulating industrial activity and further increasing demand for ferroalloys. Saudi Arabia is another major market for ferroalloys, with a growing steel production industry and a strong focus on infrastructure development. Iran has a rich mineral resource base and is a significant producer of manganese ore, a key raw material for ferroalloy production. This provides opportunities for the growth of the ferroalloy industry in Iran. Furthermore, the government's efforts to diversify the economy and reduce reliance on oil revenues have focused on developing the manufacturing sector, which is positively impacting the ferro alloy market in this region.

Chart 14: Middle East Ferro Alloy Demand

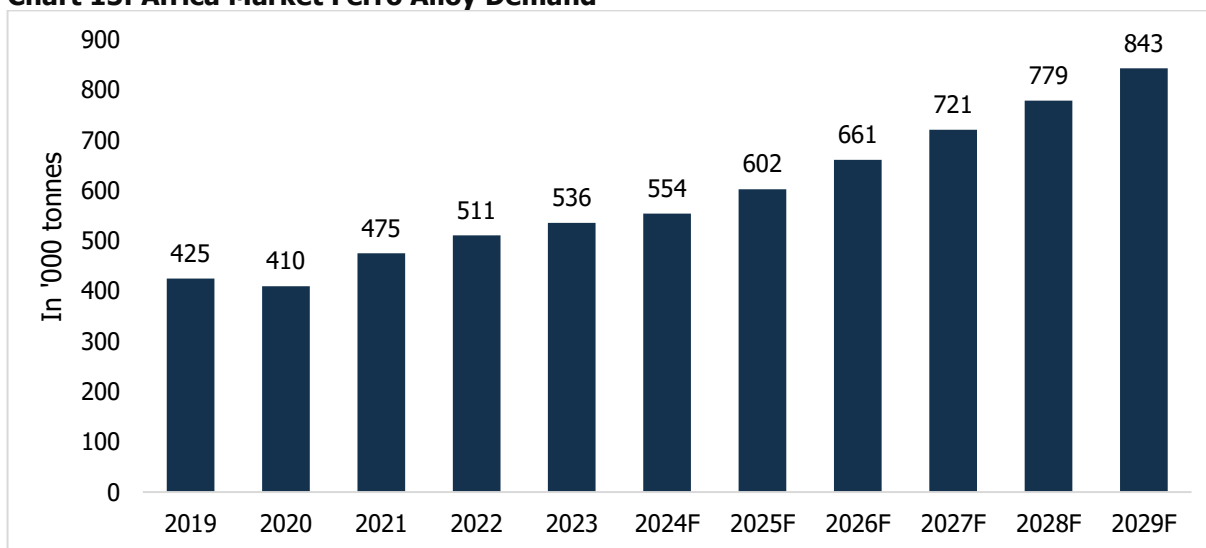


Source: CareEdge Research, Maia Research

2.2.3 Africa – Ferro Alloys Demand

The Africa ferro alloy consumption demand is projected to grow significantly at a CAGR of 7.9% over the forecast period 2023-2029. This growth is expected to be driven by factors such as industrialization, infrastructure development, and growing demand for steel in various industries. Africa's rapid industrialization is driving the demand for steel and ferroalloys. As manufacturing industries expand in Africa, there will be increased demand for ferroalloys to produce the steel required for these industries. African governments are investing heavily in infrastructure development, which is also driving the demand for ferroalloys. Infrastructure projects such as roads, bridges, and railways require large amounts of steel, which in turn requires ferroalloys. The demand for steel is expected to grow in Africa due to the rising population and urbanization. As the population grows, there will be increased demand for housing, infrastructure, and other steel-intensive products. Additionally, as cities become more urbanized, there will be increased demand for steel for construction and infrastructure projects. Investments in the infrastructure and development of the ferroalloy industry are needed to ensure Africa can meet the growing demand for steel and ferroalloys.

Chart 15: Africa Market Ferro Alloy Demand



Source: CareEdge Research, Maia Research

Ferro alloy consumption demand in South Africa, Zimbabwe, Kenya, Tanzania and Ethiopia is growing due to strong demand for steel from the local manufacturing sector, government initiatives to promote infrastructure development, and the presence of significant mineral resources. South Africa is the largest producer and consumer of ferroalloys in Africa and is expected to grow at a CAGR of 7.8% during 2023-2029. The demand for ferroalloys is being driven by the country's growing steel industry, government initiatives to promote infrastructure development, and the production of clean steel. In Zimbabwe and Tanzania, a small but growing ferroalloy market, the demand for ferroalloys is being driven by the country's expanding steel industry, government initiatives to promote infrastructure development, and the presence of rich mineral resources. Zimbabwe is projected to record a CAGR of 8.1% during 2023-2029. In Kenya and Ethiopia, two countries with rapidly expanding construction sectors, the demand for ferroalloys is being driven by the increased demand for steel from infrastructure projects. During 2023-2029, Kenya and Ethiopia are projected to increase with a CAGR of 9.2% and 6.2% respectively.

The consumption demand of ferro alloys across regions around Africa are mentioned below: -

Table 5: Country-Wise Demand in Africa (in '000 tonnes)

Categories	2019	2021	2023	2025F	2027F	2029F
South Africa	147	165	186	210	252	292
Zimbabwe	15	18	20	23	28	32
Kenya	8	9	10	11	14	17
Ethiopia	8	9	10	11	13	15

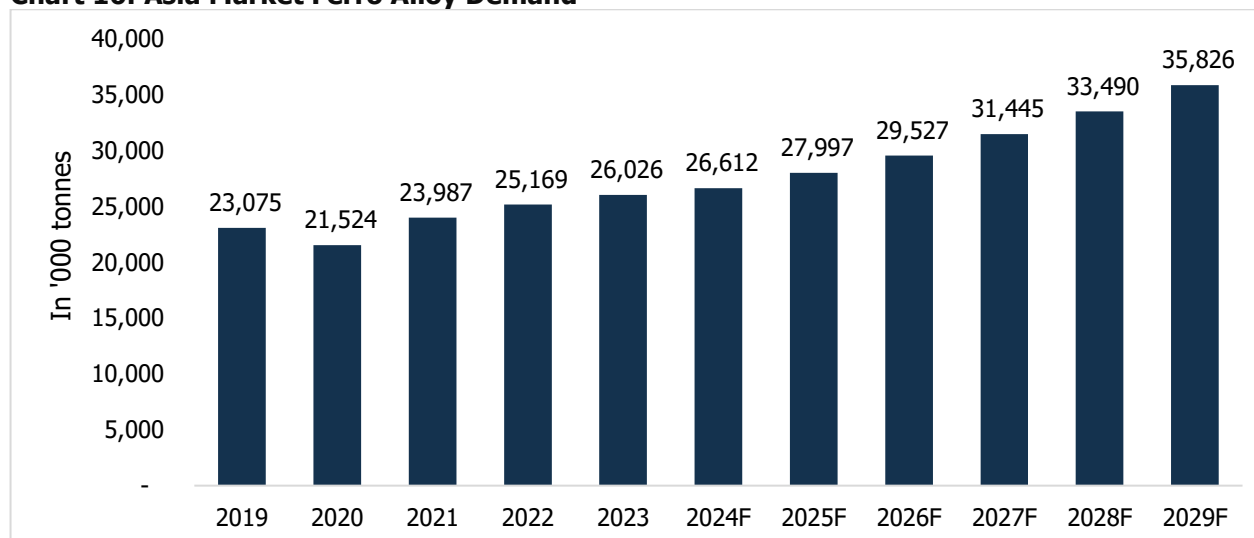
Source: CareEdge Research, Maia Research

2.2.4 Asia – Ferro Alloys Demand

The Asia ferro alloy consumption demand is projected to grow significantly at a CAGR of 5.5% over the forecast period 2023-2029 which is to be driven by the strong demand for steel from the region's growing economies. Asia is the world's fastest-growing region, and this is driving the demand for steel in various industries, including construction, automotive, and infrastructure. This region is also the world's largest producer of steel, and this is further fuelling the demand for ferroalloys. Environmental regulations in Asia region are becoming increasingly stringent, which can increase production costs and impact the profitability of ferroalloy producers. Companies are investing in cleaner technologies to meet these regulations and maintain their competitiveness. Governments in the region are investing heavily in infrastructure development, which is creating a strong demand for construction steel and ferroalloys.

China is the largest market for ferroalloys in Asia region, and it is also the world's largest producer of ferroalloys. The strong demand for steel in China is driving the growth of the ferroalloy market. India is another major market for ferroalloys, with a growing steel production industry and a strong focus on infrastructure development. Japan is a mature market for ferroalloys, but it is still a significant consumer of these products. The demand for ferroalloys in Japan is driven by the strong demand for steel from the automotive and shipbuilding industries.

Chart 16: Asia Market Ferro Alloy Demand



Source: CareEdge Research, Maia Research

2.3 Global Ferro Alloy Industry – Production by Regions

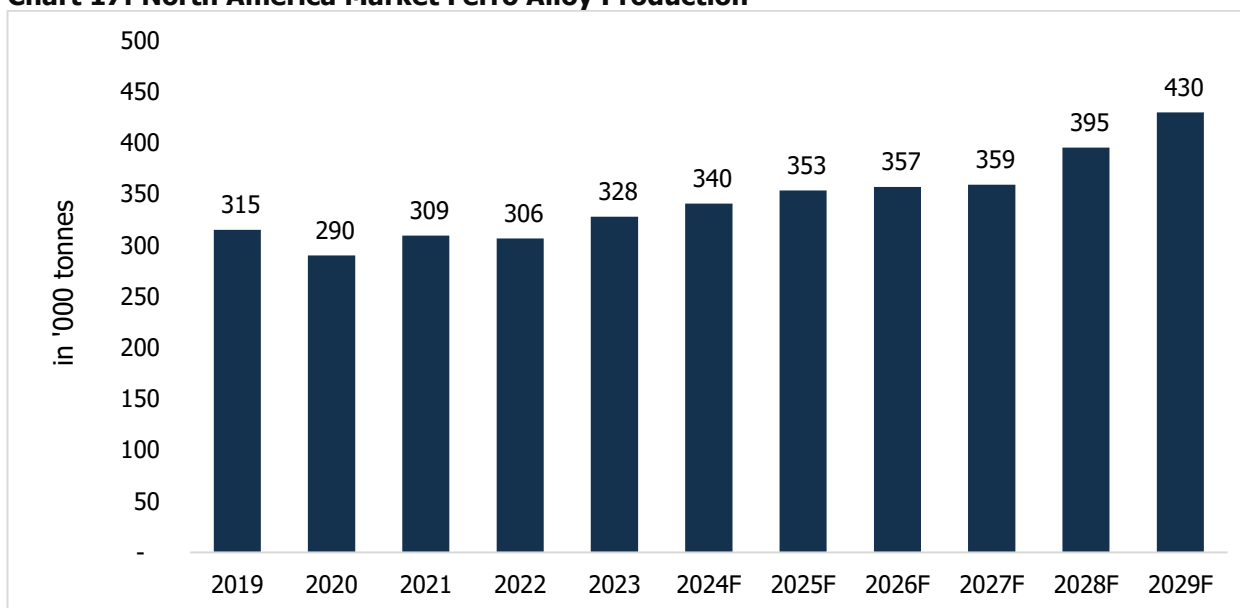
Ferroalloy production is expected to grow in the coming years, driven by the increasing demand for steel, especially stainless steel. Stainless steel is used in a variety of industries, including automotive and construction, which are expected to grow in the coming years. The construction industry is the largest consumer of steel products, and its growth will positively impact the demand for ferroalloys, which are a key feedstock in steel production.

Ferroalloys are also used in the production of automotive components to improve fuel efficiency and vehicle performance. The rapid growth of the automotive industry is therefore another major driver of the ferroalloy market. In addition to the automotive and construction industries, ferroalloys are also used in a number of other end-use industries, such as healthcare, electronics, metallurgy, and oil & gas. The increasing use of ferrochromium in stainless steel production is also driving the market forward. The governments around the world are increasingly focused on the production of ferroalloys due to their environmental benefits. Ferroalloys can help to reduce fuel consumption and emissions, which is important for addressing climate change.

2.3.1 North America- Ferro Alloys Production

The North America ferro alloy production is expected to grow significantly at a CAGR of 4.6% over the forecast period 2023-2029, driven by strong demand, technological advancements, and a focus on sustainability. The United States is the largest ferroalloy producer in North America, and demand is growing from various end-use industries, including electronics, automotive, construction, metallurgy, medical devices, and aerospace. The major factors driving market growth are rising steel production, growing demand for lightweight and high-performance materials, and technological advancements in the ferroalloys industry. However, the North American ferroalloys market also faces challenges such as high production costs, environmental and health concerns, volatility in raw material prices, and competition from other regions, especially Asia-Pacific and Europe. Therefore, market players need to adopt strategies such as innovation, diversification, expansion, and collaboration to gain a competitive edge and increase their market share.

Chart 17: North America Market Ferro Alloy Production

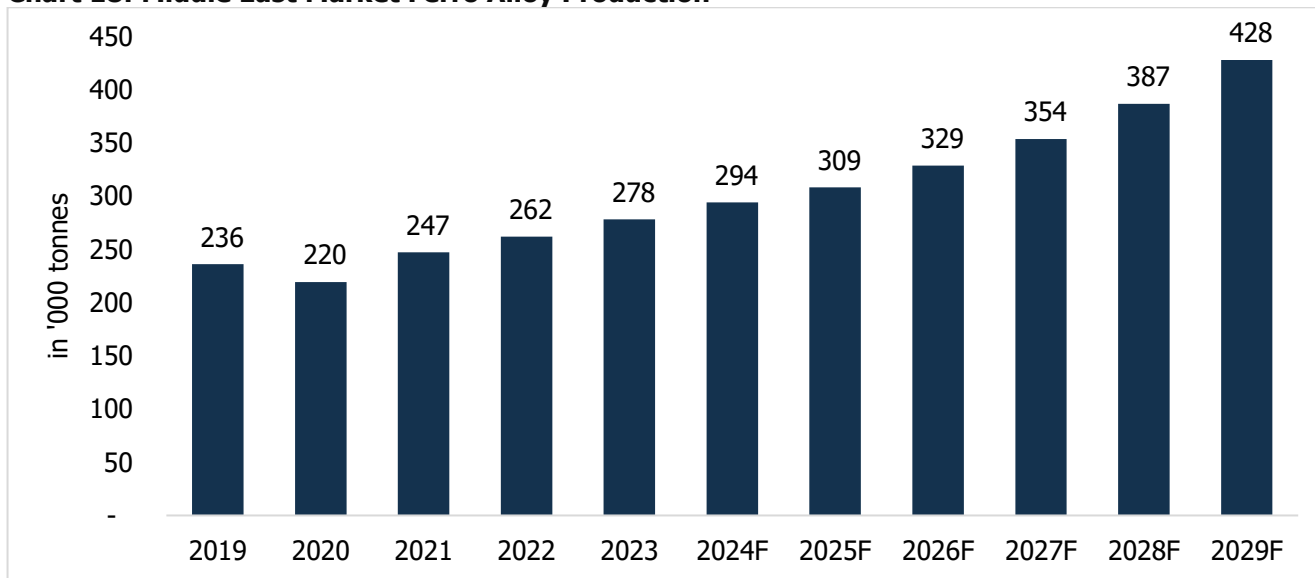


Source: CareEdge Research, Maia Research

2.3.2 Middle East- Ferro Alloys Production

The Middle East ferro alloy production is expected to grow significantly at a CAGR of 7.4% over the forecast period 2023-2029. Growth is expected to be driven by the expansion of the construction sector, especially in Saudi Arabia, the UAE, and Iran. The region also imports ferro alloys from other countries, such as China, India, South Africa, and Russia. The key factors driving the market growth are the increasing demand for personal cars, sustainable and recyclable building materials, low-carbon steel, and high-speed cutting tools.

Chart 18: Middle East Market Ferro Alloy Production

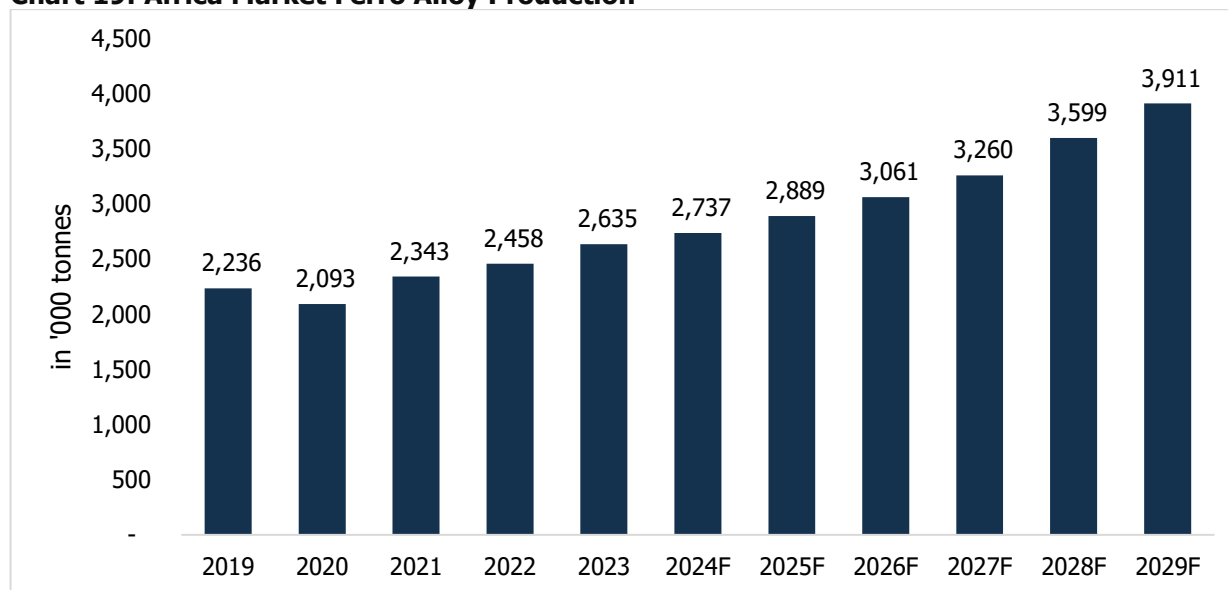


Source: CareEdge Research, Maia Research

2.3.3 Africa- Ferro Alloys Production

The Africa ferro alloy production is expected to grow significantly at a CAGR of 6.8% over the forecast period 2023-2029, driven by the growth of the steel industry, which is influenced by factors such as industrialization, urbanization, infrastructure development, and population growth. However, this region also faces challenges such as inadequate infrastructure, environmental regulations, and market competition. Africa is a continent with rich mineral resources, including iron ore, manganese, chromium, nickel, and molybdenum. Some of these minerals are essential for the production of ferroalloys. According to the International Energy Agency (IEA), Africa’s revenues from critical mineral production, which include ferro alloys, is expected to be double by 2030 in the Sustainable Development Scenario (SAS), which will further lead to growth in demand for ferro alloys in Africa region.

Chart 19: Africa Market Ferro Alloy Production



Source: CareEdge Research, Maia Research

This growth across Africa regions is expected to be driven by factors such as industrialization, infrastructure development, and growing demand for steel in various industries. South Africa is the largest producer and exporter of ferroalloys in Africa, mainly producing ferrochrome. Kenya, Ethiopia, and Tanzania are emerging markets for ferroalloys in Africa, as they have potential deposits of iron ore, manganese, and chromium. These countries are also developing their steel industries, which is expected to create growing demand for ferro alloys.

The production of ferro alloys across regions around Africa are mentioned below: -

Table 6: Production of Ferro Alloys across Africa Regions (in '000 tonnes)

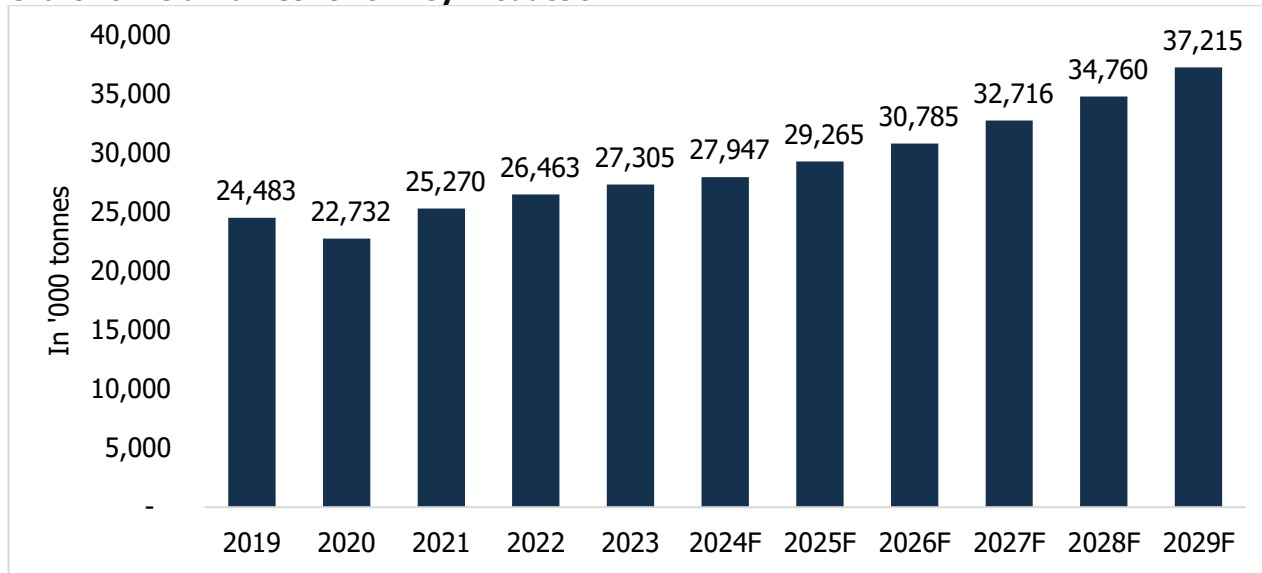
Categories	2019	2021	2023	2025F	2027F	2029F
South Africa	2,002	2,094	2,356	2,584	2,910	3,497
Zimbabwe	168	178	197	215	244	284
Kenya	5	5	6	6	7	10
Ethiopia	6	6	8	9	10	14
Others	66	71	82	92	107	132

Source: CareEdge Research, Maia Research

2.3.4 Asia- Ferro Alloys Production

The Asia ferro alloy production is expected to grow significantly at a CAGR of 5.3% over the forecast period 2023-2029. The growth is expected to be driven by strong demand from the region's growing economies, expansion of production capacity, and rising exports. Rapid industrialization, urbanization, and infrastructure development in countries such as China, India, Japan, South Korea are expected to increase the demand for ferro alloys. China is the leading producer and consumer of ferroalloys in Asia, and is expected to remain so in the coming years. Other emerging markets in the region, such as India, Indonesia, Malaysia, and Vietnam, are also expected to experience strong growth in ferroalloy production and demand. Companies operating in the Asia ferroalloy market face a number of challenges, including fluctuating raw material prices, environmental regulations, and competition from substitute materials. However, companies that can adapt to these challenges are well-positioned to succeed in the growing market.

Chart 20: Asia Market Ferro Alloy Production



Source: CareEdge Research, Maia Research

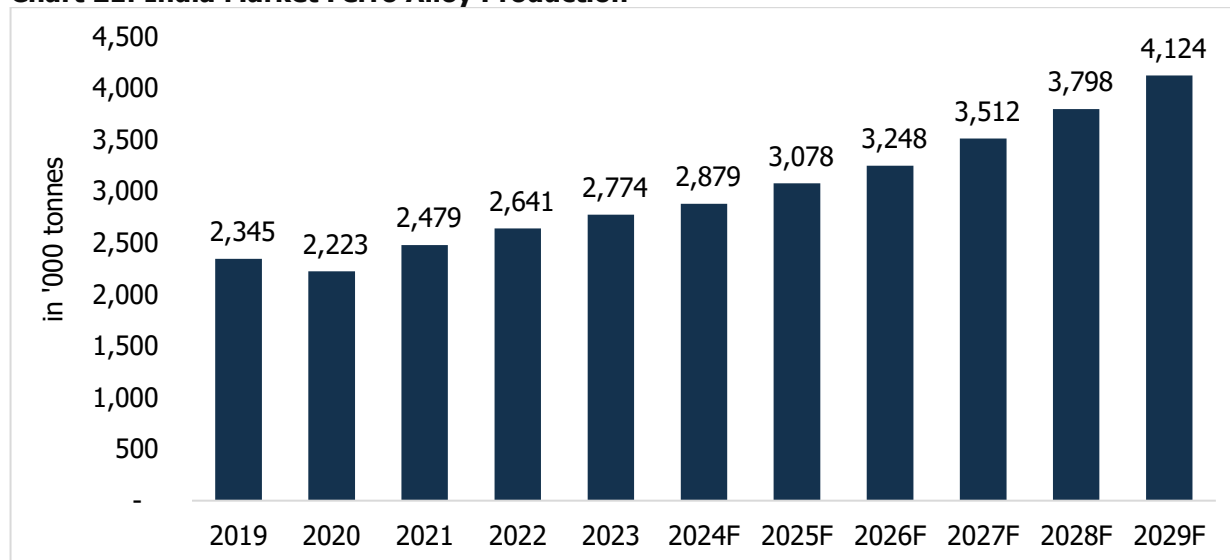
2.3.4.1 India- Ferro Alloys Production

The India ferro alloy production is expected to grow significantly at a CAGR of 6.8% over the forecast period 2023-2029. India is one of the major producers of ferro alloys in the world, with a growing steel production industry and a strong focus on infrastructure development. India is one of the world's fastest-growing economies, and this is driving the demand for steel in various industries, including construction, automotive, and infrastructure. The Indian government is promoting infrastructure development through various initiatives, such as the National Highways Development Project and the Bharatmala Project. These projects are expected to create a significant demand for ferroalloys.

