

Industry Research Report on
Infrastructure sector in India
(Roads, Construction, Water and
Power Sector)

July 2023

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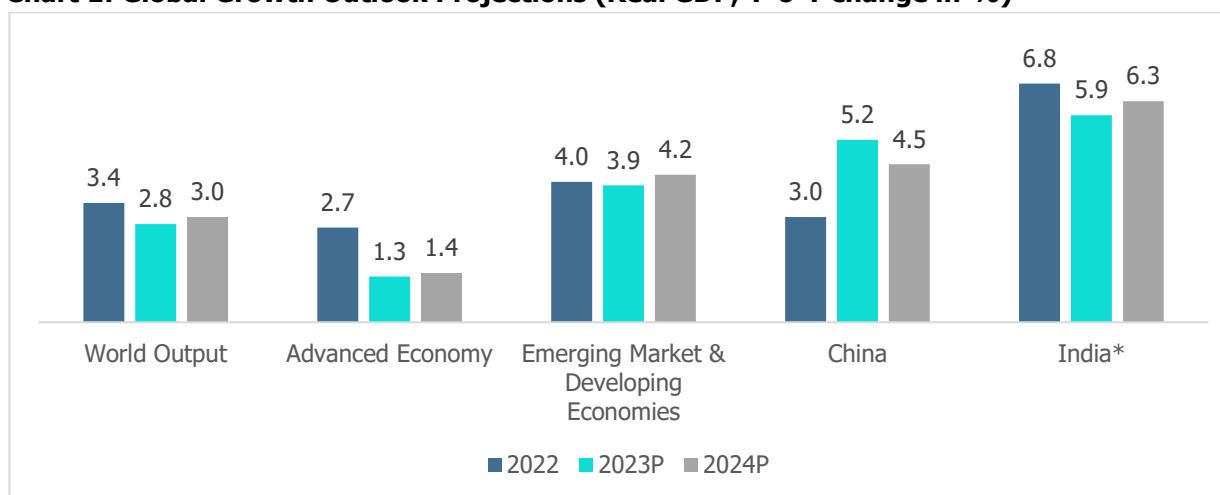
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1. Economic Outlook

1.1 Global economy outlook

As per the International Monetary Fund (IMF)'s World Economic Outlook growth projections released in April 2023, global economic growth for CY22¹ was estimated at 3.4% on year on year (y-o-y) basis, down from 6.3% in CY21 due to disruptions resulting from the Russia-Ukraine conflict and higher-than-expected inflation worldwide. The global economic growth for CY23 is projected to slow down further to 2.8% mainly due to tightening global financial conditions, expectations of steeper interest rate hikes by major central banks to fight inflation and spillover effects from the war between Russia and Ukraine with gas supplies from Russia to Europe expected to remain tightened. Growth in CY24 is projected to marginally improve to 3.0% with expected gradual recovery from the effects of the war and subsiding of inflation. For the next 5 years, the IMF projects world economic growth in the range of 3.0%-3.2% on a y-o-y basis.

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



Notes: P-Projection

*For India, data and forecasts are presented on a fiscal year basis and GDP from 2011 onward is based on GDP at market prices with fiscal year 2011/12 as a base year

Source: IMF – World Economic Outlook, April 2023

IMF revises the GDP growth outlook considering uncertainties relating to global inflation

Advanced Economies Group

For major advanced economies, the GDP growth was estimated to be 2.7% in CY22, down from 5.4% in CY21, which is further projected to decline to 1.3% in CY23. This forecast of low growth reflects rise in central bank interest rates to fight inflation and the impacts of Russia- Ukraine war. About 90% of advanced economies are projected to see decline in growth in CY23. This growth is expected to increase slightly to 1.4% in CY24.

One of the major countries from this group is **United States**. The growth for United States is estimated to be 2.1% for CY22 compared to 5.9% in CY21. Whereas, growth for CY23 and CY24 is projected at 1.6% and 1.1%, respectively. This is reflective of declining real disposable income impacting consumer demand with higher interest rates taking toll on spending.

The growth for CY22 in **Euro Area** is estimated to be 3.5% compared to 5.4% in CY21. However, the boost from reopening of economy after pandemic appears to be fading. For CY23 and CY24, the growth is projected at 0.8% and 1.4%, respectively. With inflation at about 7%-8% in several Euro Area countries and the United Kingdom, household

budgets will remain stretched. Further, the accelerated pace of rate increases by the Bank of England and the European Central Bank is tightening financial conditions and cooling demand in the housing sector and beyond.

Emerging market and developing economies group

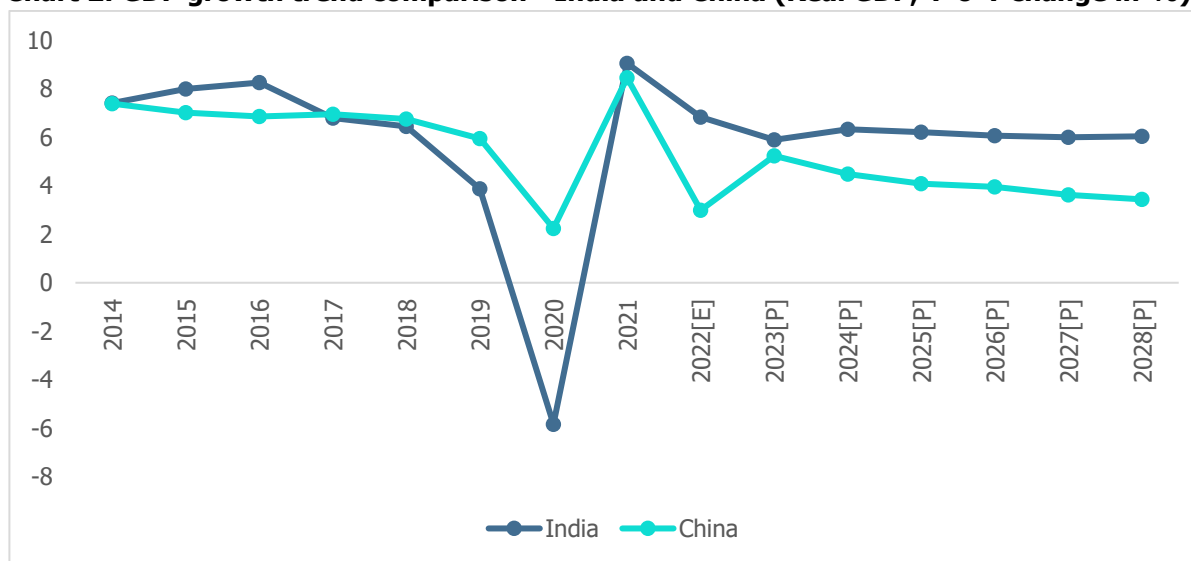
For the emerging market and developing economies group, GDP growth is estimated at 4.0% in CY22, compared to 6.9% in CY21. This growth is further projected at 3.9% in CY23 and 4.2% in CY24. This expected improvement in GDP growth in CY24 is on account of anticipation of gradual recovery.

In **China**, growth is expected to pick up to 5.2% with the full reopening in CY23. Whereas, **India's** GDP projection for CY23 and CY24 stand at 5.9% and 6.3%, respectively with resilient domestic demand despite external headwinds.

India to remain fastest growing economy transcending China

Despite the turmoil in last two-three years, India bears good tidings for becoming USD 5 trillion economy by CY27. According to the IMF dataset on Gross Domestic Product (GDP) at current prices for India, the GDP is estimated to be at USD 3.4 trillion for CY22 and projected to reach USD 5.2 trillion by CY27. The expected GDP growth rate of India for coming years is almost double compared to the world economy.

Chart 2: GDP growth trend comparison - India and China (Real GDP, Y-o-Y change in %)



P- Projections; Source: IMF, World Economic Outlook Database (April 2023)

Besides this, India stands out as the fastest growing economy amongst the major economies. Outshining the growth rate of China, the Indian economy is expected to grow at more than 6% in the period of CY24-CY28.

Indian economy is paving its way towards becoming largest economy in the world. Currently, India is the third largest economy globally in terms of Purchasing Power Parity (PPP) with ~7% share in global economy with China [~18%] on the top and United states [~15%] being second. Purchasing Power Parity is an economy performance indicator denoting relative price of an average basket of goods and services that a household needs for livelihood in each country. Despite the impact of the pandemic, high inflationary and interest rate environment globally and the geo-political tensions in Europe, India has been one of the major contributors to world economic growth.

1.2 Indian Economy Outlook

1.2.1 GDP growth and Outlook

Resilience to external shocks remains critical for near-term outlook

India's GDP grew by 9.1% in FY22 and stood at Rs. 149.3 trillion despite some spillovers of the pandemic and geopolitical Russia-Ukraine. In Q1FY23, India recorded 13.2% y-o-y growth in GDP which can largely be attributed to better performance by agriculture and services sectors. Following this double-digit growth, Q2FY23 witnessed 6.3% y-o-y growth, while, Q3FY23 registered 4.5% y-o-y growth. This slowdown in growth during Q2FY23 and Q3FY23 compared to the Q1FY23 can be attributed to normalization of the base and a contraction in the manufacturing sector's output. Subsequently, Q4FY23 registered broad-based improvement across sectors compared to Q3FY23 with growth of 6.1% y-o-y. The investments as announced in the Union Budget 2022-23 on boosting public infrastructure through enhanced capital expenditure has augmented growth and encouraged private investment through large multiplier effects in FY23. Supported by fixed investment and higher net exports, GDP for full-year FY23 was valued at Rs. 160.1 trillion registering an increase by 7.2% y-o-y.

GDP growth outlook

During FY24, strong prospects for agricultural and allied activities are likely to boost rural demand. Rebound in contact-intensive sectors and discretionary spending is expected to support urban consumption. Strong credit growth, resilient financial markets, and the government's continued thrust on capital spending and infrastructure are likely to create a congenial environment for investments.

However, El Nino is being predicted in the current fiscal which may lead to deficit rainfall in the country and impact agricultural output. Further, external demand is likely to remain subdued with slowdown in global activity, thereby indicating adverse implications for exports. Additionally, heightened inflationary pressures and resultant policy tightening may pose risk to the growth potential.

Taking all these factors into consideration, in June 2023, the RBI in its bi-monthly monetary policy meeting estimated the real GDP growth of 6.5% y-o-y for FY24.

GDP growth outlook

Table 1: RBI's GDP Growth Outlook (Y-o-Y %)

FY24 (complete year)	Q1FY24	Q2FY24	Q3FY24	Q4FY24
6.5	8.0	6.5	6.0	5.7

Source: Reserve Bank of India

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 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) as a result of robust tax collections. Of the three major sector heads, service sector has been fastest growing sector in the last 5 years.

- **Agriculture sector** was holding growth momentum till FY18. In FY19, the acreage for rabi crop was marginally lower than previous year which affected the agricultural performance. FY20 witnessed growth on account of improved production. During the pandemic impacted period of FY21, agriculture sector was largely insulated as timely and proactive exemptions from covid-induced lockdowns to the sector facilitated uninterrupted harvesting of rabi crops and sowing of kharif crops. However, supply chain disruptions impacted the flow of agricultural goods leading to high food inflation and adverse initial impact on some major agricultural exports. However, performance remained steady in FY22.

In Q1FY23 and Q2FY23, the agriculture sector recorded a growth of 2.4% and 2.5%, respectively, on a y-o-y basis. Due to uneven rains in the financial year, the production of some major Kharif crops such as rice and pulses was adversely impacted thereby impacting agriculture sector's output. In Q3FY23 and Q4FY23, the sector recorded a growth of 4.7% and 5.5%, respectively, on a y-o-y basis.

Overall, the agriculture sector performed well despite weather-related disruptions such as uneven monsoon and unseasonal rainfall impacting yields of some major crop and clocked a growth of 4% y-o-y in FY23 and stood at Rs. 22.3 trillion. Going forward, rising bank credit to the sector, increased exports and higher sowing of rabi crop will be the drivers for agriculture sector. However, performance of the sector will depend on the spatial and temporal distribution of rainfall. A downside risk exists in case the intensity of El Nino is significantly strong.

- **Industrial sector** witnessed CAGR of 4.7% for the period FY16 to FY19. From March 2020 onwards, nation-wide lockdown due to the pandemic had a significant impact on industrial activity. In FY20 and FY21, this sector felt turbulence due to the pandemic and recorded decline of 1.4% and 0.9%, respectively, on a y-o-y basis. With the opening up of economy and resumption of industrial activity, it registered 11.6% y-o-y growth in FY22, albeit on a lower base.

The industrial output in Q1FY23 jumped 9.4% on y-o-y basis. However, in the subsequent quarter, the sector witnessed a sharp contraction of 0.5% due to lower output across mining, manufacturing and construction sectors. This was mainly because of the poor performance by the manufacturing sector which was marred by high input costs. In Q3FY23, the sector grew modestly by 2.3% y-o-y. The growth picked-up in Q4FY23 to 6.3% y-o-y owing to a rebound in manufacturing activities and healthy growth in the construction sector. Overall, industrial sector is estimated to be valued at Rs. 45.2 trillion registering 4.4% growth in FY23.

- **Services sector** recorded CAGR of 7.1% for the period FY16 to FY20, which was led by trade, hotels, transport, communication and services related to broadcasting and finance, real estate & professional service. This sector was the hardest hit by the pandemic and registered 8.2% y-o-y decline in FY21. The easing of restrictions aided a fast rebound in this sector, with 8.8% y-o-y growth witnessed in FY22.

In Q1FY23 and Q2FY23, this sector registered y-o-y growth of 16.3% and 9.4%, respectively, on a lower base and supported by revival in contact intensive industries. The services sector continued to witness buoyant demand and recorded a growth of 6.1% y-o-y in Q3FY23. On the back of robust discretionary demand Q4FY23 registered 6.9% growth largely driven by trade, hotel and transportation. Overall, benefitting from the pent-up demand, service sector was valued at Rs. 20.6 trillion and registered growth of 9.5% y-o-y in FY23. Healthy growth in various service sector indicators like air passenger traffic, port cargo traffic, GST collections and retail credit is expected to support service sector going ahead.

Table 2: Sectoral Growth (Y-o-Y % Growth) - at Constant Prices

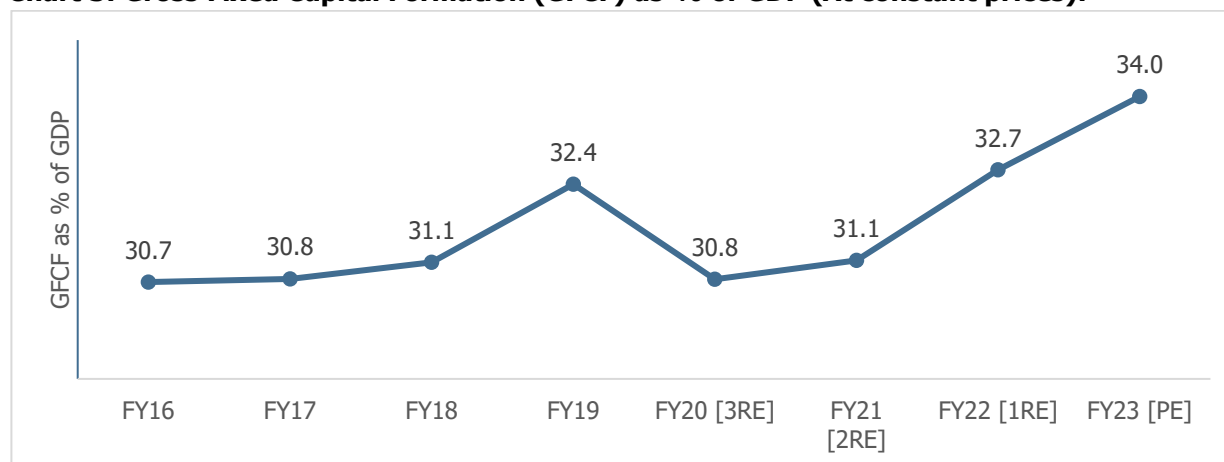
At constant Prices	FY18	FY19	FY20 (3RE)	FY21 (2RE)	FY22 (1RE)	FY23 (PE)
Agriculture, forestry & fishing	6.6	2.1	6.2	4.1	3.5	4.0
Industry	5.9	5.3	-1.4	-0.9	11.6	4.4
Mining & quarrying	-5.6	-0.8	-3.0	-8.6	7.1	4.6
Manufacturing	7.5	5.4	-3.0	2.9	11.1	1.3
Electricity, gas, water supply & other utility services	10.6	7.9	2.3	-4.3	9.9	9.0
Construction	5.2	6.5	1.6	-5.7	14.8	10.0
Services	6.3	7.2	6.4	-8.2	8.8	9.5
Trade, hotels, transport, communication & broadcasting	10.3	7.2	6.0	-19.7	13.8	14.0
Financial, real estate & professional services	1.8	7	6.8	2.1	4.7	7.1
Public administration, defence and other services	8.3	7.5	6.6	-7.6	9.7	7.2
GVA at Basic Price	6.2	5.8	3.9	-4.2	8.8	7.0

3RE – Third Revised Estimate, 2RE – Second Revised Estimates, 1RE – First Revised Estimates, 2AE – Second Advanced Estimate; Source: MOSPI

1.2.3 Investment Trend in infrastructure

Gross Fixed Capital Formation (GFCF), which is a measure of the net increase in physical assets, witnessed an improvement in FY22. As a proportion of GDP, it is estimated to be at 32.7%, which is the second highest level in 7 years (since FY15). In FY23, the ratio of investment (GFCE) to GDP inched up to its highest in the last decade at 34% as per the advanced estimate released by the Ministry of Statistics and Programme Implementation (MOSPI).

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



PE: Provisional Estimates, RE: Revised Estimate, AE: Advanced Estimate; Source: MOSPI

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

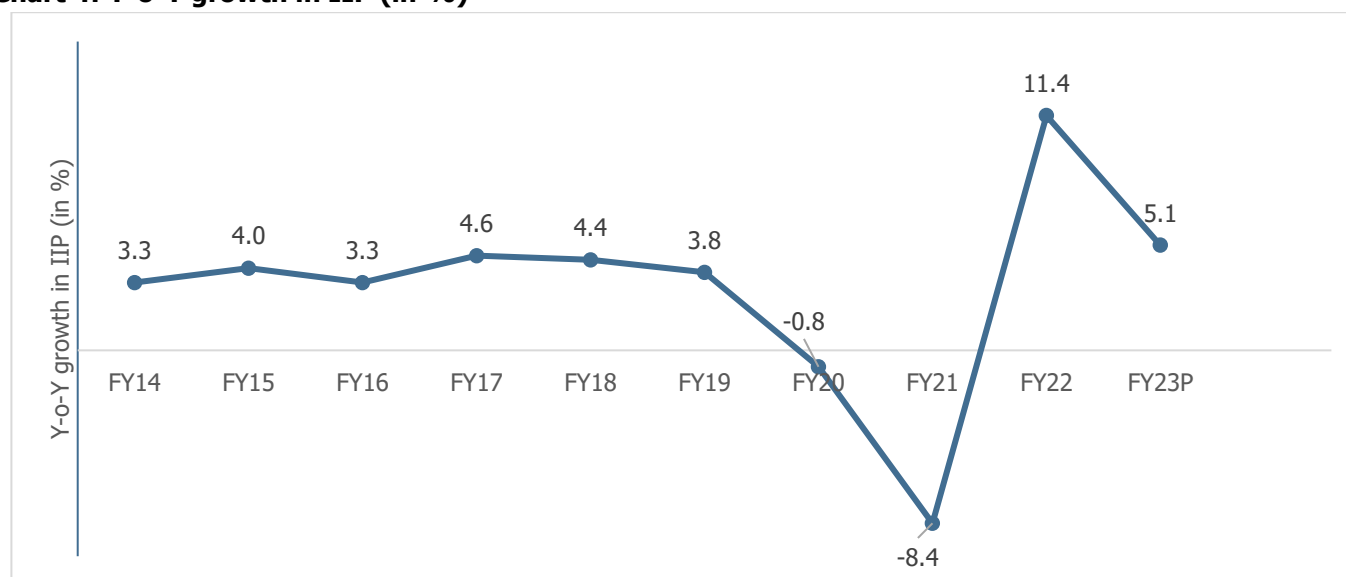
1.2.4 Industrial Growth

Improved core and capital goods sectors helped IIP growth momentum

Index of Industrial production (IIP) is an index to track manufacturing activity in an economy. On a cumulative basis, IIP grew by 11.4% y-o-y in FY22 post declining by 0.8% y-o-y and 8.4% y-o-y, respectively, in FY20 and FY21. This high growth was mainly backed by low base of FY21. FY22 IIP was higher by 2.0% when compared with the pre-pandemic level of FY20, indicating that while economic recovery was underway, it was still at very nascent stages.

During FY23, the industrial output has recorded a growth of 5.1% y-o-y supported by a favourable base and a rebound in economic activities. During April 2023, IIP grew by 4.2% y-o-y, whereas May 2023 registered 5.2% y-o-y growth. This growth was aided by mining and manufacturing sectors encouraging performance.

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



Source: MOSPI; P-Provisional

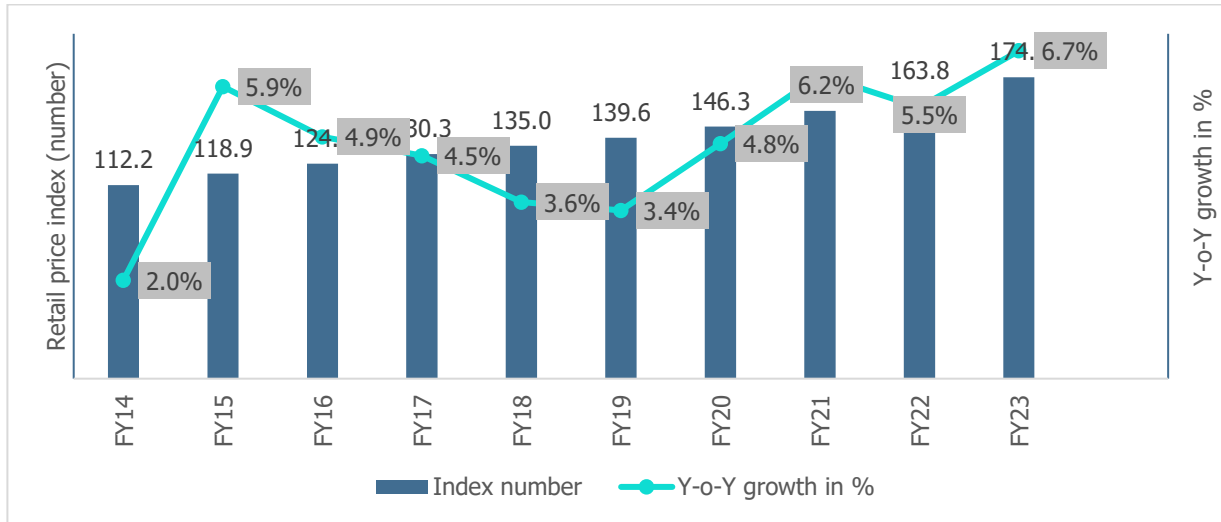
Going forward, it will be critical to maintain the current growth momentum in the industrial sector. In the environment of global slowdown, maintaining growth in industrial output will depend on the resilience and momentum of domestic demand. Healthy credit growth and moderating inflation in the economy is likely to be supportive of domestic consumption in the current fiscal. Pick-up in the investment demand is also expected to support segments like capital goods and infrastructure. However, challenges from an uncertain global economic scenario and weak external demand are likely to persist.

1.2.5 Consumer Price Index

India's consumer price index (CPI), which tracks the retail price inflation, stood at an average of 5.5% in FY22 which was within RBI's targeted tolerance band of 6%. However, the consumer inflation started to upswing from October 2021 onwards and reached the tolerance level of 6% in January 2022. Following this, CPI reached 6.9% in March 2022.

CPI remained elevated at an average of 6.7% in FY23, above the RBI’s tolerance level. However, some relief was seen towards the end of the fiscal wherein the retail inflation stood at 5.7% in March 2023 tracing back to the RBI’s tolerance band. Apart from a favourable base effect, the relief in retail inflation came from a moderation in food inflation. In the current fiscal FY24, the CPI moderated for two consecutive month to 4.7% in April 2023 and 4.3% in May 2023. This trend was snapped in June 2023 with CPI rising to 4.8% largely due to rise in food inflation.

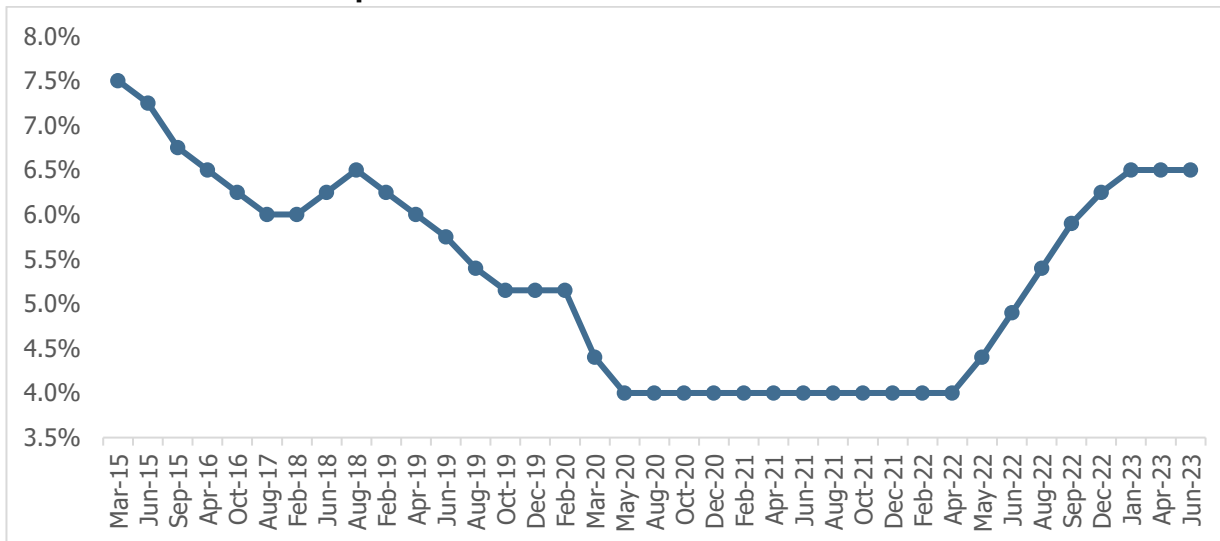
Chart 5: Retail Price Inflation in terms of index numbers and Y-o-Y Growth in %
(Base: 2011-12=100)



Source: MOSPI

The CPI is primarily factored in by RBI while preparing their bi-monthly monetary policy. The RBI has increased the repo rates with the rise in inflation in the past year from 4% in April 2022 to 6.5% in January 2023.