West Bengal is the largest producer of ferroalloys in India. The state has rich mineral resources and a strong industrial base, which are driving the growth of the ferroalloy industry. Odisha is another major producer of ferroalloys in India, with a focus on production of manganese ferroalloys. The state has significant manganese ore deposits, which are driving the growth of the ferroalloy industry. Karnataka is a growing producer of ferroalloys, with a focus on production of silicon ferroalloys. The state has a strong industrial base and is investing in developing its steel industry, which is creating opportunities for the ferroalloy industry.

The main challenges faced by the Indian ferro alloys industry are the high cost and scarcity of raw materials, such as manganese ore, chrome ore, coal, the lack of adequate power supply, the environmental regulations, and the competition from other countries, such as Malaysia and Indonesia, which have lower production costs and higher export incentives. However, companies operating in this market need to adapt to these challenges which are well-positioned to succeed in the growing Indian ferro alloy market. The Indian government is also promoting the production of clean steel, which requires the use of higher-quality ferroalloys. This is creating opportunities for ferro alloy producers to develop and supply high-quality products. Major ferroalloy producers in India are expanding their production capacity to meet the growing demand for ferroalloys. This expansion is expected to further boost the market's growth in the region.

Chart 21: India Market Ferro Alloy Production



Source: CareEdge Research, Maia Research

2.3.4.2 India- Ferro Alloys Exports Destination

India is the largest exporter of ferro alloys. The exports have grown at a CAGR of around 12% from 1,423 thousand tonnes in 2019 to 2,247 thousand tonnes in 2023. During the forecast period 2023-2029, the exports of ferro alloy in India is expected to grow with a CAGR of 7% and 8% in terms of volume and value, respectively. The growth is expected to be driven by a number of factors including abundant availability of raw materials, such as iron ore, manganese ore, and chromite ore, competitive production costs, strong domestic steel industry and growing demand for ferro alloys from global steelmakers. The Indian government has also played a role in promoting ferro alloy exports by providing incentives to exporters and developing infrastructure to support the ferroalloy industry. The ferroalloy industry in India is expected to continue to grow in the coming years, driven by strong demand from both domestic and global steelmakers. The top 5 export destinations from India are mentioned below:

Table 7: Top 5 Export Destinations from India (In USD million)

Export Countries	2019	2021	2023	2025F	2027F	2029F
China	316	403	338	406	481	560
Italy	45	230	266	324	373	396
Japan	170	230	272	322	385	461
Turkey	12	90	178	224	282	372
Egypt	61	83	163	188	217	257

Source: CareEdge Research, Maia Research

2.4 Government Policies for Global Ferro Alloys Market in Africa

• **Steel and Metal Fabrication Master Plan**

The Minister of Trade, Industry and Competition, Ebrahim Patel, along with industry stakeholders from the steel and metal fabrication sector signed a Master Plan for the sector on Friday 11 June 2021. The Master Plan, which has been developed in consultation with all stakeholders from the industry – including primary steel producers, downstream steel players, metal fabricators, and organised labour – provides a blueprint for the industry to re-energise itself and expand production. The workshop supported the development of national-level plans, including the Steel and Metal Fabrication Master Plan, which states that the South African iron and steel value chain is to achieve carbon neutrality by 2050.

• **Safeguard duties on hot-rolled steel coil and plate officially come into force**

Safeguard duties of 12% have been officially placed on hot-rolled coil (HRC) and plate entering South Africa following publication of the August 11 Government Gazette, which amends schedule two of the Customs and Excise Act. The safeguard duties have been signed by Finance Minister Malusi Gigaba and will be imposed in addition to the 10% duties already governing the products.

• **African Growth and Opportunity Act**

Enacted in May 2000, the African Growth and Opportunity Act (AGOA) is the cornerstone of U.S. economic engagement with the countries of sub-Saharan Africa. The agreement provides duty-free access to the U.S. market for eligible Sub-Saharan African nations. In June 2015, the U.S. government authorised AGOA for an additional 10 years. AGOA has succeeded in helping eligible nations grow, diversify their exports to the United States, and create employment and inclusive economic growth. Under AGOA, eligible countries can export products, including value-added manufactured items such as textiles, to the United States duty-free. Currently, all 5 EAC Partner States are currently eligible for the AGOA benefits; however, Burundi's eligibility has been revoked with effect from 01 January 2016.

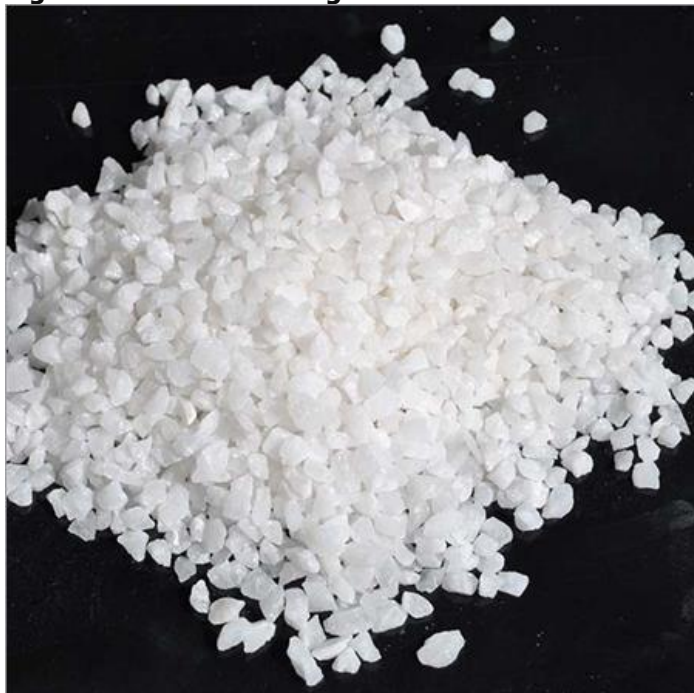
• **Strengthening of Environmental Protection Policy Supervision**

There are various production methods of ferroalloy, which can be divided into blast furnace method, electric furnace method, outside furnace method, oxygen converter method and vacuum resistance furnace method according to production equipment. Among them, the electric furnace method is the main method of producing ferroalloys, and more than 70% of ferroalloys are produced by the electric furnace method. The heat of the electric furnace reaction mainly comes from electric energy, so the electricity cost occupies a high proportion in the production cost of most ferroalloys. Therefore, the ferroalloy industry is an energy-intensive enterprise with high energy consumption, and with the increasingly prominent environmental problems, the management of carbon emissions in the world is becoming more and more strict. At the same time, carbon peak and carbon neutrality have become a global consensus, and the energy saving and carbon reduction of the ferroalloy industry is the only way for the development of the industry. Therefore, in the context of the energy crisis, with the improvement of people's awareness of low-carbon environmental protection, in order to achieve sustainable development, it is expected that the future environmental policy for ferroalloys will be more and more stringent.

3. Global Silica Ramming Mass Market

Silica ramming mass is used in the inner lining of an induction furnace. It is one of the cost-effective ways to protect the inner lining of an induction furnace. It is mainly composed of high-purity silica, along with additives like alumina and magnesia. It is compacted or "rammed" into the furnace lining to resist extreme temperatures, thermal shocks, and erosion from molten metal and slag. This specialized material ensures prolonged furnace life, reduced maintenance costs, and improved thermal efficiency during the metal melting process. It protects against the heat by providing a melting temperature of around 1,700-1,800 degrees Celsius while the melting point of iron ore is ~1,600 degrees Celsius.

Figure 2: Silica Ramming Mass



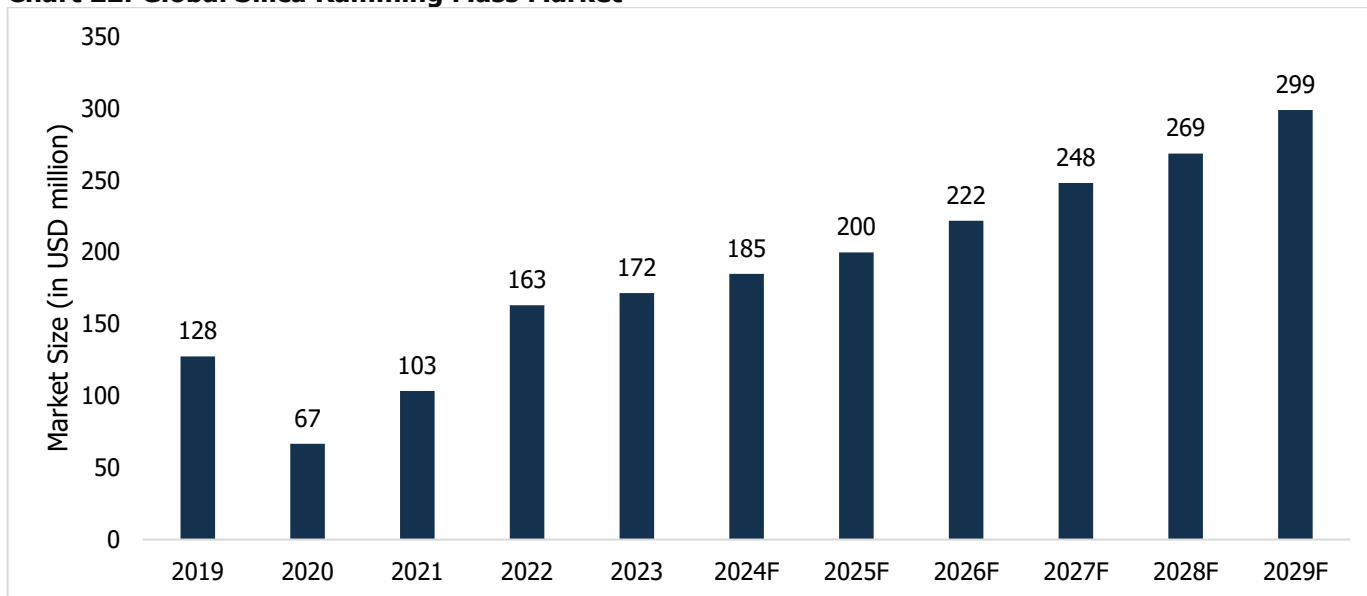
Further, the installation process involves carefully selecting and processing raw materials to achieve the desired composition. Silica ramming mass's high thermal stability and erosion resistance make it vitally important for maintaining the integrity of furnace linings in the demanding conditions of steel production. Its application extends to both coreless and channel induction furnaces, offering a reliable solution for industries requiring robust refractory materials for metal melting.

3.1 Global Silica Ramming Mass Market Size

The silica ramming mass is a rapidly growing industry with wide application in induction furnaces used in the steel industry. The industry is expected to grow at a CAGR of 9.7% from 172 USD million in 2023 to 299 USD million in 2029. The construction and infrastructure sectors, which drive steel demand, supplement the market growth. Additionally, developments in manufacturing technologies and the overall economic health of key regions, especially in emerging economies with significant steel production, contribute to the market dynamics.

Further, Asia, Europe, the Middle East, North America, and Africa are among the key players in the global silica ramming mass market. Asia is the largest market for silica ramming mass owing to the region's robust steel production industry. Besides, the steel demand is anticipated to rise steadily in the coming years, driven by factors such as urbanization, infrastructure development, and population growth. This will result in increased demand for silica ramming mass, which is crucial to steel production.

Chart 22: Global Silica Ramming Mass Market



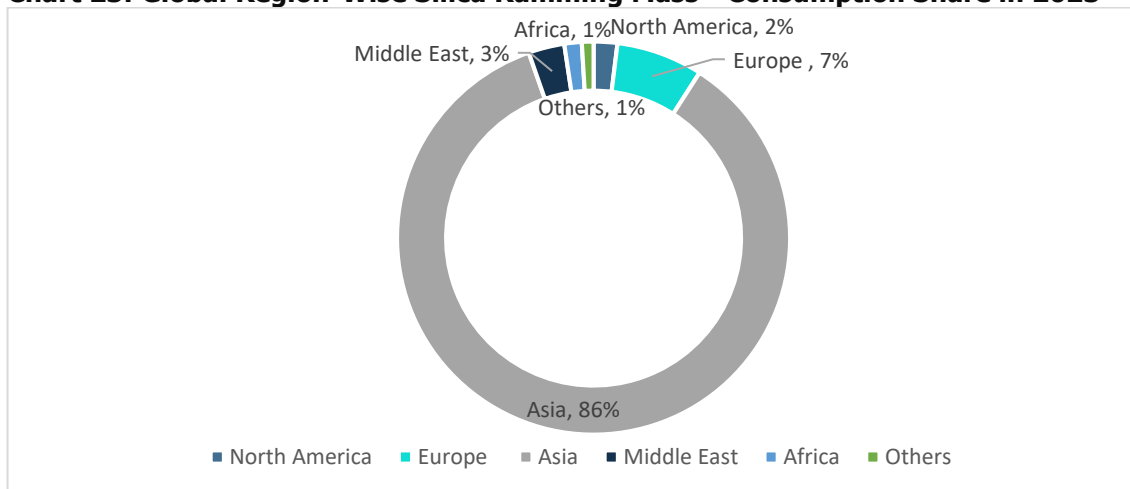
Source: CareEdge Research, Maia Research

Note: The year mentioned in this chart and subsequent sections is Calendar Year; F- Forecasted

3.2 Global Silica Ramming Mass –Demand by Regions

Given the rising steel production worldwide, the global silica ramming mass market is expected to grow at a healthy rate. Accordingly, Asia holds a significant share of 86% globally, on account of the presence of a robust steel production industry. It is followed by Europe, the Middle East, North America, and Africa.

Chart 23: Global Region-Wise Silica Ramming Mass - Consumption Share in 2023



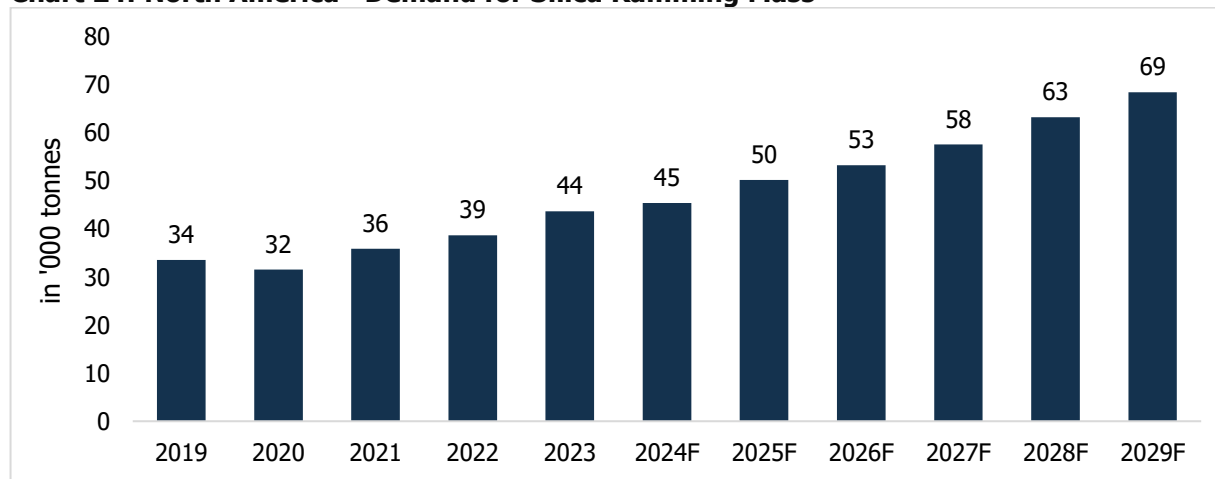
Source: CareEdge Research, Maia Research

3.2.1 North America –Demand for Silica Ramming Mass

The North American market has a significantly lower share in consumption. However, the growth potential of this region is very high. The United States, with significant steel production, is the largest market for silica ramming mass in North America. Whereas Canada’s mining and steel industries make it a significant market.

The consumption of North America is further expected to increase at a CAGR of 7.8% from 44 thousand tonnes in 2023 to 69 thousand tonnes in 2029.

Chart 24: North America –Demand for Silica Ramming Mass



Source: CareEdge Research, Maia Research

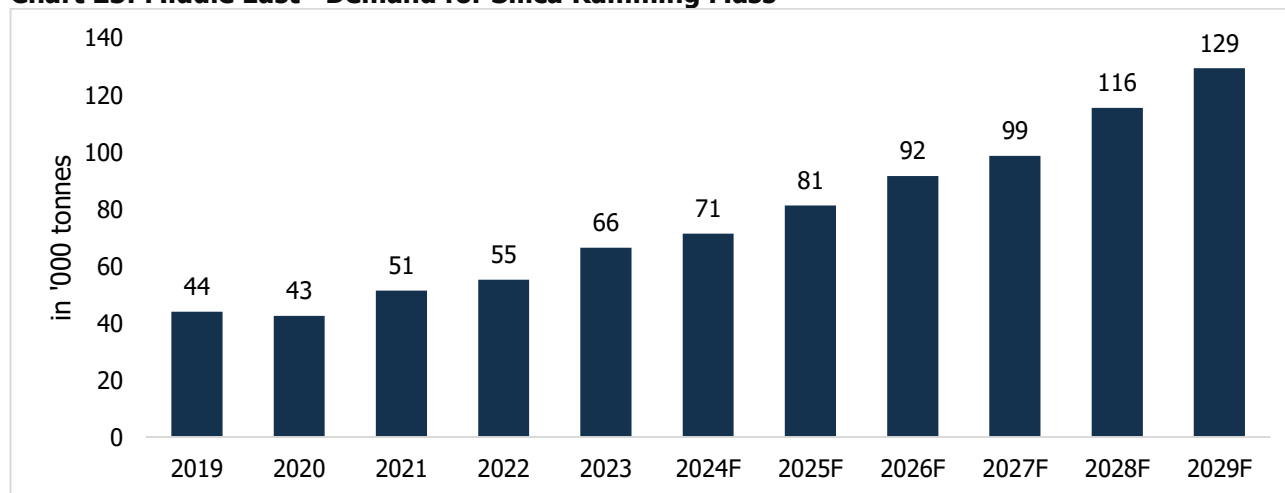
Note: The year mentioned in this chart and subsequent sections is Calendar Year; F- Forecasted

3.2.2 Middle East –Demand for Silica Ramming Mass

The Middle East encompasses increasing infrastructure projects enabling significant demand for steel and iron products, leading to higher silica ramming mass consumption. The steel industry is growing in UAE and Saudi Arabia, owing to the strong focus on infrastructure development in these countries. Additionally, the government's continuous efforts to diversify the economy and reduce reliance on oil revenues have raised the focus on the manufacturing sector developments, which is expected to augur well for the silica ramming mass market in the Middle East.

Accordingly, the consumption of the Middle East is further expected to increase at a CAGR of 11.8% from 66 thousand tonnes in 2023 to 129 thousand tonnes in 2029.

Chart 25: Middle East –Demand for Silica Ramming Mass



Source: CareEdge Research, Maia Research

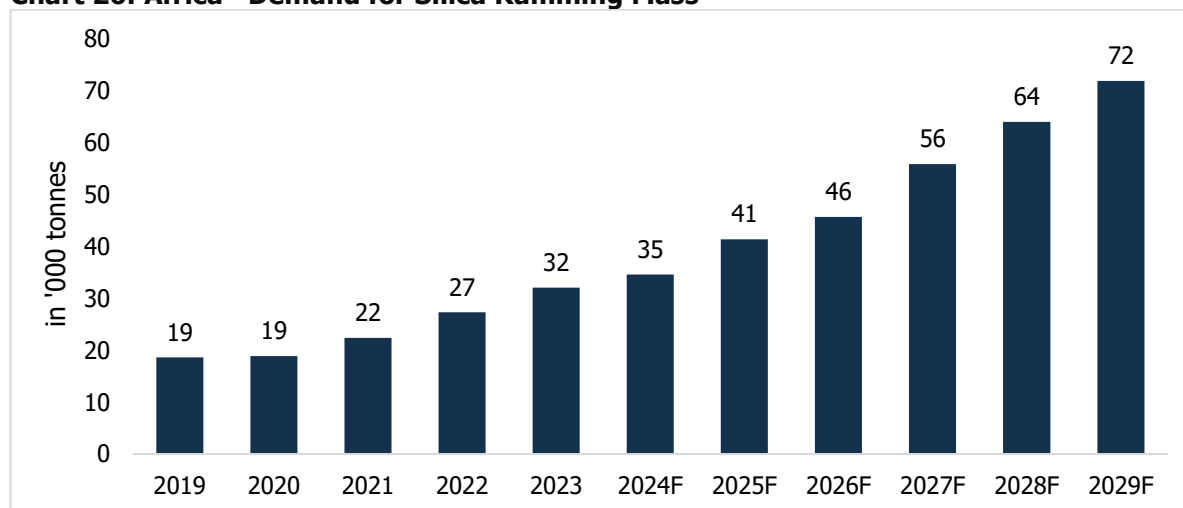
Note: The year mentioned in this chart and subsequent sections is Calendar Year; F- Forecasted

3.2.3 Africa –Demand for Silica Ramming Mass

There is rapid industrialization and infrastructure development happening in the African region which has resulted in the growing demand for steel. The demand for steel is also expected to grow backed by the rising population and urbanization. African governments are heavily investing in infrastructure projects such as roads, bridges, and railways for which steel is required in high amounts. With the growing population, there will be increased housing projects as well which will contribute to the growth of steel industry in Africa.

The consumption of Africa is further expected to increase at a CAGR of 14.4% from 32 thousand tonnes in 2023 to 72 thousand tonnes in 2029.

Chart 26: Africa –Demand for Silica Ramming Mass



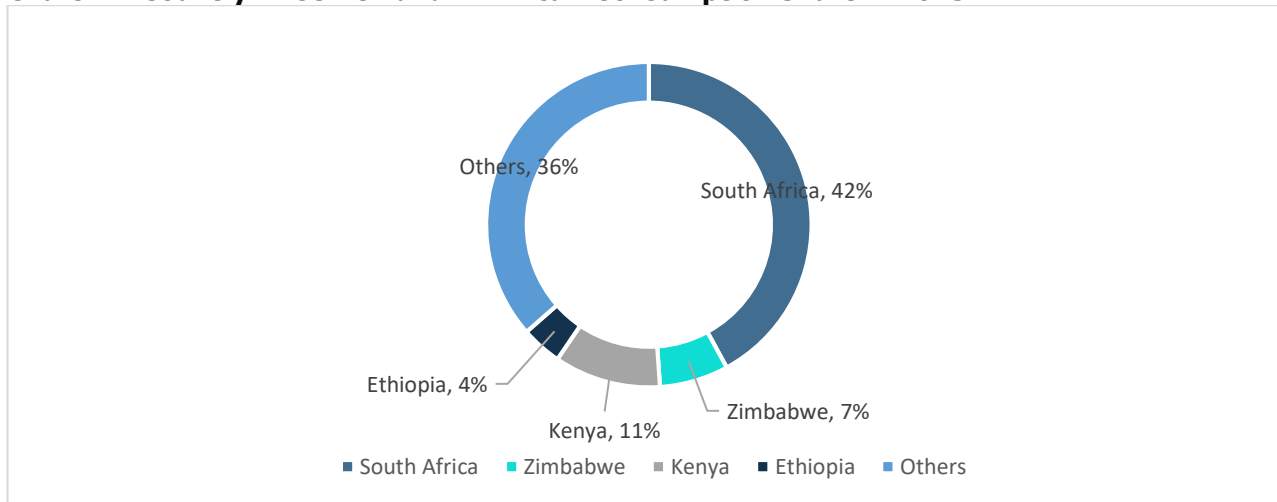
Source: CareEdge Research, Maia Research

Note: The year mentioned in this chart and subsequent sections is Calendar Year; F- Forecasted

Country-Wise Demand in Africa

South Africa (42%) has the highest share in consumption of silica ramming mass owing to the presence of the steel industry and the government’s continuous efforts to take initiatives in terms of infrastructure development. Followed by South Africa is others (36%) which constitutes Uganda, Angola, Ghana, Morocco, Niger and many others. Kenya has the third place at 11% followed by Zimbabwe (7%) and Ethiopia (4%).

Chart 27: Country-Wise Demand in Africa - Consumption Share in 2023



Source: CareEdge Research, Maia Research

Note: The year mentioned in this chart and subsequent sections is Calendar Year; F- Forecasted

The demand across African regions is as follows:

Table 8: Country-Wise Demand in Africa (in '000 tonnes)

Countries	2019	2021	2023	2025F	2027F	2029F
South Africa	8	9	14	18	24	31
Zimbabwe	1	2	2	3	4	5
Kenya	2	2	3	4	6	8
Ethiopia	1	1	1	2	2	3

Source: CareEdge Research, Maia Research

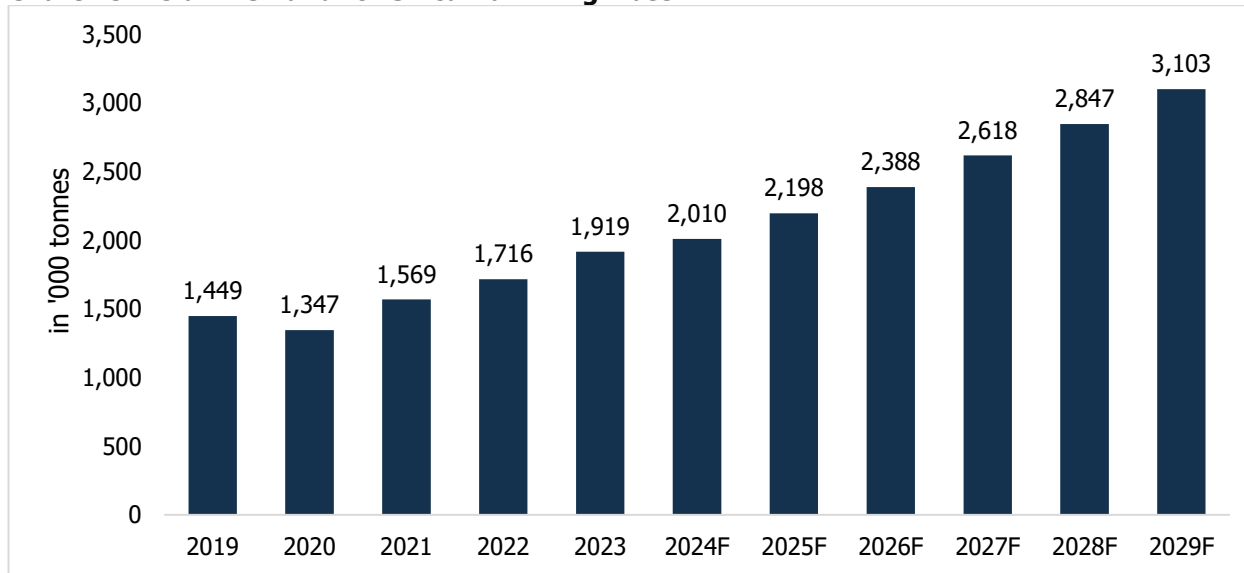
Note: The year mentioned in this chart and subsequent sections is Calendar Year; F- Forecasted

3.2.4 Asia –Demand for Silica Ramming Mass

Asia is the world's fastest-growing region and largest producer of steel, catering to increased steel demand in construction, automotive, and infrastructure. India is a net exporter of steel meeting the demands in various countries. China and India together cater to a majority of the steel demand worldwide and consumption. Similarly, real estate and infrastructure are booming in both countries, further contributing to significant consumption.

The consumption of Asia is further expected to increase at a CAGR of 8.3% from 1,919 thousand tonnes in 2023 to 3,103 thousand tonnes in 2029.

Chart 28: Asia –Demand for Silica Ramming Mass



Source: CareEdge Research, Maia Research

Note: The year mentioned in this chart and subsequent sections is Calendar Year; F- Forecasted

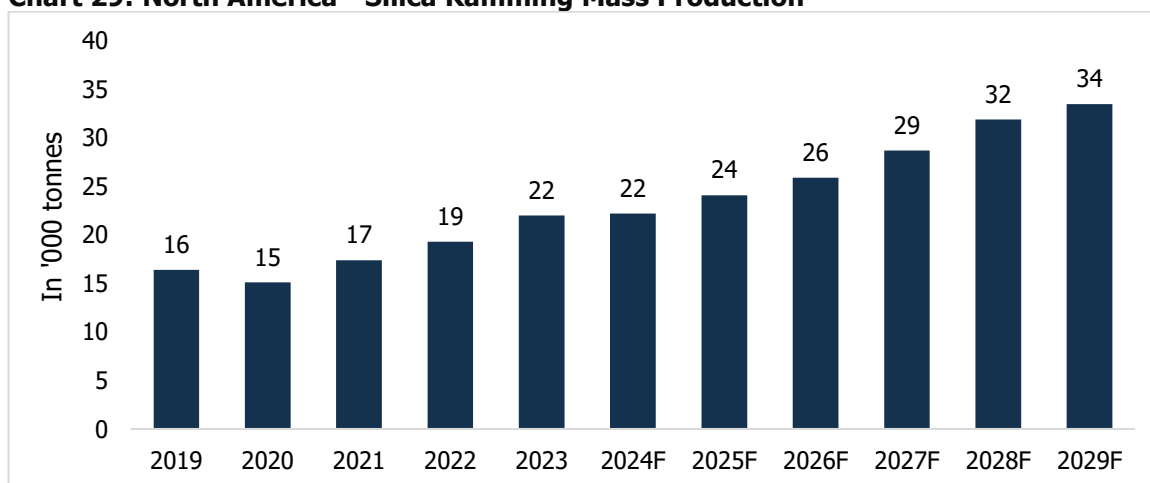
3.3 Global Silica Ramming Mass Industry - Region-Wise Production

3.3.1 North America – Silica Ramming Mass Production

North America is one of the largest silica ramming mass-producing regions. The growing demand for steel in various industries, such as construction, automotive, and infrastructure, is a major driver for the production of silica ramming mass in North America. The United States is the largest market for silica ramming mass owing to the presence of the steel production industry. There are mining and steel industries in Canada which makes it a significant market.

The production of silica ramming mass in North America is expected to grow at a CAGR of 7.3% from 22 thousand tonnes in 2023 to 34 thousand tonnes in 2029.

Chart 29: North America - Silica Ramming Mass Production



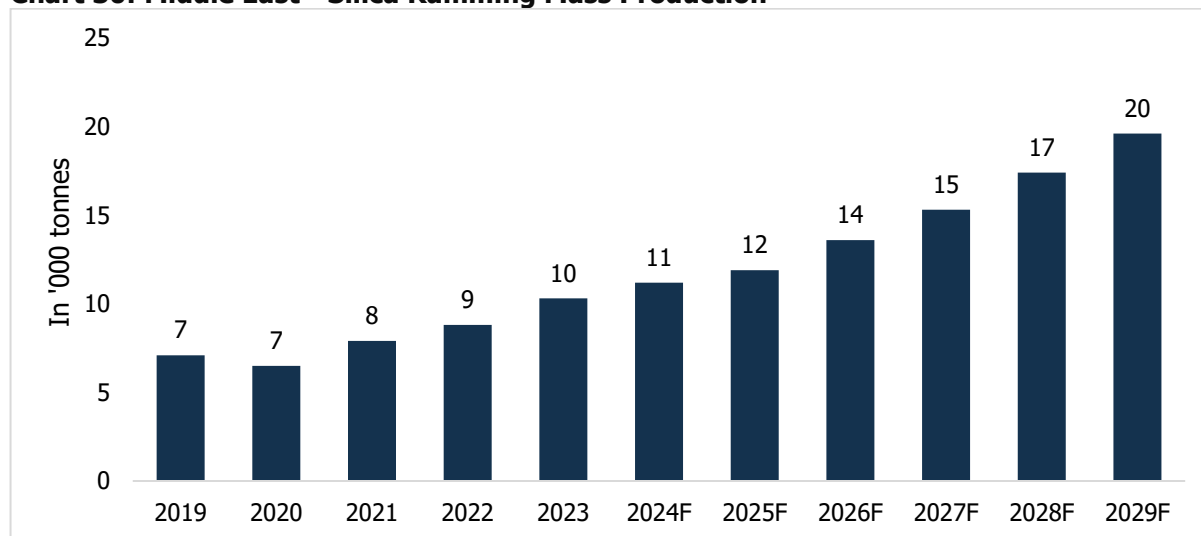
Source: CareEdge Research, Maia Research

3.3.2 Middle East – Silica Ramming Mass Production

The Middle East’s growth is expected to be driven by the expansion of the construction sector, especially in Saudi Arabia, the UAE, and Iran. Steel is widely used in these industries, and thus, the silica ramming mass production is also expected to increase.

The production of silica ramming mass in the Middle East is expected to grow at a CAGR of 11.3% from 10 thousand tonnes in 2023 to 20 thousand tonnes in 2029.

Chart 30: Middle East - Silica Ramming Mass Production



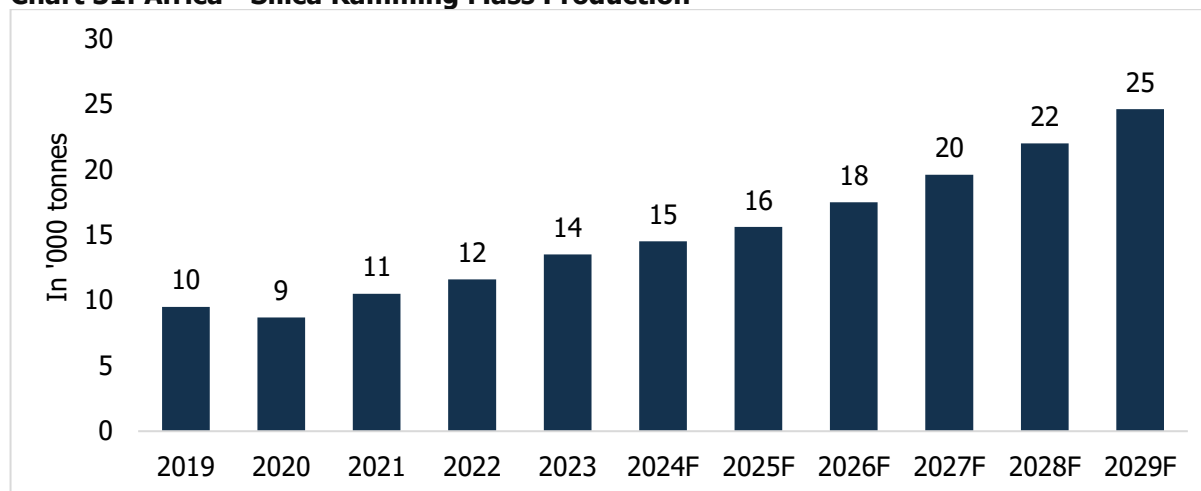
Source: CareEdge Research, Maia Research

3.3.3 Africa– Silica Ramming Mass Production

African governments are heavily investing in infrastructure projects such as roads, bridges, and railways for which steel is required in high amounts. Rapid industrialization and infrastructure development are happening in the African region which has resulted in the growing demand for steel. The government’s initiatives with regard to infrastructure development are expected to augur well for the silica ramming mass industry.

The production of silica ramming mass in Africa is expected to grow at a CAGR of 10.5% from 14 thousand tonnes in 2023 to 25 thousand tonnes in 2029.

Chart 31: Africa - Silica Ramming Mass Production



Source: CareEdge Research, Maia Research

South Africa is a well-developed nation and has good infrastructure. The country also has an existing steel industry and ranks 19th worldwide in terms of production. It is also the largest steel-producing country in Africa, accounting for 60% of the total steel production in Africa. Hence, the production of silica ramming mass is also the highest in South Africa compared to other regions. In Zimbabwe, Kenya and Ethiopia the production is significantly low owing to lack of infrastructure. However, production in these regions is also expected to grow at a healthy CAGR of 11%.

The production volume across African region is as follows:

Table 9: Production Volume across African Region (in '000 tonnes)

Countries	2019	2021	2023	2025F	2027F	2029F
South Africa	6.08	6.73	8.68	10.09	12.71	16.07
Zimbabwe	0.11	0.12	0.16	0.19	0.24	0.32
Kenya	0.01	0.01	0.02	0.02	0.03	0.06
Ethiopia	0.02	0.03	0.03	0.04	0.06	0.07
Others	3.26	3.57	4.56	5.23	6.52	8.12

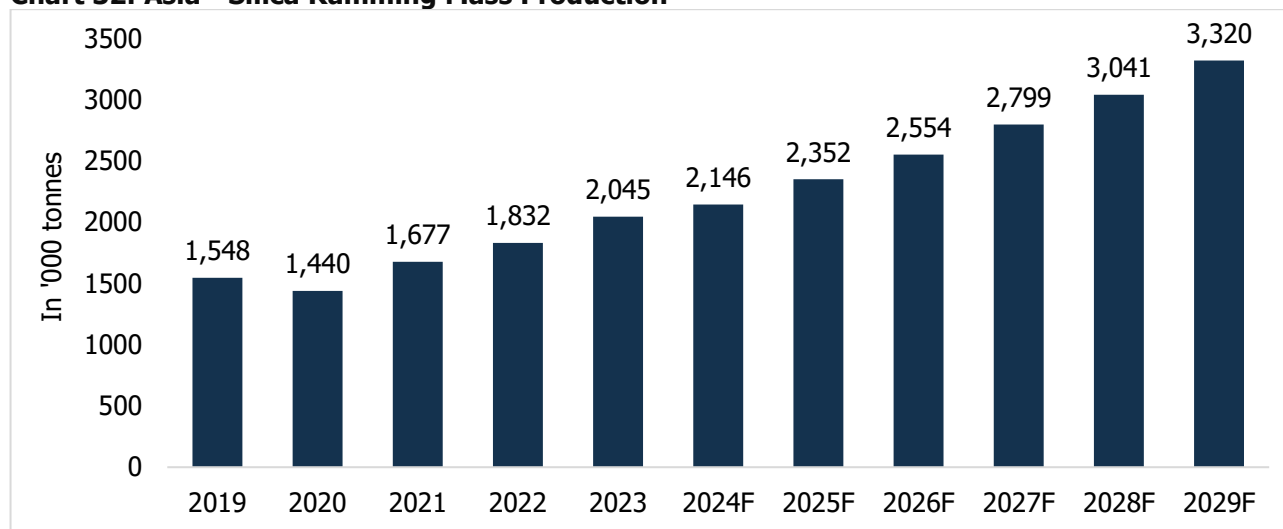
Source: CareEdge Research, Maia Research

3.3.4 Asia – Silica Ramming Mass Production

Asia produces the highest amount of silica ramming mass, owing to the presence of growing economies such as India and China. There is rapid industrialization and infrastructure development in India, China, South Korea, and Japan. India and China have constantly been expanding their steel production capacities to boost their exports as well as to support the growing consumption demand.

The production of silica ramming mass in Asia is expected to grow at a CAGR of 8.4% from 2,045 thousand tonnes in 2023 to 3,320 thousand tonnes in 2029.

Chart 32: Asia - Silica Ramming Mass Production



Source: CareEdge Research, Maia Research

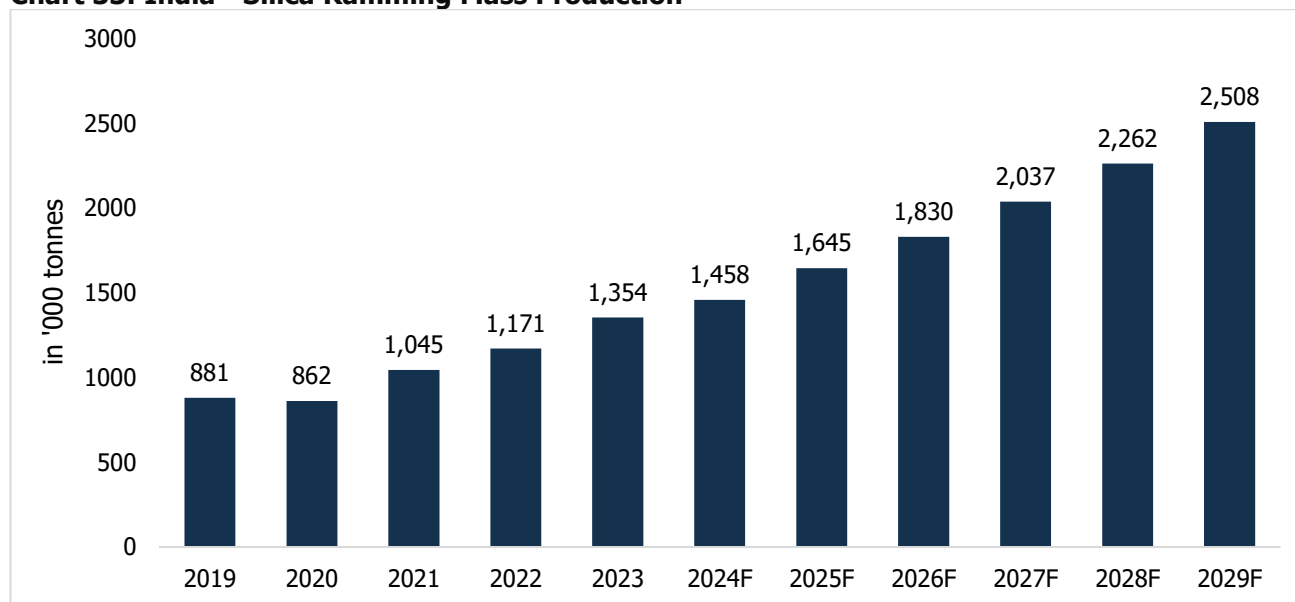
3.3.4.1 India – Silica Ramming Mass Market

India is one of the largest silica ramming mass producers in the world. India is also one of the world's fastest-growing economies, which propels the demand for steel in various industries, including construction, automotive, and infrastructure. In addition, the Indian government is promoting infrastructure development through various initiatives, such as the National Highways Development Project and the Bharatmala Project. Additionally, India is rich in quartzite, the main raw material for silica ramming mass.

Further, India has a significant production capacity for steel, with numerous steel plants across the country like Odisha, Jharkhand, Chhattisgarh, Karnataka, and West Bengal. Some of the major steel companies are expanding their steel capacities to cater to the growing demand.

The steel industry in India faces challenges such as fluctuations in raw material prices, energy costs, and global economic conditions. However, steel players in India have been resilient in tackling them. The silica ramming mass production in India is expected to grow at a healthy CAGR of 10.8% from 1,354 thousand tonnes in 2023 to 2,508 thousand tonnes in 2029.

Chart 33: India - Silica Ramming Mass Production



Source: CareEdge Research, Maia Research

3.3.4.2 India – Silica Ramming Mass Top 5 Exports Destination

India is the largest exporter of silica ramming mass. The top 5 countries where most of the silica ramming mass is exported are Saudi Arabia, the UAE, Uganda, Ghana, and Turkey. India’s exports in volume have increased at a healthy CAGR of 14.8% from 45 thousand tonnes in 2019 to 78 thousand tonnes in 2023. It is further expected to grow by 18.2% during the period 2023-2029. On the other hand, the value of these exports is projected to increase at a CAGR of 19.6% over the forecast period 2023-2029.

The growth is majorly backed by the demand for silica globally and its wide application in steel manufacturing industries. Also, there is a continuous demand for steel to support various industries such as automotive, infrastructure, and many others. To meet up with this demand, silica ramming mass will be needed in large quantities.

Table 10: Top 5 Export Destinations of India (In USD million)

Countries	2019	2021	2023	2025F	2027F	2029F
Saudi Arabia	1.3	1.1	2.2	2.9	4.1	5.6
UAE	0.3	0.3	0.6	0.8	1.2	1.6
Uganda	0.2	0.2	0.4	0.5	0.8	1.1
Ghana	0.2	0.2	0.4	0.5	0.8	1.2
Turkey	0.2	0.2	0.4	0.6	0.8	1.3

Source: CareEdge Research, Maia Research

Note: F stands for Forecasted

3.4 Government Policies in Africa

Steel and Metal Fabrication Master Plan- The Minister of Trade, Industry and Competition, Ebrahim Patel, along with other stakeholders from the steel and metal fabrication sector signed a Master Plan for the sector on 11th June 2021. This master plan was formulated post-consultation with all stakeholders including primary steel producers, downstream steel players, met fabricators, and organised labour.

The key focus is on continuous improvement and collaboration between all stakeholders in order to maintain and ensure the sustainability of the steel and metal fabrication industry. It is an action-oriented plan based on the identification of competitiveness and improvements in the firms and to take measures to reduce levels of imports and reposition the industry to be resilient to global pressures.

Safeguard Duties on Hot-Rolled Steel Coil and Plate – Following the publication of the August 11 Government Gazette, which amends schedule two of the Customs & Excise Act, safeguard duties of 12% have been officially placed on Hot Rolled Coil (HRC) and plate entering South Africa.

These safeguard duties were imposed in addition to the 10% duties that are already governing the products.

African Growth and Opportunity Act – The African Growth and Opportunity Act (AGOA) is the cornerstone of U.S. Economic engagement with the countries of Sub-Saharan Africa. It was enacted in May 2000 and around 35 African countries are eligible. This agreement provided duty-free access to the U.S. market for eligible Sub-Saharan African nations.

The U.S. government authorised AGOA for an additional 10 years in June 2015. AGOA has succeeded in helping eligible nations grow, diversify their exports to the U.S. and create employment. The eligible countries can export products including value-added manufactured items such as textiles, to the U.S. duty-free. Some of the countries that have benefitted from AGOA are Ghana, Kenya, Madagascar, Ethiopia, and Lesotho. All other partner states are still eligible for the AGOA benefits. However, Burundi's eligibility has been revoked with effect from 1st January 2016.

However, only about half of the eligible countries have developed strategies pertaining to the utilization of AGOA and the majority of exports come from just a few. AGOA has had a positive impact but there is a need to update and improvise to include newer industries like technology and digital services.

4. Global Calcined Petroleum Coke Market

Calcined petroleum coke is a high-purity carbon substance produced by heating green petroleum coke to remove moisture, volatile matter, and impurities while increasing electrical conductivity. It is used to manufacture anodes for the aluminium, steel, cement, and titanium smelting industries, as well as feedstock for synthetic graphite manufacturing.

Calcined petroleum coke has a high carbon content, making it an effective carbon additive for iron and steel production, as it reduces carbon use while enhancing end-product quality. Due to its low sulfur concentration, it is a good fuel for cement kilns, since it helps to reduce harmful emissions.

Figure 3: Calcined Petroleum Coke



According to the sulfur content, calcined petroleum coke can be divided into the following types:

Table 11: Types of Calcined Petroleum Coke

Types	Description
Low-Sulfur Calcined Coke	Petroleum coke with sulfur content less than or equal to 1% is called low-sulfur coke.
Medium-Sulfur Calcined Coke	Petroleum coke with 1% greater than or equal to 2.5% sulfur content is medium sulfur coke.
High-Sulfur Calcined Coke	Petroleum coke with a sulfur content greater than 2.5% (can also be 3% or 2.8%) is called high-sulfur petroleum coke.

Source: Maia Research

4.1 Global Calcined Petroleum Coke Industry Market Size

During 2019-2023, the market size of the global calcined petroleum coke industry grew at a CAGR of 10.5% on account of the increasing supply of crude oil and growth in the steel industry. However, a slowdown in industrial activities due to COVID-19 and geo-political tensions caused fluctuations in crude oil prices further impacting petcoke prices. The global calcined petroleum coke market is expanding across the globe and is estimated to grow by 5% on a y-o-y in 2024.

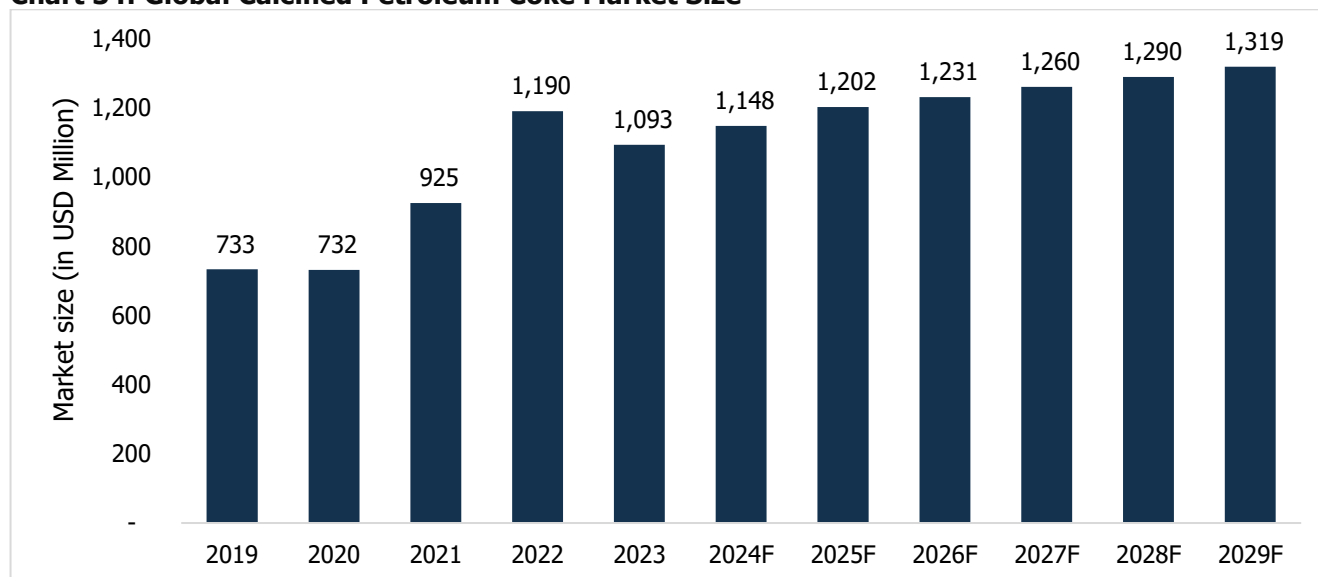
The Asia Pacific region is the largest market owing to rising construction and manufacturing activities. Also, China is the world's leading producer and consumer of calcined petroleum coke. Whereas Europe is the second-largest market for

calcined petroleum coke, followed by North America. The growth of the calcined petroleum coke market in these regions is being driven by the healthy demand in the automobile, construction, real estate, and steel industries.