Chart 6: RBI historical Repo Rate



Source: RBI

However, with the inflation easing over the last few months, RBI has kept repo rate unchanged at 6.5% in the last two meetings of the Monetary Policy Committee. At the bi-monthly meeting held in June 2023, RBI projected inflation at 5.1% for FY24 - Q1FY24 is projected at 4.6%, Q2FY24 at 5.2%, Q3FY24 at 5.4% and Q4FY24 at 5.2%.

In a meeting held in June 2023, RBI also maintained the liquidity adjustment facility (LAF) corridor by adjusting the standing deposit facility (SDF) rate of 6.25% as the floor and the marginal standing facility (MSF) at the upper end of the band at 6.75%.

The central bank continued to maintain its stance as accommodative. With domestic economic activities gaining traction, RBI has shifted gear to prioritize controlling inflation. While RBI has paused on the policy rate front, it has also strongly reiterated its commitment to bringing down inflation close to its medium-term target of 4%. Given the uncertain global environment and lingering risks to inflation, Central Bank has kept the window open for further monetary policy tightening in the future, if required.

1.2.6 Key Demographic drivers for Economic Growth

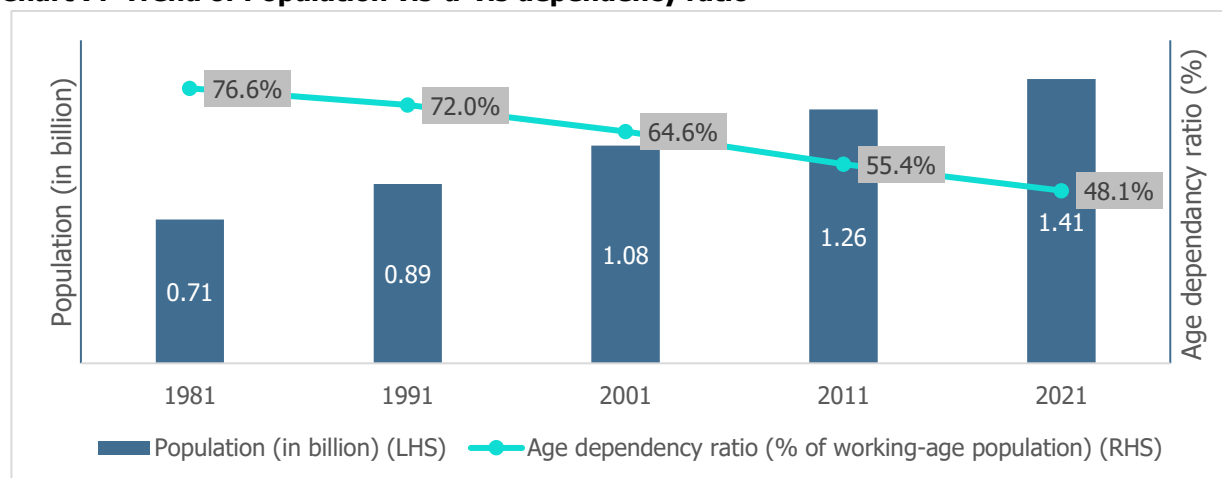
The trajectory of economic growth of India and private consumption is also driven by socio-economic factors such as demographics and urbanization. Some of the key demographic drivers are:

- **Growing Population and Declining Dependency Ratio:**

With 1.41 billion people, India is the second most populous country in the world. The population has witnessed significant growth in the past few decades.

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 76.6% in 1981, which has reduced to 48.1% in 2021. In the year 2022, the dependency ratio has further declined to 47.5%. Declining dependency means the country has improving share of working age population generating income, which is a good sign for the economy. Lower dependency ratio implies fewer dependents on individuals with income which will allow them to spend their income more on discretionary items likes hobbies, entertainment, electronics and furniture etc.

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

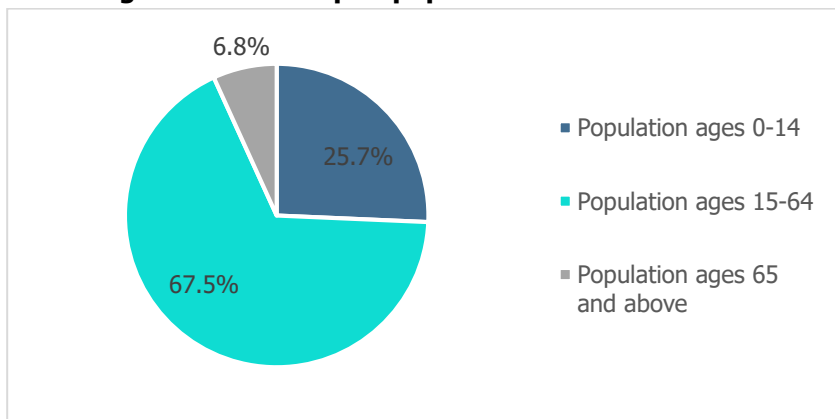


Source: World Bank Database

• **Young Population:**

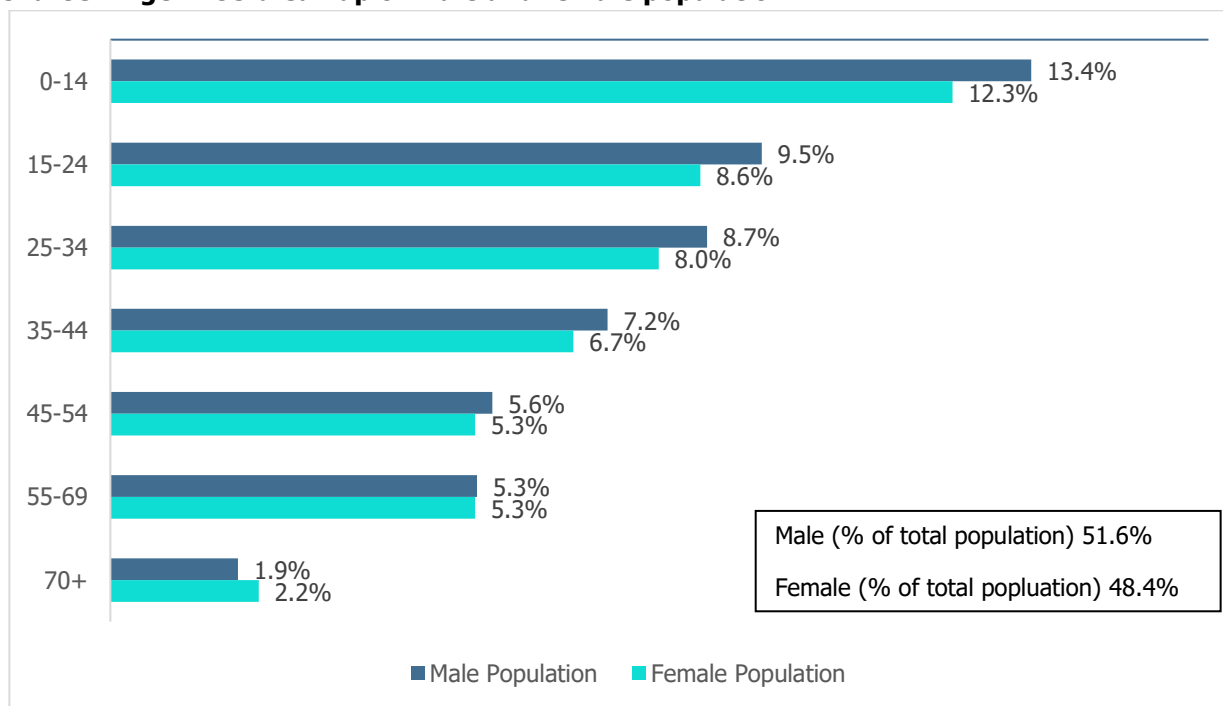
With an average age of 29, India has one of the youngest populations globally. As a vast resource of young citizens enters the workforce every year, it could create a 'demographic dividend'. India is home to a fifth of the world's youth demographic and this population advantage will play a critical role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

Chart 8: Age-wise break up of population



Source: World Bank Database

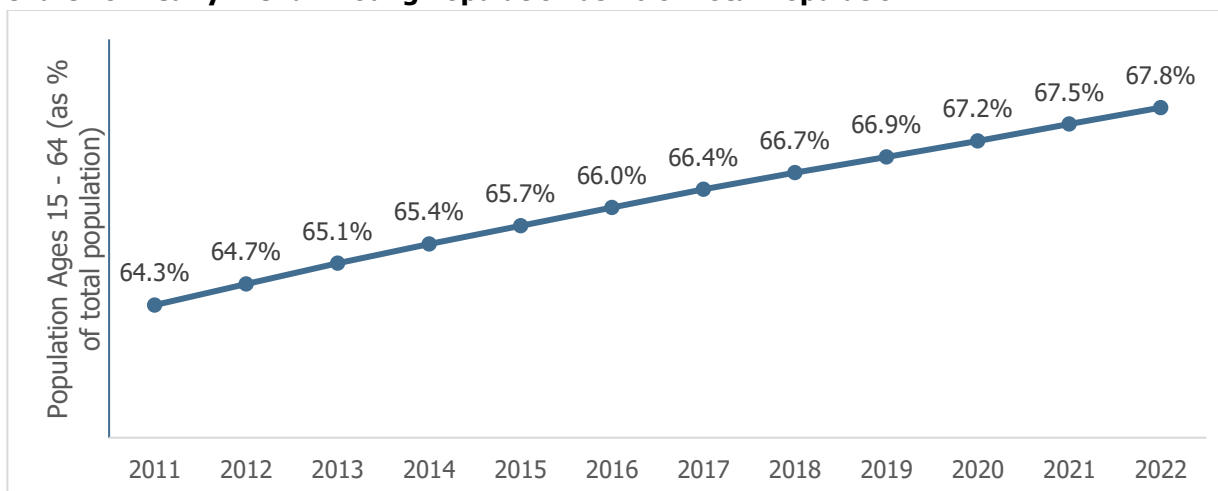
Chart 9: Age-wise break up of male and female population



Source: World Bank Database

With the rise in number of working women, increasing proportion of working population and younger age group amongst the urban population in India, the consumer demand is expected to grow in the future. The increasing focus on education among the youth will lead to a decline in dependency ratio and enhanced lifestyles. This, in turn would enhance consumer spending.

Chart 10: Yearly Trend - Young Population as % of Total Population



Source: World Bank database

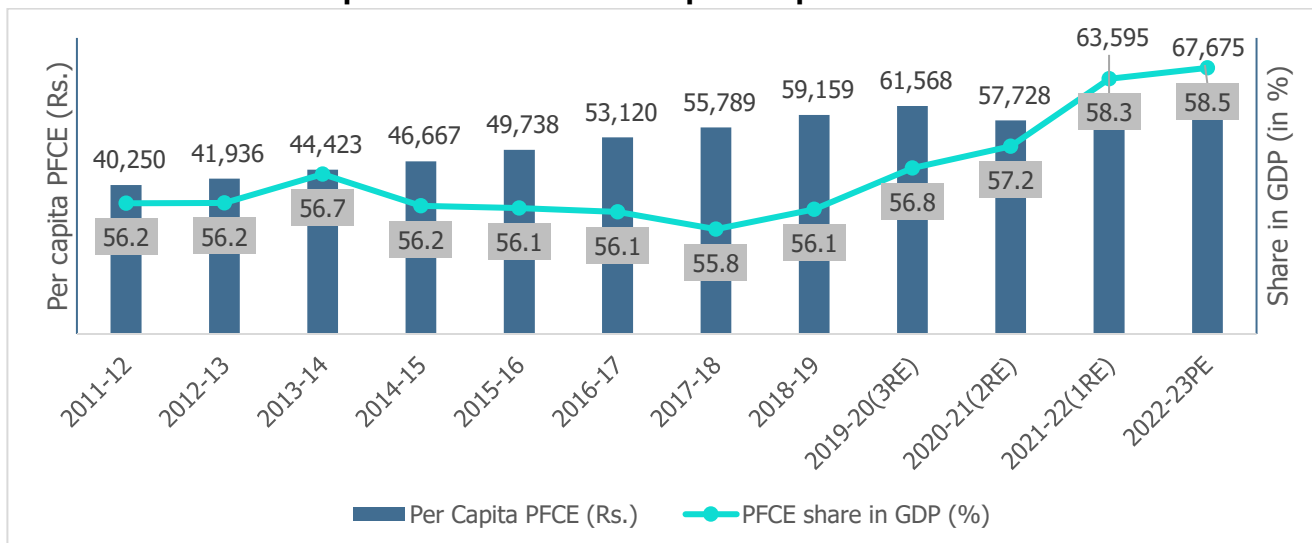
- **Growing Middle-Class**

According to the estimate of People Research on India’s Consumer Economy (PRICE), the share of the middle class with an annual household income of Rs. 5-30 lakh, more than doubled from 14% in FY05 to 31% in FY21. It is projected to rise to 63% by FY47.

- **Consumer Spending**

There has been a gradual change in consumer spending behaviour. Private Final Consumption Expenditure (PFCE) which is measure of consumer spending has showcased growth in the past decade. Following chart depicts the trend of per capita PFCE:

Chart 11: Trend of Per Capita Private Final Consumption Expenditure

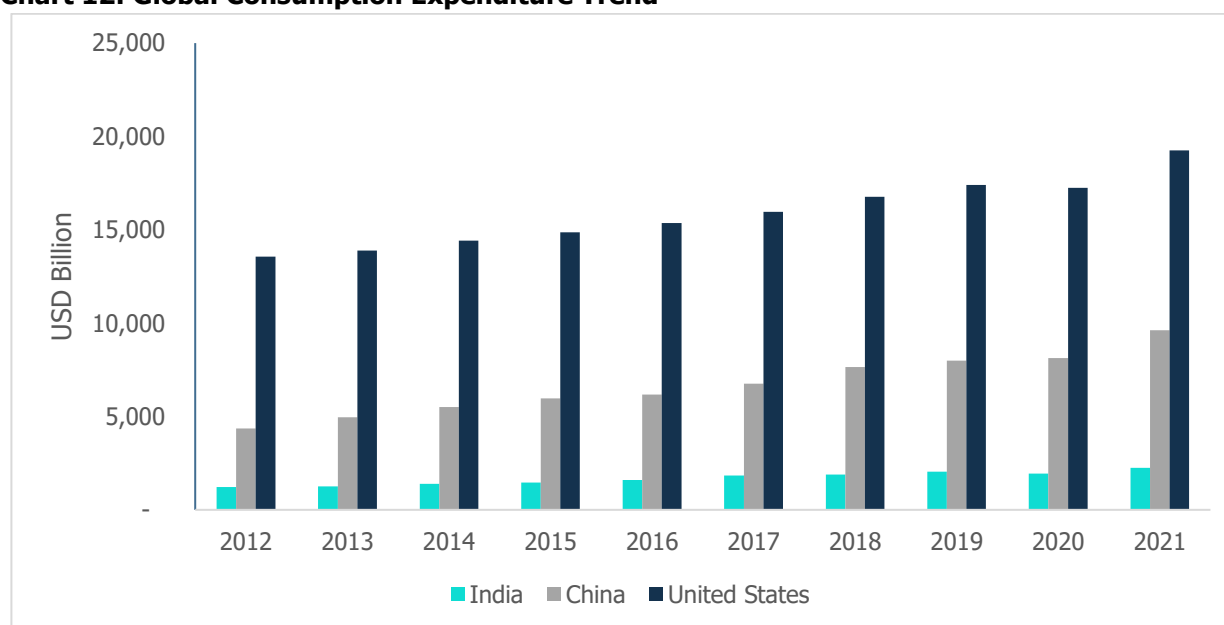


Note: 3RE – Third Revised Estimate, 2RE – Second Revised Estimates, 1RE – First Revised Estimates, PE –Provisional Estimate; Source: MOSPI

The consumption pattern trend is also gradually moving towards higher spend on branded products and purchase from organised retail. This includes discretionary spending on food and beverages, apparel, accessories, jewellery, luxury products, consumer durables and across other discretionary categories.

When compared to the other global economies like China and United States, consumption expenditure by China accounted for about 14% of total consumption expenditure of the world in 2021, while, United States accounted for about 28% and India about 3%. The world's total consumption expenditures were valued at USD 69,472 billion in the year 2021.

Chart 12: Global Consumption Expenditure Trend



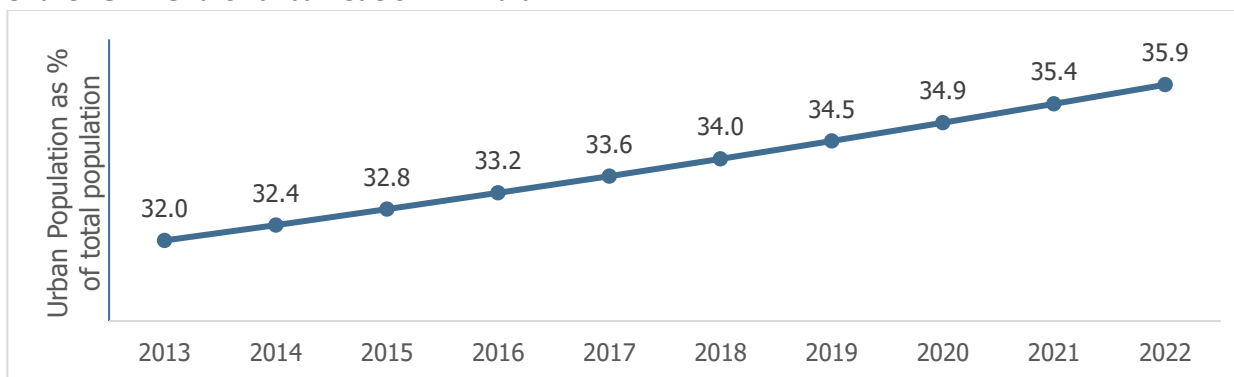
Source: World Bank Database

In the coming years, the private consumption in India is expected to be driven by revival in rural demand, the sustained buoyancy in services, especially contact-intensive sectors, and moderating inflationary pressures.

- **Urbanization**

Urbanization of India's population is growing on a larger population base. The urban population in India is estimated to have increased from 403 million (31.6% of total population) in the year 2012 to 498 million (35.4% of total population) in the year 2021. People living in tier-2 and tier-3 cities have greater purchasing power parity, high internet penetration, and increasingly brand-conscious young population. Due the rapid urbanization, there have been changes in lifestyle and working styles which has led to shift in buying behavior pattern as well.

Chart 13: Trend of urbanisation in India

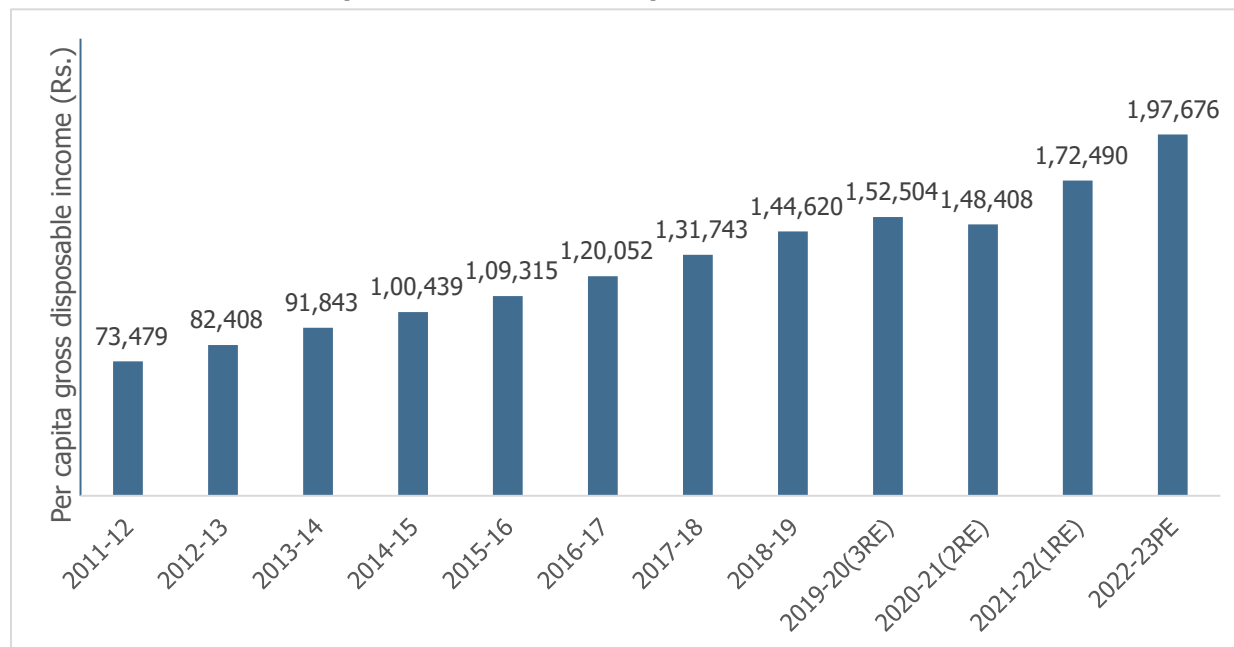


Source: World Bank Database

- **Increasing per capita disposable income**

Gross National Disposable Income (GNDI) is a measure to arrive at the income available to the nation for final consumption and gross saving. Between the period fiscal 2012 to fiscal 2023, per capita GNDI registered a CAGR of 9.4%. More disposable income, in turn, drives more consumption, thus economic growth. Below chart depicts the trend of per capita GNDI in the past 12 years:

Chart 14: Trend of Per Capita Gross National Disposable Income



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

1.2.7 Concluding Remarks

Despite the global growth uncertainties, Indian economy is relatively better placed. The major headwinds to economic growth are escalating geopolitical tensions, volatility in global commodity prices and shortages of key inputs. However, the bright spots for the economy are continued healthy domestic demand, support from government towards capital expenditure, moderating inflation and improving business confidence. Various high-frequency growth indicators including purchasing managers index, auto sales, bank credit, GST collections have shown improvement in the FY23. Moreover, normalizing employment situation after the opening up of economy is expected to improve and provide support to consumption expenditure.

The IMD forecasts a normal monsoon despite El Nino which bodes well for the agricultural sector's outlook however, a lot will depend on the spatial and temporal distribution of rainfall. A downside risk exists in case the intensity of El Nino is significantly strong.

Public investment is expected to exhibit healthy growth as the government has budgeted for strong capital expenditure in FY24. Private sector's intent to invest is also showing improvement as per the data announced on new project investments. However, the volatility in commodity prices and the economic uncertainties emanating from global turbulence may slow down the improvement in private capex and investment cycle.

Among sectors, the industrial segment is expected to perform better as the input costs are now moderating. With flagship programmes like 'Make in India' and the PLI schemes, the government is continuing to provide the necessary support to boost the industrial sector. Service sector is expected to see continued growth in FY24 with healthy economic growth. However, some segments like information technology in the services sector would feel the pinch of slowdown in the US and European economies.

2. Roads and Highway Industry Overview

Robust infrastructure is an essential sign of a developing nation. Development of roads, bridges, airports and railways is crucial for economic development of the country. Out of all modes of transport, road is the only mode which has the ability of last mile connectivity.

Transportation of freight as well as of passengers by road is one of the most cost-effective modes of transport. With a total 63.32 lakh kilometres (kms) of road network, India ranks second in the world after USA. This road network supports movement of 60% of freight traffic in the country and 87% of the total India's passenger traffic. The Indian road network comprises of National Highways, Expressways, State Highways, Major District Roads, Other District Roads and Village Roads. To get the country in fast forward mode, development of National Highways has been the key focus area, however state highways, district and rural roads continue to be a large part of overall road network.

Table 3: Breakup of Road Network

	Lakh kms	%
National Highways	1.45	2%
State Highways	1.67	3%
Other Roads	60.20	95%
Total	63.32	100%

Source: MoRTH & CareEdge Research

With improvement in road connectivity over the years between cities, towns and villages, transportation by way of road has gradually increased over the years. Development and maintenance of roads in India are undertaken by various agencies of both Central and State Governments. The primary agency responsible for the development and maintenance of National highways is the Ministry of Road Transport & Highways (MORTH) and it executes the same through the agency of National Highways Authority of India Ltd (NHAI), National Highway Infrastructure Development Corporation Ltd (NHIDCL) and State Public Works Department (PWDs) & Border Roads Organizations etc.

India's road infrastructure has seen consistent improvement in the last few years. Connectivity has improved and road transportation has become a focus of rapid development. Roads are providing better access to services, ease of transportation and movement to people. Recognizing the significance of a reliable and swift road network in the country and the role it plays in influencing its economic development, MoRTH has taken up the responsibility of building quality roads and highways across the country. Road Transport emerged as the dominant segment in India's transportation sector with a share of 4.5% in India's GDP in FY06. As per the Economic Survey, road transport is the dominant mode of transportation in terms of its contribution to Gross Value Added (GVA). In FY18 the share of transport sector in the GVA was about 4.77% of which the share of road transport is 3.06% followed by Railways (0.75%), air transport (0.15%) and water transport (0.06%). Total investment in the roads and highways sector has gone up more than 3 times in five-year period of FY15 to FY19.

Road construction trends in the recent years also give optimism of achieving high targets during next few years, in spite the sector badly hit by the COVID – 19 pandemic and partial lockdowns at various states across India. The sector has clearly shown focus on Bharatmala Pariyojana with added emphasis on multimodal integration, road safety, increasing use of Information Technology applications, augmentation of existing funding sources and emphasis on green initiatives.

Impact of COVID - 19

The Road transport acted as the backbone of the country in difficult pandemic times. It was an enabler of smooth movement of essential goods to various parts of the country.

On the other hand, due to COVID - 19 pandemic, the construction activities took a temporary halt throughout the country. The awarding activity slowed down leading to halt in construction. Construction moved slowly in first half of FY21 and picked up in the latter half of the year. The rate of construction activity dropped to 28km per day in FY20 in the last month of the year, as the lockdown was imposed. However, this rate picked up when lockdown impositions were lifted in a phased manner in FY21. As per MoRTH presentation showing the works being carried during the lockdown period, 1,315 projects covering 49,238 kms worth Rs 5,89,648 crores were under progress, of which 819 projects covering 30,301 kms costing about Rs 3,06,250 crores were delayed. It also showed State-specific issues like pending land acquisition, environment clearance etc. which had been delaying the project implementation.

However, the impact of COVID - 19 was reversed by the Government's relentless focus on infrastructure spending which led to a sharp growth in highway construction in FY21.

2.1 Institutional framework for Roads at Central level

MoRTH is an apex organisation under the Central Government. It is entrusted with the task of formulating and administering, in consultation with other Central Ministries/Departments, State Governments/UT Administrations, organisations and individuals, policies for Road Transport, National Highways and Transport Research. MoRTH's overall objective is to increase mobility and efficiency of the road transport system in the country. The Ministry has two wings:

- **Roads wing** responsible for development and maintenance of National Highways in the country
- **Transport wing** responsible for matter relating to Road Transport.

Main Responsibilities of Road wing are:

- Planning, development and maintenance of National Highways in the country
- Extending technical and financial support to the State Governments for the development of state roads and the roads of inter-state connectivity and economic importance
- Evolving standard specifications for roads and bridges in the country
- Serves as a repository of technical knowledge on roads and bridges

Main Responsibilities of Transport Wings are:

- Motor Vehicle legislation
- Administration of the Motor Vehicles Act, 1988
- Taxation of motor vehicles
- Compulsory insurance of motor vehicles
- Administration of the Road Transport Corporations Act, 1950
- Promotion of Transport co-operatives in the field of motor transport
- Evolving road safety standards in the form of a National Policy on Road Safety, and preparing and implementing the Annual Road Safety Plan
- Collecting, compiling and analysing road accident statistics and taking steps for developing a Road Safety Culture in the country by involving the members of public and organising various awareness campaigns
- Providing grants-in-aid to Non-Governmental Organisations in accordance with the laid down guidelines

Various institutes with various responsibilities make the functioning of MoRTH smooth. An autonomous body **NHAI** is responsible for development and maintenance of National Highways. A societies/associations **National Academy of Highway Engineers** (formerly National Institute of Training for Highway Engineers) is responsible for sharing of knowledge and pooling of experience on subjects dealing with the construction and maintenance of roads, bridges, tunnels and road transportation including technology, equipment, research, planning, finance, taxation, organization and all connected policy issues. A fully owned company of MoRTH, **NHIDCL** is responsible for promoting, surveying, establishing, designing, building, operating, maintains and upgradation of National Highways and Strategic Roads including interconnecting roads in parts of the country which share international boundaries with neighbouring countries.

2.2 National Highways Development Project (NHDP)

NHDP was launched in 1999-2000 to achieve a turn-around in the road sector in phased manner. Under first and second phase, four laning of 6,359 km and 6,359 km was approved on 12th January 2000 and 18th December 2003 at the cost of Rs 30,300 crores and Rs 34,339 crores. These two phases comprise of Golden Quadrilateral (GQ), North-South and East-West Corridors (NS-EW), Port Connectivity and other projects. The GQ (5,846 km) connects the four major cities of Delhi, Mumbai, Chennai and Kolkata. The NS-EW Corridors (7,300 km) connect Srinagar in the North to Kanyakumari in the South, including a spur from Salem to Kochi and Silchar in the East to Porbandar in the West.

Under third phase, upgradation of 12,109 km was approved on 12th April 2007 at the estimated cost of Rs 80,626 crores. Under fourth phase, upgradation/strengthening of 20,000 km of national highways to 2/4 lane with paved shoulders on EPC/ BOT (Toll/Annuity) basis was approved on 18th June 2008. Under fifth phase, six laning of 6,500 km of national highways comprising 5,700 km of GQ and balance 800 km of other sections were approved on 5th October 2006 at the cost of Rs 41,210 crores. Under sixth phase, construction of 1,000 km of expressways with full access control on new alignments at a cost of Rs. 16,680 crores was approved in November 2006. Under seventh phase, construction of ring roads, bypasses, grade separators, flyovers, elevated roads and tunnels at a cost of Rs. 16,680 crores were approved in December 2007. Below table explains the status of completion of various phases of NHDP, which have been subsumed under the umbrella programme of Bharatmala Pariyojana, Phase-I:

Table 4: Completion status of NHDP Phases December 2020

NHDP Phases	Length completed up to 31.12.2020 in km
I+II+III+IV: GQ, Port connection & Up-gradation with 2/4/6-laning / North-South & East West Corridor	38,685
V: 6-laning of GQ and High-density corridor	4,088
VI: Expressways	219
VII: Ring Roads, Bypasses and flyovers and other structures	181

Source: MoRTH

2.2.1 NHAI – Authority in Charge for National Highways

NHAI as the name goes, is the authority responsible for the development of National Highways in India. It came in to existence by passing of NHAI Act 1988 in Parliament. It was formed with the vision to meet the need of provision and maintenance of National Highway networks to global standards. Its mission is to develop, maintain and manage National Highways vested in it by the Government, to collect fees on National Highways, regulate and control the plying of vehicles on National Highways for its proper management, to develop and provide consultancy and construction services in India and abroad and carry on research activities in relation to the development, maintenance and management of highways or any other facilities, to advise the Central Government on matters relating to highways, to assist on such

terms and conditions as may be mutually agreed upon, any State Government in the formulation and implementation of schemes for highway development. It has tried to achieve its mission by bringing innovative ways of construction so as to increase private sector participation.

NHAI receives its funding through:

- Government support in form of capital base, cess funds, additional budgetary support, capital grant, maintenance grant, ploughing back of toll revenue and Toll Operate & Transfer (TOT) proceeds
- Loan from multilateral agencies
- Market borrowings
- Borrowing from International market through Masala Bonds by Inaugural international debt offering
- Asset Monetisation through InvIT

Table 5: NHAI Source of Funds (in Rs. Billion)

Sources of Funds	FY19-20	FY20-21
Receipts of Cess	111	239
Plough Back of Toll Revenue	106	115
Plough Back TOT Remittance	50	73
Additional Budgetary Support	10	28
Capital Grant (JICA &WB)	2	1
Capital Gain Tax Exemption Bonds	45	34
Taxable Bonds	495	458
Loan from National Small Saving Fund	100	-
Term loan	110	159
Other Sources (DME, Interest, Capital Receipts, Maintenance)	4	136
Utilisation of Opening Balance	8	11
Total	1,041	1,254

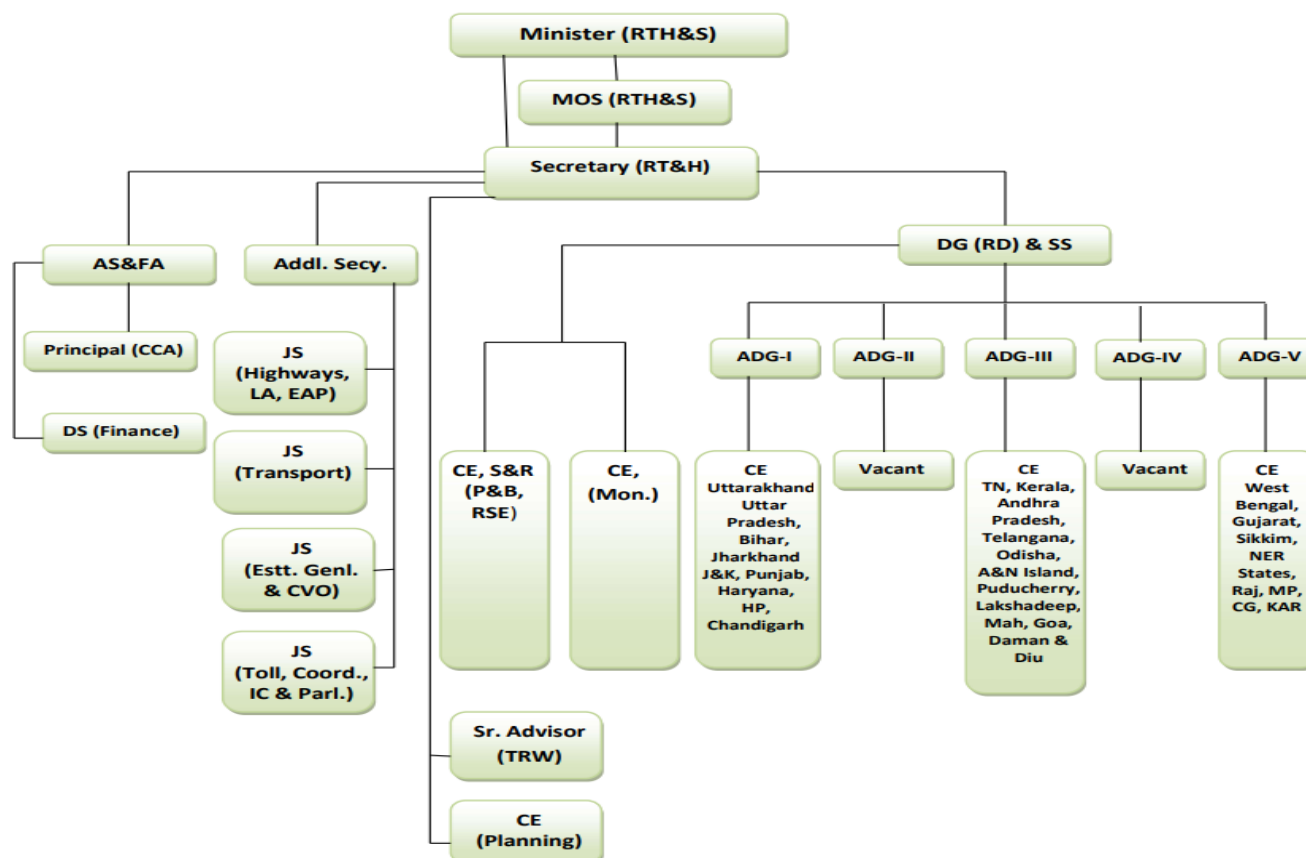
Source: NHAI

Table 6: NHAI Application of Funds (in Rs. Billion)

Application of Funds	FY19-20	FY20-21
Land Acquisition	285	359
Project Expenditure	498	615
Repayment of Loans and Interest thereon	194	256
Other Outflow	63	24
Total	1,041	1,254

Source: NHAI

Organisation Chart of MoRTH:



Note:- The matters relating to Vigilance, Land Acquisition, International Cooperation and Parliament shall be submitted directly to Secretary (RT&H) by the concerned Joint Secretary

Institutional framework for Roads at State level

- 1) Gujarat: Road and Building (R&B) department is a governing body in the State of Gujarat and it is responsible for the R&B Department is in charge of all activities pertaining to planning, construction and maintenance of all categories of roads and all Government owned Buildings in the State of Gujarat. These activities constitute a vital component of developmental work in the State.
- 2) Maharashtra: PWD is the authority that is responsible for the development of roads and highways in the state of Maharashtra. It is mainly entrusted with the construction and maintenance of roads, bridges, and Government buildings. The department also acts as the technical advisor to the State Government.
- 3) Uttar Pradesh: PWD is the authority that is responsible for the development of roads and highways in the state of Uttar Pradesh. It is mainly entrusted with the construction and maintenance of roads, bridges, and Government buildings. The department undertakes the maintenance of National Highways passing through Uttar Pradesh which are not covered by the National Highways Authority for which funds are provided by the Government of India. UP State Bridge Corporation, U.P. Rajkiya Nirman Nigam Ltd and U.P. State Highway Authority are the corporation and authorities working under UP PWD.

- 4) Madhya Pradesh: PWD is an authority in Madhya Pradesh. The main activities of the PWD are construction, upgradation and maintenance of National Highways, Major District Roads, Other District Roads, Village Roads and Construction of Bridges, Fly Overs and ROB's in the State. The total length of Road network under PWD is about 61,616.00 kms. The PWD undertakes construction of buildings in the state in project mode. Public Works Department is Nodal Agency for e - registration of Contractors of all Works Department in the State.

2.2.2 Policy framework for the infrastructure sector

To develop infrastructure, there should be certain policies to understand its need and also know its development stage. If there is any delay in the execution of projects then the reason for it can be known only if there is some policy. Hence, NITI Aayog had brought in the National Program and Project Management Policy Framework for sweeping reforms in the way infrastructure projects were executed in India with an action plan to:

1. Adopt a program and project management approach to infra development
2. Institutionalize and promote the profession of program and project management and build a workforce of such professionals
3. Enhance institutional capacity and capability of professionals

Major functions of the Infrastructure Policy & Planning Division are:

- Matters relating to the Harmonized List of Infrastructure Sub-sectors
- All policy related issues in infrastructure sectors including those concerning road, ports, shipping, railways, inland water transport, urban development, power, new and renewable energy, railways and telecommunication sector referred to Department of Economic Affairs by the Administrative Ministries concerned
- Examination of proposals requiring the approval of EFC/PIB/CCEA/COS/CCI in above sectors for viability and justification. In addition, all matters relating to Delhi Mumbai Industrial Corridor Trust
- Matters relating to infrastructure financing and promotion of investments in infrastructure sectors and credit enhancement
- All international interface on infrastructure policy issues and infrastructure financing
- Matters relating to the Infrastructure and Investment Working Group (IIWG) of G-20
- All policy related issues pertaining to energy sector, viz., Petroleum & Natural Gas, Coal, Atomic Energy and New & Renewable Energy
- Examination of proposals for grant of viability gap funding (VGF) under the National Clean Energy Fund (NCEF), matters relating to OPEC Fund for International Development (OFID) and Committee on Allocation of Natural Resources (CANR)
- Policy matters related to Public Private Partnerships (PPPs). The Public Private Partnership (PPP) Cell is responsible for matters concerning Public Private Partnerships, including policy, schemes and programmes and all other matters relating to mainstreaming PPPs
- Matters and proposals relating to the scheme for Financial support to Public Private Partnerships in Infrastructure [Viability Gap Funding (VGF)] Scheme and the India Infrastructure Project Development Fund

These major functions were further allocated Subject/Section wise work

1. Infrastructure (policy) Cell:

- All policy related issues in infrastructure sector including those concerning roads, ports, shipping, railways, inland water transport, urban development, power and telecommunication sector referred to the Department of Economic Affairs (DEA) by the concerned administrative Ministries or identified and examined by DEA
- Examination of proposals in above sectors requiring the approval of EFC/PIB/CCEA/COS/CCI for their viability and justification
- Sectoral Charge – Ministry of Road Transport & Highways, Ministry of Shipping including Ports and Inland Water Transport, Ministry of Urban Development, Ministry of Railways, Ministry of Civil Aviation, Department of Telecommunication, Department of Post
- All matters relating to Roads projects (PPP and non-PPP) including EFC/SFC/PPPAC and EI/EC under the Government of India VGF Scheme
- Matters relating to Delhi Mumbai Industrial Corridor Trust
- Development of Smart Cities
- Atal Mission for Rejuvenation & Urban Transformation (AMRUT)
- Institutional Mechanism (IM) for Harmonized Master List of Infrastructure Sub-sectors
- Telecom Commission
- National Highway Authority of India
- External charge – China, South Korea and North Korea
- India Korea Macro-economic and Financial Dialogue and
- India – China Financial Dialogue

2. Infrastructure Finance Section:

- Matters related to infrastructure financing and promotion of investments in infrastructure sectors
- Matters relating to Infrastructure Debt Funds (IDFs), Real Estate Investment Trusts (REITs)/Infrastructure Investment Trust InvITs, Tax Free Bonds, Municipal Bonds and other instruments meant for infrastructure financing and credit enhancements
- All international interfaces on infrastructure financing (other than PPPs)
- Model Tripartite Agreements (MTA) for sectors such as Road, Ports, etc.
- External charge- Bahrain, Oman, Saudi Arabia, Qatar, Kuwait, UAE, Yemen, Israel, Jordan and Lebanon

- Matters relating to Infrastructure and Investment Working Group (IIWG) of G-20
- India - Saudi Joint Investment Fund, Indo-Israeli R & D Fund
- Examination of proposals in above sectors requiring the approval of EFC/PIB/CCEA/COS/CCI for their viability and justification
- All policy matters relating to Project Monitoring Group (PMG)
- India Saudi Arabia Joint Commission for Technical and Economic Cooperation
- Matters relating to meetings of Board of Directors of ONGC-Videsh Limited (OVL), IIFCL and IRFC as Government nominee on the Board of Directors
- Coordination and general matters pertaining to the Division

3. Public Private Partnership (PPP) Cell

- Matters relating to appraisal and approval of Central sector PPP projects, as per the Cabinet approved "Compendium of Guidelines for Central Sector PPPs" and the Delegation of Powers assigned from time to time except those in Road Sector
- Matters and proposals relating to clearance by Public Private Partnership Appraisal Committee (PPPAC) except those in Road Sector
- Matters and proposals relating to the scheme for Financial support to Public Private Partnerships in Infrastructure Viability Gap Funding (VGF) Scheme except those in Road Sector
- Matters and proposals relating to the scheme for India Infrastructure Project Development Fund (IIPDF)
- Developing Multi-pronged and innovative interventions and support mechanisms for facilitating PPPs in the country, including Technical Assistance and programmes from bilateral/multilateral agencies on mainstreaming PPPs and support to State and local Governments
- Managing training programs, strategies, exposures for capacity building for PPPs and other matters relating to institution building for mainstreaming PPPs
- All International interfaces on PPPs & other matters concerning PPPs

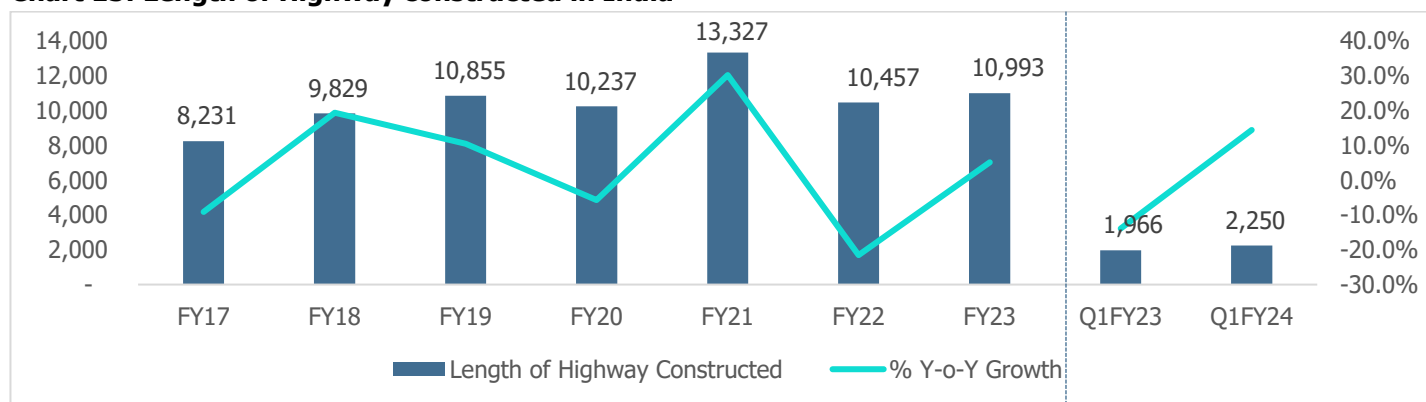
3. National Highway

Recovery Mode on – Highway construction pace returned to pre Covid level

Total Highways Construction in India grew at a CAGR of 13% between FY16-FY21. Despite the challenges amid COVID - 19, the Government’s relentless focus on infrastructure spending, supported a sharp growth in highway construction in FY21. After a slow growth in the first half of FY21, the pace of highway construction picked up in the second half of FY21, specifically months of February and March 2021 registered a record high construction at a pace of over 70 kms a day.

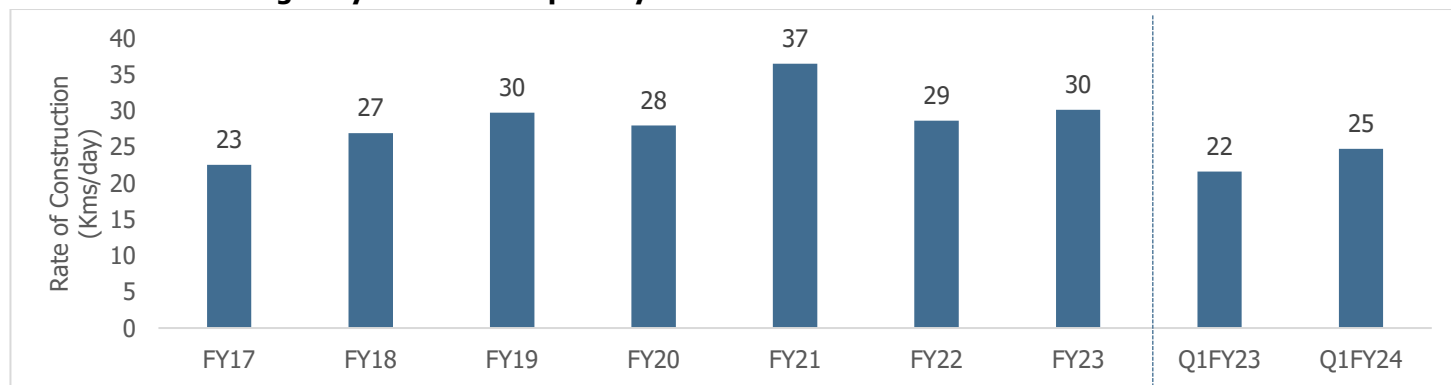
In FY22, the construction slowed down by 21.5% y-o-y after record highway construction in FY21, however, the awarding increased by 16.1% y-o-y. The pace of road construction picked up in FY23 with 10,993 km of construction, a growth of 5.1% y-o-y, however, the projects awarded were 12,375 km, a marginal decline of 2.8% as compared to the previous financial year. The pace of awarding has slowed by 36.9% y-o-y in Q1FY24 with 611 kms of highways awarded, however, construction activity increased up by 14.4% y-o-y with 2,250 Kms of highways constructed during the quarter.

Chart 15: Length of Highway constructed in India



Source: MoRTH & CareEdge Research

Chart 16: Rate of Highway construction per day



Source: MoRTH & CareEdge Research

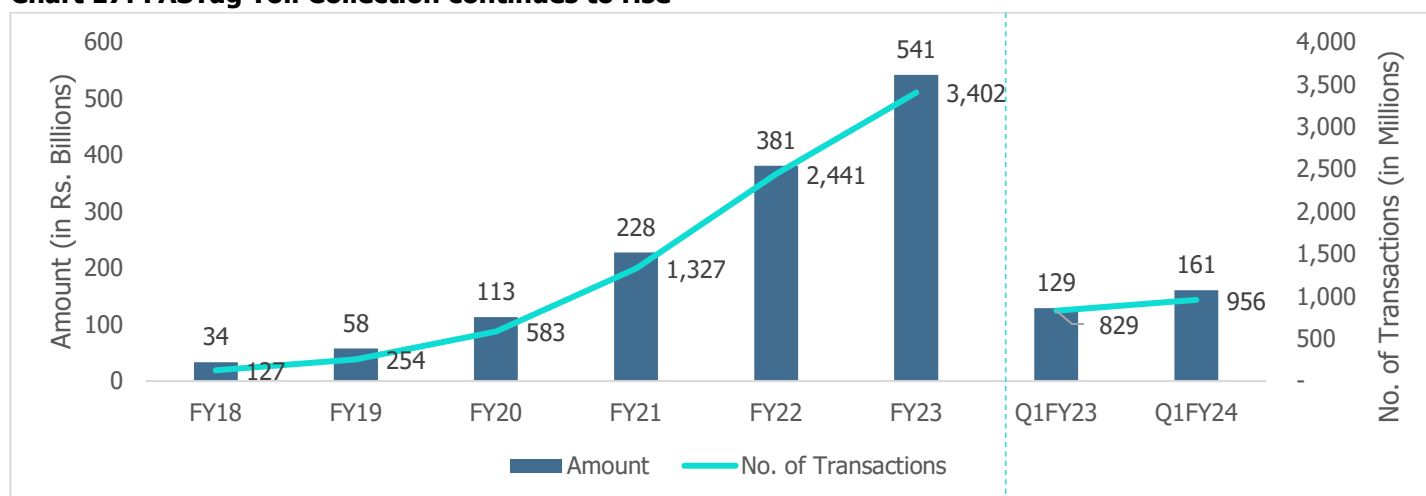
3.1 Electronic Toll Collection

FASTag is proving an effective and time saving mode of Toll Collection

Electronic toll collections have soared since the introduction of FASTag. FASTag toll collection for the Q1FY24 stood at Rs. 161 Billion from 956 Million transactions compared to Rs 129 Billion from 829 Million transaction in Q1FY23 a growth of 25% y-o-y, making it highest ever collection during the first quarter of financial year. FY23 has seen record high toll collection of Rs 541 Billion a growth of 42% from 3402 Million transaction. This record high toll collection was achieved due to declaration of all lanes on national highway as FASTag lanes, increased economic and transportation activities across India especially during the festive season.

FASTag comes as a part of the Government of India’s initiative to enhance digital transactions across various sectors in the country. It was first introduced in India in 2014 and was made mandatory from February 2021. It has transformed the way toll tax is collected in the country. It is a Radio Frequency Identification (RFID) technology enabled card that allows drivers to pay their toll tax electronically at the toll booth reducing long vehicle queues and waiting times and at the same time saving time and fuel.