Further, the increasing consumption of metals such as steel and aluminium, the growing demand for cement and power generation industries, and government initiatives to promote a sustainable environment are raising the demand for calcined petroleum coke. In addition, the traction in the construction sector contributes to the industry’s growth. Such factors are projected to facilitate the global calcined petroleum market growth at a CAGR of 3.2% over 2023-2029.

Moreover, rapid economic and population growth in emerging countries such as China and India will continue to play a role in the development of the global market. Besides, growing urbanization & industrialization and advancement in technology will enable growth opportunities in the coming years.

Chart 34: Global Calcined Petroleum Coke Market Size



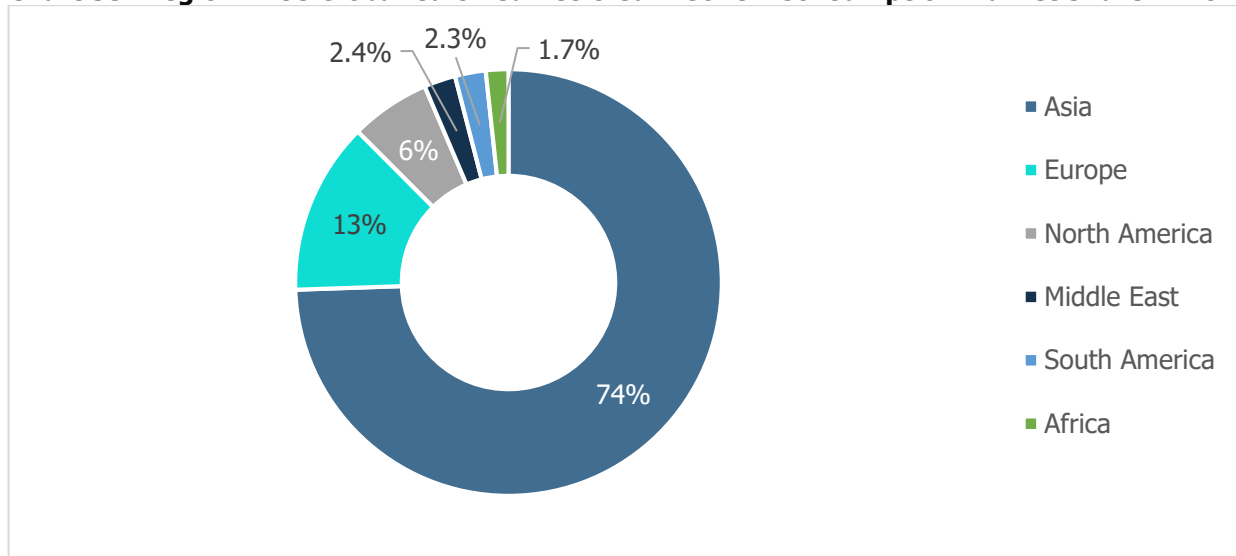
Source: CareEdge Research, Maia Research

Note: The year mentioned in this chart and subsequent sections is Calendar Year; E- Estimated; F- Forecasted

4.2 Global Calcined Petroleum Coke Industry - Demand by Regions

The global calcined petroleum coke market is expected to grow on account of a substantial increase in the production of steel across the world. The rising consumption of steel globally is likely to boost the expansion of the market. Asia holds the maximum market share of 74% in consumption followed by Europe and North America, which accounted for 13% and 6%, respectively, in 2023.

Chart 35: Region Wise Global Calcined Petroleum Coke - Consumption Market Share in 2023



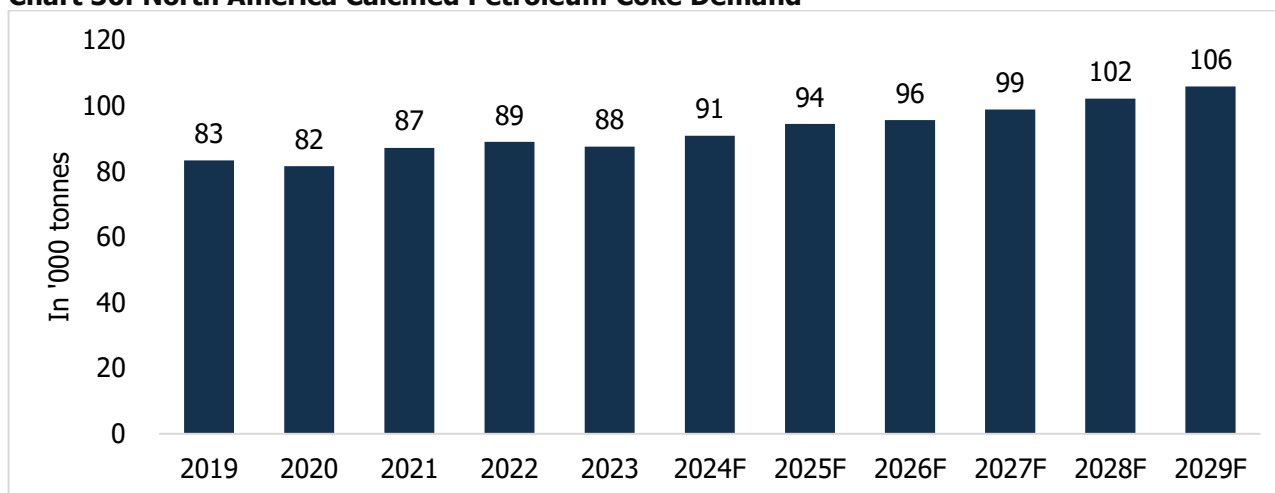
Source: CareEdge Research, Maia Research

4.2.1 North America – Calcined Petroleum Coke Demand

The North American calcined petroleum coke market is projected to grow at a CAGR of 3.2% over the forecast period 2023-2029. The rising demand is driven by the thriving steel manufacturing industry, rapid technological advancements, and the growing awareness of sustainability. End-user industries such as construction and infrastructure, automobile, housing, etc., with increased steel needs fuel the demand for calcined petroleum coke. Moreover, the development in the metal industry and proliferation of investments in oil & gas refineries are expanding the calcined petroleum coke market in North America.

Further, the United States is the largest market for calcined petroleum coke in North America. The market prospects are attributed to the automotive, construction, and commercial real estate sectors and the significant presence of refineries. Additionally, the increasing focus on using cleaner technologies and the growing adoption of renewable energy sources will also likely boost the demand for calcined petroleum coke. These trends are creating new market opportunities for calcined petroleum coke producers in the North America market.

Chart 36: North America Calcined Petroleum Coke Demand



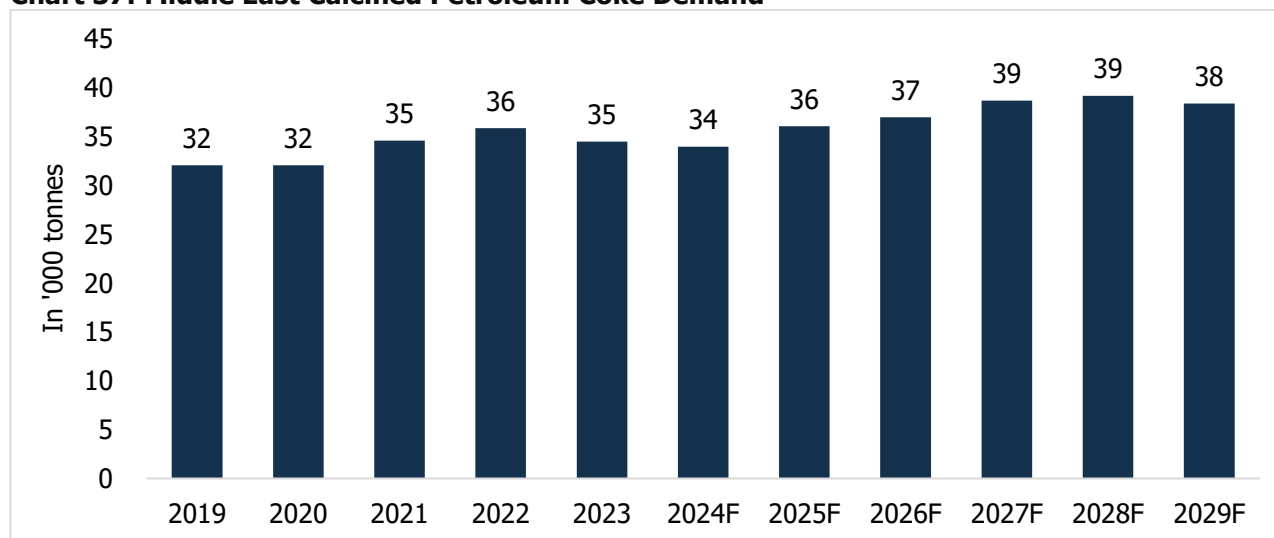
Source: CareEdge Research, Maia Research

4.2.2 Middle East – Calcined Petroleum Coke Demand

The Middle East accounted for 2.4% of the total consumption of calcined petroleum coke in 2023. The growth is attributed to the increasing production of iron and steel in the region. The steel demand in 2023 slowed down due to sluggish construction activities in Qatar and Saudi Arabia. However, it is likely to pick up in 2024 on account of pent-up demand for housing and other infrastructure projects. On the other hand, the demand in Egypt continues to be affected by the ongoing Russia-Ukraine war, which has resulted in high-interest rates, inflationary pressures, higher production costs, etc.

Further, the demand for calcined petroleum coke in this region is projected to grow at a CAGR of 1.8% over the forecast period, 2023-2029. The growth is expected to be driven by significant opportunities enabled by the steel manufacturing transition from blast-furnace-based production to direct reduced iron (DRI)-based steel production with the use of green hydrogen. As a result, the expansion of the steel industry with a huge pipeline of hydrogen projects and new DRI-based plants in Saudi Arabia and UAE will boost the demand for calcined petroleum coke in the Middle East. In addition, the real estate segment in the UAE will aid in the growth of the industry.

Chart 37: Middle East Calcined Petroleum Coke Demand



Source: CareEdge Research, Maia Research

4.2.3 Asia-Pacific – Calcined Petroleum Coke Demand

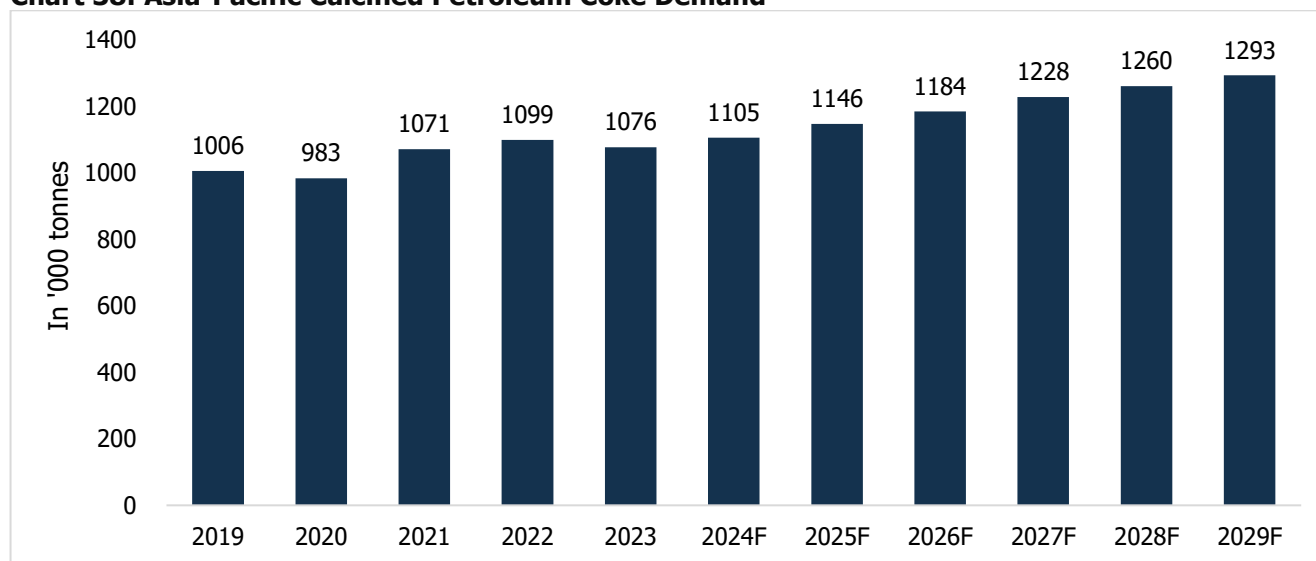
The calcined petroleum coke demand in Asia-Pacific is projected to grow at a CAGR of 3.1% over the forecast period, 2023-2029, driven by the robust demand for steel from developing countries. Asia-Pacific is the world's fastest-growing region, fuelling the demand for steel in various end-user industries, including construction, automotive, transportation, and infrastructure. China is the largest market for calcined petroleum coke in Asia and the largest producer globally. India is another major market for calcined petroleum coke, with a thriving steel industry and a strong focus on infrastructure development.

The steel demand in these developing nations is significantly rising on account of increased investments in infrastructure and policy support by the government. The steel consumption in China was reduced due to movement restrictions and lockdowns brought on by COVID-19, environmental concerns, and the target to lower carbon emissions. However, government support is expected to aid in the recovery of demand with the resumption of construction and real estate

activities. Despite the inflationary pressures and uncertainties around the global economy, India witnessed a healthy demand from auto, consumer durables, capital goods, and real estate sectors.

Moreover, Japan is a significant consumer of calcined petroleum coke. The Japan calcined petroleum coke market growth will be primarily driven by the recovery of automotive production and the moderate growth in steel manufacturing activities. Whereas South Korea is expected to witness a recovery in steel demand on account of traction in construction activities and the auto sector.

Chart 38: Asia-Pacific Calcined Petroleum Coke Demand



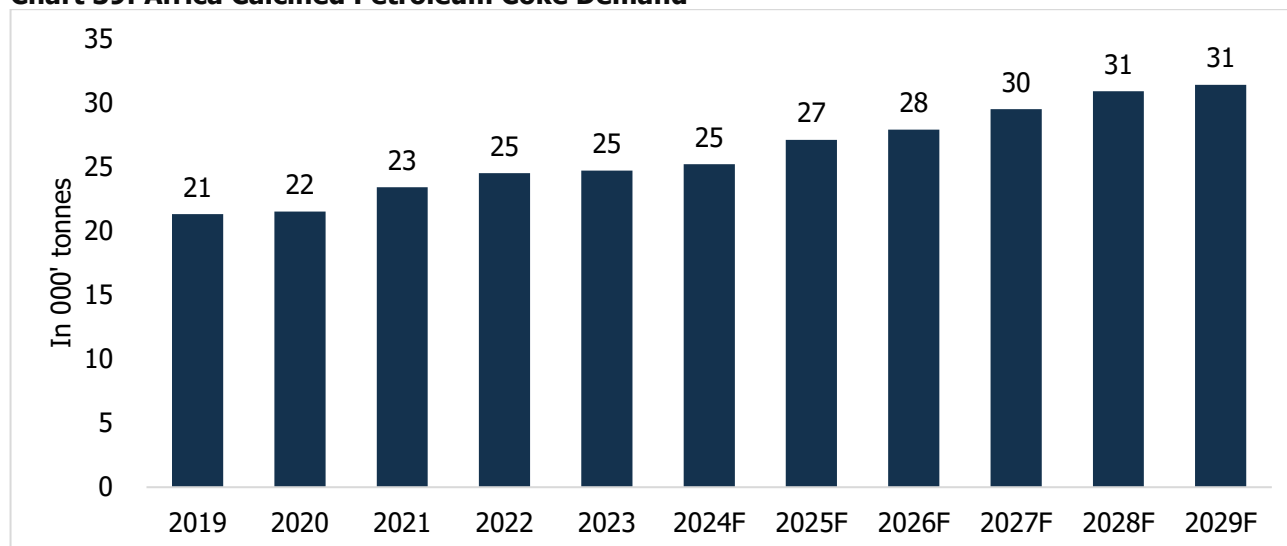
Source: CareEdge Research, Maia Research

4.2.4 Africa – Calcined Petroleum Coke Demand

The Africa calcined petroleum coke demand is projected to grow at a CAGR of 4.1% over the forecast period, 2023-2029. Africa accounted for 1.7% of the global demand for calcined petroleum coke in 2023. However, the demand for calcined petroleum coke in Africa is comparatively low to other regions due to the lack of investments in infrastructure development and the availability of coal (substitute for carbon).

The steel and aluminium smelting industries are the key industries of calcined petroleum coke in Africa. However, their consumption is far lower compared to Asia and North America. At the same time, it is anticipated that the demand for calcined petroleum coke in Africa will rise in the coming years. This is attributed to rapid industrialization, infrastructure development, expansion in manufacturing industries, and growing demand for steel.

Chart 39: Africa Calcined Petroleum Coke Demand



Source: CareEdge Research, Maia Research

The calcined petroleum coke demand in South Africa, Zimbabwe, Kenya, and Ethiopia is growing due to robust steel demand. South Africa is the largest consumer of calcined petroleum coke with a share of around 35% of the total consumption in Africa. The demand for calcined petroleum coke is driven by the increasing usage of steel in the manufacturing and construction sectors. In addition, the government initiatives to promote infrastructure development further raise the product demand.

Whereas in Zimbabwe, the demand for iron and steel products is rapidly increasing and the steel used in end-user industries such as construction and transportation is leading to the steel industry expansion. In Kenya, the growing demand for residential and commercial buildings and infrastructure developments drive the demand. Another growth driver is the thriving steel industry, given the usage of steel in construction, energy, chemical & allied products, and electronics. In Ethiopia, the demand for calcined petroleum coke is propelled by the increased demand for steel from infrastructure projects such as roadways, railways, telecom, etc.

The consumption of calcined petroleum coke across regions around Africa is mentioned below: -

Table 12: Consumption of calcined petroleum coke across African Regions (in '000 tonnes)

Categories	2019	2021	2023	2025F	2027F	2029F
South Africa	7.3	8.1	8.6	9.5	10.4	10.8
Zimbabwe	0.8	0.8	0.9	1.0	1.1	1.2
Kenya	0.7	0.7	0.8	0.9	1.0	1.1
Ethiopia	0.4	0.5	0.5	0.5	0.6	0.6

Source: CareEdge Research, Maia Research

4.3 Global Calcined Petroleum Coke Industry – Production by Regions

Calcined petroleum coke is an important component in steel production. It is made by heating green petroleum coke to eliminate volatile chemicals and other impurities, which results in a higher carbon concentration. It is mainly used as a

carbon addition in the steel manufacturing process. It works as a fuel and adds carbon content to steel, enhancing its strength and hardness. In addition, it aids in the reduction of impurities and enhances the quality of the steel. The global production of calcined petroleum coke has increased at a CAGR of 1.6% during the period 2019-2023.

The global steel industry is a major consumer of calcined petroleum coke. The steelmakers generally mix calcined petroleum coke, iron ore, and other raw materials in a blast furnace to produce molten iron, which is subsequently transformed into steel by refining processes. Calcined petroleum coke helps maintain the optimum carbon content and temperature, resulting in effective steel production.

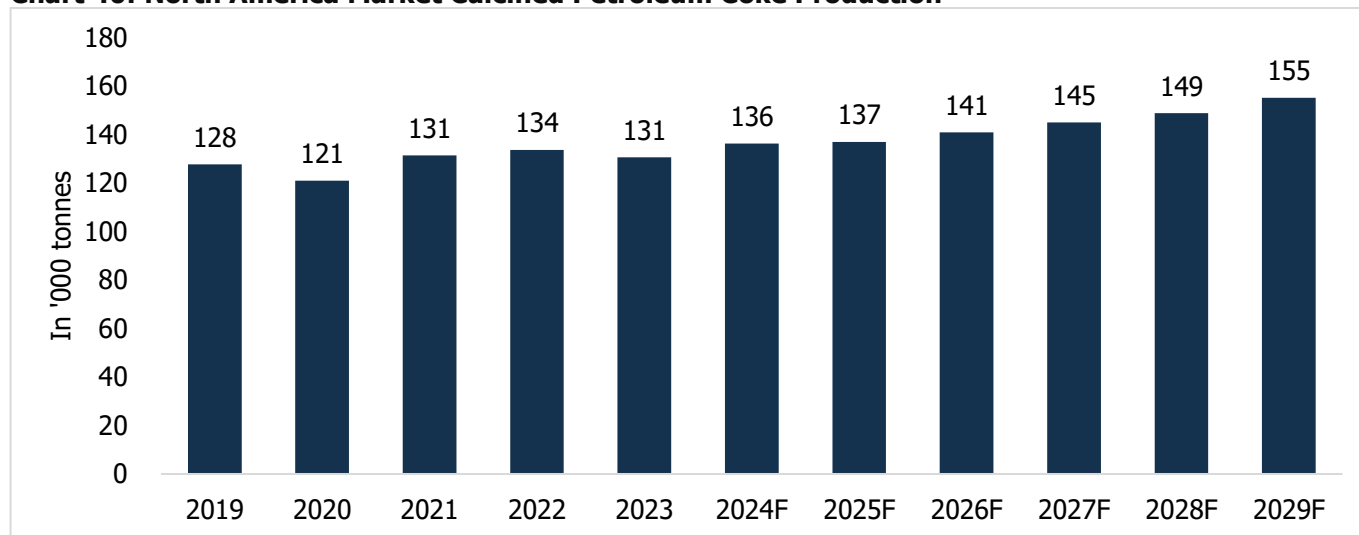
Moreover, the calcined petroleum coke market has been affected by the pandemic and caused supply chain disruptions in the economy. This led to a slowdown in industrial activities and reduced the demand for calcined petroleum coke. After witnessing a slowdown, the calcined petroleum coke market gained slow momentum growth with the resumption of industrial activities. This market is anticipated to grow at a CAGR of 3.1% over 2023-2029.

4.3.1 North America- Calcined Petroleum Coke Production

The North America calcined petroleum coke production is expected to grow at a CAGR of 2.9% over the forecast period 2023-2029, driven by healthy demand, technological advancements, and a focus on sustainability. While the market faces challenges like high production costs, environmental concerns, fluctuation in raw material prices, and competition from other regions, especially Asia-Pacific and Europe.

The United States is the largest market for calcined petroleum coke in North America and the growing demand in end-user segments such as automotive, construction, medical devices, housing, aerospace, etc., is increasing the production of steel. The demand for calcined petroleum coke is expected to rise steadily on account of increased investments in infrastructure and construction activities. Further, the focus on sustainability and the need to lower greenhouse gas emissions are likely to drive the demand for calcined petroleum coke.