Chart 17: FASTag Toll Collection continues to rise



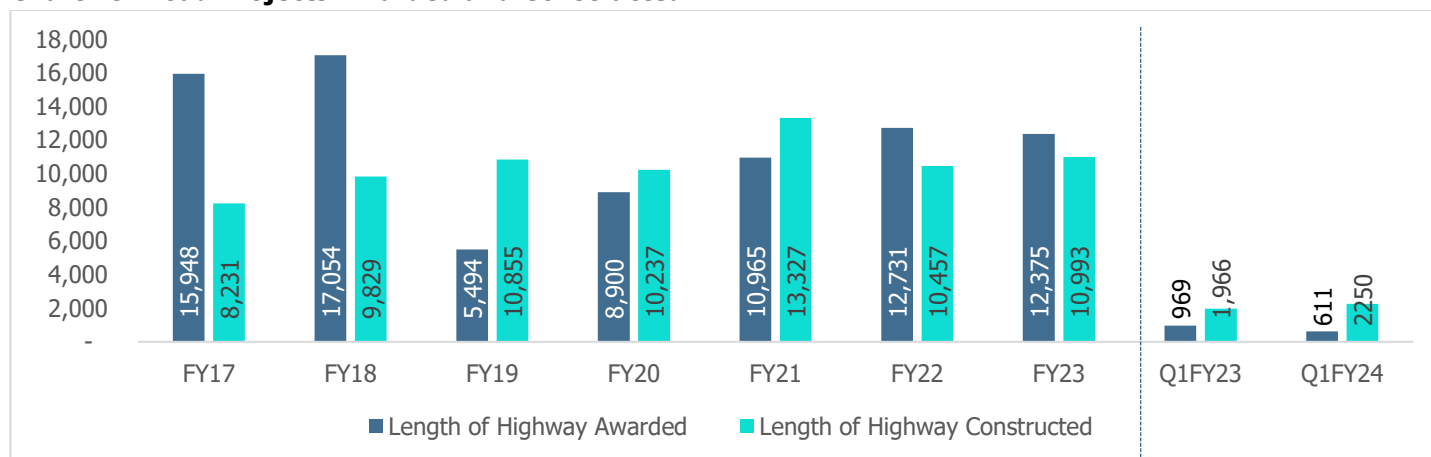
Source: National Payments Corporation of India

3.2 Key Drivers of the sector

Firing the fuel that lead to achieve pre Covid levels

The national highway projects had witnessed decline in awarding activity due to lower participation from private players. However, with increased focus towards Engineering, Procurement and Construction (EPC) and Hybrid Annuity Model (HAM) models, the pace of awards of NH projects grew at a strong pace of 11.41% CAGR over the past 4 years (Refer chart below). The project awarding has remained strong during FY22 and FY23 at an average of 12,553 Km per year and the construction pace has also been maintained. Project awarding and execution is expected to continue its momentum in FY24 on back of various Government initiatives such as Gati Shakti, Bharatmala Pariyojana, National Infrastructure Pipeline.

Chart 18: Road Projects Awarded and Constructed



Source: MoRTH & CareEdge Research

Government's infrastructure focus to support growth in the medium term

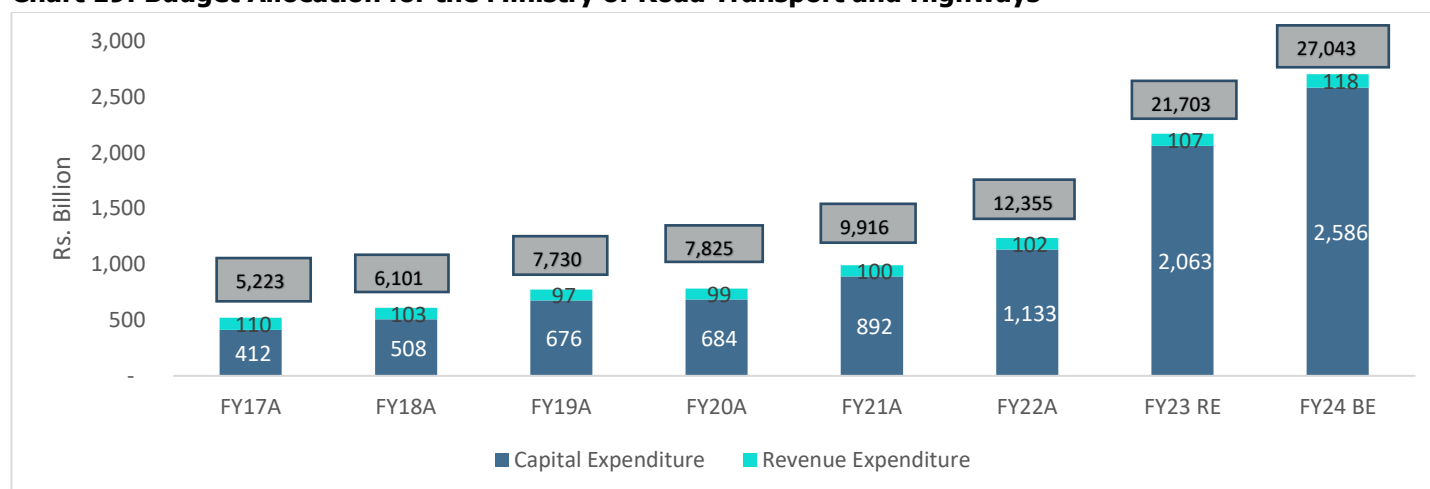
Road construction is amongst the critical sub-segments of infrastructure development, economic growth as well as for employment creation. Infrastructure is a major focus of the Government currently.

In the Union budget 2023-24, the Government budgeted to incur higher expenditure towards road construction, wherein, the Central Government made the highest ever outlay of Rs. 2,704 Billion (compared to the estimated expenditure of Rs. 2,170 Billion for 2022-23).

Overall, the Union Budget for 2023-24 emphasized on infrastructure development. The budget plan aims for multi-modal logistics facilities and connectivity systems under the PM Gati Shakti. For infra push, financial assistance of Rs.1,300 Billion in interest free loans for 50 years has been allocated to states from the Centre. Through this, the Government is planning to generate employment opportunities and augurs well for the roads sector.

In addition to the above, Rs. 1,11,000 Billion of investments have been projected in infrastructure projects during FY20-FY25 by the Task Force on National Infrastructure Pipeline (NIP), with ~18% of the targeted investment expected to be made in the road sector in India. Also, under the recently announced National Monetization Pipeline, around Rs.1,600 Billion are to be raised through monetization of roads over FY22-25.

Chart 19: Budget Allocation for the Ministry of Road Transport and Highways



Source: MoRTH

RE – Revised Estimates; A – Actual; BE – Budgeted Estimates

Private sector participation sees a gradual uptick

Despite the ambitious targets set for the construction of national highways, the private sector participation has remained constrained since FY16, primarily due to challenges faced by developers in the projects bid under the erstwhile BOT mode between FY11 and FY12.

However, there has been a gradual shift towards EPC and HAM projects which has again gradually revived the interest and investments of private sector players. Interest in BOT (Toll) projects has reduced. Projects have been primarily bid out in HAM and EPC mode.

Under Bharatmala Pariyojana, a total number of 604 road projects with an aggregate length of 20,965 km have been approved and awarded with a total capital cost of Rs. 6,417 Billion. Out of the total approved projects, 389 projects have been awarded under EPC mode (56%), 209 projects have been awarded under HAM mode (42%) and 6 projects have been awarded under BOT (Toll) mode (2%).

Table 7: Bharatmala Pariyojana Projects Approved and Awarded as on December 2021

Sr. No	Mode of Implementation	Bharatmala & Residual NHDP – Awarded (A)		Bharatmala & Residual NHDP – Approved - To be Awarded (B)		Bharatmala & Residual NHDP – Total (A+B)		Capital Cost (Rs. in Billion)	% Length
		No. of Projects	Length (km)	No. of Projects	Length (km)	No. of Projects	Length (km)		
1.	EPC	373	11,288	16	423	389	11,710	2,995	56%
2.	HAM	197	8,298	12	483	209	8,781	3,296	42%
3.	BOT Toll	4	341	2	133	6	473	126	2%
	Total	574	19,926	30	1,038	604	20,965	6,417	100%

Source: MoRTH

3.3 Key budget announcements for road sector in 2023-24 Budget

The 2023-24 budget by the Government highlights the impetus for growth by focusing on big public investment for modern infrastructure, which shall be guided by PM Gati Shakti and benefited by the synergy of multi-modal approach.

- It's a step towards economic growth as well as sustainable development and is driven by seven engines, namely, Roads, Railways, Airports, Ports, Mass Transport, Waterways, and Logistics Infrastructure. Rs 150 Billion has been set aside under Pradhan Mantri PVTG Development Mission to improve socio-economic conditions of the particularly vulnerable tribal groups (PVTGs) by way of providing basic facilities such as safe housing, clean drinking water and sanitation, improved access to education, health and nutrition, road and telecom connectivity, and sustainable livelihood opportunities.
- 100 critical transport infrastructure projects have been identified at an investment of Rs 750 Billion including Rs 150 Billion from private players.
- For the urban infrastructure in Tier – II and Tier – III cities, a corpus of Rs 100 Billion has been set aside via establishment of Urban Infrastructure Development Fund.

3.4 Government Initiatives for Development of Road Infrastructure

Government of India has introduced a number of policy initiatives to ensure an enabling environment for various stakeholders involved.

The initiatives are broadly categorized as follows:

1. Development Initiatives by Government of India

- **Bharatmala Pariyojana**

The Ministry of Road Transport and Highways has envisaged an ambitious highway development program Bharatmala Pariyojana which includes the development of 65,000 km of national highways. The key objective of the programme is to optimize the efficiency of freight and passenger movement – this would be achieved by bridging critical infrastructure gaps through the development of Greenfield expressways, economic corridors, inter-corridors and feeder routes. Under Phase-I of Bharatmala Pariyojana, the ministry has approved implementation of 34,800 km of National highways in 5 years with outlay of Rs 5,350 Billion. NHAI has been mandated the development of about 27,500 km of National Highways under Bharatmala Pariyojana Phase-I.

- **Connectivity in LWE Area**

The Government has approved a scheme for development of about 1,177 km of NHs and 4,276 km of State Roads in Left Wing Extremism (LWE) affected areas as a Special Project with an estimated cost of about Rs. 73 Billion. This Scheme is being implemented by Ministry of Road Transport & Highways for improving road connectivity in 34 LWE affected districts in 8 States i.e. Andhra Pradesh, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Maharashtra, Odisha and Uttar Pradesh. The detailed estimates for 5,422 km length have been sanctioned at an estimated cost of Rs. 87 Billion. Development in 4,792 km length has been completed up to March, 2019 and cumulative expenditure incurred so far is Rs. 73 Billion.

- **Char Dham Pariyojana**

The Ministry has taken up separate programme for connectivity Improvement for Char-Dham (Kedarnath, Badrinath, Yamunothri & Gangotri) in Uttarakhand. Out of total 53 civil works covering the entire length of 889 km under

Chardham project, 40 civil works of total project cost amounting to Rs. 95 Billion (including cost of pre-construction works amounting to Rs. 5 Billion) and length of 673 km has been sanctioned.

- **Special Accelerated Road Development Programme (SARDP) including Arunachal Pradesh Package**

The scheme has been envisaged to be taken up under three phases. In first phase, improvement of about 4,099 km length of roads (3,014 km of NH and 1,085 km of State roads). Out of these, 3,213 km roads have been approved for execution and balance 886 km has been approved 'In-Principle'. 3,333 km of length has been awarded and 2,101 km of roads have been completed till March, 2019. The SARDP-NE first phase is expected to be completed by 2023-24. Second phase of SARDP-NE, covers 3,723 km (2,210 km NHs and 1,513 km of State roads) of road and shall be taken up after completion of first phase.

The Arunachal Pradesh Package for Road & Highways involving development of about 2,319 km length of road (2,205 km of NHs & 114 km of State / General Staff / Strategic Roads) has also been approved by the Government. Projects on 776 km are to be taken up on BOT (Annuity) mode and the remaining are to be developed on EPC mode / Item Rate Contract as per Ministry's extant policy. Projects of 2,047 km length have been awarded and 928 km of road has been completed till March, 2019. The entire Arunachal Pradesh package is targeted for completion by 2023-24. An amount of about Rs 30,315 crores has been spent in SARDP including Arunachal Pradesh Package.

- **State PWD and Border Road Organization (BRO)**

An amount of about Rs. 310 Billion have been earmarked during the year 2022-23, for the development of NH entrusted to State PWDs. States have spent Rs. 182 Billion till 31st December 2022. An amount of about Rs. 5 Billion crores was earmarked during the year 2022-23, for the development of NH entrusted to BRO. BRO has spent Rs 3 Billion till 31st December 2022. An amount of about Rs 13 Billion was earmarked during the year 2022-23, for the maintenance of NH entrusted to State PWDs. States have spent Rs. 3 Billion till 31st December 2022. An amount of about Rs. 2 Billion has been earmarked during the year 2022-23, for the maintenance of NH entrusted to BRO. BRO has spent Rs. 1 Billion till 31st December 2022.

- **FDI Investment in Roads and Highways**

Government has permitted 100% FDI investment in roads and highways projects by automatic route. This has attracted many international institutes to invest in projects. Some of the investments are as follows:

- Australia-based Macquarie Infrastructure and Real Assets' second pan-Asian infrastructure fund, Macquarie Asia Infrastructure Fund 2 (MAIF 2), in association with Ashoka Buildcon, has bagged contract for the first bundle of nine highway stretches measuring 680 km in Andhra Pradesh and Gujarat
- Canada Pension Plan Investment Board (CPPIB) and Allianz Capital Partners (ACP) acting as anchor investors in India's first private infrastructure investment trust, namely, IndInfravit Trust, which is sponsored by L&T Infrastructure Development Projects Ltd (L&T IDPL). Under this, CPPIB's investment of Canadian \$200 Million fetched it 30% of IndInfravit units with ACP and L&T IDPL accounting for 25% and 15%, respectively. The remaining units were subscribed by other institutional investors.

2. Various Operational Initiatives to smoothen construction

Process streamlining is being increasingly taken up by the ministry to ensure smooth appraisal and approval of road sector projects. Some of the major steps for process streamlining are:

- **Mode of Delivery:** MoRTH is empowered by a Cabinet Committee on Economic Affairs (CCEA) decision on mode of delivery of projects.
- **Increased threshold for project appraisal and approval:** MoRTH was authorized through a CCEA decision to appraise and approve projects up to Rs. 100 Billion.

In addition to this many technological initiatives have been adopted by the ministry to aid the execution and operation of a road projects. Some of technological initiatives are:

- **Use of Bhoomirashi:** The ministry has corroborated with the National Informatics Centre, to create Bhoomirashi, a web portal which digitizes the cumbersome land acquisition process and also helps in processing notifications relating to land acquisition process and also helps in processing notifications relating to land acquisition online. Processing time, which was earlier two or three months, has come down to one to two weeks now.
- **E-procurement System:** NHAH is using the e-procurement portal for tendering of all kinds of goods and services. This has led to greater transparency. The system currently in use by NHAH is the Central Public Procurement Portal by National Informatics Centre (NIC).
- **Implementation of FASTag:** Introduced in 2014, the RFID-based FASTags affixed on vehicle windscreens would enable toll to be debited from a linked account, without requiring vehicles to stop for transactions. However, it did not pick up until a transport ministry directive in July 2019 called for equipping all toll lanes barring one across National highways in the country with electronic toll collection (ETC) infrastructure.
- **Bidder Information Management System (BIMS):** This system aims to simplify the qualification process of bidders for road construction contracts. This helps in faster evaluation of technical information provided by the bidders.
- **Interlinked between various platforms:** The two IT initiatives Bhoomirashi and BIMS, have now been integrated with the Public Financial Management System (PFMS). PFMS allows for the compensation amount to be paid to the concerned person directly rather than being deposited with CALA (Competent Authority for Land Acquisition).
- **mVahan:** mVahan has been envisaged as a convenient mobile solution for managing various VAHAN services by Department Officers at the RTOs and other stakeholders like Dealers. The current version, facilitates a number of processes including automation of Vehicle Inspection and Fitness, facilitation of documents uploads by Dealer/RTO during vehicle registration and other services like processing requests for change of address etc. The Government is further working to expand to cover the full range of RTO operations.

3. Revival of Languishing Projects

Projects which were languishing for a number of years have been attempted to be revived with the help of number of policy measures taken by the Government. Some of the policy measures have been discussed below:

- **100% equity divestment two years post COD** – The policy enables private developers to take out their entire equity and exit all operational BOT projects two years from commercial operation date.
- **Premium deferment in stressed projects** – The policy permits rescheduling of premium committed by concessionaires during bid stage for awarded projects.

- **Rationalized compensation to concessionaires for languishing NH projects in BOT mode for delays not attributable to concessionaires** – The policy enables extension of concession period for languishing BOT projects to the extent of delay provided. The original operation period remains unchanged.
- **One-time fund infusion** – The policy enables revival and physical completion of languishing BOT projects that have achieved at least 50% physical progress, through one-time fund infusion by NHAI, subject to adequate due diligence on a case to case basis.

4. Amicable Dispute Resolution

To enable time-bound resolution in an affordable manner, efforts have been made by NHAI for dispute resolution through the established mechanism of alternate dispute resolution through the three-tier stage of:

- 3-CGM committee
- Independent Settlement Advisory Committee (ISAC) and
- Executive Committee/Board of NHAI for Settlement of disputes

In 2017, NHAI has also established Conciliation through Committee of Independent Experts (CCIE) Society of Affordable Redressal of Disputes (SOROD) was formed in 2013 by NHAI to reduce cost and time overruns due to the arbitration process and for fast dispute redressal. The main objectives of SAROD were to reduce cost due to the arbitration process and pendency of disputes, efficient disposal of disputes and to develop experts for the arbitration process 347 arbitrators have already been empanelled.

3.5 PPP models

To boost the Private participation, Government has come up with various models

Overview

Connectivity has been priority of the Government and making last mile connectivity road is the best and cheapest way of increasing connectivity. Construction of roads in every corner of the country by only Government agency is difficult as it will increase time and cost both. To achieve complete connectivity by way of roads, Government partnered with the private players and it came to be known as Public Private Partnership (PPP). Initially, PPP road projects broadly fell in one of the two categories of toll or annuity. However private sector participation gradually subdued post 2012 due to various issues including aggressive bidding and over-leveraged balance sheet of developers, shortcomings in project preparation activities and land acquisition issues. To attract PPP participation in the road sector, Government introduced the Hybrid Annuity Model (HAM). It focused on proper allocation of risk amongst the partners. Further, operational asset monetization model has gained prominence recently with the advent of the Toll-Operate-Transfer (TOT). Other asset monetization options like use of Infrastructure Investment Trusts (InvIT) and Securitization of toll revenues are also in various stages of implementation.

Key types of PPP models in India

- **Build Operate and Transfer (BOT)**
This is a simple and conventional PPP model where the private partner is responsible to design, build, operate (during the concession period) and transfer back the facility to the public sector. Role of the private sector partner is to bring finance for the project and take the responsibility to construct and maintain it. In return, the public sector will allow it to collect revenue from the users by way of Toll. A number of BOT variants are depending on the allocation of roles and risks - these include DBO, DBFOT, BOOT, DBOOT, BOO, etc.

- **BOT (Annuity)**

In the BOT (Annuity) mode, the private partner is responsible for building, operating and transferring the road at the end of the agreement period to the public sector. The toll collection is however undertaken by the Government agency and the payment is made on semi-annual basis to the private players.

- **Engineering, Procurement and Construction (EPC)**

In the EPC mode, the cost is completely borne by the Public Sector Government. Public sector invites bids for engineering knowledge from the private players. Procurement of raw material and construction costs are met by the public player. The private sector's participation is minimum and is limited to the provision of engineering expertise.

- **Management Contract**

The private promoter has the responsibility for a full range of investment, operation and maintenance functions. He has the authority to make daily management decisions under a profit sharing or fixed-fee arrangement. Variants include basic management for fee contract, management contract with performance incentives, management and finance contract with some rehabilitation and expansion.

- **Lease Contract**

In this approach, the Government gives a concession to a private entity to build a facility (and possibly design it as well), own the facility, lease the facility to the public sector and then at the end of the lease period transfer the ownership of the facility to the Government. Usually, the private partner in such cases would require an assurance in terms of tariff levels, increases over term of lease and compensation and review mechanism in case the tariff levels do not meet the estimates. Variants include BLT, BOLT, and BTL.

- **Service contract**

In this approach, the private promoter performs a particular operational or maintenance function for a fee over a specified period of time. In addition, there are modes such as TOT and Operate-Maintain-Transfer (OMT) for monetizing future toll earnings of completed projects.

- **Hybrid Annuity Model (HAM)**

Due to subdued private sector participation in the bidding process, the Government opted for advance version of the Hybrid Annuity Model (HAM) in FY2017. It came in the time when private players were highly leveraged and banks were cautious in increasing their lending exposure to private sector players as majority of the projects were getting delayed and stuck in execution. Major BOT project had proven to be bad choice as the main assumption for the returns was traffic was quite aggressive. But in case of HAM, it is a mix of BOT (Annuity) and EPC models. This model safeguards the interest of both the parties i.e., Government and private entity. During the construction period, the private entity is provided 40% grant of the bid project cost by the Government in five equal instalments depending on the physical progress of the project. The remaining 60% of the bid project cost is to be borne by private entity through debt and equity. The Government generates its revenue from the project by way of toll collection. This model has been very successful as the burden of financing of private players has reduced.

In the first year of its implementation, Rs 28,000 crores of projects were awarded by the NHAI of which 50% of the projects were under HAM. HAM has not only brought back private participation but it has also safeguarded the banks as the fund disbursed to private players are backed by the Government annuity payments i.e. the traffic risk is taken care by Government itself,

3.6 Challenges faced by the roads sector

Despite Government’s continuous support by way of Finance and tweaking PPP models many challenges still persist for the sector

- **Land Acquisitions:** Post Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2003, many land owners demand for higher compensation and refuse to hand over possession of their land. With the Act coming into effect, cost of land has increased and in some case land cost is higher than the project cost.
- **Mismatch between project cashflows and debt repayment tenure:** Revenue from large infrastructure projects is spread over 20-30 years whereas the loan for the same project is for the period of 10-15 years. This results into cashflow mismatches in the initial years of operations till the project stabilizes and also overall tenure mismatch between project cashflows and debt repayment, thereby resulting in private players to fund cashflow mismatches from their own sources.
- **Projects Delays Impact on Financial Institutions:** As the debt are on the rise due to push for road projects, many projects which get stuck or delayed result in loans turning into NPAs which leads to contraction in the lending capacity of the banks.
- **Financial Stress:** Due to failed BOT projects on account of lower than estimated traffic or delays in project completion due to approvals/ land acquisition, private players have come under financial stress due to significantly leveraged balance sheets in anticipation of high levels of project revenue growth. Due to slowdown in economic activity due to COVID - 19, revenue realisation has also been much lower rate than anticipated.
- **Highly stressed Loan portfolios:** With lower than anticipated revenues, the private players’ debt servicing capacity has been impacted. To mitigate the risk of failure of the company, restructuring of loan has been opted by the private players. Restructuring of loans for the first time does not impact asset classification but subsequent restructuring leads to NPA recognition in the books of financial institutions.

3.7 SWOT Analysis

In broader sense, following is the SWOT Analysis of Roads and Highway sector:

STRENGTH	WEAKNESS
<ul style="list-style-type: none"> • India ranks second in the world with the road network of 63.32 lakh Kilometres • State and National Highways form backbone of the country • It is most cost-effective way of linking the Urban and Rural areas • Government initiatives such as Gati Shakti, Bharatmala Pariyojana, National Infrastructure Pipeline etc. • Development of Roads and Highways with the help of Private Players 	<ul style="list-style-type: none"> • Fund set aside for the maintenance and expansion of road network have been insufficient • National highways represent only 2% of the total network length and major traffic by road is handled by National Highways • Lower Private players participation on account of unfavourable PPP models, delay in construction work due to land acquisition

OPPORTUNITY	THREAT
<ul style="list-style-type: none"> • With National Highways and State Highways accounting to 5% of the total road network, there is still an opportunity of expanding them • Conversion of state roads from 2 lane to 4 lane and 4 lanes to 6 lane gives an added opportunity of development • Budgetary allocation has been increased from Rs 522 Billion in FY17 to Rs 2,704 Billion in FY24 giving a Government seriousness to the connectivity by road • To mitigate the difficulty of land acquisition, NHAI has decided to allot project post 90% of land acquisition • Government has come up with Bhoomirashi, a web portal, for the faster acquisition of land 	<ul style="list-style-type: none"> • Decrease or stagnant Private participation in road construction will lead to delayed development resulting to higher cost of construction • Protest by landowners for higher compensation for their surrendered land result into delay and higher cost of construction • Default of private player due to failed project under PPP model will further reduce private participation • Reduction in Budgetary allocation will take back the sector as private players too will think twice before placing bids • Development of Border roads may face off from neighbouring countries which will lead to delay and higher cost of construction

3.8 Outlook

Connectivity has always been the backbone of any economy as it not only reduces the overall cost of logistics but also reduces the overall cost of production. To achieve last mile connectivity, roads and highways pave the way as they are cost effective way of connectivity. Over the years budgetary allocation has been increased from Rs 522 Billion in FY17 to Rs 2,704 Billion in FY24 proving the Government’s high focus on infrastructure sector. India has second largest road network in world with 63.32 lakh kilometres of roads and highways of which 5% falls under Highways. For better connectivity and faster movement of goods, Government is expanding 2 lane highways to 4 lanes and 4 lanes to 6 lanes. Sector has higher opportunities as the connectivity of ports and other key locations such as consumption centres, metros, Tier-2 cities and strategic importance is still under developed.

To achieve the complete connectivity, private player participation is a must and to attract the investment of private players, Government has brought into several Public-Private Partnership (PPP) models which has attracted significant investment over the past decade. Of all the PPP models, HAM has proven to be a successful. It has given favourable condition for the participation of private players. Government is looking forward to bring in more projects under HAM followed by EPC. Lower participation for private players has at some point hampered the overall development of roads and highway sector. Issues of delay in project completion, due to land unavailability has been dealt by NHAI’s decision to allot project, post completion of 90% of land acquisition. Also, the Government has allowed 100% FDI in the sector and allowed asset monetisation for private players post construction is complete.

Further, to set a clear view of development, Government has set up National Infrastructure Pipeline. Under the National Infrastructure Pipeline (NIP), 18% of the Rs. 1,11,000 Billion investment targeted over FY20-FY25 is expected to be made in the roads sector. Majority of it is targeted towards improving road length and safety features. A total of 1815 national highway projects spanning 87,612 kms and 5 expressway projects spanning 2,142 kms have been identified under the pipeline with a capital expenditure of Rs. 1,38,000 Billion over the fiscals 2020 to 2025. Delhi-Mumbai expressway and Chennai-Bengaluru Expressway have been identified as the marquee projects.

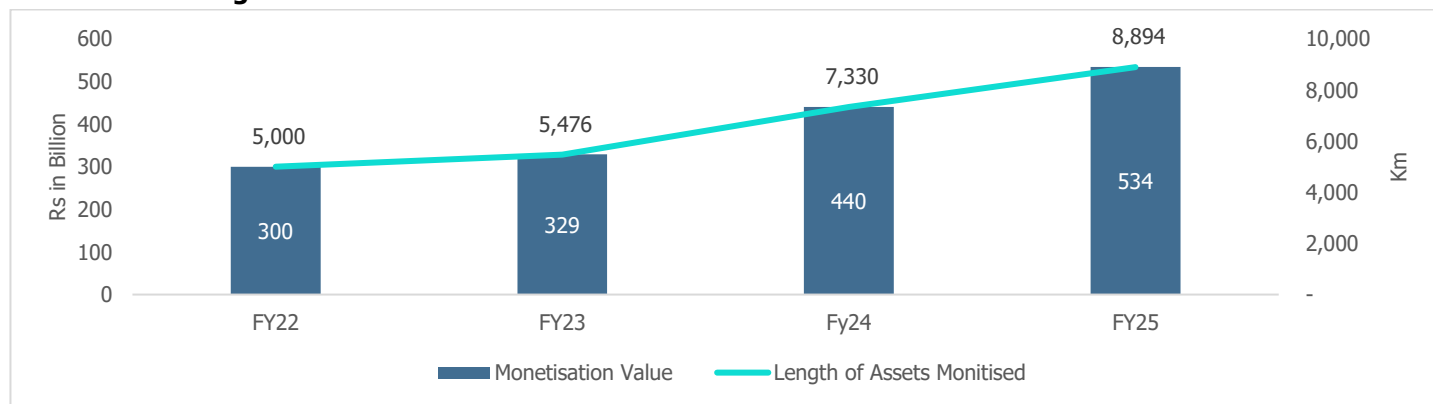
To finance the NIP, several innovative financial avenues would have to be looked at, such as asset monetization, increased implementation of de-risked models such as Hybrid Annuity Model (HAM) and introduction of investment platforms such

as Infrastructure Investment Trusts (InvITs) apart from monetization planned through the National Monetization Plan (NMP).

National Monetization Plan

The National Monetization Plan (NMP) announced by the Government has identified the road sector having the maximum potential at Rs. 1,60,200 crores which constitutes 27% share in the overall NMP. Around 26,700 km of road assets are to be monetized under NMP which makes around 20% of the total asset length. The chart below shows the phasing planned under NMP.

Chart 20: Phasing Under NMP



Source: National Monetization Pipeline, Volume II

NHAI announced InvIT as a mode to monetize road projects under NMP. The InvIT will initially have a portfolio of five operating toll roads with an aggregate length of 390 kilometres. These roads are located across the states of Gujarat, Karnataka, Rajasthan, Maharashtra, Andhra Pradesh, Madhya Pradesh and Telangana. NHAI's first InvIT raised more than Rs 50 Billion in November 2021 and second InvIT raised Rs 15 Billion in October 2022. TOT projects covered under InvITs are Kotha Kota Kurnool Project Highway, Chittorgarh Kota Project Highway, Maharashtra Belgaum Project Highway, Abu Road Swaroopganj Project Highway and Palanpur Abu Road Project Highway. The Government plans to add more national highways to the InvIT portfolio as the long-term revenue generating assets such as toll roads provide stable and long-term yields under the InvIT structure. With InvIT coming into picture, burden on budget will be lowered as monetization of assets through InvIT will generate cash flows for investment in ongoing and future projects. Further, this will also result in reduction in debt of NHAI.

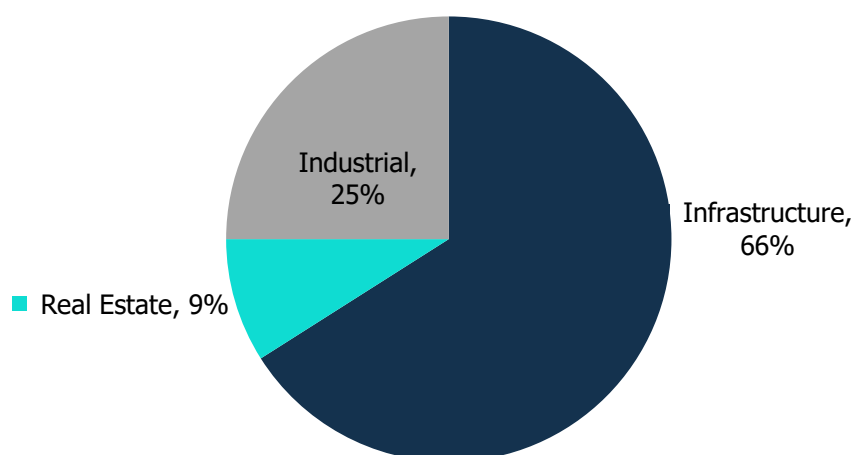
4. Construction Sector

4.1 Overview

The construction industry in a country is an important indicator of its development. Broadly, the construction sector can be classified into infrastructure, real estate and industrial construction. Wherein, infrastructure can further be spread across different sectors such as roads and highways, telecom, airports, ports, power, oil and gas and railways.

The construction sector contributed around 8.4% to the national GVA (at constant price) in FY23. Increase in Infrastructure demand & Government initiatives shows the potential for catapulting India to the third largest construction market globally.

Chart 21 : Share of key segments that contribute to construction spending



Source: Department of Industrial Policy and Promotion (DIPP)

Key indicators of raw material consumption in construction sector:

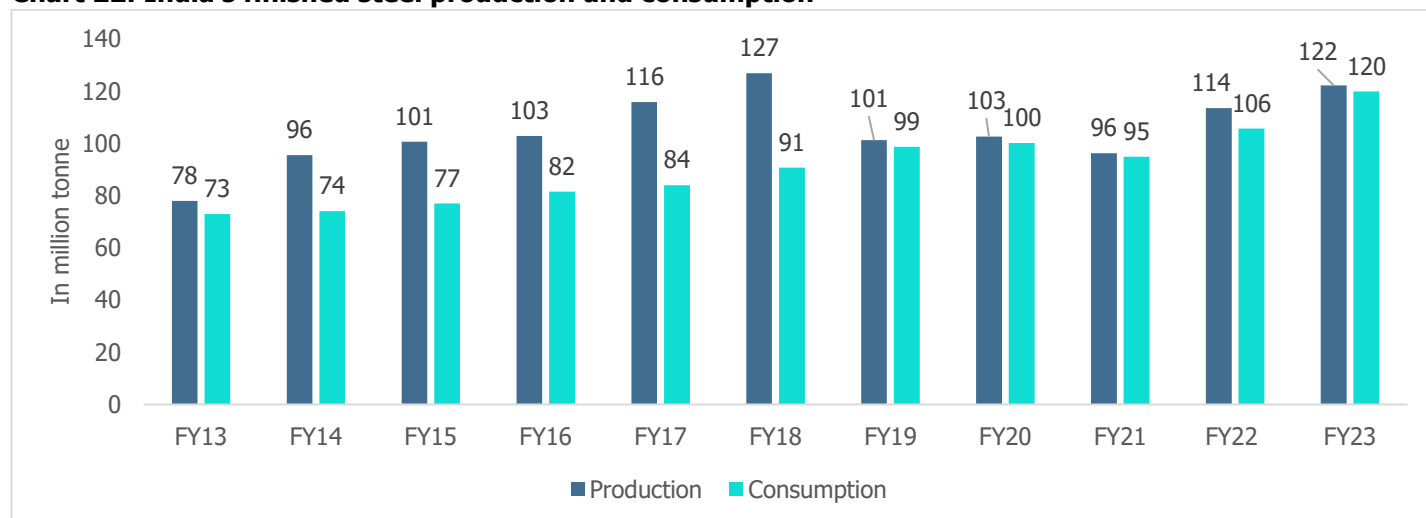
Steel industry

India is the second largest steel producer in the world. The Indian steel sector has been able to grow over the years due to domestic availability of raw material such as iron ore and cost-effective labour.

Trend in India's finished steel production and consumption

In the last 11 years, finished steel production increased at a CAGR of 4.9% from 78 MT in FY13 to 126 MT in FY23. The growth in production is backed by a rise in domestic steel consumption on account of growing economic activities in the country like increase in infrastructure and construction spending by the Government, improved automobile and consumer durable demand among others. During these years, finished steel consumption in India has increased at a CAGR of 5.1% from 73 MT in FY13 to 120 MT in FY23.

Chart 22: India's finished steel production and consumption



Source: CMIE

The domestic steel production in FY23 was 122 Million tonnes up from 114 Million tonnes in FY22, an increase of 8% y-o-y. India's steel consumption was at 120 Million tonnes in FY23, up from 106 Million tonnes in FY22, an increase of 13% y-o-y on account of increased consumption by the Government on developing infrastructure as well as the resumption of real estate and construction activities.

Cement industry

Cement industry forms part of the core industrial sectors in the country and in terms of production, India is the second largest producer of the cement. For a developing and transitioning economy such as India, cement as a commodity holds significant value given the immense infrastructure requirements of a growing and urbanizing country, as well as its contributions by way of direct and indirect employment. The GoI has time and again emphasized its focus on infrastructure development with the announcement of several schemes such as Housing for All and NIP to name a few schemes. Growth in the cement industry is indicative of the overall growth in the economy.

Even though India is the 2nd largest producer of cement in the world, the market is highly underpenetrated. The per capita consumption of cement is only between 200-250 kg/per capita compared to the world average of 500-550 kg/per capita.

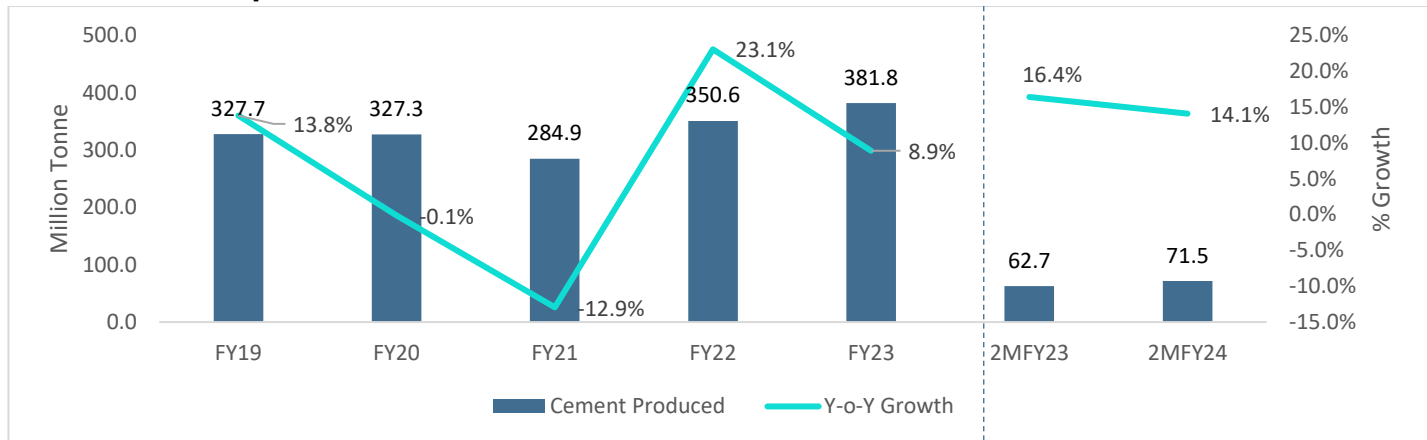
Trend in production

In FY22, production of cement at 350.6 Million tonnes (MT) surpassed the pre-pandemic levels, growing by 23.1% as compared with 285 MT of cement produced in FY21 aided by a low base of FY21 and pent up demand from the previous years.

In FY23, there was an 8.9% increase in production on a year-on-year basis to 381.8 MT driven by increase in Government push for infrastructure development especially in the rural segment, urban housing and construction activities like metros, highways, smart cities etc. in different regions of India.

There is a cyclical trend in the cement production/consumption where-in the same is low during April to October mainly on account of monsoons and picks up subsequently over November to March as the monsoons subside and construction activity increases across the country. As a result, the production declines in the 1st and 2nd quarter of any financial year compared to previous half year, but it soon picks up after the festive season and usually see a significant growth in 3rd and 4th quarters of a financial year.

Chart 23: Cement production



Source: CMIE, CareEdge Research

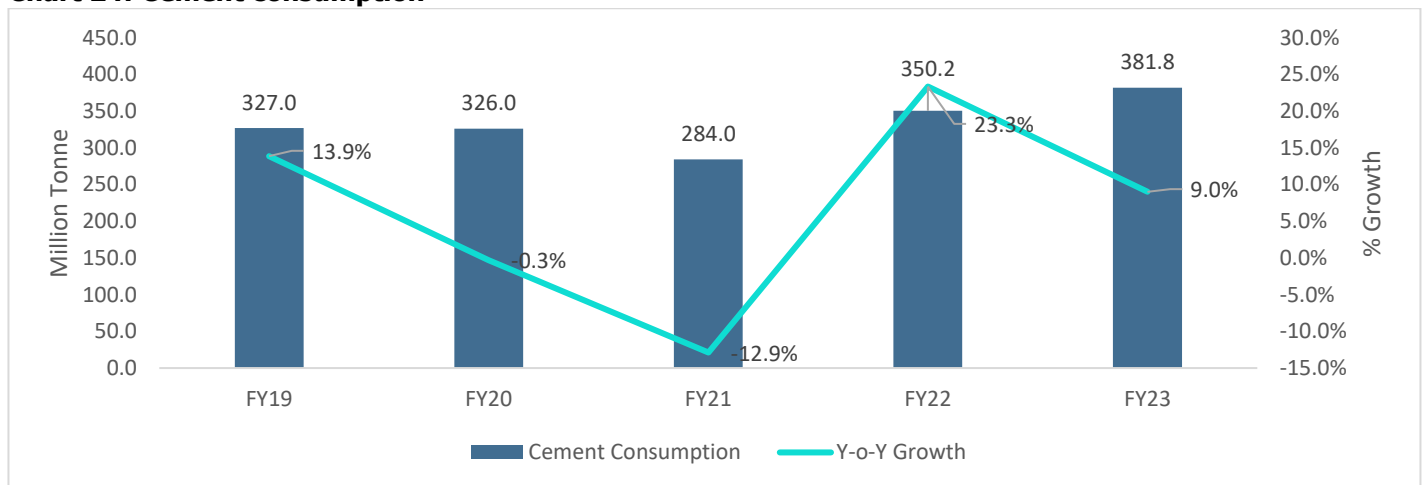
Cement consumption:

There was a major decline in cement consumption to 284 MT (13% y-o-y) in FY21, which can be attributed to the challenging environment witnessed by the industry on account of Covid-19 pandemic outbreak. The end user industries of cement such as real estate sector and infrastructure sectors were severely impacted. The persisting liquidity crunch in the sector worsened, and restrictions imposed by the Government to arrest the spread of Covid-19 led to many developers postponing completion of their projects. The industry had to also grapple with issues such as reverse migration and disruption in supply chain.

In FY22, after opening of the economy, the real estate industry is demonstrated signs of recovery. Reopening of the property markets in India led to an uptick in buyers. The second half of FY22 saw improvements in the real estate capital flow even with emergence of Omicron though not to the pre-Covid levels. The cement consumption stood at 350.2 MT in FY22 and continued to increase backed by growth in demand from end user industries such as construction of public infrastructure and real estate. The demand growth continued in FY23 backed by fast paced construction of roads, railways and other infrastructure projects across the country.

In FY23, there was an 9% increase in consumption on a year-on-year basis to 381.8 Million Tonnes due to increased demand and increase in infrastructure activity across India.

Chart 24: Cement consumption



Source: CMIE, CareEdge Research

4.2 PPP models for enabling infrastructure growth

The Government has taken constant steps for encouraging strong private participation in infrastructure sector, particularly from the perspective of the NIP. Hence, the focus has been on building a robust enabling environment with a well-thought policy framework and a well-developed public authority for encouraging PPPs.

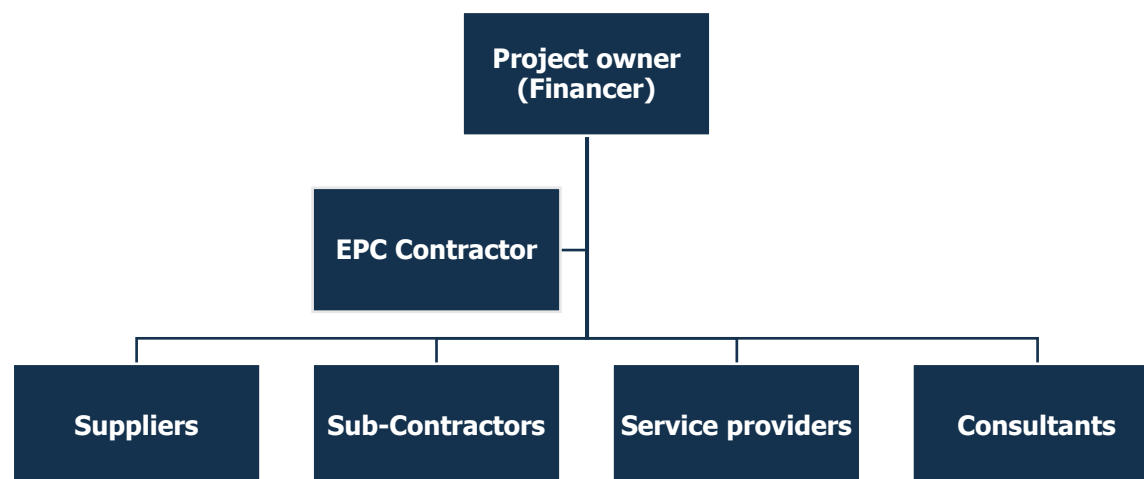
The different types of PPP models are as follows:

- Build – Operate – Transfer (BOT)
- Build – Own – Operate (BOO)
- Build – Own – Operate – Transfer (BOOT)
- Design – Build (DB)
- Design – Build – Operate (DBO)
- Design – Build – Finance (DBF)
- Lease – Renovate – Operate – Transfer (LROT)
- Engineering, Procurement and Construction (EPC)

4.3 Construction EPC in India

EPC stands for '**Engineering, Procurement and Construction**'. EPC entails the contractor build the project by designing, installing and procuring necessary labour and land to construct the infrastructure, either directly or by subcontracting. The EPC contract is a type of construction contract between parties where the contractor is responsible for all the engineering, procurement, and construction activities to deliver the completed project to the employer or owner. In addition to the delivery of the complete facility, the EPC contractor must deliver it within a guaranteed time.

Chart 25: Key Stakeholders of EPC Contract



Source: CareEdge Research

Basic Features of an EPC Contract

- Single point responsibility
- Fixed contract price
- Fixed completion date
- Performance guarantee
- Caps on liability
- Security
- Liquidated damage
- Defect liability period
- Force majeure

EPC companies are generally responsible for design, procurement, construction, commissioning, and handover of the project to the project owner. An EPC contract is a project document that binds the owner and contractor into a contractual framework by clearly transferring the risk responsibility related to designing, procuring, and constructing to the contractor. It also documents the performance standards the completed project is required to meet. EPC contractor then uses various suppliers, sub-contractors, engineers, and consultants to execute the project.

EPC contracts are of various types including turnkey contracts or contracts with fixed prices.

EPC companies can be classified based on their area of operation/specialization as below:

- General Contracting/Infrastructure
- Building construction – Residential and Commercial segments
- Oil & Gas EPC
- Power EPC: General Power EPC and Power Transmission, Solar Power
- Specialized EPC: Marine, Industrial, Railways, Tunnelling, Mining etc.

4.4 Key Infrastructure Segments

4.4.1 Roads and Highways outlook

India's road infrastructure has seen consistent improvement in the last few years. Connectivity has improved and road transportation has become a focus of rapid development. In current fiscal till the month of August 2022, the pace of construction slowed to 18 km/day. Overall, till August 2022, 2,912 Kms of highways were constructed and 2,706 kms were awarded as compared to 3,355 Kms constructed and 3,261 Kms awarded in the previous year. This slowdown can be attributed to increase in cost of input materials, longer-than-usual monsoon and problems related to land acquisition and environmental clearance.

For more details on this segment, please refer to [chapter 2](#)

4.4.2 Railways outlook

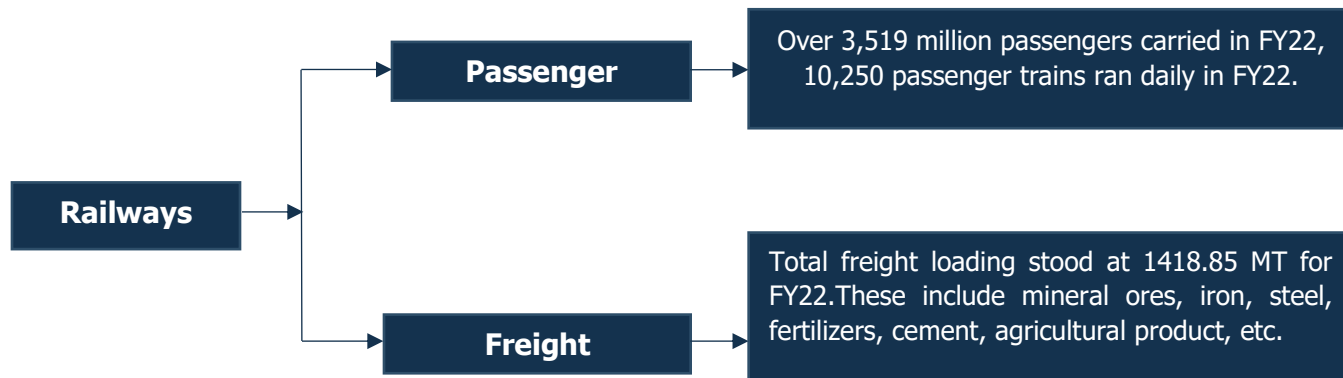
The Indian Railways is the largest rail network in the World and is a regulated body under Government of India and is the backbone of the Indian economy. It is also the fourth largest national railway system in the world. It consists of a total track length of over 1,28,305 km with route consisting of more than 7,000 stations. Indian railways run about 9,164 good trains and over 10,250 passenger trains daily. Around 9.64 million passengers are carried daily by the railways and the

freight carried daily stands at 3.88 million tonnes for the year FY22. It is also the largest employer in India and contributes to about 1.5% of the GDP as it supports about 45% share of the modal freight of India. It is the driver of India’s economic growth and is considered safe, viable and environment friendly mode of transport in India.

The Railways operations can be divided into passenger and freight segments.

Owing to customer centric approach and business development units backed by strong policies, the Railways breached the 1,400 Million Tonne (MT) Freight loading Mark for the first time in FY22. The originating freight loading of the Indian Railways stood at 1512 MT in FY23 as compared to 1,418 MT in FY22.

Figure 1: Railway Operation



Indian Railways recorded a revenue of Rs 2,400 billion for the FY23. This was mainly supported by improvement in passenger earnings through introduction of new trains and special trains or premium special trains etc. increase in freight earnings like rationalizing merry-go-round policy, reducing distance in mini rakes, leasing of parcel space to private parties and liberalization of parcel policy.

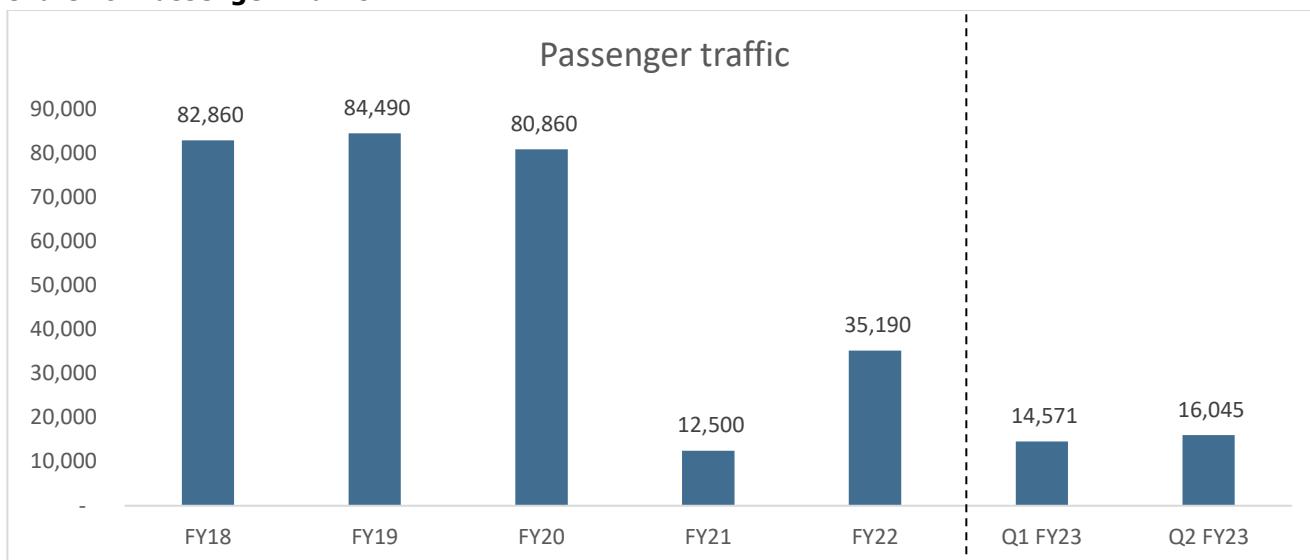
Apart from this, Indian railways is also considering to explore areas like changing coaches’ composition, having additional streams by monetizing traffic on digital booking through IRCTC.