Chart 40: North America Market Calcined Petroleum Coke Production



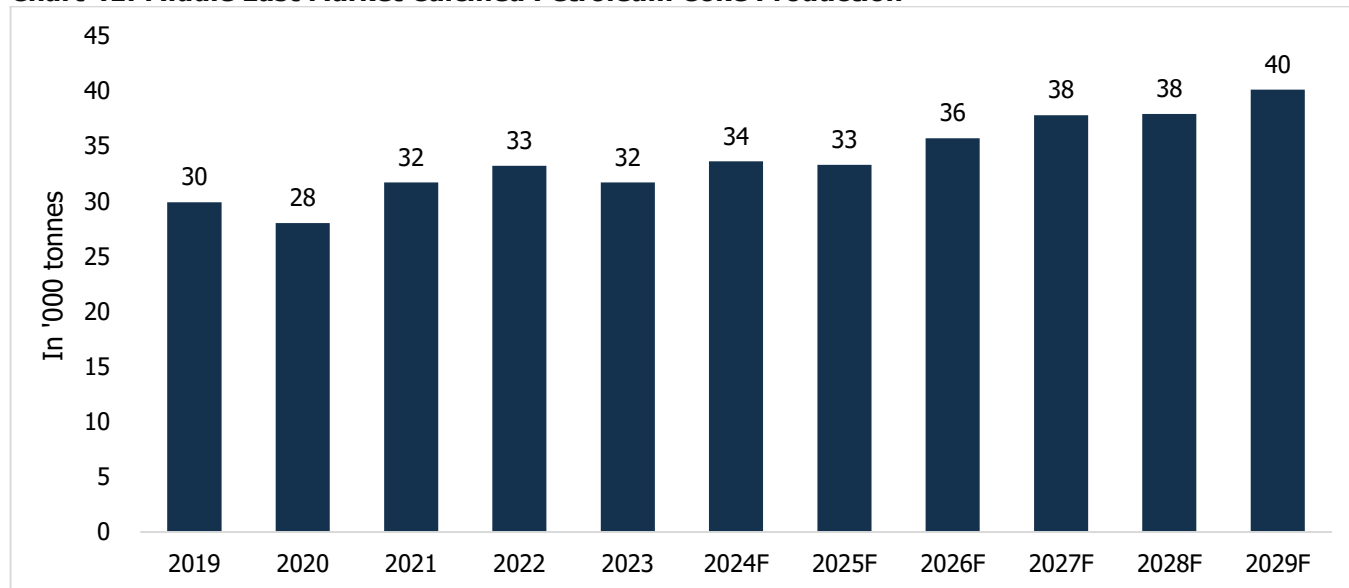
Source: CareEdge Research, Maia Research

4.3.2 Middle East- Calcined Petroleum Coke Production

The Middle East calcined petroleum coke production is expected to grow at a CAGR of 4% over the forecast period, 2023-2029. The market demand is expected to be driven by the expansion of the steel sector, especially in Saudi Arabia, UAE, and Qatar. Whereas the key factors propelling the production growth include strong demand from construction and infrastructure and increasing activities in the residential and commercial real estate sectors.

Further, the steel manufacturing facilities in the Middle East and reliance on calcined petroleum coke as a critical component in the steelmaking process will encourage manufacturers to produce more volumes.

Chart 41: Middle East Market Calcined Petroleum Coke Production



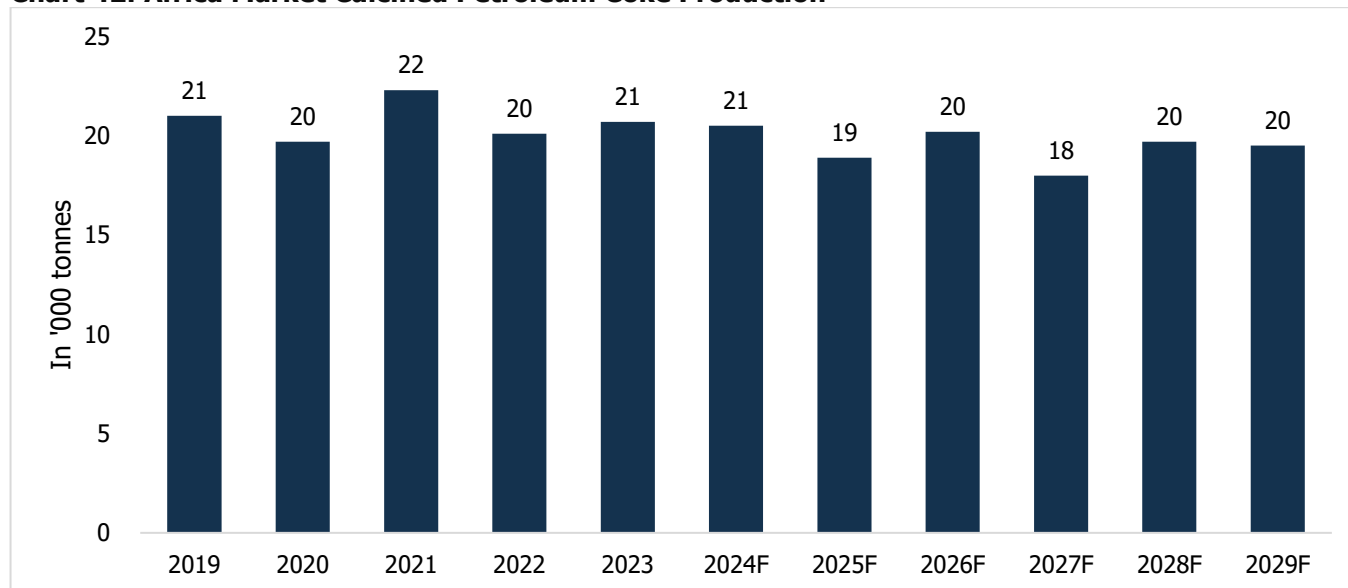
Source: CareEdge Research, Maia Research

4.3.3 Africa- Calcined Petroleum Coke Production

The growth for Africa calcined petroleum coke is driven by the thriving steel industry and capacity expansion plans to fulfil the rising demand for manufacturing, building materials, and infrastructure. This has increased the demand for carbon-based commodities such as calcined petroleum coke. Furthermore, rapid industrialization in this region will boost the demand for calcined petroleum coke.

The key challenges that may hamper the growth in this region include a lack of investments in infrastructure development, environmental regulations, and high competition.

Chart 42: Africa Market Calcined Petroleum Coke Production



Source: CareEdge Research, Maia Research

Further, infrastructure development, industrialization, and the growing demand for steel across a range of end-user sectors are expected to propel the market growth across the African regions. As of 2023, South Africa, the largest producer in Africa, accounted for around 88% of the continent's total production of calcined petroleum coke. Moreover, the demand for green and calcined petroleum coke in the steel-making process will rise in tandem with the growing steel production.

The production of calcined petroleum coke across regions around Africa is mentioned below: -

Table 13: Production of Calcined Petroleum Coke across African Regions

Categories	2019	2021	2023	2025F	2027F	2029F
South Africa	18.2	19.5	18.2	16.8	16.2	17.6
Zimbabwe	0.7	0.7	0.7	0.6	0.6	0.7
Kenya	0.6	0.7	0.6	0.6	0.6	0.6

Source: CareEdge Research, Maia Research

4.3.4 Asia-Pacific - Calcined Petroleum Coke Production

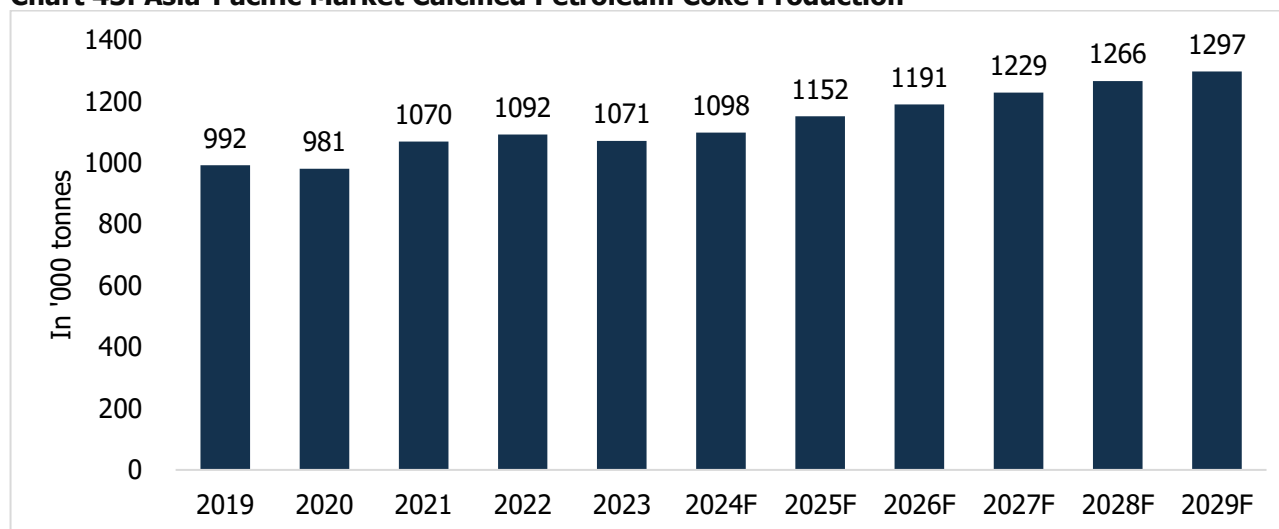
The Asia-Pacific calcined petroleum coke production is expected to grow at a CAGR of 3.2% over the forecast period, 2023-2029. The growth is expected to be driven by strong demand from developing countries and expansion of production capacities in steel industries. Besides, the increasing population and urbanization are expected to drive various sectors including real estate, construction, transportation, and infrastructure.

Further, China, India, Japan, and South Korea, which constitute around 96% of the total production of calcined petroleum coke, as of 2023, are expected to witness more production volumes in the coming years. The demand in China, the leading producer which usually accounts for up to 76% of the overall production in Asia-Pacific is expected to remain robust on account of increased urbanization and growing industrial activities. This, in turn, will raise the demand for calcined petroleum coke in this region.

Moreover, India, another developing country is expected to drive the market due to expansion in steel manufacturing operations, given the rising demand from end-user segments and increased investments in infrastructural development.

Besides, the overall development of the manufacturing sector and infrastructure in the emerging countries will aid the market growth in Asia-Pacific.

Chart 43: Asia-Pacific Market Calcined Petroleum Coke Production



Source: CareEdge Research, Maia Research

4.3.4.1 India- Calcined Petroleum Coke Production

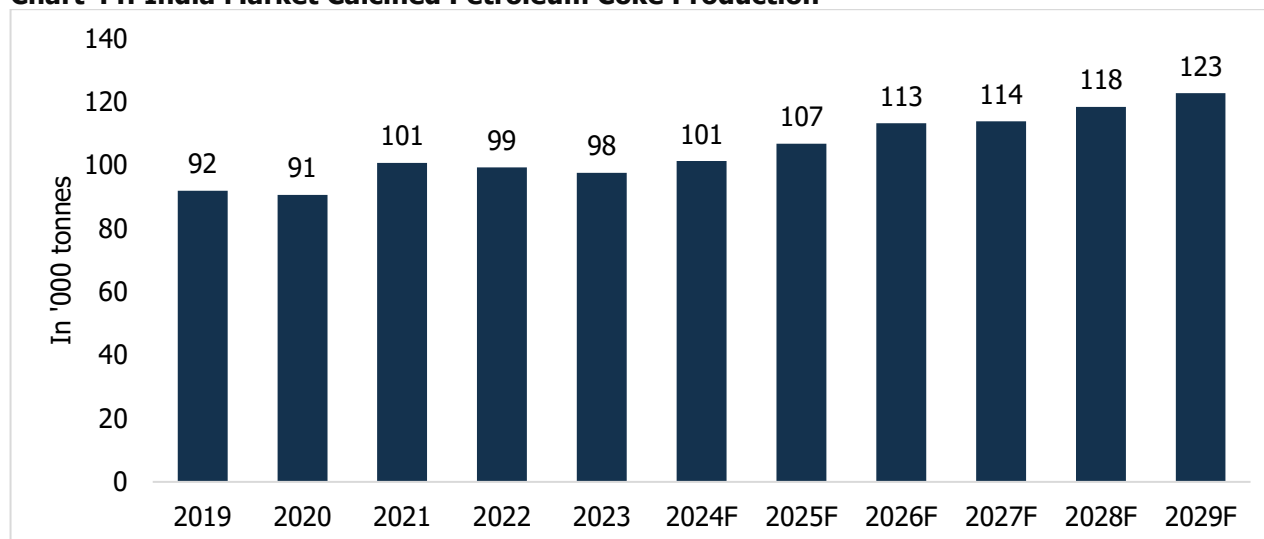
The India calcined petroleum coke production is expected to grow at a CAGR of 3.9% over the forecast period, 2023-2029. India is one of the major producers of calcined petroleum coke in the world, catering to the needs of various industries where steel is used. Some of the industries propelling the steel demand include automobile, transportation, real estate, and construction. It is also committed to the development of infrastructure (road, rail, airports, etc.) in the country.

Steel being the most crucial material in infrastructure development, the government has taken multiple initiatives over the last decade to encourage steel production and consumption of domestically manufactured steel targeted toward making India 'Atmanirbhar' for its present as well as future demand. These efforts by the government are expected to increase the demand for calcined petroleum coke.

In addition, the growing awareness of energy efficiency and sustainable environment will further boost the market growth. The demand was affected by the pandemic which resulted in a slowdown in industrial activities and disruptions in the supply chain. However, despite the global uncertainties, India registered healthy growth in the manufacturing and construction sectors.

Moreover, the main challenges faced by the Indian calcined petroleum coke market are volatility in crude oil prices, which impacts pet coke prices, and environmental regulations on petroleum refining and coke production, which affect the cost and availability of calcined petroleum coke.

Chart 44: India Market Calcined Petroleum Coke Production



Source: CareEdge Research, Maia Research

4.3.4.2 India- Calcined Petroleum Coke Exports Destination

India's exports of calcined petroleum coke are predicted to expand at a CAGR of 6.1% from 10 thousand tonnes in 2023 to 15 thousand tonnes in 2029. In value terms, it is expected to grow at a similar CAGR of 6.1% during the same period. India's position as a major producer and consumer of steel is projected to drive growth in the market. The Indian government is also helping to boost growth by introducing various schemes and incentives for manufacturers and exporters. Moreover, it is playing a significant role in infrastructure development, which will support market demand. The top 5 export destinations from India are mentioned below:

Table 14: Top 5 Export Destinations from India (In USD million)

Export Countries	2019	2021	2023	2025F	2027F	2029F
Saudi Arabia	1.88	1.93	2.10	2.88	3.30	3.79
Oman	0.01	1.81	1.34	1.49	1.52	2.35
Qatar	1.72	0.92	1.58	1.98	2.08	2.11
China	0.24	0.57	0.65	0.62	0.68	0.81
Nepal	0.06	0.18	0.34	0.55	0.81	0.44

Source: CareEdge Research, Maia Research

4.4 Government Policies for Global Calcined Petroleum Coke Market in Africa

• Steel and Metal Fabrication Master Plan

The Minister of Trade, Industry and Competition, Ebrahim Patel, along with industry stakeholders from the steel and metal fabrication sector signed a Master Plan for the sector on Friday 11 June 2021. The Master Plan, which has been developed in consultation with all stakeholders from the industry – including primary steel producers, downstream steel players, metal fabricators, and organised labour – provides a blueprint for the industry to re-energise itself and expand production. The workshop supported the development of national-level plans, including the Steel and Metal Fabrication Master Plan, which states that the South African iron and steel value chain is to achieve carbon neutrality by 2050.

- **Safeguard duties on hot-rolled steel coil and plate officially come into force**

Safeguard duties of 12% have been officially placed on hot-rolled coil (HRC) and plate entering South Africa following publication of the August 11 Government Gazette, which amends schedule two of the Customs and Excise Act. The safeguard duties have been signed by Finance Minister Malusi Gigaba and will be imposed in addition to the 10% duties already governing the products.

- **African Growth and Opportunity Act**

Enacted in May 2000, the African Growth and Opportunity Act (AGOA) is the cornerstone of U.S. economic engagement with the countries of sub-Saharan Africa. The agreement provides duty-free access to the U.S. market for eligible Sub Sahara African nations. In June 2015, the U.S government authorised AGOA for an additional 10 years. AGOA has succeeded in helping eligible nations grow, diversify their exports to the United States, and create employment and inclusive economic growth. Under AGOA, eligible countries can export products, including value-added manufactured items such as textiles, to the United States duty-free. Currently, all 5 EAC Partner States are currently eligible for the AGOA benefits; however, Burundi's eligibility has been revoked with effect from 01 January 2016.

- **Strengthening of Environmental Protection Policy Supervision**

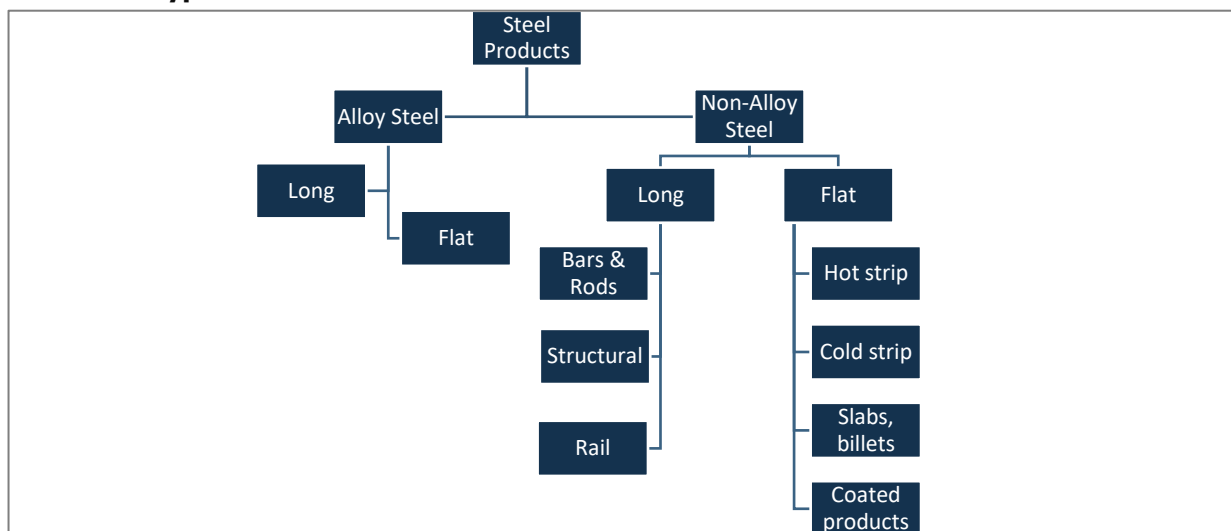
There are various production methods of ferroalloy, which can be divided into blast furnace method, electric furnace method, outside furnace method, oxygen converter method and vacuum resistance furnace method according to production equipment. Among them, the electric furnace method is the main method of producing ferroalloys, and more than 70% of ferroalloys are produced by the ore furnace method. The heat of the ore furnace reaction mainly comes from electric energy, so the electricity cost occupies a high proportion in the production cost of most ferroalloys. Therefore, the ferroalloy industry is an energy-intensive enterprise with high energy consumption, and with the increasingly prominent environmental problems, the management of carbon emissions in the world is becoming more and more strict. At the same time, carbon peak and carbon neutrality have become a global consensus, and the energy saving and carbon reduction of the ferroalloy industry is the only way for the development of the industry. Therefore, in the context of the energy crisis, with the improvement of people's awareness of low-carbon environmental protection, in order to sustainable development, it is expected that the future environmental policy for ferroalloys will be more and more stringent.

5. Steel Industry

5.1 Overview of the Global Steel Industry

Steel is a paramount material in the fields of construction and engineering. It has widespread applications in industries such as automotive, construction, consumer goods, infrastructure, capital goods, mechanical & medical equipment, packaging, and utensils, among others. Its popularity stems from its abundant availability, cost-effectiveness, exceptional strength and durability, ductility, and recyclability. According to the World Steel Association, there are over 3,500 different grades of steel produced worldwide, each possessing unique physical, chemical, and environmental properties to suit various applications.

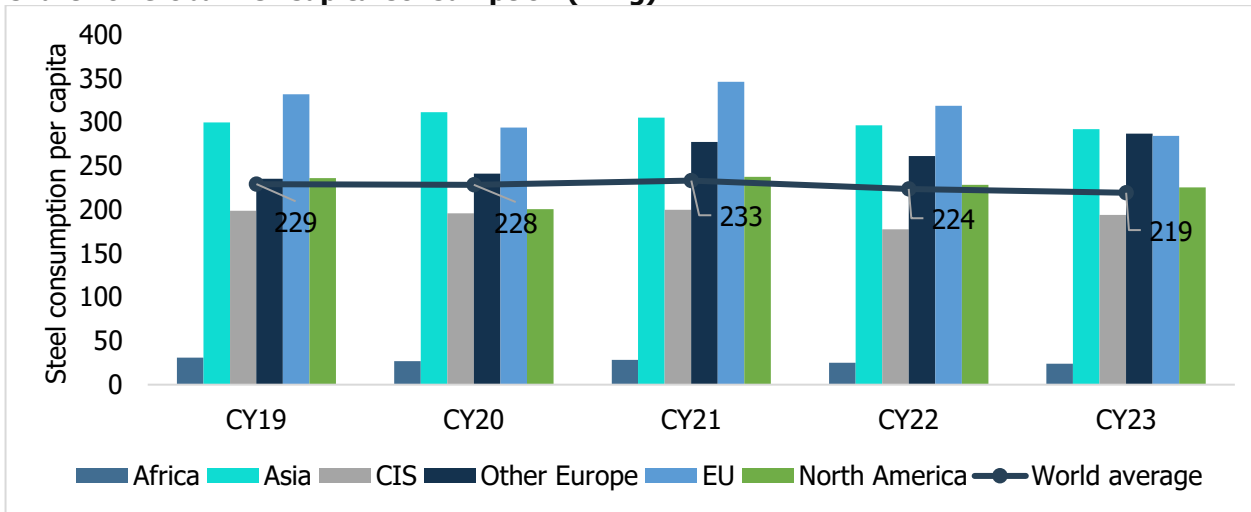
Chart 45 : Types of Steel Products



Source: Industry Sources, CareEdge Research

Further, the global per capita consumption of steel has been on the rise. For instance, the consumption increased to 233 kg in CY21 from 229 kg in CY19. However, it decreased to 224 Kg in CY22 as the demand was affected by macroeconomic factors such as global slowdown and uncertainties due to the Russia-Ukraine war. It further fell down to 219 kg in CY23 due to ongoing geopolitical uncertainty, fluctuations in energy prices, persistent inflation, and bleak economic outlook. As of CY23, the per capita consumption of Asia was the highest at 292 kg in CY23, driven by high consumption in South Korea and China followed by Other Europe (287 kg) and EU (European Union) (284 kg).

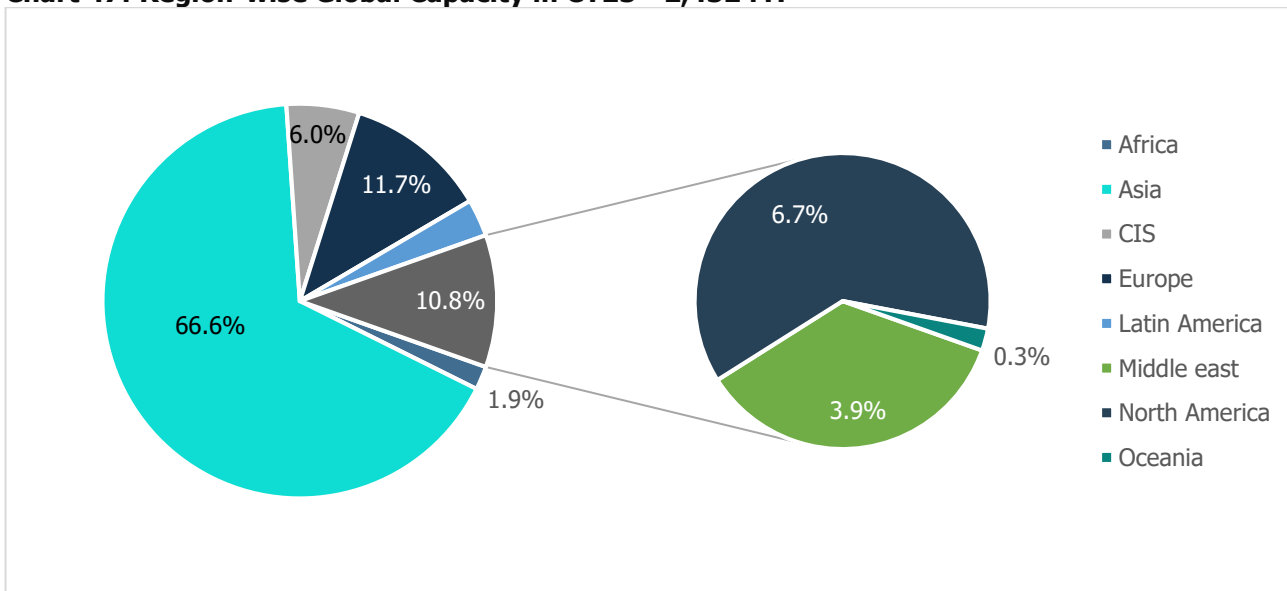
Chart 46: Global Per Capita Consumption (in kg)



Source: World Steel Association

The global steel production capacity reached 2,432 million tonnes (MT) in CY23 with Asia accounting for the largest share of 66.6%. China holds a dominant position in steelmaking capacity, production, and consumption, boasting the highest steel production capacity globally, followed by India and United States. Additionally, the European Union, North America, Latin America, the Middle East, and Oceania also contribute significantly to the global steel production capacity.