Passenger Earnings

Train travel is the preferred means of transport for long-distance travel for majority of Indians. Passenger traffic is broadly divided into two categories i.e. suburban and non-suburban traffic. Suburban trains usually cover small distances like 150 kms and carries the passenger within the cities whereas non-suburban trains cover larger distances and covers inter cities or states. Majority of the revenue i.e. 94% comes from non-suburban trains. In FY22, there was a 61% growth in passenger revenue Y-o-Y according to the provisional reports and it was majorly because of low base effect due to the lockdown in COVID – 19 pandemic.

In H1FY23, the passenger traffic has already reached 3,062 million and is expected to cross pre-covid level in the coming years. The increase in the demand for passenger trains is supported by return of normalcy after the blow of pandemic, urbanization, improving income standards, etc.

Chart 26: Passenger Traffic



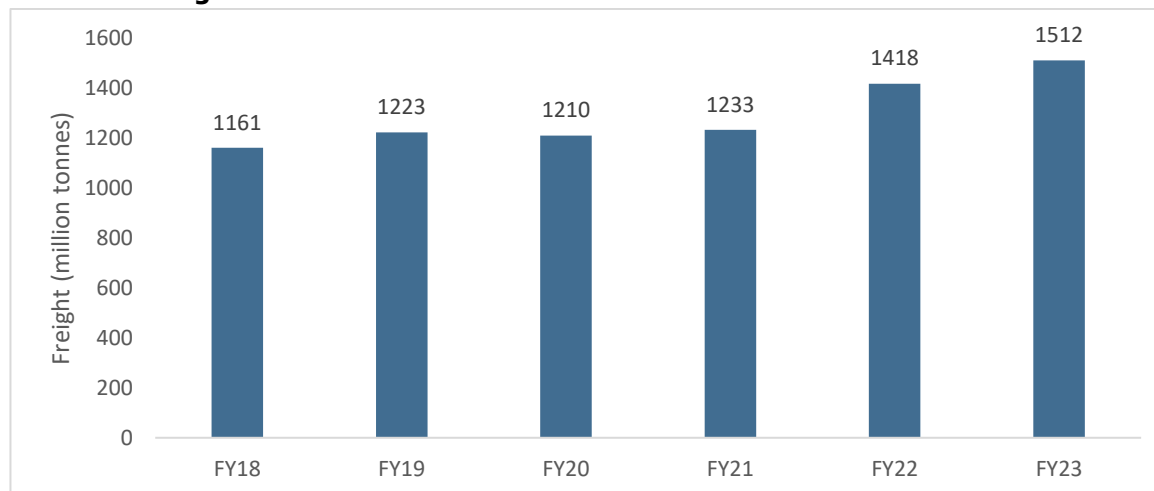
P- Provisional; Source: Ministry of Railways, CareEdge Research

Freight Traffic

The freight traffic in India mainly consists of 9 commodities - coal, steel, iron ore, food grains, petroleum products, amongst others. Coal has accounted for major freight volume at 728 MT in FY23. Along with coal, increase in automobile loading has been a highlight of the freight business of the FY23.. Despite of the passenger traffic being lower than the pre-covid levels, the freight traffic was 6.6% higher in FY23. The Indian Railways has recorded for the best freight business in history in the FY23 with 1512 MT freight loading.

The government is also heavily investing in rail infrastructure to improve freight transport. Due to favorable policy measures and increasing private participation, continued healthy growth in freight traffic is expected in the medium to long term.

Chart 27: Freight Traffic



Source: Ministry of Railways, CareEdge Research

Current Handling Capacity

The freight loading during FY22 was 1512 MT as against last year's loading of 1418 MT registering growth of 6.6% year – on – year over last year loading. Freight revenue of Indian railways grew by 16% in FY23 and reached 16,20,000 million vis-à-vis 13,92,870 in FY22.

The Mantra, "Hungry for Cargo" has been followed by the Indian Railways owing to which sustained efforts have been made to improve the ease of doing business and to improve the service delivery at competitive prices. This has resulted into new conventional and non-conventional commodity streams traffic coming to railways. Strong policy making and customer centric approach has helped Railways to achieve this landmark.

Commodity wise the Railways has achieved an incremental loading of 75 MT in Coal, followed by 11 MT in balance of other goods, 6 MT in cement & clinker and 7 MT in Fertilizer. FY23. Apart from this, increase in automobile loading has also improved the freight traffic in FY23 and 5,527 rakes have been loaded in FY23 as compared to 3,344 rakes in FY22 showing a growth of 65%. The freight ecosystem is also expected to grow from the present level of 4,700 MT to 8,200 by 2030.

The sustained efforts of Indian Railways to increase supply of coal to power houses, in close coordination with Ministries of Power and Coal, has again been one of the key features of the freight performance for FY23. The loading of coal (both domestic and imported) to power houses has increased by 84 MT in FY23, with 569 MT coal being moved to Power houses as against 485 MT last year, i.e. a growth of 17.3%.

Capacity Expansion Plans and Investments

Being the third largest network in the world under single management and over 68,000 route km Indian Railways is known to provide safe, efficient, competitive transport system. On an average 1,835 km of track per year track km per year of new track length has been added via new-line and multi-tracking projects during the period of 2014 to 2021, as compared to the average of 720 track kms per day during the period of 2009 to 2014. Indian Railways is adopting new technology such as KAVACH, Vande Bharat trains and redevelopment of stations to have safe and better journey experience for the passengers.

Capex has been added substantially during 2009-14 at an average of Rs 4,59,800 million to Rs 21,50,580 million during 2021-22. Indian Railways is also targeting for 100% electrification of its network by December 2023. In addition to the above, projects connecting difficult terrain such as Rishikesh - Karnaprayag line is also laid to connect all capitals of north east states. Further, a number of infrastructure development initiatives are taken under the National Rail Plan (NRP) prepared by Indian Railways.

The National Rail Plan is the road map for capacity expansion of the railway network by 2030 to cater to growth up to 2050. It has been incorporated to take care of the demand and expectation of passengers and also increase the modal share of railways in freight to 40-45% from the present level of 26-27%. The target of 40-45% modal share for railways is necessary from the perspective of sustainability and also from the national commitments made globally for reducing emission levels.

Government regulations and initiatives

PM- GatiShakti

PM Gati-Sakti is a national master plan for multi-modal connectivity across the country. It is a digital platform to bring 16 ministries including railways, roadways together with an integrated plan to coordinate the implementation of infrastructure connectivity projects.

Under PM-Gatisakti, the concept of 'One Station- one product' concept is to be popularized to help the local businesses and supply chain. About 2,000 kms of network will be brought under Kavach as a part of Atmanirbhar Bharat. Kavach is indigenous world-class technology for safety and capacity augmentation in 2022-23.

Under this scheme, a total of 400 new-generation Vande Bharat Trains with greater energy efficiencies and passenger experience are to be developed and manufactured and 100 cargo terminals for multimodal facilities are to be setup in the next three years.

National Rail Plan

Indian Railways prepared a National Rail Plan for India-2030. This plan is to make railway system future ready by 2030. The plan will be aimed to formulate strategies based on operational capacities and commercial policy initiatives to improve the modal share of the railways to 45% in freight.

As per the National Rail Plan, the freight ecosystem is expected to grow from the present level of 4,700 MT to 8,200 MT by 2030. At present the railway capacity is barely able to carry 1,220 MT which is around 26-27% of the modal share. The Plan provides a pipeline of projects, which on completion will increase railway capacity to capture 45% of freight traffic. Since the railways is already having a large number of sanctioned projects that need to be completed before taking up new projects, it has been planned to increase railway capacity in two surges. The first surge is to be provided by the Vision 2024 plan to prioritize and complete sanctioned projects so that railway capacity does not fall far behind the targeted modal share such that by the time capacity is finally created, the traffic would have shifted to another mode. To prevent further bleeding away of modal share, railway capacity enhancing projects have been categorized as Super Critical and Critical. 58 projects have been identified as Super Critical and are targeted for completion by December 2022 and 68 projects have been identified as Critical and have been targeted for completion by March 2024. These projects are focused at increasing capacity on routes that serve major mineral, industrial hubs along with ports and major consumption centres.

Dedicated Freight Corridor (DFC)

Dedicated Freight Corridor Corporation of India Ltd. (DFCCIL) is already building two freight corridors - Eastern Freight Corridor from Ludhiana to Dankuni (1,856 km), and Western Freight Corridor from Dadri to Jawaharlal Nehru Port (1,504 km), at a total cost of Rs 8,10,000 million.

DFCCIL, a special purpose vehicle, was set up for implementing the DFC project under the administrative control of Ministry of Railways.

- The plan is to construct dedicated freight lines along the eastern (1,856 km route length) and western (1,504 km route length) parts of India
- Total length: 2,8243 kms, total estimated cost: USD 11.66 billion as on September 2019 and financial progress stands at 63.6% and physical progress stands 67.5%.
- The eastern wing of the DFC is being funded by the World Bank and western wing is being financed by the Japanese International Cooperation Agency.
- The Japanese International Cooperation Agency has granted Rs 85,530 million (USD 1,167.68 million) for phase 1 of the DFC
- The World Bank granted loan of USD 1,100 million for EDFC-2 and sanctioned loan of USD 650 million for EDFC-3 in October, 2016

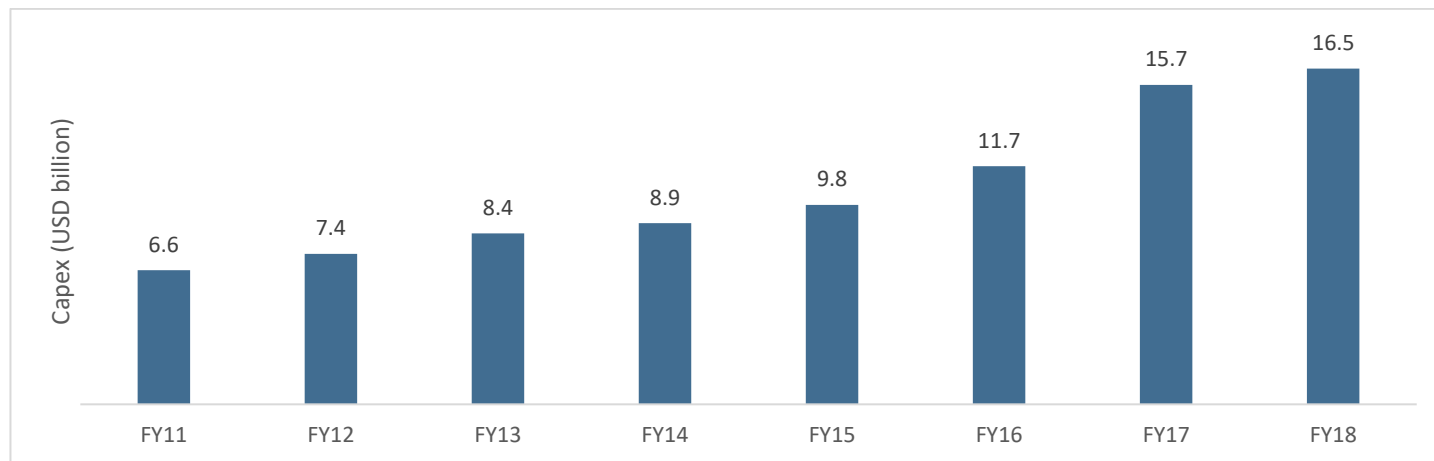
4.4.3 Urban Infrastructure

India is the second largest urban system in the world with almost 11% of the total global urban population living in Indian cities. With growing population and major contribution by urban, development of urban infrastructure remains a key focus of the Government. It is an important element in infrastructural development of the nation. The urban infrastructure

mainly consists of drinking water, sanitization, sewage systems, electricity and gas distribution, urban transport, primary health services and environmental regulation.

The investments in urban infrastructure has been growing steadily over the years. While most investment in this period has been in basic municipal services (around 0.48% of GDP), investment in metro-rail infrastructure has witnessed stronger growth. This growth can also be attributed to higher allocations and fiscal transfers under the Government of India's flagship programs namely Smart Cities and Atal Mission for Rejuvenation and Urban Transformation (AMRUT) missions.

Chart 28: Trend in investment in urban infrastructure in India



Source: World Bank report

Need for Urban Infrastructure Development

Some of the issues like lack of availability of serviced land, traffic congestion, pressure on basic infrastructure, extreme air pollution, urban flooding, water scarcity and droughts generate the need of infrastructural development.

Some of the key pointers focusing on the needs of urban infrastructure development are listed below:

- **Growing urbanization**

India is in the process of transitioning from mostly rural to a quasi-urban country. This offers great opportunity for leveraging the benefits of urbanization with robust system in place. There is immense scope in infrastructure development of many Indian cities and town with the help of technology and planning. The census indicates 30% of net increase in urban population between 2001 and 2011 indicating the nature of transformation that is taking place in the rural areas. Along with this, the United Nations also estimates addition to urban population of around 416 million people between 2018 and 2050. This highlights the need of constant urban infrastructural development.

- **Contribution to the economic growth**

According to NITI Ayog, urbanization contributes to about 60% to India's GDP. India being one of the fastest growing economies in the world, cities plays vital role in economic growth and innovation. Cities are where productive firms, better paying jobs and key institutions are located. There are some studies that attest linkages between urbanisation and per capita GDP. Furthermore, there also exist large, untapped economies of scale. This needs effective interventions incorporating urban planning, development and governance. Several growth targets of India reflect the need for concerted action for fulfilling the full potential of the urban economy.

- **Need to ensure Multi-sector convergence**

There are multi-sectoral schemes that directly-indirectly impact the urban landscape in India, for instance, Smart Cities Mission, Ministry of Housing and Urban Affairs, National Mission on Electric Mobility and Green city. This is not possible without adequate technical knowhow and planning capacities at the local level. Thus, it necessitates a stronger demand in infrastructure segment of construction industry.

Flagship government schemes for urban development

- **Smart cities mission**

Smart cities mission (SCM) is launched by the Government with an objective of promoting cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' solutions. The strategic components of Smart Cities' initiative are Area-Based Development (ABD) involving city improvement (retrofitting), city renewal (redevelopment) and city extension (Greenfield development) and a pan city development in which Smart Solutions are applied covering larger parts of the city.

The expected impact outreach under smart cities program is as below:

Table 8: Impact outreach under smart cities program as on 24.11.2022

Particulars	Impact
No. of cities	100
No. of projects	5,151
Project amount (Rs. million)	20,50,180
Projects tendered	7,757 projects amounting to Rs. 18,47,270 million
Work orders issued	7,656 projects amounting to Rs. 18,25,430 million
Works completed	4,436 projects amounting to Rs. 7,58,270 million

Source: Ministry of Housing and Urban Affairs

- **Atal Mission for Rejuvenation and Urban Transformation (AMRUT)**

The Atal Mission for Rejuvenation and Urban Transformation (AMRUT) was launched on 25th June, 2015 covering 500 cities. Thrust areas of the Mission are water supply, sewerage & septage management, storm water drainage, green spaces & park, non-motorized urban transport and capacity building. Mission focuses on development of basic urban infrastructure with the following intended outcomes:

- i. Universal coverage for access to potable water for every household
- ii. Substantial improvement in coverage and treatment capacities of sewerage
- iii. Developing green spaces and parks
- iv. Reform implementation and
- v. Capacity building

Table 9: Overall progress of implementation till January 2023 - Sector wise:

Sector	Projects completed		Projects ongoing		Total projects grounded	
	No.	Amount (in Mn)	No.	Amount (in Mn)	No.	Amount (in Mn)
Water supply	934	1,75,976	407	250,401	1341	4,26,378
Sewage and septage management sector	507	1,21,637	357	218,209	864	3,39,846
Storm water drainage sector	682	13,589	118	16,186	800	29,775
Parks and Green spaces	2,312	13,651	209	2,326	2,521	15,978
Urban transport	265	5,460	83	4,788	348	10,248
Total	4,700	3,30,313	1174	4,91,912	5874	8,22,226

Source: Ministry of Housing and Urban Affairs

4.4.4 Irrigation

Water is a critical input for agriculture which accounts for about 80% of the current water use in the country. The share of net irrigated area accounts for about 49% of the total net sown area in the country and out of the net irrigated area, about 40% is irrigated through canal systems and 60% through groundwater. Micro Irrigation systems paves the way for highest and efficient use of our water resources. Micro irrigation is a modern method of irrigation; by this method water is irrigated through drippers, sprinklers, foggers and by other emitters on surface or subsurface of the land.

On the other hand, there are large and complex irrigation projects that have transformed the landscape in many parts of India. These include dams, barrages, and networks of major / minor canals and lift irrigation projects.

Some of the measures which are seen as major reform areas within the irrigation sector include effective water pricing, addressing the deficiencies of canal supplies, modernization of canals and canal controls, reclamation of waterlogged and saline/alkaline soils, increasing farm-water use efficiencies, and making command area development programs more effective. A number of reforms in the agriculture sector are also envisaged to enhance production, productivity, and the farmer's income and livelihood.

Some of the recent major government initiatives under irrigation segments are as below:

Micro Irrigation Fund Scheme

With the objective of facilitating the States in mobilizing resources for expanding coverage of micro irrigation, a Micro Irrigation Fund (MIF) with corpus of Rs 50,000 million were created with National Bank for Agriculture and Rural Development (NABARD) during FY19. As per NABARD, 14 projects have been sanctioned to 08 States (Andhra Pradesh, Gujarat, Haryana, Punjab, Rajasthan, Tamil Nadu, Uttarakhand and West Bengal) under MIF as on 31 December 2022. The total loan sanctioned to 8 states stands at 47,109 million as on 31 December 2022.

Pradhan Mantri Krishi Sinchayee Yojana

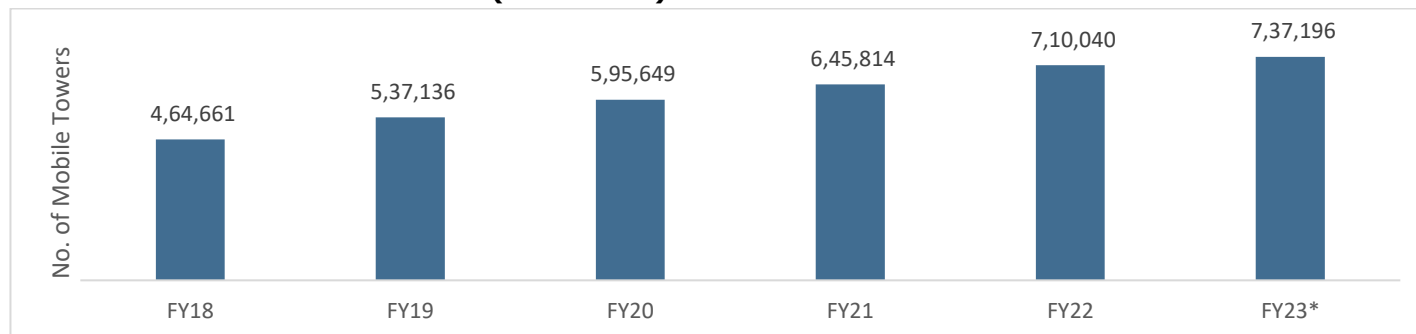
The Government of India is promoting micro irrigation viz. Drip and Sprinkler Systems in the Country for enhancing water use efficiency at farm level under the Per Drop More Crop component of Pradhan Mantri Krishi Sinchayee Yojana (PMKSY-PDMC) from FY16. Under PMKSY-PDMC, as on 14.12.2021, total area of 59.37 lakh hectare has been covered under micro irrigation in the country from FY16.

4.4.5 Other Sector

Telecom - The growth of telecom sector is largely backed by in proliferation of broadband subscribers and data consumption. Evidently, growth of telecom industry has high dependency on robust and ubiquitous infrastructure.

Over the last few years, telecom sector in India has become data driven and reducing costs of data due to the fierce competition in the sector. With this, the number of telecom towers has also increased substantially over the years. This reflects infrastructure built up that is going to boost the government's digital campaign. The number of mobile towers installed stands as 7,37,196 as on October 2022.

Chart 29: Number of mobile towers (Cumulative)



Note: FY23 is as on 31.10.2022; Source: Department of Telecommunication

Overall, telecom infrastructure providers play a key role in transformative initiatives of the Government of India like Smart City Mission and BharatNet to enhance connectivity by robust telecom infrastructure. Under the flagship BharatNet Project, 6.03 lakh kms Optical Fiber Cables were laid as on 10.10.2022. A total of 1.9 lakh Gram Panchayats have already been connected with Optical Fibre Cables. The scope of BharatNet has also been extended to cover all inhabited villages beyond Gram Panchayats.

Furthermore, the Government of India is implementing a Comprehensive Telecom Development Plan (CTDP) for the North-Eastern Region and Comprehensive Telecom Development Plan for Islands to provide mobile connectivity in the uncovered villages and along National Highways in the North-east. These initiatives reflect the thrust towards expansion in telecom infrastructure.

4.5 Government initiatives

The Indian government has enacted several development schemes. Some of the major Government initiatives relating to construction sector are listed as below:

- **Atal Mission for Rejuvenation and Urban Transformation (AMRUT)** - AMRUT aims to enhance the quality of life for Indian citizens by providing services such as water supply and sewerage
- **Deen Dayal Upadhyay Gram Jyoti Yojana (Ddugjy)** - DDUGJY aims to provide continuous power supply to India's rural areas
- **Pradhan Mantri Krishi Sinchai Yojana** - National mission to improve farm productivity and ensure better utilization of the resources in the country
- **Railways Station Redevelopment Program** - National program to redevelop 400 railway stations through PPP mode

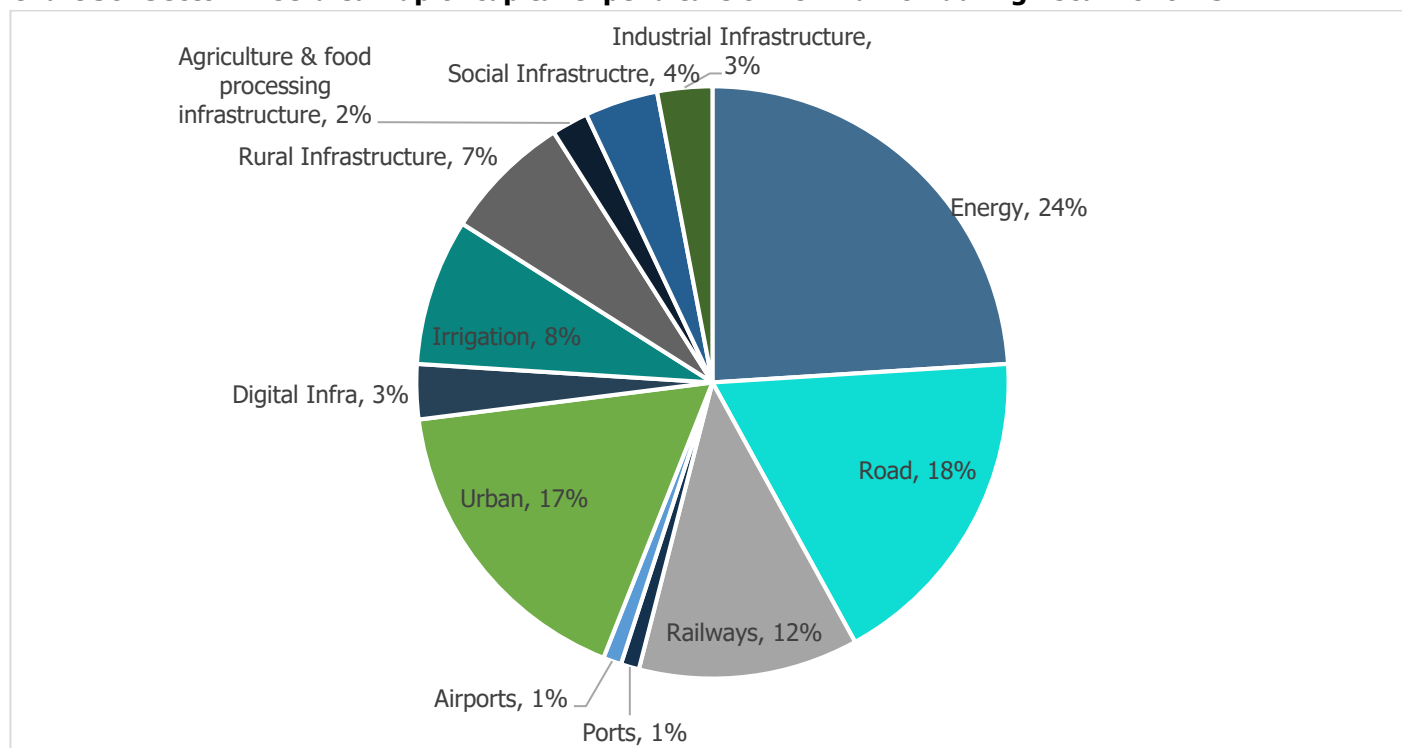
- **Smart City Mission** - Enhancing quality of life by enabling local development and creating smart solutions

4.6 Opportunities in NIP for the construction segment

Before the onset of the pandemic the Government of India had unveiled the National Infrastructure Policy (NIP) covering various sectors and regions indicating that it is relying on an 'infrastructure creation' led revival of the country's economy. The NIP which covered rural and urban infrastructure entailed investments to the tune of Rs.1 billion to be undertaken by the Central Government, State Governments and the private sector during FY20-25. This in turn is expected to offer significant opportunities to construction players in India.