Chart 47: Region-wise Global Capacity in CY23 - 2,432 MT



Source: Organisation for Economic Co-operation and Development (OECD)

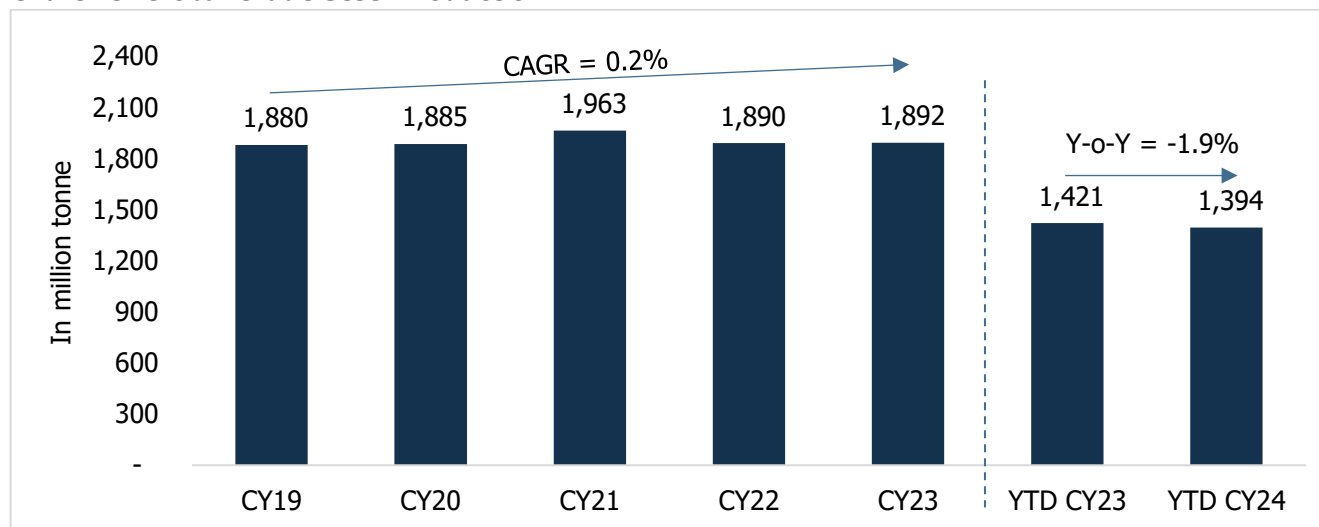
5.2 Global Steel Production

The global crude steel production has grown at a CAGR of around 0.2% to 1,892 MT in CY23 from 1,880 MT in CY19. However, it declined by ~4% y-o-y in CY22 from 1,963 MT in CY21 due to a slowdown in China, monetary tightening in the United States and Europe, inflationary pressures leading to increased input costs, and supply chain disruptions

caused due to the Russia-Ukraine war. Global Crude Steel production remained almost flat in CY23. While for countries like India, Russia, South Korea, and the United States, production increased, production fell in Japan, Germany, Turkey, and Brazil. Moreover, the production remained flat for China and Iran.

During YTD CY24 (January 2024-September 2024), the production of global crude steel decreased by 1.9% corresponding to the same period in CY23.

Chart 48: Global Crude Steel Production



Source: World Steel Association

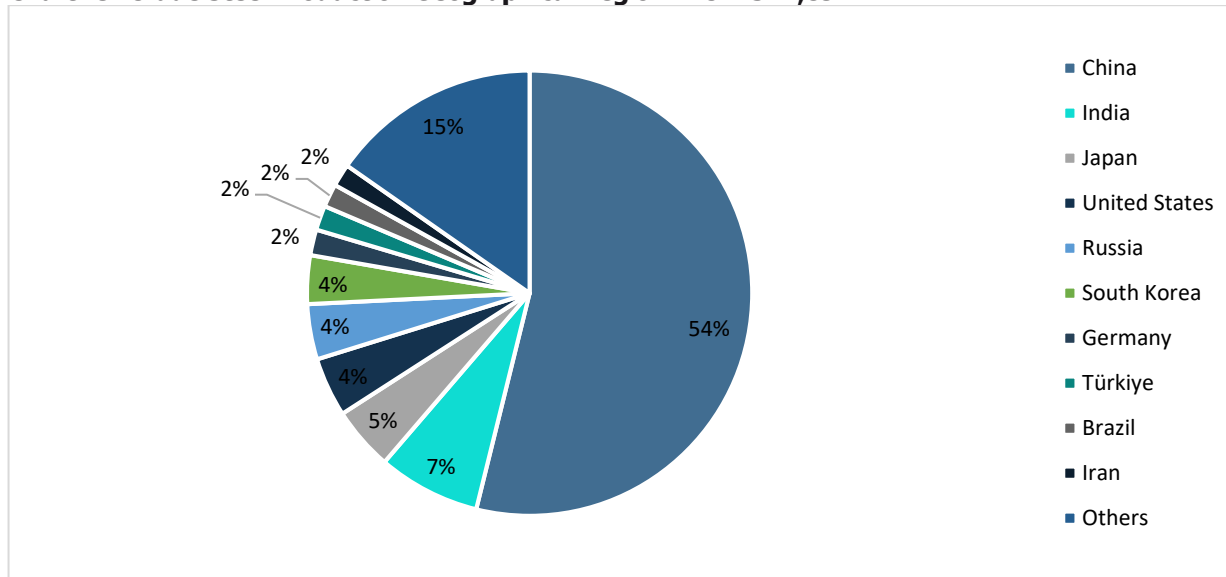
Note: YTD CY23 refers to the period from January 2023-September 2023

YTD CY24 refers to the period from January 2024- September 2024

Further, China continued to be the largest crude steel producer in CY23, accounting for ~54% share. However, Chinese production remained flat in CY23 from CY22. This is due to the decline in steel consumption by property sector and slow progress of infrastructure projects.

India was the second-largest producer of crude steel in CY23 with a ~7% share, followed by Japan with a ~5% share. The USA, Russia and South Korea accounted for around 4% share each in the total production during CY23.

Chart 49: Crude Steel Production Geographical Region in CY23- 1,892.2 MT



Source: World Steel Association

5.3 Global Steel Consumption

Steel is used in industries like energy, construction, automotive, transportation, infrastructure, packaging, and machinery. There was a strong recovery in finished steel consumption post-COVID-19. In developed economies like the USA, Europe, Japan, and South Korea, the demand was driven by the automotive and durable goods sectors.

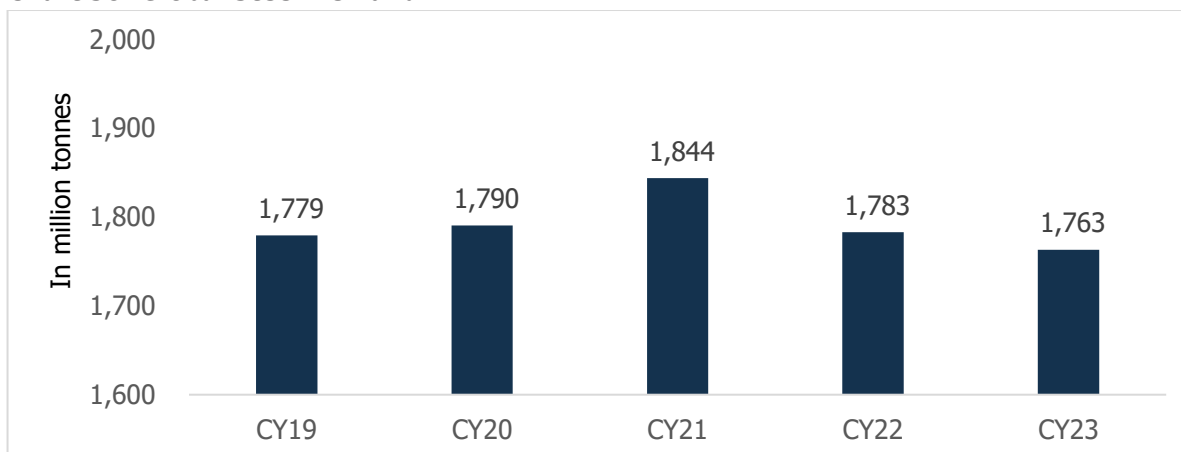
The global finished steel consumption has increased at a CAGR of 1.8% from 1,779 MT in CY19 to 1,844 MT in CY21. During the period CY21-CY23, it declined at a CAGR of 2.2% to 1,763 MT in CY23.

The global consumption of finished steel declined by 3.3% y-o-y in CY22, because global production was affected due to a slowdown in China, monetary tightening in the United States and Europe, inflationary pressures which raised input costs, and disruptions in supply chain due to the Russia-Ukraine war.

Further, the finished steel consumption in China was reduced on account of movement restrictions and lockdowns brought on by COVID-19, environmental concerns, and the target to lower carbon emissions. However, government support is expected to aid in the recovery of demand with the resumption of construction and real estate activities.

Moreover, the consumption of finished steel in India has been robust given increased investments in infrastructure and policy support by the government. Despite the inflationary pressures and uncertainties around the global economy, India witnessed a healthy demand from auto, consumer durables, capital goods, and real estate sectors.

Chart 50: Global Steel Demand

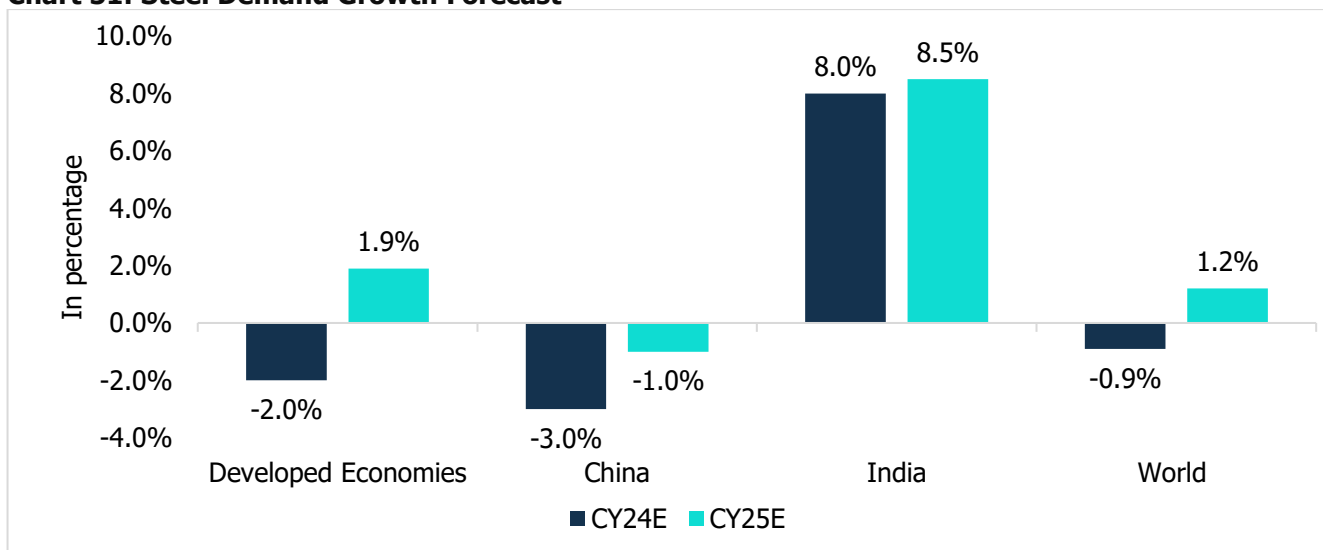


Source: World Steel Association

5.4 Outlook of Global Steel Consumption

The World Steel Association forecasts¹ the steel demand to rebound by 1.2% y-o-y to 1,771.5 MT in CY25 after a decline of 0.9% y-o-y to 1,750.9 MT in CY24. This growth is expected to be driven by the stabilization of China’s real estate sector, effective interest rate adjustments boosting private consumption and investment, and increased infrastructure spending focused on decarbonization and digital transformation.

Chart 51: Steel Demand Growth Forecast



Source: World Steel Association

The steel demand in China, accounting for over half of the global consumption, is expected to decline by 3% in CY24 and decline further by 1% in CY25. The ongoing downturn in the Chinese real estate sector is expected to drive this decline in steel demand. However, the growing possibility of substantial government intervention might aid Chinese steel demand in CY25.

¹ Worldsteel Short Range Outlook October 2024 dated October 14, 2024

The steel demand in India is estimated to grow by 8% in CY24 and 8.5% in CY25. This growth is driven by growth across all steel consuming sectors, especially infrastructure.

The World Steel Association expects demand from developed economies to decline by 2% in CY24 on account of decline in major steel using economies like Korea, Germany, Japan, and the United States. However, the steel demand is expected to increase by 1.9% in CY25. The growth is expected to be supported by the anticipated upturn in steel demand in the European Union and moderate recoveries in Japan and the United States.

5.5 Overview on Indian Steel Industry

India is the second-largest steel producer in the world with an installed capacity of 161.3 MT in FY23. It is also the second-largest consumer of finished steel² with a consumption of 120 MT in FY23. The Indian steel sector growth over the years has been attributed to the domestic availability of raw materials such as iron ore and cost-effective labour. Additionally, the industry has benefitted from domestic demand in sectors such as construction, consumer durables, capital good, railways, real estate, and automobiles. Whereas the vast coastline has enabled exports and imports, making India one of the leading countries in the global steel industry.

Further, the per capita finished steel consumption in India was 93.4 kg in CY23, significantly lower than the world average of 219.3 kg per capita. Aligned with the government's vision of Atmanirbhar Bharat, The National Steel Policy 2017 aims to achieve 300 MT of steel-making capacity by 2030 by enhancing the per capita domestic steel consumption to 160 kg. Steel industry growth contributes to all aspects of the economy, including GDP, industrial, and infrastructural development. It has an output multiplier effect of 1.4x on GDP with an employment multiplier effect of 6.8x³. Thus, the steel industry has significant domestic potential and is expected to play a key role in the future economic growth of the country.

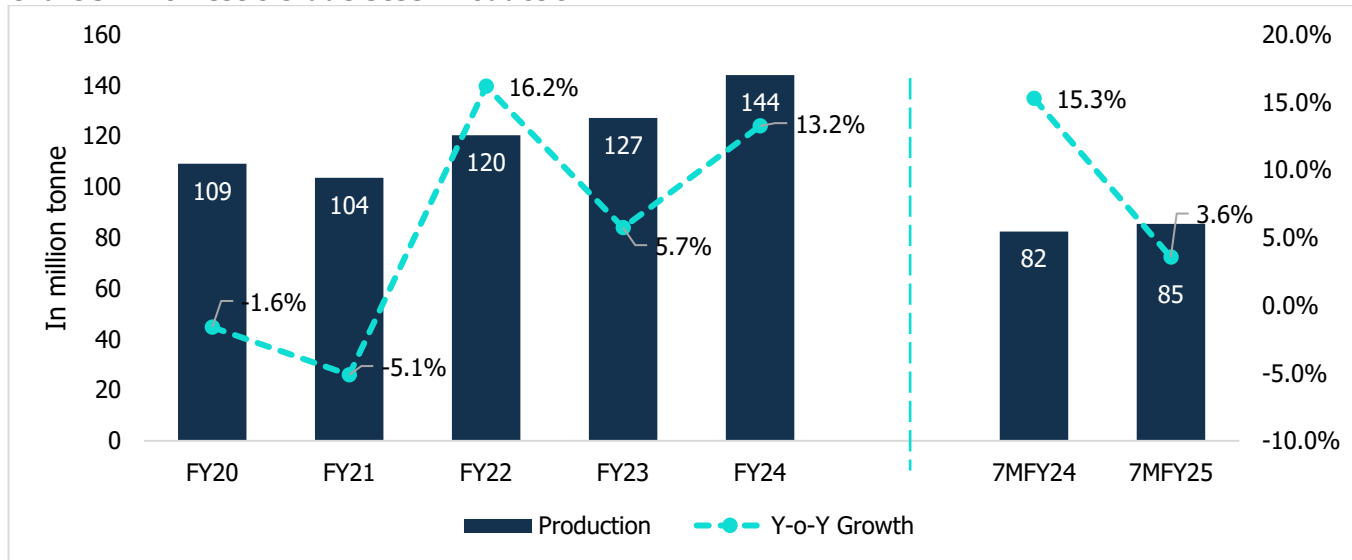
5.6 Domestic Crude Steel Production

The domestic crude steel production has grown at a CAGR of 7.2% in the past five years to reach 144 MT in FY24 from 109 MT in FY20. Large steel manufacturers' capacity utilization has been in the range of 80% to 90% in FY23 and most players have announced the expansion of crude steel capacities. Additionally, improvements in the financial health of steel companies will also ensure that industry is comfortably leveraged to undertake capital expenditure for further capacity addition. The National Steel Policy 2017 envisages achieving 300 MT of production capacity from the current level of 161.3 MT in FY23 to cater to the expected steel demand of 230 MT by FY31. Additionally, for 7MFY25, crude steel production grew at 3.6% y-o-y from 82 MT to 85 MT.

² Finished steel includes both long, flat products and specialty steel

³ National Steel Policy 2017

Chart 52: Domestic Crude Steel Production

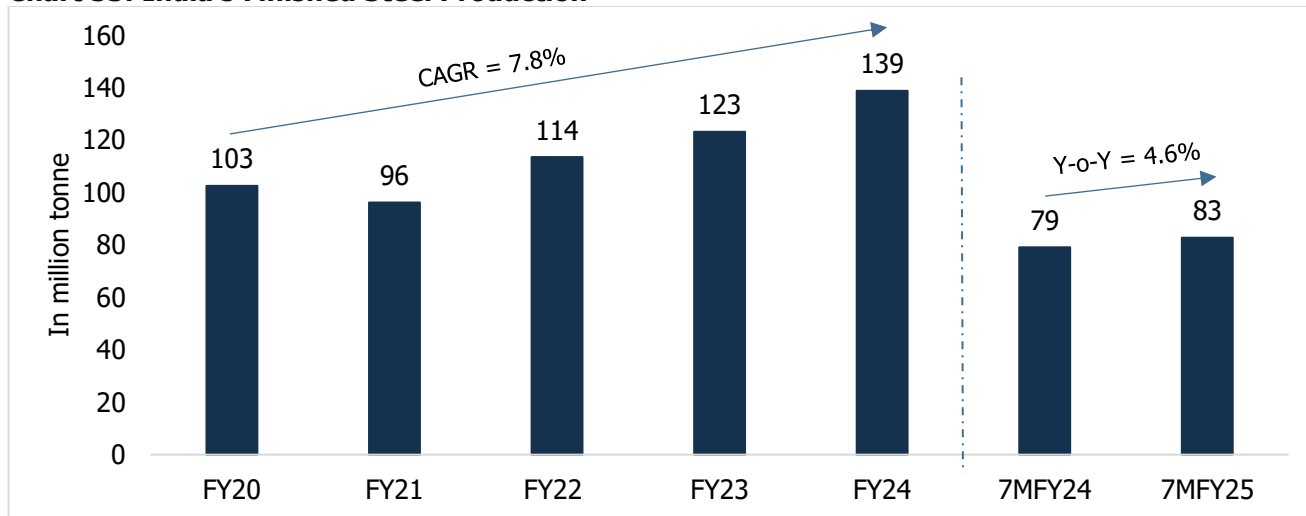


Source: CMIE; Note: 7MFY24 refers to April 2023-October 2023, 7MFY25 refers to April 2024-October 2024

5.7 Domestic Finished Steel Production and Consumption

In the last 5 years, finished steel production has grown at a CAGR of 7.8% to 139 MT in FY24 from 103 MT in FY20. The growth in production has been backed by a rise in domestic steel consumption on account of growing economic activities in the country supported by an increase in infrastructure and construction spending by the government, a rise in automobile and consumer durable demand, among others. Additionally, for 7MFY25, finished steel production grew at 4.6% y-o-y from 79 MT to 83 MT.

Chart 53: India's Finished Steel Production

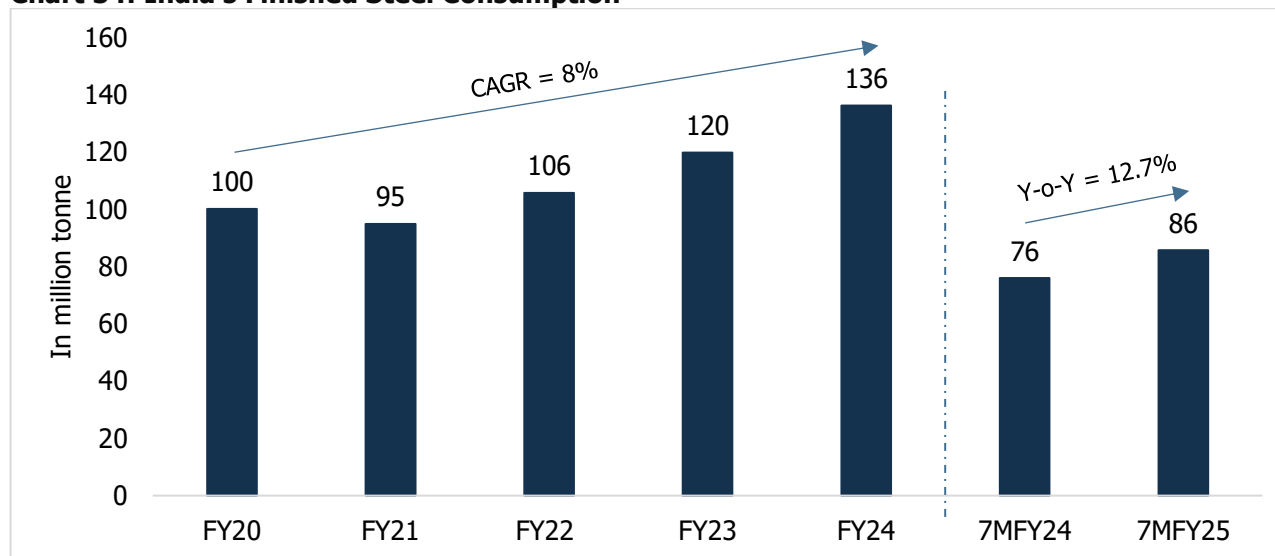


Source: CMIE; Note: 7MFY24 refers to April 2023-October 2023, 7MFY25 refers to April 2024-October 2024

The domestic finished steel consumption has increased at a CAGR of 8% to 136 MT in FY24 from 100 MT in FY20. After a steady increase in steel production, India witnessed a de-growth of 6.3% y-o-y in FY21 due to the outbreak of COVID-19. The rebound in domestic demand from the impact of COVID-19 in the previous financial years, continuous investment in infrastructure, and policy support by the government, and pick-up in real estate construction during

FY23 have led to an increase in consumption of finished steel to 120 MT, implying a y-o-y growth of 13.4%. Further, during FY24 the finished steel production grew by 12.7% y-o-y as compared to its previous year. This growth can be attributed to strong demand in the domestic market which witnessed a growth rate of 13.6% during the same period. Additionally, for 7MFY25, finished steel consumption grew at 12.7% y-o-y from 76 MT to 86 MT.

Chart 54: India’s Finished Steel Consumption



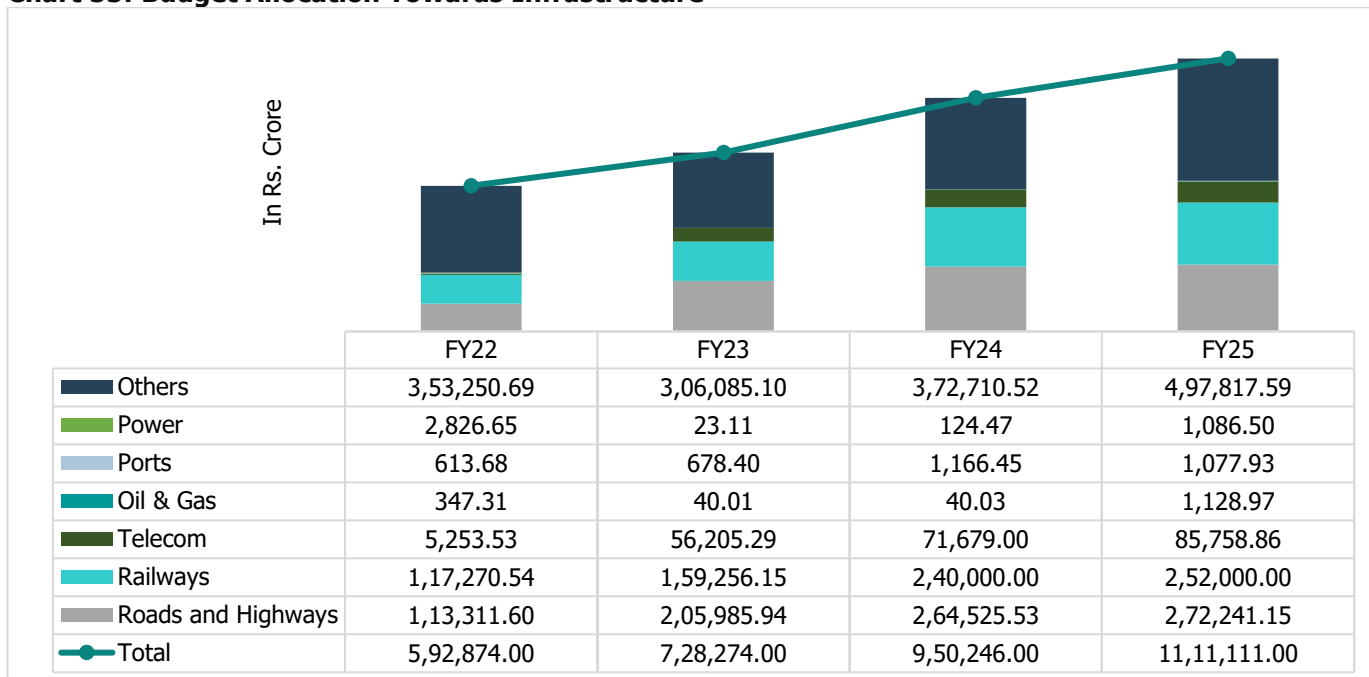
Source: CMIE; Note: 7MFY24 refers to April 2023-October 2023, 7MFY25 refers to April 2024-October 2024

5.8 Key Demand Drivers for Steel Industry

- Continued Thrust on Construction and Infrastructure**

One of the major growth drivers of the steel industry is the infrastructure investment thrust by the Government of India. The budgetary allocation toward infrastructure has grown at a CAGR of about 23.3% in the past 4 years between FY22 to FY25. In the Union Budget 2024-25, the government continued its focus on infrastructure development with the allocation of Rs 11.1 lakh crore toward infrastructure capital expenditure, an increase of 16.9% over allocation under the Union Budget 2023-24.

Chart 55: Budget Allocation Towards Infrastructure



Source: Union Budget 2024-25

The government has expanded the National Infrastructure Policy (NIP) to over 9,000 projects from 6,835 projects and announced plans for the National Monetization Pipeline (NMP) and the Development Finance Institution (DFI) to improve the financing of infrastructure projects. The NIP covering rural and urban infrastructure, entails investments to the tune of Rs. 111 lakh crores, which is being undertaken by the central government, state governments, and the private sector during FY20-25. Moreover, the alignment of PM Gati Shakti National Master Plan and National Infrastructure Policy (NIP) will aid in debottlenecking hurdles for faster execution of projects.

• **Growing Real Estate Absorption led by Increased Urbanisation and Purchasing Power**

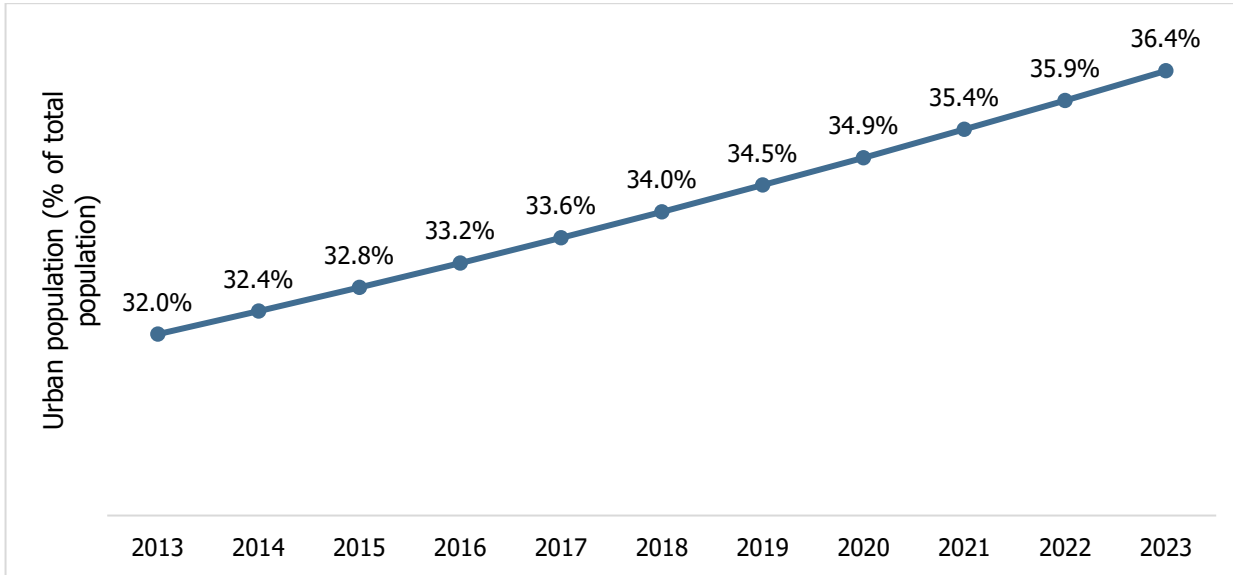
Rising Urbanization

Rapid urbanization bodes well for the sector. India is the second-largest urban system in the world. Indian cities are home to about 11% of the total global urban population.

According to the Ministry of Health and Family Welfare (MoHFW), 2019, urban growth is expected to contribute to around 73% of the total population increase by 2036. Further, as per the Census of India 2011, India has an urbanization level of 31.1%, which has only increased over the years. Earlier estimations indicate that about 416 million people will be added as urban dwellers in India between 2018 and 2050, according to a United Nations study dated 2018. Moreover, India will be 50% urban by 2050, according to UN-Habitat, 2017.

Therefore, the growing urbanization will lead to increased demand for tubular steel structures as it involves usage in the construction of buildings, pipes for water supply, improved drainage systems, waste treatment plants, elevators, etc.

Chart 56: Urbanization Trend in India

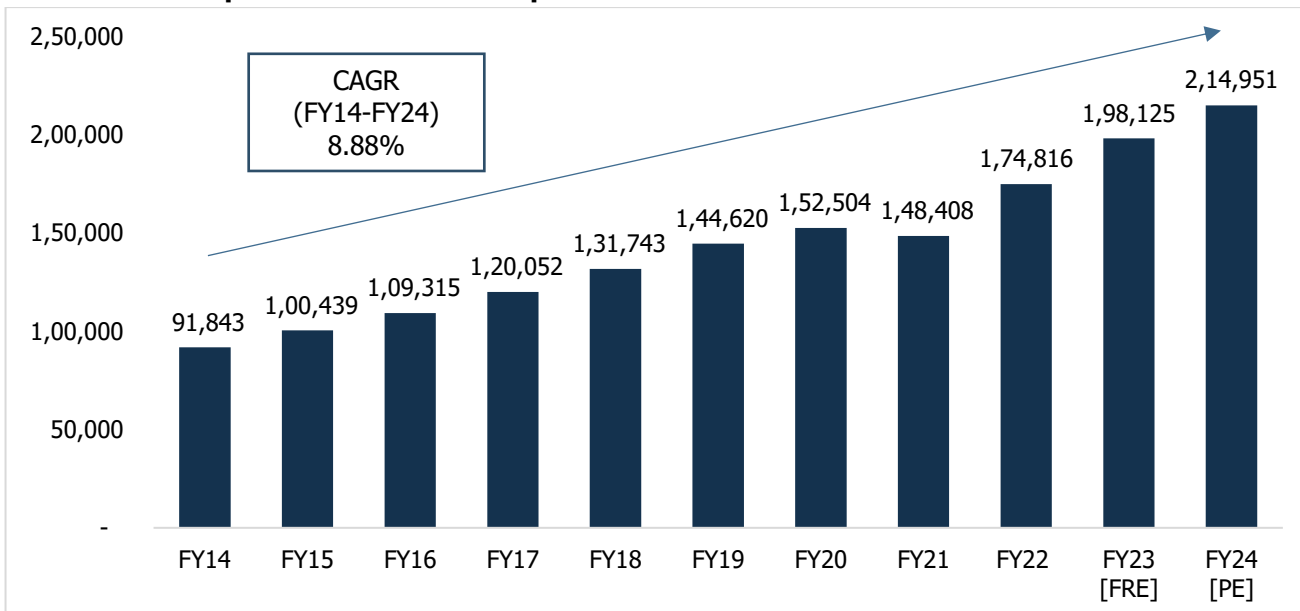


Source: World Bank Database

Growing Purchasing Power

The rising disposable income, which has grown at a CAGR of 8.88% between the period FY14 to FY24, is expected to lead to increased demand for residential real estate in India as more and more people are able to afford real estate purchases. This will lead to more consumption of steel in the country and help the steel manufacturers to produce more steel, thus improving the demand in the steel industry.

Chart 57: Per Capita Gross National Disposable Income



Source: MOSPI; Note: FRE – First Revised Estimates, PE – Provisional Estimate

- **Development of the Natural Gas Sector**

The government's focus on enhancing the share of natural gas in India's energy mix will increase the demand for steel products. Additionally, India has taken several initiatives to develop the natural gas sector such as facilitating the development of gas infrastructure, including LNG terminals, long-distance transmission pipelines, and city gas distribution networks. A total of 1544 Km of pipelines have been laid as part of the National Gas Grid in 2020. Also, the government launched the Indian Gas Exchange (IGX), the first nationwide online delivery-based gas trading platform in 2020.

With the government's focus on increasing natural gas consumption, massive investments are expected in developing the natural gas infrastructure. Many infrastructural developments are in progress including expansion of LNG import capacity, addition of new gas pipelines, and development of city gas distribution networks. As of June 2024, the total operational length of the national gas pipeline network is 23,563 km whereas 5,630 km are under construction. The government's favourable policies will help drive the gas demand growth over the next decade, and this, in turn, will boost the demand for steel.

The natural gas sector, with the announcement of the 'One Nation One Gas Grid' initiative, will attract new investments. It is expected that the gas pipeline network which stands at 24,945 km as of September 2024, will reach 35,000 km in the coming 4-5 years. Accordingly, the increasing length of natural gas pipelines by 2024-2025 is expected to contribute toward the expansion of steel pipe production. The efforts of moving towards a gas-based economy and the implementation of city gas distribution networks are expected to augment the demand for pipes going forward. Besides, the increasing number of CNG stations (7,125 as of August 2024), bio-refineries, bio plants, etc., will support the infrastructure for gas.

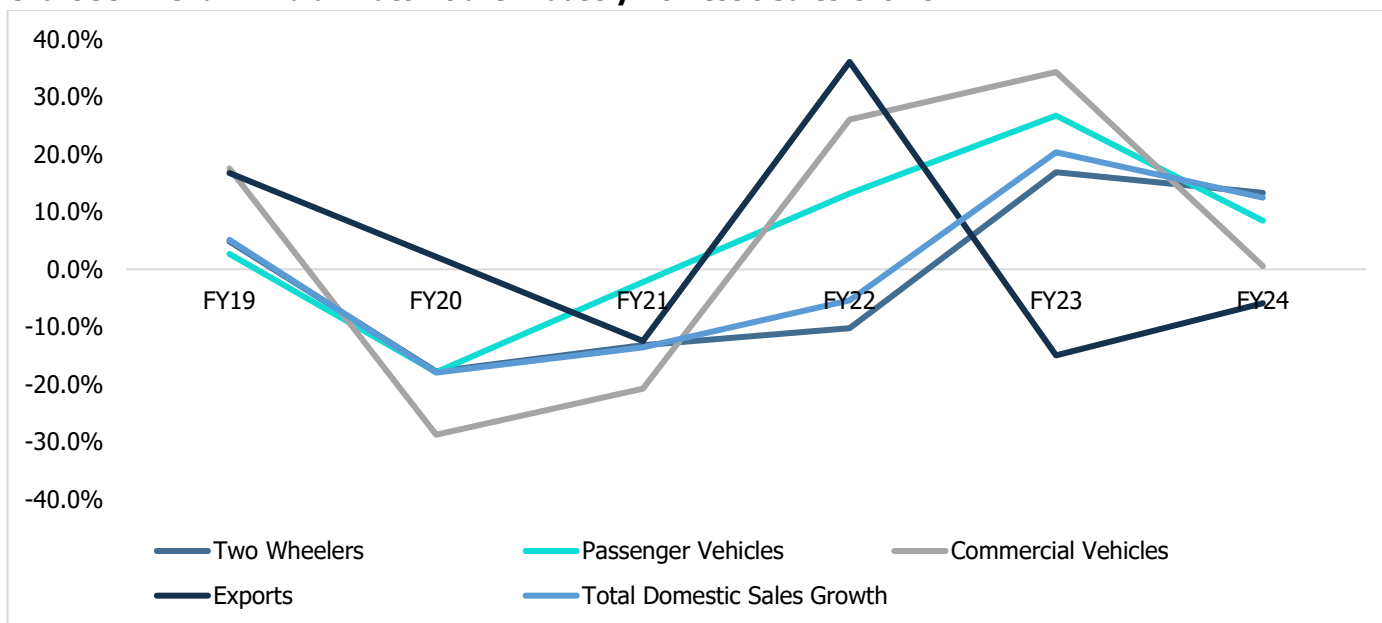
- **Stable Growth in the Automotive Industry**

Steel products are used in the main structure of the vehicle known as the chassis. They are also used in other automotive components such as control shaft tube stack pipes, shock absorbers, exhaust pipes, sway bars, other vehicle accessories (side railings, bumpers, and grill guards), etc.

India was the third-largest automobile market in 2022. After witnessing a de-growth due to the pandemic, the automobile sector began to recover on account of a revival in economic activities. For instance, domestic automobile sales grew by 20% y-o-y in FY23, the first full year without any impact of the pandemic after a gap of two years. The growth in sales volume across segments was supported by healthy demand in the urban areas, increasing replacement demand, growing demand for utility vehicles in the passenger vehicle segment, vehicle scrappage policy, and higher infrastructure spending.

Despite inflationary pressure throughout the year, preponing purchases before the implementation of new fuel emission norms (BS-VI Phase -II), easing of semiconductor chip supply, and pent-up demand supported the sales growth. During FY23, all the categories saw double-digit growth, with two-wheelers at 17%, passenger vehicles at 27%, commercial vehicles at 34%, tractors at 12%, and 3-wheelers at 87% y-o-y growth in domestic sales.

Chart 58: Trend in Indian Automobile Industry Domestic Sales Growth



Source: CareEdge Research, SIAM

During FY24, growth in domestic sales growth for two-wheelers was 13.3%. For passenger and commercial vehicles, it was 8.4% and 0.6% in FY24 respectively. Total domestic sales (excluding tractors) grew by 12.5% in FY24. The growth momentum is expected to continue after the robust demand (20% sales growth) seen in FY23, supported by favourable demand sentiments and various government initiatives for the rural and urban development.

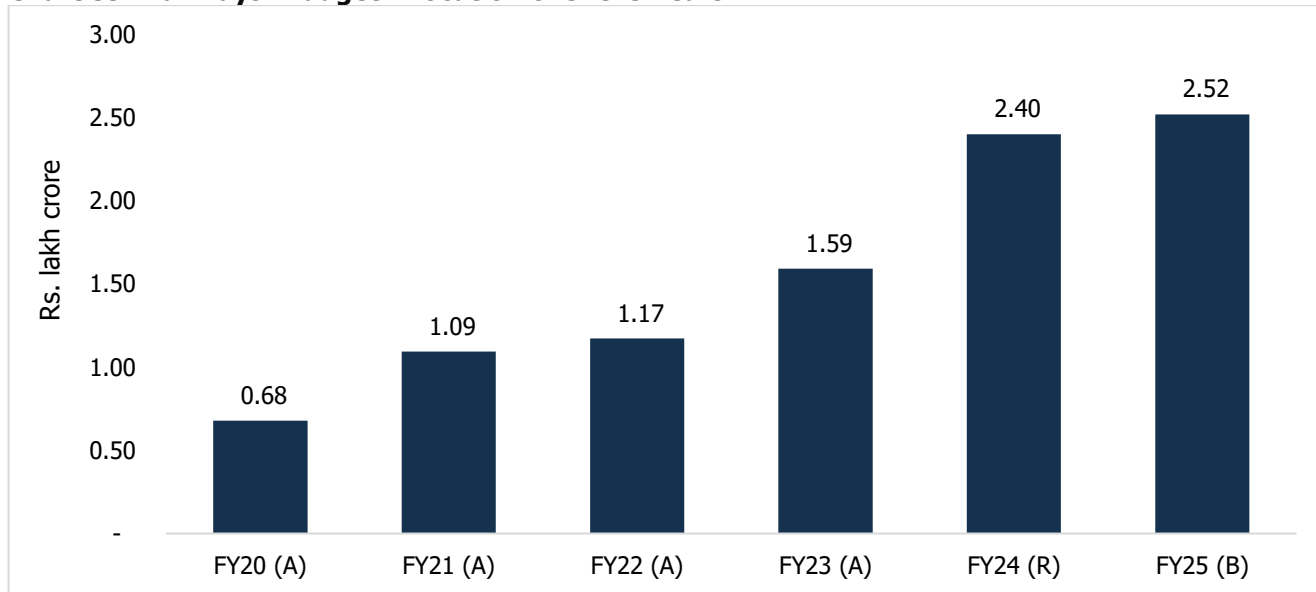
Furthermore, the automobile sector growth will be supported by electric vehicles (EVs) due to the increasing shift toward electric vehicles. In February 2024, the Ministry of Heavy Industries also enhanced FAME (Faster adoption and manufacturing of EVs) subsidies from Rs. 10,000 crores to Rs. 11,500 crores. As per the revised outlay, electric two-wheelers, electric three-wheelers, and electric four-wheelers are eligible to avail of subsidies to the tune of Rs 7,048 crore. Moreover, the cut in customs duty on lithium-ion batteries from 21% to 13% will also result in more sales and accelerate the demand for EVs.

• **Growing Infrastructure for Railways**

As the infrastructure expenditure to GDP multiplier is estimated to be 2.5-3.5x, the government has identified infrastructure development as a key focus area to become a USD 5 trillion economy by 2026-27. To achieve this objective, the government launched the National Infrastructure Pipeline (NIP) in 2020, which identified a group of social and economic infrastructure projects to be implemented during FY20-25. The expected Capex under NIP is USD 1.4 trillion with railways having an allocation of 12%. Railways are one of the key enablers for economic growth and an investment of USD 750 billion was suggested by the government in the Union Budget 2019-20 to improve the railway infrastructure over 2018-2030.

Accordingly, the budgetary allocation to Indian Railways has consistently been on the rise. The Capex for Indian Railways has increased substantially from Rs. 0.68 lakh crore during FY20 to Rs. 2.52 lakh crore allocated in the Union budget 2024-25. This is an increase of 5% over the previous year’s allocation.

Chart 59: Railways- Budget Allocation over the Years



Source: Budget Documents. Note: B – Budgeted, A – Actual, R – Revised and Includes Internal and Extra Budgetary Resources (IEBR)

• **Expansion of Metro Rail**

As of March 2024, about 945 Km of metro lines have been operationalised across 21 cities. The metro network, including regional rapid transit systems (RRTS), is proposed, to be expanded to 1,700 Km across 27 cities by 2025 and subsequently to 50 cities. The government is also proposing Metro Lite and Metro Neo lines suitable for smaller cities with lower peak traffic. Currently, approximately 2,500 coaches have been deployed in the operational metro lines roughly costing 32,500 Cr. 31 metro rail projects are under construction and 18 projects are under approval. As the operational metro lines are expected to increase by more than 2x over the next 4-5 years, domestic demand for metro rail rolling stock is expected to witness a significant increase.

• **Others**

The growth in demand for steel products will also be supported by transportation, capital goods (construction, electrical equipment, machine tools, industrial machinery, plant equipment, etc.), aircraft components, mining activities, and renewable energy projects.

5.9 Outlook of Indian Steel Consumption

The steel consumption in India has witnessed a double-digit growth for the third time consecutively in FY24. The growth is attributed to enhanced activities in the construction sector and the sustained momentum in the real estate and automobile sectors.

On export front, shipments remained weak during FY23 and FY24 despite the removal of export duty on steel products by the government in November 2022 and India became a net-importer of steel.

Furthermore, the steel demand will be driven by end-user industries such as construction, real estate, railways, roads, power, auto, capital goods, consumer durables, etc. In addition, government expenditure on infrastructure is expected to augur well for the sector.

For instance, the thrust toward infrastructure projects is majorly contributing to the increased steel demand in the domestic market.

Some of the key budgetary announcements which reflect the same are:

- Significant increase in allocation towards Product Linked Incentive (PLI) Scheme for Specialty Steel from Rs. 2.4 Crore to Rs. 270 Crore.
- An increase of 16.9% in the allocation of CapEx towards infrastructure from Rs. 9.5 lakh crore to Rs. 11.1 lakh crore in Union Budget 2024-25.
- A capital outlay of Rs. 2.5 lakh crore for Indian Railways.
- Rs. 84,670.8 Crore was allocated towards the Pradhan Mantri Awas Yojana (PMAY) scheme from Rs. 79,590 Crore in the previous budget. Moreover, an additional 2 crore houses have been targeted for the next 5 years under PMAY Grameen.
- Also, the Budget allocated Rs. 70,163 Crore towards Jal Jeevan Mission from Rs. 70,000 Crore.

Moreover, the ongoing expansion and development of airports under the Ude Desh ka Aam Nagrik (UDAN) scheme to enhance regional air connectivity. Whereas continual developments in metros are in place to promote urban transformation and enhance the railway infrastructure. Such factors are raising the demand for steel.

On the other hand, global steel prices are expected to remain stable in range. Similarly, domestic prices are also expected to trend in line with global prices.

Based on the above factors, CareEdge Research estimates India's steel demand to be moderate at 6-8% in FY25.

6. Key Growth Drivers for Refractory Materials

• Mineral Rich Resources in Africa

Africa is rich in mineral resources. Its reserves and mineral tastes occupy a particularly important position worldwide. Ferrochrome is concentrated on the African continent. It is mainly distributed across Southern Africa, South Africa, and Zimbabwe and among a small number of countries such as Madagascar and Sudan. The chromite deposits in South Africa are mainly distributed across the Bushveld complex, located in the northeast of the country. The ore bodies are mainly layered, with 300 million tons reserves. Whereas Zimbabwe has 140 million tonnes of chromite reserves. South Africa and Zimbabwe together account for 80% of the world's chromite reserves.

Further, manganese ore is mainly distributed across South Africa, Gabon, Ghana, Morocco, Angola, the Democratic Republic of the Congo, Namibia, and other countries. Of these, South Africa has the world's largest manganese resources with 370 million tons reserves, accounting for 46% of the world's total reserves. Gabon is the second-largest manganese resource country in Africa with 45 million tons reserves.

While iron ore in Africa is mainly distributed in the Republic of South Africa, followed by the Democratic Republic of Congo, Gabon, Guinea, Mauritania, Morocco, Egypt, Zimbabwe, Tanzania, Liberia, Angola, and other countries. Moreover, South Africa is the largest iron ore resource country in Africa with 1 billion tons reserves, accounting for more than 40% of the total iron ore reserves in Africa.

The raw materials of ferro alloy are iron ore, metal ore, and non-metal ore. Whereas the raw materials for ferro manganese alloy are manganese ore and coke. Moreover, manganese ore accounts for the largest share of the production cost of ferromanganese. Africa is also the largest supplier of manganese ore, shipping manganese ore worldwide. Therefore, Africa, especially South Africa, is rich in resources and provides development opportunities for the refractory materials industry.

• Mature Steel Industry of South Africa

South Africa's metallurgical industry is large, well-developed, and rich in resources, with good infrastructure. It encompasses basic iron ore, steel, basic non-ferrous metals, and metal products. The steel industry includes raw ore smelting to semi-finished product stages. In addition, South Africa's steel production ranks 19th worldwide. It is also the largest steel-producing country in Africa, accounting for 60% of the total steel production in Africa. Moreover, it is one of the world's largest net exporters of steel with products exported to the Far East, the European Union, North America, Africa, the Middle East, and South America.

Furthermore, the booming infrastructure development has promoted the demand for steel across Africa in recent years, with Africa enhancing its infrastructure-supporting facilities and promoting the industrialization process. This has led to the establishment or upgrading of more rolling mills to meet the growth of steel demand. Therefore, South Africa's well-developed steel industrial base enables a good foundation for the ferro alloy industry development. Whereas the growth of African steel demand in recent years will promote the development of the ferro alloy industry.

• Increased Infrastructure Spending

Emerging market economies like Africa are often thought of as economies in transition to developed market economies. The growing steel industry demand will enable development opportunities for the refractory material industry development. Increased steel production capacity and significant investments in infrastructure construction aid in accelerating urbanization and modernization in emerging economies. Therefore, investments in infrastructure accelerated, high-tech industries maintaining their rapid growth this year, and major projects played a stronger role in driving growth of the

analysed industry. Therefore, the growing investments in infrastructure will propel the growth of steel demand, thereby promoting the development of the ferro alloy industry.

- **Increasing Oil Demand in Africa**

Based on the complete development of the oil industry in some African countries, the development of related industries is promoted, such as the supply and export of petroleum coke industry. Petroleum coke is a by-product of oil refining, and calcined petroleum coke is a high-purity carbon material produced by high-temperature processing of petroleum coke. In recent years, the continuous discovery of oil and gas resources, as well as regulatory policies and rapidly growing energy demand, have provided major opportunities for the African oil industry and also promoted the development of oil-related industries. Take Nigeria as an example, Nigeria is Africa's largest oil producer, Africa's largest economy and the world's sixth largest oil exporter, and is also a member of the Organization of Petroleum Exporting Countries (OPEC). The law is expected to spur investment and boost the region's oil industry.