In order to achieve the GDP of USD 5 trillion by FY25, India needs to spend about USD 1.4 trillion over these years on infrastructure. During FYs 2008-17, India invested about USD 1.1 trillion on infrastructure. However, the challenge is to step up infrastructure investment substantially. Keeping this objective in view, National Infrastructure Pipeline (NIP) was launched with projected infrastructure investment of around Rs 1 billion (USD 1.5 trillion) during FY 2020-2025 to provide world-class infrastructure across the country, and improve the quality of life for all citizens. It also envisages to improve project preparation and attract investment, both domestic and foreign in infrastructure. NIP was launched with 6,835 projects, which has expanded to over 9,000 projects covering 34 infrastructure sub-sectors.

Chart 30: Sector-wise break-up of capital expenditure of Rs. 1 billion during fiscal 2020-25



Source: NIP

During the fiscals 2020 to 2025, sectors such as energy (24%), roads (18%), urban infra (17%), and railways (12%) amount to around 70% of the projected capital expenditure in infrastructure in India. NIP has involved all the stakeholders for a coordinated approach to infrastructure creation in India to boost short-term as well as the potential GDP growth.

Further, the number of projects and the total cost as per NIP for different sectors are as follows:

Sector	No. of projects	Value of projects (Rs. billion)
Roads & bridges	3,564	400.2
Railways	679	208.36
Power and others	325	153.8
Urban Infra	227	115.13

Source: Department of Economic Affairs

4.7 Opportunities in the construction industry

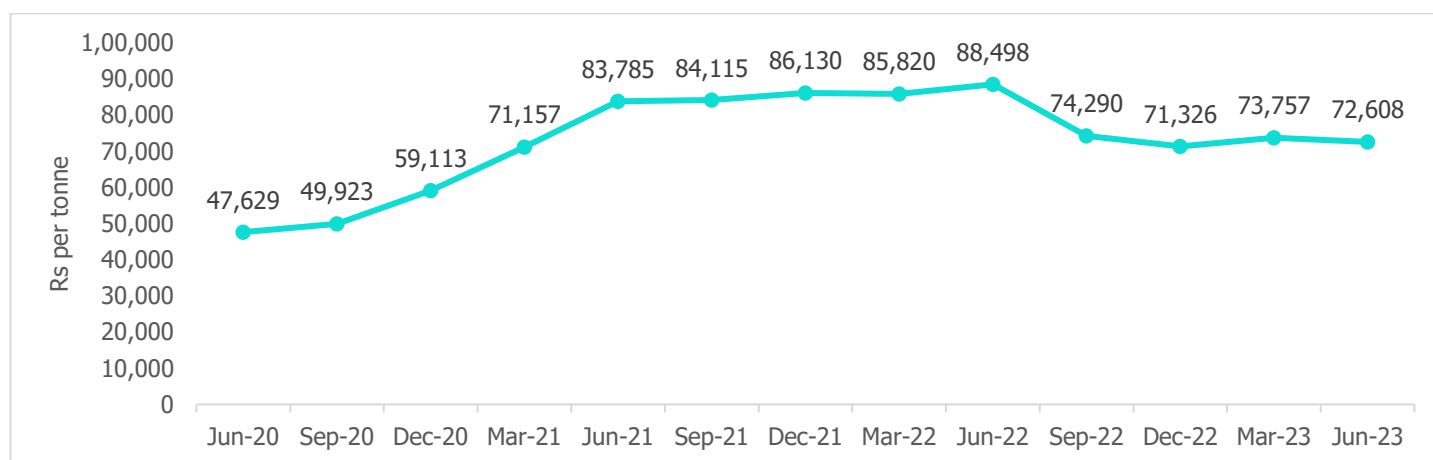
- Continued Government spending** - Over the long term, the outlook for construction sector is favorable supported by continued Government spending on infrastructure. The Government has expanded the National Infrastructure Policy (NIP) during the Budget to 7,400 projects from 6,835 projects and announced plans for the National Monetization Pipeline and Development Finance Institution (DFI) to improve the financing of infrastructure projects. The NIP covers various sectors and regions indicating that it is relying on an 'infrastructure creation' led revival of the country's economy. The NIP covering rural and urban infrastructure entailed investments to the tune of Rs.1 billion will be undertaken by the Central Government, State Governments and the private sector during FY20-25.
- Growth in road construction** - Road construction in India is expected to grow with new funding mechanisms by NHAI, such as ToT (Toll Operate Transfer) and InvITs (Infrastructure Investment Trust) and interest from international funds (both for equity as well as debt).
- Strengthening real estate developments** - Real Estate has the potential for catapulting India to the third largest construction market globally. The sector is expected to contribute 15% to the Indian economy by 2030. The recent policy reforms such as the Real Estate Act, GST and REITs are steps to reduce approval delays and are only going to strengthen the real estate and construction sector.
- Development in Railways** - Indian Government is taking several initiatives to upgrade aging of railway infrastructure and its quality of service. The upgrades include 100% electrification of railways, upgrading existing lines with more facilities and higher speeds, expansion of new lines, upgrading railway stations, introducing and eventually developing a large high-speed train network interconnecting major cities in different parts of India and development of various dedicated freight corridors to cut down cargo costs within the country. These developments augurs well for growth in construction segment.
- Growing focus towards renewable energy and rural electrification** - The demand for electricity in the country has increased rapidly and is expected to increase further. Increasing Government focus towards renewable energy sector as well as rural electrification are also expected to drive the investments in the Power sector.
- Adoption to Electric Vehicle** - Several nationwide initiatives and state EV policies are enabling an ecosystem for accelerated deployment of Electric vehicles (EV). The estimated future growth of EVs in India is estimated due to faster and higher penetration and to achieve the leading position in cutting edge technology, India has set ambitious target of 30@30 goals. As EV adoption grows, readiness of the electricity grid to EV charging demand offers opportunity for innovative infrastructural development.

4.8 Challenges in the construction sector

- Volatility in raw material prices** - The rising cost of steel and cement, two major raw materials consumed by the construction industry saw a sharp rise during the second half of FY21. Raw material cost of different construction companies ranges in 30-50% of the total cost. Any variation in the prices of raw materials during the construction period of the project has a direct impact on total cost of the project. The average domestic steel prices surged 26% y-o-y in FY21. In FY22 as well, the average price of domestic steel and cement increased by 45% and 8% respectively. Here, increased international steel prices led to significantly higher export volumes, which in turn led to an increase in domestic steel prices. Whereas, the rise in cement prices was primarily on account of rising input and fuel costs pressure due to geopolitical tensions. The volatile commodity prices are expected to impact margins of construction players.

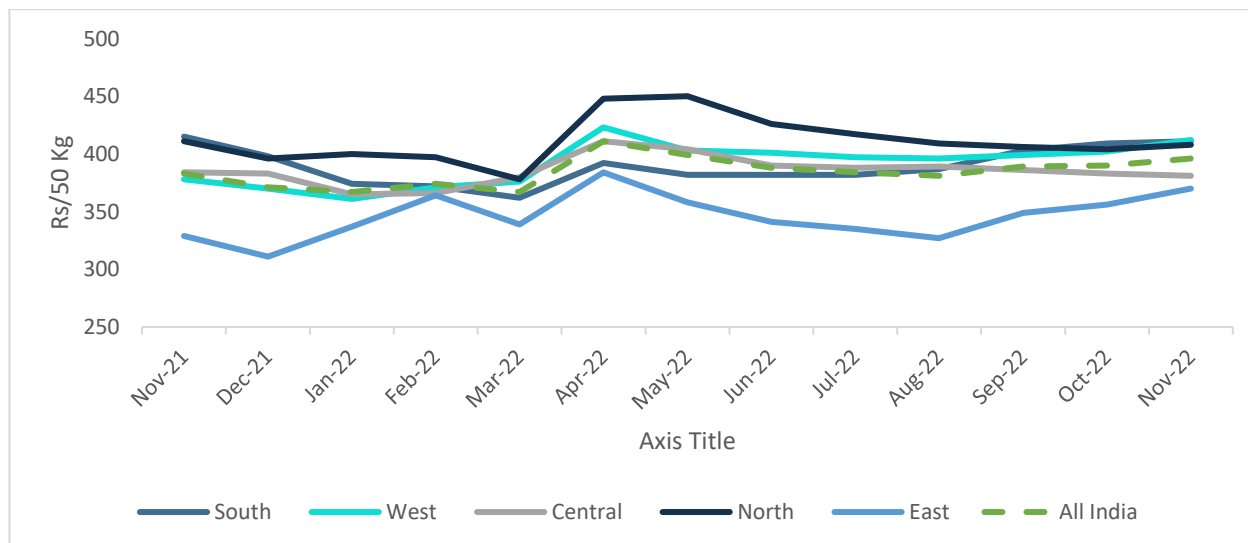
Chart 31: Movement in raw material prices

Steel: Domestic average finished steel prices



Source: CMIE

Cement: All India price per 50 kg bag of cement is depicted in the chart below:



Source: Industry Sources, CareEdge Research

- **Time and cost overrun due to delay in getting clearances** - Construction sector has witnessed many consistent changes over the past few years. Delay in project completion is one of the major challenges for the construction market in India. Construction projects are large scale, time and cost sensitive. The gestation period of project also increases because of factors such as political risks in the country, liquidity crunch, and delay in getting environmental clearance, forest clearance, defence land handovers etc. Time overrun and project inflationary cost escalations plague many large Government-based projects. All projects have to be time bound to be profitable, however, the market still suffers from inherent delays owing to these reasons.
- **Environment Preservation** - One of the important aspects of a construction project is preservation of the environment. With problems like soil erosion, air and water pollution, the construction players are obligated to adopt to innovative measures and increase their investment in reducing the negative impact on environment.
- **Quality related challenges** - Quality in construction industry is an important factor yet it often gets compromised during the initial stage of the life cycle of the project. That is at the design and the construction stage. Some of the factors affecting the quality of construction are design changes during construction stage, poor supervision and project management on construction site and inadequate contractor experience.
- **Natural Disaster and Calamities** - The impact of natural disaster and calamities can be huge for any construction activity. The financial set back faced and rehabilitation work after any such hazards is itself a great challenge for the construction industry. Thus, it becomes imperative to bring in innovations in construction related technologies to cope with natural disasters.
- **Revenue and operational gap in electricity distribution** - India has one of the highest AT&C losses in the world. As per the Central Electricity Authority of India, over 27% of the total power produced is lost due to either dissipation from wires or theft which impacts the revenue of the discoms. Usually, discoms face a power deficit during the day time and a power surplus during the night. At times of power deficit, the discoms purchase the additional power required from the open market and at time of power surplus, the discoms sell the surplus power on the open market.

4.9 SWOT Analysis

In broader sense, following is the SWOT analysis of construction industry covering all the key segments:

STRENGTH	WEAKNESS
<ul style="list-style-type: none"> • Growing urbanization • Availability of labour force • Continuous Government support • Better economic growth rate 	<ul style="list-style-type: none"> • Lack of clearly defined processes and procedures • Issues relating to funding • Unskilled labour force • Ageing Infrastructure
OPPORTUNITY	THREAT
<ul style="list-style-type: none"> • Continued Government spending • Growth in road construction • Strengthening real estate developments • Development in railways • Growing focus towards renewable energy and rural electrification • Adoption to Electric Vehicles 	<ul style="list-style-type: none"> • Volatility in raw material prices • Time and cost overrun due to delay in getting clearances • Environment Preservation • Quality related challenges • Natural Disaster and Calamities • Revenue and operational gap in electricity distribution

5. Water and Wastewater Industry

5.1 Overview

India is the world's second most populous country with 1.38 billion people. Out of this, 65% of the population lives in rural area and 35% are connected to the urban centers according to United Nation (2019). The metropolitan cities of the country are seeing major expansion as a result of economic expansions and reforms. This expansion in urban population is unsustainable without efficient planning of cities and provision of utility services especially clean and affordable water. Water allocation in cities are usually done from common pool with multiple sectoral demand.

It is expected that by 2050, about 1450 km³ of water will be required out of which approx. 75% will be used in agriculture, ~7% for drinking water, ~4% in industries, ~9% for energy generation. However, because of growing urbanization, the need for drinking water will take precedence from the rural water requirements. Many of the cities are situated by the bank of rivers from where the fresh water is consumed by the population and the waste water is disposed back into the river, thus contamination of the water source and irrigation water. This has raised serious challenges for urban wastewater management, planning and treatment.

According to the by Central Pollution Control Board (CPCB), the estimated wastewater generation was almost 39,600 million litres per day (MLD) in rural regions, while in urban regions it was estimated to be 72,368 MLD for the year 2020-21. The estimated volume in the urban cities is almost double than that of the rural regions because of the availability of more water for sanitation which has increased standard of the living.

Water supply management

With increasing population of the country, the need for water and its management is ever increasing. Water availability is projected to become a major concern in the future. In addition to that, the damage to water resources done by pollution is yet another concern. Releasing industrial waste, discharge of untreated or partly treated municipal waste water through drains, discharge of industrial effluent, improper solid waste management, illegal ground water abstraction, encroachments in flood plains/ river banks, deforestation, improper water shade management and non-maintenance of e-flows and agriculture run off etc. are some of the major reasons for pollution of water bodies. The GoI has come up with various schemes that emphasizes on water conservation and restoration. As a result, the number of polluted river stretches has reduced from 351 in 2018 to 311 in 2022 and improvement in water quality has been observed in 180 out of 351 Polluted River Stretches (PRS) during the year 2018. As per a report by Ministry of Jal Shakti, assessment of water quality over the years discloses that in the year 2015, 70% of rivers monitored were identified as polluted, whereas in the year 2022 only 46% of rivers monitored are identified as polluted. The water requirement is only estimated to grow higher in the coming years.

Market size for water requirement for different uses (in Billion Cubic Meters) in coming years:

Sr No.	Uses	Scenario (2025)	Scenario (2050)
1	Irrigation	611	807
2	Domestic	62	111
3	Industries	67	81
4	Power	33	70
5	Others	70	111
	Total	843	1,180

Source: CareEdge Research

Providing clean drinking water is the main focus of the Government. Over the years, the drinking water quality has become a major concern in the rural areas.

Central Water Commission (CWC) periodically assesses country's overall water resources and it has accorded water supply for drinking purpose as the top most priority under water allocation.

To address the present and future food and water security concerns, the GoI has been implementing various schemes. Following are some of the priority areas, focusing on water resources development, that have been identified by the GoI:

- Improving the overall water use efficiency in irrigation and drinking water supply system
- Adoption of piped distribution system in place of open canal system to reduce the conveyance water loss
- Command area development by implementing more micro irrigation system and participatory irrigation management
- Dam safety, dam rehabilitation and performance improvement
- Repair, renovation and restoration of existing water bodies for irrigation, drinking water supply, cultural activities, etc.
- Improving the rural drinking water supply system and sanitation

Impact of COVID – 19

COVID – 19 restated the importance of sanitation and water availability to the world. It made the need for water management more prominent than it was before the pandemic.

The Government has in the past five years introduced a number of schemes to streamline water supply and waste water management. However, COVID - 19 impacted the construction activities across sectors due to labor shortage and material shortage. With the support of the Government, majority sectors were able to sail through the tough times.

Although, it was challenging for the department to ensure testing of water sources during COVID-19, 12,000 Self-Employed Mechanics (SEMs) & more than 11,000 members of women Self-Help Groups (SHGs) were trained & provided with 7,000 Field Test Kits to act as water warriors. COVID - 19 did slowdown the speed of the project execution, however, the execution pace has picked up since fiscal 2023.

In Dam Rehabilitation and Improvement Project, due to the COVID - 19 pandemic, Ministry of Jal Shakti initiated some urgent actions to facilitate the partner agencies to compensate for the loss of time and complete the ongoing rehabilitation activities. The Scheme was extended by additional nine months i.e. up to March 31, 2021. Also, the loan amount of US\$ 101 Million was surrendered in 2020 to avoid the commitment charges on undisbursed loan amount. Phase I of project closed successfully on March 31, 2021.

After the successful implementation of Jal Shakti Abhiyan in 2019, Ministry of Jal Shakti planned to take up the Jal Shakti Abhiyan-II (JSA-II), covering all blocks of all districts of the country but it could not be taken up due to COVID - 19 pandemic imposed restrictions. However, to keep its continuity, National Water Mission, launched a campaign "Catch the Rain" with the tag line "Catch the rain, where it falls, when it falls" to nudge the states and all stakeholders to create Rain Water Harvesting Structures (RWHS) suitable to the climatic conditions.

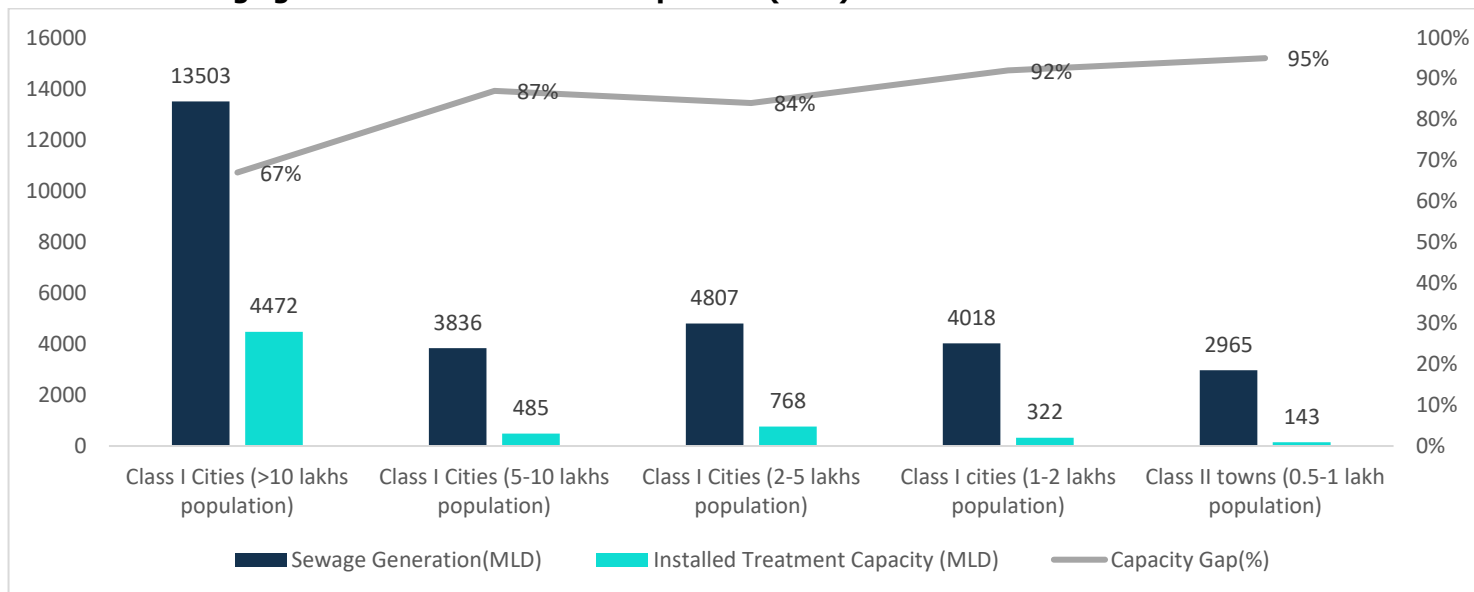
Urban Waste Generation and Treatment

In India, the sewage generation in the urban region was 72,368 MLD for the year 2020-21, while the installed sewage treatment capacity is 31,841 MLD. The operational capacity is on 26,869 MLD, which is very low than the load generation.

Of the total sewage generation only 28% i.e. 20,236 MLD was treated which implies that 72% of the waste water is left untreated and is disposed in the various water bodies like river, lakes or underground water. There is some capacity addition like 4,827 MLD sewage treatment has been added but a gap between the waste water generation and treatment of 35,700 MLD i.e. 49% still remains.

In the city-scale assessments, the wastewater generation from Class I cities and Class II towns (as per the 2001 census) is estimated as 29,129 MLD, and under the assumption of a 30% decadal increase in urban population, it is expected to be 33,212 MLD at the current time. Against this, the existing capacity of sewage treatment is only 6,190 MLD. There is still a 79% (22,939 MLD) capacity gap between sewage generation and existing sewage treatment capacity. Another 1742.6 MLD wastewater treatment capacity is being planned or built. Even with this added to the current capacity, there is still a sewage treatment capacity shortfall of 21,196 MLD.

Chart 32: Sewage generation and treatment capacities (MLD)



Source- Central Pollution Control Board, as on March 2021

Note- Performance of 115 sewage treatment plants studied by Central Pollution Control Board

5.2 Government Initiatives

Water supply

Jal Jeevan Mission - 'Har Ghar Jal'

JJM is a Central Government initiative undertaken by Ministry of Jal Shakti. It aims to ensure piped water access to every household in India. The initiative was launched on 15th August 2019 by the Prime Minister of India.

The program is implemented in partnership with States to assure tap water supply in adequate quantity, prescribed quality, adequate pressure, on a regular and long-term basis in all rural households and public institutions, which includes anganwadi, schools, ashramshalas, public/ community health centres, sub-centres, wellness centres, community centres, gram panchayat buildings, etc., by the year 2024.

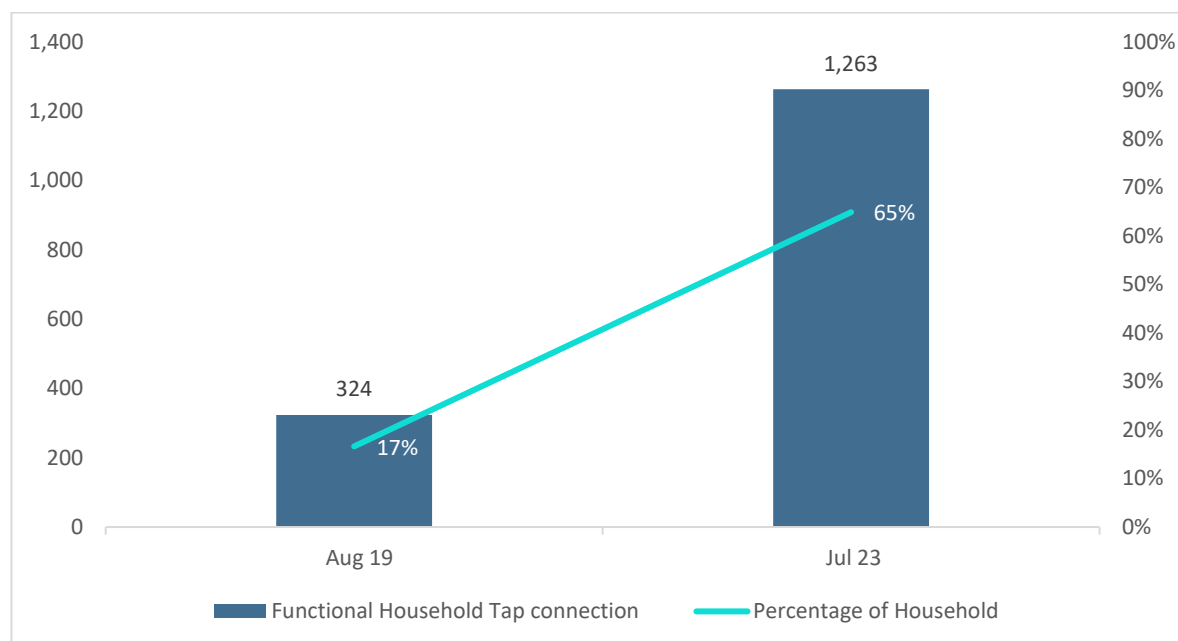
Under JJM, 30% weightage was assigned for difficult terrains which inter alia include areas under Desert Development Programme (DDP) and Drought Prone Area Programme (DPAP) while allocating the fund, to prioritize the coverage in these areas. Further, provisions have been made in the operational guidelines for planning and implementation of bulk water transfer from long distances and regional water supply schemes for ensuring tap water supply in drought-prone & water-scarce areas/ areas with inadequate rainfall or dependable ground water sources. In addition, provisions have also been made for source recharging, viz. dedicated bore well recharge structures, rain water recharge, rejuvenation of existing water bodies, etc., in convergence with other schemes such as the Mahatma Gandhi National Rural Employment Guarantee

Act 2005 (MGNREGA), Integrated Watershed Management Programme (IWMP), 15th Finance Commission tied grants to Rural Local Bodies (RLB)/ Panchayat Raj Institutions (PRI), State schemes, Corporate Social Responsibility funds, etc.

For villages in water-scarce areas, in order to save the precious fresh water, states are also being encouraged to plan new water supply scheme with dual piped water supply system, i.e. supply of fresh water in one and treated grey/ waste water in another pipe for non-potable/ gardening/ toilet flushing use. Moreover, the households in these areas are to be encouraged to use the faucet aerators that save a significant amount of water, in multiple taps that they may be using inside their house.

Functional Household tap connection under Jal Jeevan Mission – Status of tap water connection in rural homes:

Chart 33: Number of HouseHolds with tap water connection



Source: Jal Jeevan Mission, CareEdge Research

Funds allocated for Jal Jeevan Mission:

The estimated cost of the mission is Rs 36,00,000 million. The Central and State have a share of Rs 20,80,000 million and Rs 15,20,000 million, respectively of the total cost.

The 15th Finance Commission has identified water supply and sanitation as a national priority and allocated funds of Rs 23,60,000 million to Rural Local Bodies/Panchayat Raj Institutions (RLBs/PRI) for the period 2021-22 to 2025-26. Accordingly, 60% of the fund, i.e., Rs 14,20,000 million provided as Tied Grants are meant to be utilized exclusively for the drinking water, rainwater harvesting and sanitation & maintenance of open-defecation free (ODF) village. This huge investment in rural areas across the country is accelerating economic activities and boosting the rural economy, as well as creating employment opportunities in villages. This is a progressive step to ensure that villages have potable water supply with improved sanitation for transforming the villages into 'Water Sanitation and Hygiene (WASH) enlightened ' villages. In 2022-23, the GoI has released Rs 2,29,750 million to 21 eligible States for the implementation of JJM. In FY24 Budget, the allocation for JJM has increased to Rs 7,00,000 million, an increase of 27% from Rs 5,50,000 million in FY23. The Central funds are released by the GoI based on the utilization of available Central funds and matching State share. For online

monitoring, Integrated Management Information System (IMIS) and JJM–Dashboard have been put in place. Provision has also been made for transparent online financial management through Public Financial Management System (PFMS).