- **Increasing Downstream Demand**

The refractory materials discussed in earlier chapters are used in steelmaking. Therefore, the growth is driven by the steel industry demands. Steel is a widely used downstream, involving power, petrochemicals, environmental protection, automobiles, transportation, ships, construction, etc. In recent years, with the development of the world economy, the process of global urbanization and modernization continues to deepen, the downstream application field of steel continues to increase, and the demand for steel products is increasingly perfect, driving the development of the industry. Also, the government is focusing on improving the supply of steel to industries such as infrastructure, armaments, and advanced military equipment. In short, the expansion and prosperity of the steel market brought about by the strong demand for steel will continue to promote the development of the refractory materials market.

- **Vigorous Development of Petroleum Processing Industry**

Petroleum is the main raw material of calcined petroleum coke and a by-product of petroleum processing industry. With the steady growth of economy, the rise of automobile ownership, and the rapid growth of organic chemical industry, the processing volume of crude oil has maintained a steady growth trend, which has indirectly promoted the development of calcined petroleum coke industry. According to Statista, the global production capacity of petrochemical products reached nearly 2.3 billion tons in 2021. By 2030, substantial growth is expected, with China, India and Iran among the countries with the most announced or planned additions to petrochemical capacity. China alone plans to add 134 million tons of capacity per year to dominate the market in the medium term. The vigorous development of petroleum processing industry has led to the development of calcined petroleum coke industry and provided a new opportunity for the development of calcined petroleum coke industry.

- **Increasing Demand for Petroleum Calcined Coke in Steelmaking**

Calcined petroleum coke is mainly used as a carburizer in steelmaking, which is used to increase the carbon content in molten steel. It acts as a carburizer, and its main component is carbon. High quality steel carburizer adjusts the carbon content of molten steel to improve the quality of steel at the same time, the content of harmful elements is low, not only effectively protect the environment to reduce the emission of harmful gases, but also to prevent the production of brittle steel caused by sulphur, while the higher the carbon composition, the lower the ash, volatile content and other debris. If there is no special petroleum coke carburizer in steelmaking, it will break the balance of carbon elements in steel making, resulting in poor absorption of carbon in steel, resulting in serious slag reflux in steel, which will increase pollution in environmental protection, and cause a decline in steel quality. Calcined petroleum coke plays an important role in steelmaking, so its market development can be driven by the growth of steel demand.

- **Rising Demand from the Steel Sector and Infrastructure Growth**

The ferro alloys industry in India is experiencing a strong growth trajectory, primarily driven by the increasing demand from the steel sector. The rise in demand for stainless steel and alloy steel, both crucial components for industrial applications, is bolstered by expanding sectors like construction, automobiles, and infrastructure. The Indian government's significant investment in infrastructure development, including projects in railways, roads, and housing, has created a surge in steel consumption. As India moves forward with ambitious infrastructure goals, the ferro alloys industry stands to benefit greatly. This presents long-term growth opportunities, especially as India's demand for stainless steel increases in line with its economic progress and infrastructure expansion. The combination of domestic consumption growth and India's positioning as a major exporter of ferrochrome will further enhance the sector's growth prospects.

- **Technological Advancements and Industry Consolidation**

The ferro alloys industry in India is becoming increasingly competitive, prompting companies to adopt strategies such as capacity expansion and technological innovations. Investment in greenfield manufacturing units reflects the industry's confidence in meeting future demand. To improve efficiency and reduce environmental impact, companies are turning to cleaner technologies, such as submerged arc furnaces, which enhance both operational performance and sustainability. Technological advancements also help address rising production costs and optimize resource usage. This shift towards innovation enables ferro alloy producers to navigate challenges like supply chain disruptions, increasing raw material costs, and fluctuating market conditions. Industry consolidation is another important trend, as smaller players merge with larger ones or improve operational efficiencies to remain competitive. Government initiatives, which focus on self-reliance and boosting domestic production capabilities, support the sector's resilience against market volatility. These technological improvements and consolidation efforts ensure long-term sustainability and growth for the ferro alloys industry in India.

- **Global Export Opportunities and Market Demand**

India's ferro alloys industry benefits significantly from the growing global demand for ferrochrome and other ferro alloys. India is a leading exporter of ferrochrome, producing approximately half of its output for export markets. The global demand for stainless steel, particularly from developed markets like the U.S. and Europe, continues to drive the need for high-quality ferro alloys. As economies worldwide recover and infrastructure and manufacturing sectors grow, the demand for these alloys is expected to remain robust. India's export opportunities are further supported by competitive pricing, efficient manufacturing capabilities, and proximity to key markets in Asia. The rising global consumption of stainless steel, coupled with India's increasing production capacity, will continue to strengthen the country's position as a major player in the global ferro alloys market. Additionally, the expanding market for alloys in renewable energy sectors, automotive manufacturing, and aerospace applications adds another layer of growth potential for Indian producers.

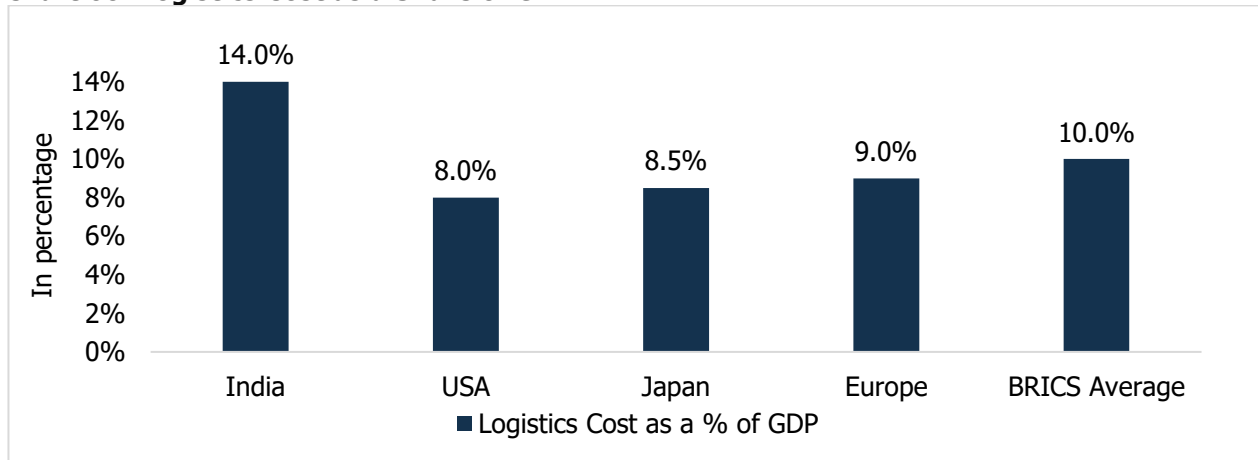
7. Threats and Challenges

Threats and challenges in India:

- **High Logistics Costs**

Logistics costs in India are significantly higher compared to global peers and account for about 14% of the GDP. The chart below shows the comparison of the share of logistics cost in GDP of India vs. developed economies.

Chart 60: Logistics Cost as a Share of GDP



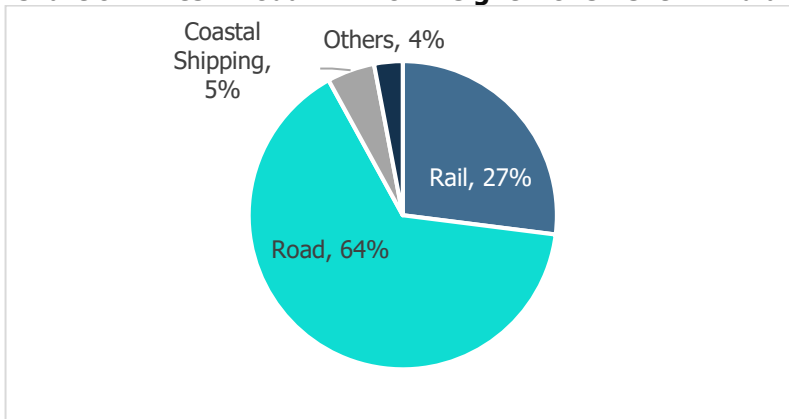
Source: Ministry of Railways, Report of the Committee on Mission 3000 million tonnes, Industry Sources

The logistics industry connects other industries to domestic and international markets. It affects the efficiency of the manufacturing global value chains and the competitiveness of a country’s economy within these value chains.

Some of the reasons that can be attributed to the higher cost of logistics in India are:

- **Inter-Modal Mix is Skewed toward Road Transport:** The capacity of Indian railways is constrained and there are various challenges like rake availability and delays in rake placements. Road transport is preferred compared to railways despite it being a cheaper alternative. Road transport currently has a share of about 64% in the freight movement in the country.

Chart 61: Inter-modal Mix for Freight Movement in India as of FY22



Source: National Railway Plan

- **Inefficient Transport Vehicles:** India has a fleet of small and inefficient trucks. The highest capacity of trucks in India is between 16 tonnes and 32 tonnes. Whereas in countries like China, the trucks have 26-40T capacity.
- **Road Infrastructure Constraints:** Underdeveloped road infrastructure leads to inefficient movement of freight. Additionally, there is a lack of 4/6 lane roads, which further results in congestion across the key routes leading to an increase in costs.

The high cost of logistics adversely affects the global competitiveness of Indian steel products.

• **Global Slowdown**

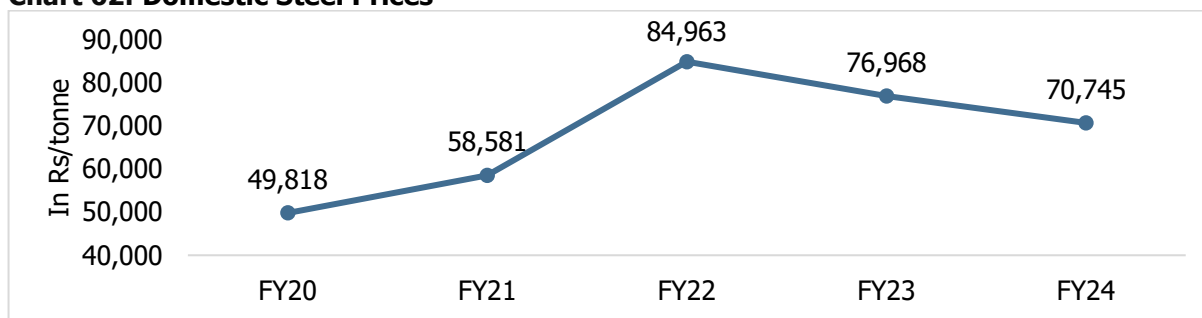
Global growth, which stood at 3.3% in CY23, is anticipated to fall and remain at 3.2% in both CY24 and CY25. The global real GDP growth outlook shows signs of improvement as cyclical imbalances ease, aligning economic activity with potential output in major economies. While global disinflation progresses, risks remain, particularly from financial market volatility and geopolitical tensions that could disrupt trade and increase commodity prices. Nonetheless, stronger public investment in advanced economies aimed at infrastructure and the green transition may stimulate private sector investment and bolster global demand. Additionally, accelerating structural reforms in both advanced and emerging markets could enhance productivity and support medium-term growth.

• **Volatility in Steel Prices**

The prices of steel have been volatile due to geopolitical tensions, weak international demand, and fluctuation in raw material costs, such as coking coal and iron ore.

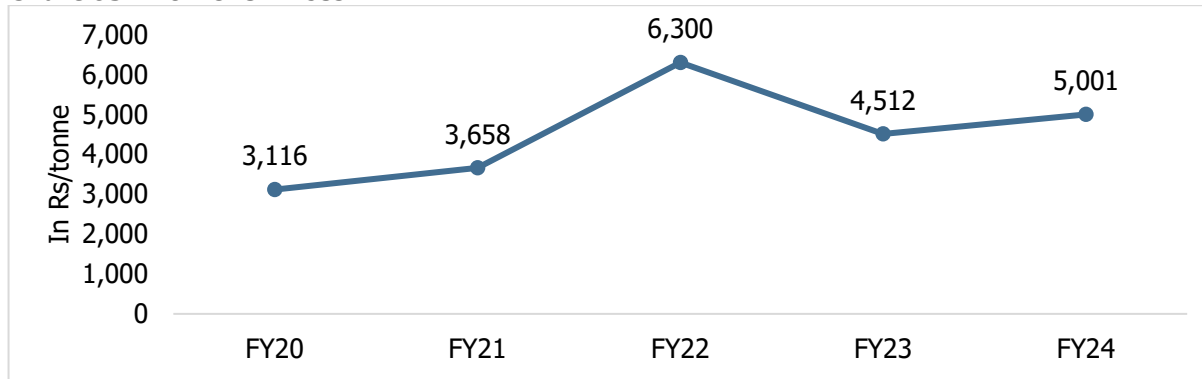
Further, volatility in steel prices could impact the input cost of steel manufacturers. In case of a sharp correction in steel prices, players need to sell high-cost inventory at lower prices which temporarily impacts their margin. Further, if the prices remain high over a long period, the procurement from industries such as water infra, irrigation, etc., gets postponed, thereby impacting the demand.

Chart 62: Domestic Steel Prices



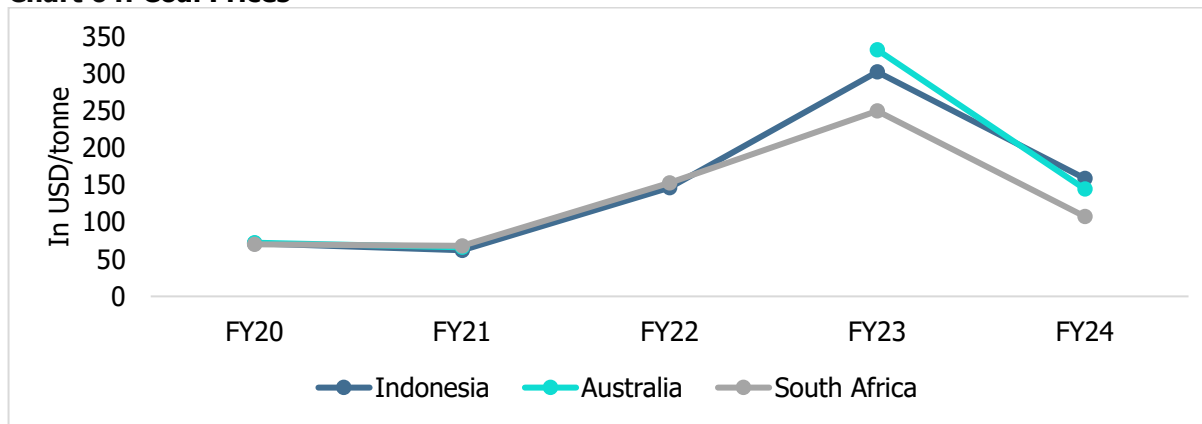
Source: CMIE

Chart 63: Iron Ore Prices



Source: CMIE

Chart 64: Coal Prices



Source: CMIE

• **Lack of Infrastructure**

The ferro alloy industry is a high-energy consumption industry. The main factors restricting local ferroalloy production in African countries are high power costs and poor transportation infrastructure. Although Africa is rich in resources, it is extremely difficult to transport to the entire African region, given the constraints in the railway, road, and other transportation facilities. Additionally, it is impossible to convert resources into economic benefits.

Also, there are huge differences in power development in Africa. For example, South Africa and some North African countries (Egypt, Algeria, etc.) have relatively perfect power system development. Whereas Congo (Democratic Republic of), Ethiopia, Mali, Sudan, and other regions are devoid of power infrastructure; most areas cannot use electricity. As a result, intermittent power outages are commonplace in most African cities and towns, with frequent blackouts making diesel generators a necessity.

Furthermore, in remote rural areas, many homes do not even have electricity. Access to electricity is difficult and expensive, which has become a solidified label in Africa. In addition, according to a 2018 report released by the African Development Bank, the average cost of electricity for manufacturing companies in Africa is close to \$0.2 per kilowatt hour, about four times that of industrial electricity in the rest of the world. Moreover, data released by the International Energy Agency (IEA) shows that 580 million people in Africa did not have access to electricity at the end of 2019. Therefore, the lack of infrastructure and the high cost of electricity are key factors restraining the industry growth.

- **Restriction in Raw Materials**

The main upstream raw materials of ferro alloy are iron ore, metal ore, non-metallic ore, coal, etc. Raw material costs account for an important share of production costs. Iron ore is one of the important raw materials of ferro alloy. In addition, as a bulk trade commodity with several price factors, the international economic & trade situation and iron ore downstream demand changes & its replacement commodities, have an impact on iron ore prices. Accordingly, the fluctuating iron ore prices will affect the production cost of ferroalloys, thus limiting the development of the industry.

- **Fierce Competition**

The ferro alloy market is highly competitive. The increasing investment in infrastructure construction and the automotive, aerospace, shipbuilding, and other industries has raised the demand for steel. However, the expanding downstream demand enables good prospects for ferro alloy products. At the same time, it results in a growing number of industry players. Thus, the market competition is increasing as the market expands, adversely affecting the average profit level of the industry. For enterprises with good reputation in the industry, if they cannot continuously improve their technical level, enhance innovation ability, expand production capacity, and improve management efficiency, they may be at a disadvantage in the market competition, resulting in declined product gross profit margin and profitability. Therefore, the fierce competition in the industry may affect the further expansion of the market.

8. Competitive Landscape

➤ Raghav Productivity Enhancers Limited

Raghav Productivity Enhancers Limited ('RPEL' formerly known as Raghav Ramming Mass Ltd.) is the world's largest manufacturer of silica ramming mass. The company manufactures, supplies and exports silica (acidic) ramming mass and refractory products to its customers across the globe. The company offers premium quality White Silica Sand, Casting Powder, White Ramming Mass, Premixed Ramming Mass, Quartz Silica Ramming Mass. It caters to around 100+ big-capacity steel plants in India and other countries including the Middle East, Africa and South East Asia. RPEL relentlessly strives to maintain global quality standards and produce high-quality products using best-in-class materials and advanced technology.

The Company's manufacturing units are located in Newai, Tonk (Rajasthan). The plants are equipped with fully-automated processing and VSI based crushing technology and have installed capacity of 180,000 MTPA of ramming mass, respectively. The Company is setting up a new plant under its wholly owned subsidiary with 180,000 MTPA capacity adjoining its existing plants. Further, the Company's in-house research and development laboratory, which is the only government-approved facility in India, develops customised furnace lining solutions to meet and exceed the needs and demands of its customers.

Table 15: Raghav Productivity Enhancers Limited – Company Profile

Information	Description
Company Name	Raghav Productivity Enhancers Limited
Establishment Year	2009

Source: Company disclosures

Table 16: Raghav Productivity Enhancers Limited – Financial Information (Consolidated)

Particulars	Unit	FY20	FY21	FY22	FY23	FY24	H1 FY25
Revenue	Rs. crore	66	65	100	137	133	94
EBITDA	Rs. crore	15	15	25	36	40	25
PAT	Rs. crore	9	9	18	25	26	17
EBITDA Margin	%	23%	23%	25%	26%	30%	27%
PAT Margin	%	14%	14%	18%	18%	20%	18%
Current Ratio	Times	2.3	6.9	3.2	4.4	5.3	5.8
Debt to Equity	Times	0.1	0	0.1	0.1	0.1	0

Source: Company Reports

➤ Maithan Alloys Limited

Maithan Alloys Ltd is among India's leading manufacturers and exporters of niche value-added manganese alloys. The company is the largest ferro-manganese manufacturing company in India offering a range of ferro-alloys (ferro-manganese, silico-manganese and ferrosilicon). The Company is a nationally dispersed manufacturer leveraging its respective geographic advantages, comprising an access to natural resources, power, customers, tax advantages and ports. The Company's manufacturing units are located in Kalyaneshwari (West Bengal), Visakhapatnam (Andhra Pradesh) and Byrnihat (Meghalaya).

Table 17: Maithan Alloys Limited – Company Profile

Information	Description
Company Name	Maithan Alloys Limited
Establishment Year	1985

Source: Company disclosures

Table 18: Maithan Alloys Limited- Financial Information (Consolidated)

Particulars	Unit	FY20	FY21	FY22	FY23	FY24	H1 FY25
Revenue	Rs. crore	1,831	1,620	2,992	2,885	1,729	839
EBITDA	Rs. crore	233	292	1,068	586	114	71
PAT	Rs. crore	222	230	818	499	349	599
EBITDA Margin	%	13%	18%	36%	20%	7%	8%
PAT Margin	%	12%	14%	27%	17%	20%	71%
Current Ratio	Times	6.7	4.9	6.1	9.5	12.1	4.9
Debt to Equity	Times	0	0	0	0	0	0.1

Source: Company Reports

➤ Eloquent Steel Private Limited

Eloquent Steel Private Limited (a part of the Shakambhari Group) is into manufacturing of metals, chemicals and their products based out of Kolkata, West Bengal. It is also engaged in trading of goods. The products & services of the company include iron crates, special grade iron castings (S.G. Iron), holding bolts, steel fabrication and graded castings.

Table 19: Eloquent Steel Private Limited – Company Profile

Information	Description
Company Name	Eloquent Steel Private Limited
Establishment Year	2012

Source: Company disclosures

Table 20: Eloquent Steel Private Limited - Financial Information (Consolidated)

Particulars	Unit	FY20	FY21	FY22	FY23	FY24
Revenue	Rs. crore	323	453	725	761	NA
EBITDA	Rs. crore	11	21	131	36	NA
PAT	Rs. crore	2	9	91	19	NA
EBITDA Margin	%	3%	5%	18%	5%	NA
PAT Margin	%	1%	2%	13%	3%	NA
Current Ratio	Times	1.4	1.6	1.7	1.7	NA
Debt to Equity	Times	2.2	1.9	0.6	0.5	NA

Source: Company Reports

➤ Jainam Ferro Alloys Limited

Jainam Ferro Alloys (I) Limited was originally incorporated as Jainam Infraways Private Limited in March 2014. It is a manufacturer and exporter of niche value-added manganese alloys and products such as Ferro manganese, Silicon manganese and Ferro manganese slag. The company provides customized manganese alloys to large and growing steel companies the world over. The Company also has sub merged arc furnaces which is the basic infrastructure for a ferro alloy industry.

Table 21: Jainam Ferro Alloys Limited – Company Profile

Information	Description
Company Name	Jainam Ferro Alloys Limited
Establishment Year	2014

Source: Company disclosures

Table 22: Jainam Ferro Alloys Limited - Financial Information (Standalone)

Particulars	Unit	FY20	FY21	FY22	FY23	FY24	H1 FY25
Revenue	Rs. crore	121	102	200	255	190	114
EBITDA	Rs. crore	3	5	38	30	5	11
PAT	Rs. crore	1	3	28	23	5	8
EBITDA Margin	%	3%	5%	19%	12%	3%	10%
PAT Margin	%	1%	3%	14%	9%	3%	7%
Current Ratio	Times	2.0	1.7	2.1	3.8	2.7	2.6
Debt to Equity	Times	0.3	0.1	0	0	0.1	0

Source: Company Reports

➤ Jajoo Rashmi Refractories Limited

Jajoo Rashmi Limited is a manufacturer and exporter of a various grades of ferro alloys, which are primarily utilised as an essential raw material in the steel industry. It is also engaged in manufacturing of a wide range of refractory products which are designed to withstand high temperature without deteriorating its physical and chemical properties, without melting or breaking. Jajoo Rashmi Limited has an operating history of more than two decades, and our operations are spread across three manufacturing units situated in Jaipur (Rajasthan), Kalyaneshwari (West Bengal) and Kandla SEZ (Gujarat).. They have operations across the world in various regions such as Middle East, Southeast Asia, Africa etc. with presence in around 29 countries and has over 200 customers.

Table 23: Jajoo Rashmi Refractories Limited – Company Profile

Information	Description
Company Name	Jajoo Rashmi Refractories Limited
Establishment Year	1995

Source: Company disclosures

Table 24: Jajoo Rashmi Refractories Limited - Financial Information (Consolidated)

Particulars	Unit	FY20	FY21	FY22	FY23	FY24	H1 FY25
Revenue	Rs. crore	82	98	233	307	334	117
EBITDA	Rs. crore	4	3	11	28	28	8
PAT	Rs. crore	3	3	9	23	24	6
EBITDA Margin	%	4%	3%	5%	9%	8%	7%
PAT Margin	%	4%	3%	4%	7%	7%	5%
Current Ratio	Times	1.5	1.8	1.6	2.2	2.3	2.3
Debt to Equity	Times	1.0	0.8	1.0	0.5	0.4	0.4

Source: Company Reports

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About:

CareEdge is a knowledge-based analytical group that aims to provide superior insights based on technology, data analytics and detailed research. CARE Ratings Ltd, the parent company in the group, is one of the leading credit rating agencies in India. Established in 1993, it has a credible track record of rating companies across multiple sectors and has played a pivotal role in developing the corporate debt market in India.

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