The details of Central funds allocated, funds drawn, and funds utilization reported in the year 2019-20, 2020-21, 2021-22, and 2022-23 under JJM is as below:

Fund allocation for Jal Jeevan Mission: (in Rs million)

Year	Funds allocated	Funds drawn by State/UT	Reported Utilization
2019-20	1,00,006	99,518	59,988
2020-21	1,10,000	1,09,178	1,25,420
2021-22	4,50,110	4,00,097	2,55,243
2022-23 *	5,50,000	4,19,194	4,17,964

*As on 22.03.2023

Use of technology: JJM is focusing on using various technologies for the community-led implementation of:

- Source sustainability measures such as aquifer recharge, rainwater harvesting, increased storage capacity of water bodies, reservoirs, de-silting, etc. to improve the lifespan of water supply systems
- Water budgeting and audits
- Operation and maintenance
- Grey water management
- Water quality monitoring and surveillance
- Pre-positioned emergency water supply kits to provide transitional services in camps
- Solar based water supply schemes using solar energy which are steps intended to reduce the carbon footprints
- Technologies like Internet of Things (IoT) for Supervisory Control and Data Acquisition (SCADA), remote sensing & Geographic Information System (GIS), design software have been used in building climate resilience through water accounting, water quality control, water use efficiency, water resource planning, and impact assessment. IoT Pilots are being implemented in 118 villages in 14 States/UTs. 25 innovative projects related to water are recommended by Technical Committee for water treatment, water quality & monitoring, IoT-based battery vehicles, and software for the hydraulic design of water treatment plants in rural India.

Reducing Non – revenue water: The community - led water audits and water security planning is crucial to reduce the real and apparent losses in the water supply distribution system and non-revenue water.

Measures like IoT-based technology, water metering, installation of flow control valves in water connection, water budgeting, community surveillance, water conservation measures and convergence with various water-related programs, etc. are being taken up to further strengthen the water supply management for all.

Status of tap water connections provided under JJM:

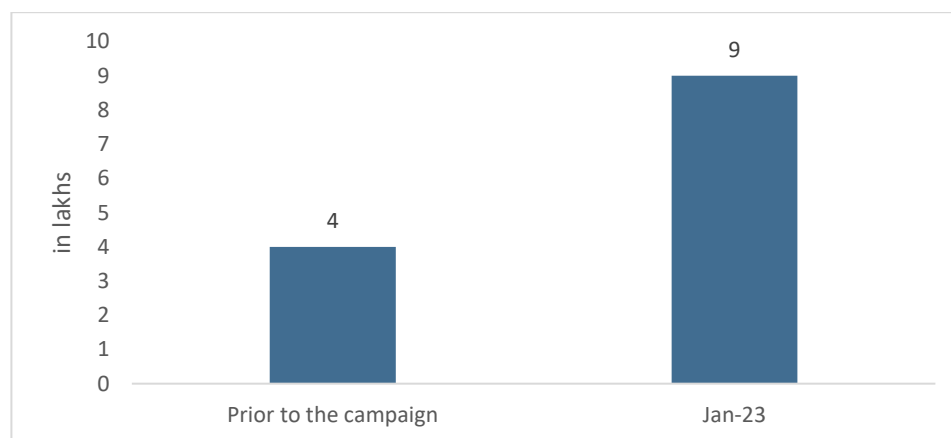
Households: State/UTs with 100% tap water connection (in lakhs):

State/UT	Remaining households as on 15/8/2019	Progress till date	Progress %
Goa	0.60	0.60	100%
A&N Islands	0.30	0.30	100%
D&NH and D&D	0.90	0.90	100%
Haryana	12.70	12.70	100%
Gujarat	26.00	26.00	100%
Puducherry	0.20	0.20	100%
Telangana	38.30	38.30	100%
Punjab	34.26	34.26	100%
Himachal Pradesh	17.09	17.09	100%

Source: Jal Jeevan Mission, CareEdge Research

Schools:

Chart 34: Schools provided with tap water connection



Source: Jal Jeevan Mission, CareEdge Research

Schools with 100% water supply:

State/UT	Total schools	Schools with tap water supply	Schools with tap water supply (%)
Andaman & Nicobar Islands	368	368	100%
Dadra & Nagar Haveli and Daman & Diu	411	411	100%
Goa	1,098	1,098	100%
Haryana	12,818	12,818	100%
Kerala	10,877	10,877	100%
Lakshadweep	33	33	100%
Puducherry	390	390	100%

Source: Jal Jeevan Mission, CareEdge Research

Atal Bhujal Yojana

Atal Bhujal Yojana was launched in 2019 to undertake community-led sustainable ground water management of the stressed areas identified. It was launched to strengthen institutional framework and monitoring ground water data and improve planning and implementation of the water management interventions.

It is a Scheme of the GOI aided by the World Bank with an outlay of Rs 60,000 million and is implemented to focus on community participation and sustain ground water level in identified water stressed areas during five-year duration. The schemes currently are taken up in seven states of Haryana, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Rajasthan and Uttar Pradesh.

It is the world's largest community-led ground water management program which is helping villagers understand the water availability and usage pattern in their areas.

Jal Sakti Abhiyan (JSA)

Jal Sakti Abhiyan - I was launched in the year 2019 in the stressed districts of the country to promote conservation of water, water resource management, implementing rain water harvesting, renovation of traditional water bodies, reuse of water, recharging water body structures, watershed development and afforestation. The actual expenditure from MGNREGS fund was Rs 1,80,660 million.

JSA is expanded to 'Jal Sakti Abhiyan: Catch the Rain' to cover all the blocks of the districts across the country to focus on –

- 1) Rainwater harvesting & water conservation
- 2) Enumerating, geo tagging & making inventory of all water bodies
- 3) Setting up Jal Shakti Kendras
- 4) Afforestation
- 5) Generation of awareness

The progress of the Jal Shakti Abhiyan: Catch the Rain campaign of 2021 as uploaded on the portal from 22.3.2021 to 28.03.2022 are as follows: -

- Water Conservation & Rainwater Harvesting Structures: 16.20 lakhs
- Renovation of Traditional Water Bodies: 3.00 lakhs
- Reuse and Recharge Structures: 8.30 lakhs
- Watershed Development: 19.20 lakhs
- Intensive Afforestation: 3,675.70 lakhs
- and Training Programmes/ Kisan Melas: 0.43 lakhs

The above details include completed as well as ongoing works. Actual expenditure from MGNREGS fund was Rs 6,56,660 million. States/UTs have also been directed to utilize their own resources.

Water Vision@2047

'Water Vision@2047' conference was held in Bhopal on 6th January, 2023 under the Ministry of Jal Sakti. In this conference different ways of increasing water availability and efficient utilization of water resources and their development was discussed. Challenges of water conservation, increasing population, climate change, rapid industrialization and urbanisation, and economic boom which will lead to increase in demand of water were discussed. It was also stated that the harvestable component of water resources is to be surpassed and planning is to be done towards 2047 to achieve the water conservation goals were discussed.

Water quality was also discussed and the vision was set to creating over 2,000 water quality testing laboratories, training 4 lakh women for using Field Testing Kits to testing water using Internet of Things based on sensor.

Atal Mission for Rejuvenation and Urban Transformation (AMRUT)

The Atal Mission for Rejuvenation and Urban Transformation was launched in June 2015 under GoI. It is the first focused national water mission and was launched in 500 cities and covers 60% of the urban population. In the Budget of FY24, the allocation to AMRUT has increased from Rs 1,53,000 million to Rs 1,60,000 million.

The program focuses on basic urban infrastructure in water supply system and access to potable water for every household.

Universal coverage of water supply is the priority under the Mission, under which 228 million tap connections have been provided. The total plan size of all State Annual Action Plan (SAAPs) was Rs 7,76,400 million out of which Rs 3,90,110 million i.e. 50% has been allocated to water supply.

Waste water management:

Jawaharlal Nehru National Urban Renewal Mission

This scheme was launched in December 2005 and is the largest national urban initiative to encourage reforms and fast track planned development of 63 identified cities. The focus is improving efficiencies of the urban infrastructure and services. It consists of two sub-missions - Urban Infrastructure & Governance and Basic Services to the Urban Poor.

It focuses on many aspects of urbanization like redevelopment, water supply, sewage and solid waste management, urban transport including roads, high ways, metro projects, parking lots, heritage area development, prevention of soil erosion, preservation of water bodies etc.

Atal Mission for Rejuvenation and Urban Transformation (AMRUT)

The Atal Mission for Rejuvenation and Urban Transformation was launched in June 2015 under the GoI. It is the first focused national water mission and was launched in 500 cities and covered 60% of the urban population.

Under the program, 883 sewerage & septage management projects which amounts to Rs 3,40,810 million have been taken up out of which 370 projects costing Rs 82,580 million have been completed till date. In the Budget FY24, the allocation to AMRUT has increased from Rs 1,53,000 million to Rs 1,60,000 million.

Namami Gange programme

It is an integrated Conservation Mission approved as 'Flagship Programme' by the Union Government in June 2014 with budget outlay of Rs 2,00,000 million to accomplish the twin objectives of:

- i. effective abatement of pollution
- ii. conservation and rejuvenation of National River Ganga

The Programme has main objectives of Sewerage Treatment Infrastructure, River Surface Cleaning, Afforestation, Industrial Effluent Monitoring, etc. For conservation of rivers, the Ministry of Jal Sakti has been supplementing efforts with the states and Union Territories by providing financial and technical assistance for abatement of pollution under the programme. The National River Conservation Plan has so far covered polluted stretches of 34 rivers across 77 towns and sanctioned cost of Rs 59,610 million and created a sewage treatment capacity of 2,677 Million litres per day.

Under the Namami Gange programme, so far, a total of 352 projects have been sanctioned. 157 sewage treatment projects of 4,900 million litres per day, sewer network of 5,212 kms have been taken up with a sanctioned amount of Rs 3,04,580 million for all projects.

Swachh Bharat Mission (Urban)

Swachh Bharat Mission (SBM) (Urban) was launched by GoI with the vision of ensuring hygiene, waste management and sanitation across the country in 2019. The SBM (Urban) was implemented under the Ministry of Housing and Urban Affairs. The key focus area under this are eliminating open defecation, eradication of manual scavenging by converting insanitary toilets to sanitary, solid waste manager, behavioural change, general sanitation awareness etc.

Under Swachh Bharat Mission (Urban) 2.0 launched on October, 2021 an amount of Rs 1,58,830 million has been allocated to states and union territories for waste water management including setup of sewage treatment plants and faecal sludge treatment plants.

5.3 Key drivers

Use of technologies and innovative waste water treatment play an important role in improving urban sanitation and enhancing water security. The implementation of reuse of treated wastewater is still an issue in India despite the known benefits of water waste treatment and reuse technologies.

Water supply management:

- **Mission on making water available to all**

The focus of the GoI in the past few years has been to make potable water available to all the households in the country. For the same reason, a number of schemes have been established by the GoI. The per capita water availability in the country is decreasing due to increasing population. As per a NITI Aayog report, India is facing water crisis with around 50% population experiencing high-to-extreme water shortage.

The Government has introduced schemes like 'Jal Jeevan Mission' to execute the mission of providing safe and adequate water to all. Under JJM, the tap connections in rural households have increased to 55% as of December 2022.

- **Focus on improving water availability**

Based on the study of "Reassessment of Water Availability in India using Space Inputs" (CWC, 2019), the average annual per capita water availability for the year 2031 has been assessed as 1,367 cubic meters. The Government is coming up with measures to improve availability of water by building and maintaining natural resources of water. Below schemes have been set up by the GoI to tackle the declining availability of water:

- Atal Bhujal Yojana (Atal Jal): Sustainable groundwater management
- Jal Shakti Abhiyan: "Jal Shakti Abhiyan: Catch the Rain" focuses on creating Rainwater Harvesting Structures

The thrust areas for these schemes will be rain water harvesting, rejuvenation of water bodies.

On the other hand, the Department of Water Resources and other schemes aim to ensure maintenance and efficient use of water resources to match the continuously growing demand of water.

- **Rejuvenation of urban water bodies**

Water bodies in urban areas such as lakes, ponds, step-wells, and baolis have traditionally served the function of meeting water requirements of various needs like washing, agriculture or religious/cultural purposes. Surface water bodies and traditional water harvesting structures in numerous cities have either dried up, or disappeared due to encroachment, dumping of garbage, and entry of untreated sewage. These water bodies can store water and recharge ground water if revived thus helping in meeting the increased requirement of water.

Key drivers for waste water treatment:

Central Government policies push for wastewater treatment and use

Under the National Sanitation Policy, water waste treatment and reuse of water to enhance alternative water supplies and conservation are promoted. Initiatives like National Lake Conservation Plan, National Wetland Conservation Program are taken to identify lakes and wetlands across the country and undertake various conservation, water waste treatment, pollution abatement, education and awareness creation etc.

Central Government has also implemented National River Conservation Plan for abatement of pollution across stretches of various rivers and undertaking conservation plan, sewage systems construction, sewage treatment plant construction, electric crematoria and river front development.

Financial assistance for treatment plants installation are also provided to small scale industries. Apart from this, the Central Government has also issued directions for zero liquid discharge implementation.

Development plans to clean River Ganga and improve wastewater treatment and management

There are two flagship programs the Government of India launched to clean the River Ganga namely Ganga Action Plan (GAP) (1985) and the current Namami Gange Programme (2014). The Government has also initiated sectorial plans to improve un sewerd and sewerd sanitation like Swachh Bharat Mission, AMRUT, Smart City initiatives etc. Under these initiatives, the State Government and municipal and private sector applicants are given grants and subsidies for the construction of sewage treatment plants and water treatment plants.

Agricultural water reuse

Low quality water is traditionally not conventionally used in agricultural production. The two sources of non-conventional water (NCW) are – wastewater used for domestic, municipal and industrial and saline water from underground, drainage or surface sources. But many countries are using the NCW sources for agricultural uses as the fresh water sources are limited. The NCW is primarily treated and blended with other water to produce desired quality and quantity. In India, under GAP-I, to improve the water quality, diversion and treatment of domestic sewage and industrial wastes are taken place. If not properly treated the low-quality irrigation water might cause severe water and soil contamination. To tackle this, India needs water treatment plants with advanced technology and increased volume across the country.

Industrial water reuse

Industrial water can be reused and recycled in which the waste water produced can be treated and reused in same or a different process. Various methods are used to perform this depending of the quality of the waste water requirements, space constraints, and budget. Benefit of this is reduction of fresh water cost and reduce in the water footprint. The operational and sustainability of the industries can also be improved with improved water treatment process and production capacity.

5.4 Challenges

Water Supply:

- **Regulatory challenges:**

Under water supply management, permits and finance are key elements for setting up the project. Different projects might need different permits along with financial sanctions which follow a regulatory process. The process can become time consuming due to delayed submissions, incomplete information, revised project plans. The unexpected changes could lead to extended timelines and delay the project timelines. Also, receiving funds required for implementation and execution of projects takes time, which leads to project execution delay.

- **Financial challenges:**

When the draft for a water supply project is presented, an estimated cost of the project is presented to the authorities as well. The project cost estimates typically get revised as the design gets more specific or the design gets updated due to additions made in the project. Based on the draft design, the authorities sanction the budgeted amount which may get revised due to factors like inflation, change in material cost, economic changes or even inaccurate estimations. These unexpected changes lead to revised project cost which need approval from the authorities again or in some cases the additional construction cost may have to be borne by the construction company assigned.

- **Environmental challenges**

Climate change is affecting the environment in a major way. It is impacting rainfall patterns, causing floods and may also lead to long term decline in naturally available sources like groundwater storage. Groundwater availability is closely linked to food security as it has played a vital role in increasing agricultural production over the years. Groundwater contributes nearly 62% in irrigation, 85% in rural water supply and 50% in urban water supply. Even though Groundwater is replenishable but its availability is non-uniform as it is dependent on rainfall. The over exploited groundwater sources are a major challenge as it is a key water supply source for agriculture.

Waste water management:

Institutional Challenges

The Urban Local Bodies (ULBs) are responsible for domestic waste water management and treatment. However, there is a lack of planning capacity and project implementation. According to the audit report of Comptroller and Audit General (CAG 2017), there was a shortage of man power in the municipalities for waste water collection, treatment and revenue collection which affected delivery of citizen services. It also exposed deficiencies in planning, financial management, implementation and monitoring of various projects. Similarly, the CAG performance audit (2016) in the state of Jharkhand found that none of the sampled ULBs had a sewage network. In the absence of the same, around 175 MLD of untreated waste water is discharged into open drains polluting nearby water bodies.

The current institutional, legal and policy mechanisms for management and treatment of waste water and control of water pollution in the country is not sufficient to address the looming crisis.

Economic Challenges

The gap between the sewage generation and present treatment capacity is very large in all the classes of cities and towns due to increasing population and urbanization in India. It is difficult for smaller cities and towns in finding necessary resources to set water treatment plants considering high capital expenditure and operation and maintenance cost. Community participation in operation and maintenance is suggested to improve the economic viability of Sewage Treatment Plants (STP). Private sector waste water treatment investments are difficult in India due to high capital investments and unpredictable revenue stream.

Technical Challenges

There is an overdependence in India on older technologies for waste water treatment due to its high cost. This results in more repair work and less efficiencies of these plants. The limitations lead to poor performance of these plants hence adulteration of sewage and water bodies.

Apart from this the land requirement for STP plants is a big challenge. In urban areas the land availability is a big issue due to limited availability and cost. People usually resist these plants around their society. Conventionally centralized water waste

treatment are designed to remove Nitrogen, Biological Oxygen Demand and Phosphorous but with rapid urbanization and changing type of contamination, technologically advanced plants are needed to be setup to deal with them.

Apart from this the land requirement for STP plants is a big challenge. In urban areas land availability is a big issue due to limited land availability and high cost.

Social Challenges

Social acceptance of treated waste water is a big challenge due to fear and disgust when it comes to reuse. Recycled water is unlikely to be used as drinking water when compared to its use in irrigation etc. The negative attitude towards this has also stemmed from concerns like health risk and aesthetic aspects like colour, odour, taste and cultural and religious background of consumers.

Identifying and obtaining of sites for plant setup is another challenge due to people not preferring to live near these plants. This is because of the reasons like health risks, aesthetic impacts and factors like land depreciation. Solutions like underground plant setup can help eliminate the above stated factors but involves a huge capital expenditure. Also, buffer zones are limited to solid wastes. Conventional systems in India suffers operational costs, management costs, demand of treated water and decentralized systems.

5.5 SWOT Analysis

Waste water management is crucial to the development of an economy. More than 70% of the used water is disposed directly into the sources. There are many factors contributing to the need for efficient water treatment plants. Following is a SWOT analysis on the sector:

STRENGTH	WEAKNESS
<ul style="list-style-type: none"> • Increased Urbanization, hence the increasing need for water and food • Reduced contamination of water resources • Treated waste water is not limited to irrigation, it has other economic benefits like toilet flushing, fish rearing and industrial uses • Introduction of Government run programmes like Namami Gange program and Jal Jeevan Mission 	<ul style="list-style-type: none"> • There is a lack of planning, financial management, implementation and monitoring of various projects across India • Centralization of Sewage Treatment Plants is difficult considering the population growth and land use pattern • Large initial investments are required in installation of STPs • In treated water, high concentrations of Urea might be a major concern
OPPORTUNITY	THREAT
<ul style="list-style-type: none"> • Availability of advanced engineering and technology benefits • Increasing awareness about water conservation and reuse in the society • Government's focus to fund more STP projects for river water conservation and treatment • Development in green economy to conserve water bodies • Emergence of mega cities and hence demand for water and sanitation 	<ul style="list-style-type: none"> • Low efficiency and outdated technological use in the overall infrastructure • No proper sewage line to carry the waste water to a common centralized Sewage Treatment Plant • People unwilling to live near the treatment plants due to the odour and possible health risks to operators, neighbours, farmers and consumers

5.6 Outlook

About 35% of the Indian population lives in urban centers according to census 2011 and the number is expected to go up rapidly leading to increased demand of fresh water. The generation of waste water is double in cities as compared to rural India because of availability of more water in urban cities due to increased living standards and the urbanization pace.

Rapid urbanization has also added pressure on the food and fresh water requirement. This is also responsible for consuming large water quantities and discharging the wastewater back into the source. Due to increased use of water for various household uses, industrial and agricultural purposes, waste water management and treatment is very important. Of the total sewage generated in FY21 only 28% i.e. 20,236 MLD was treated which implies that 72% of the waste water is left untreated and is disposed in the various water bodies like river, lakes or underground water. This is a huge opportunity of development in this sector.

Government has allocated major projects of waste water treatment plants under schemes like Namami Gange Programme and Swatch Bharat Mission (Urban). These initiatives are focused on reducing the contamination in the water bodies and reuse of treated water for purposes like toilet flushing, industrial use, irrigation etc.

6. Power sector

6.1 Overview

Power is one of the most critical components of infrastructure which is crucial for the economic growth and well-being of nation. The existence and development of adequate infrastructure is essential for the sustained growth of the Indian economy.

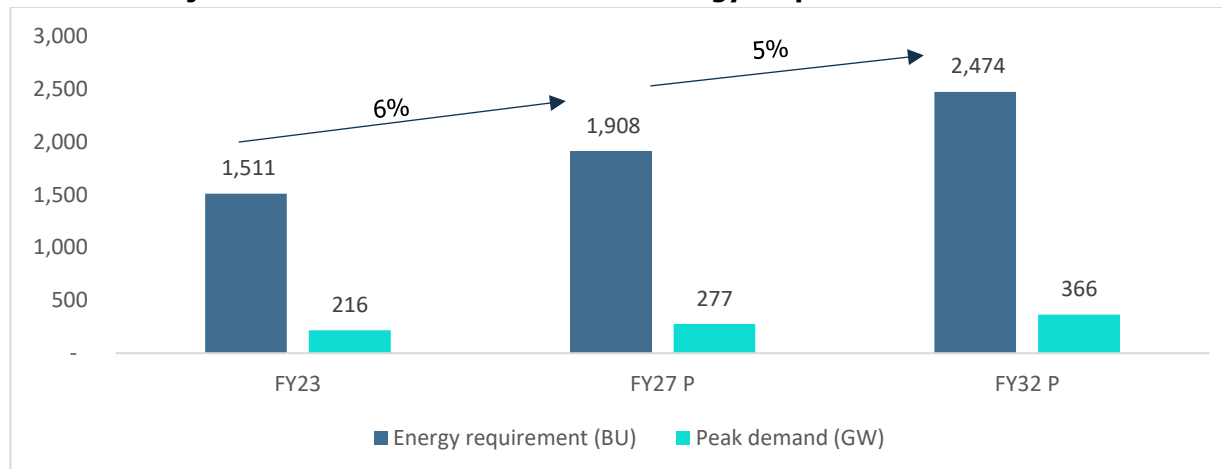
The power industry is divided into three segments:

- Generation
- Transmission
- Distribution

The Industrial sector accounts for majority of the power consumption in India followed by the domestic sector. The industrial sector had a CAGR of 4% between FY12 and FY21 whereas the domestic sector has a CAGR of 7% over the same period indicating an increase in power consumption from the domestic sector as more and more households gets access to electricity.

The demand for electricity in the country has increased rapidly and is expected to increase further. There has been steady decrease in the power deficit of the country, supported by improving supply. Going forward, the power demand is further expected to rise with rise in population and increased economic activity. The power demand forecast using Peak Demand (highest energy consumption) and total energy requirement is shown in the chart below:

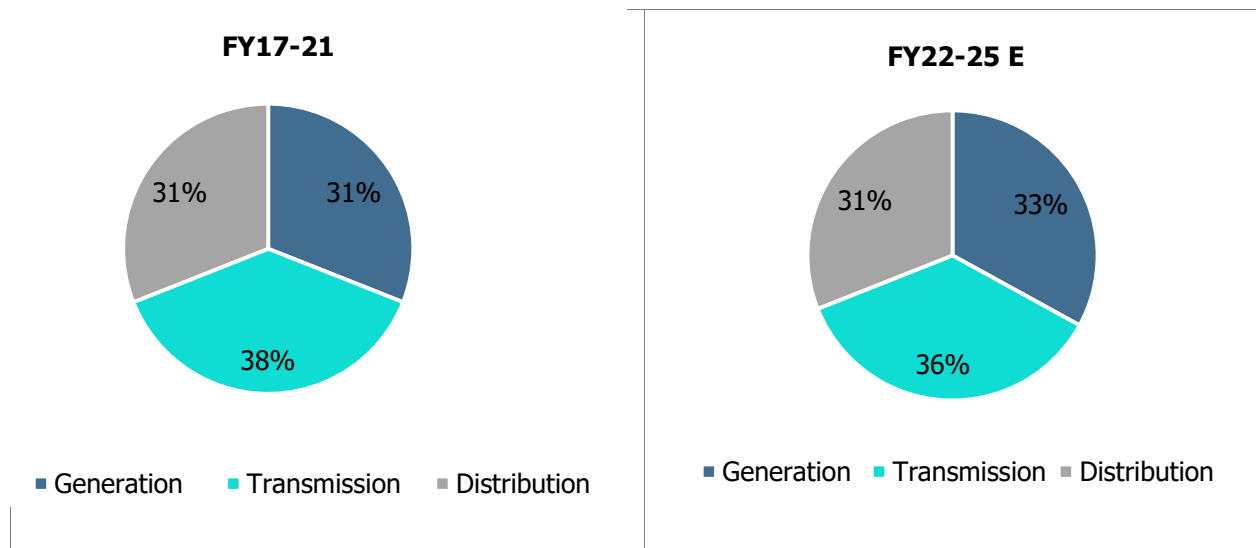
Chart 35: Projected All India Peak Demand and Energy Requirement



Source: CEA

Investments across the power value-chain

Chart 36: Investments in the Power Sector



Source: Sterlite Power Annual Report, CareEdge Research

Between FY17 and FY21, transmission took the largest share of investments made in the sector (38%) followed by generation and distribution at 31% each. It is estimated that another Rs. 10-11 trillion would be invested in the sector over the next five years, where again transmission would be the major focus (36%) followed by generation (33%) and distribution (31%).

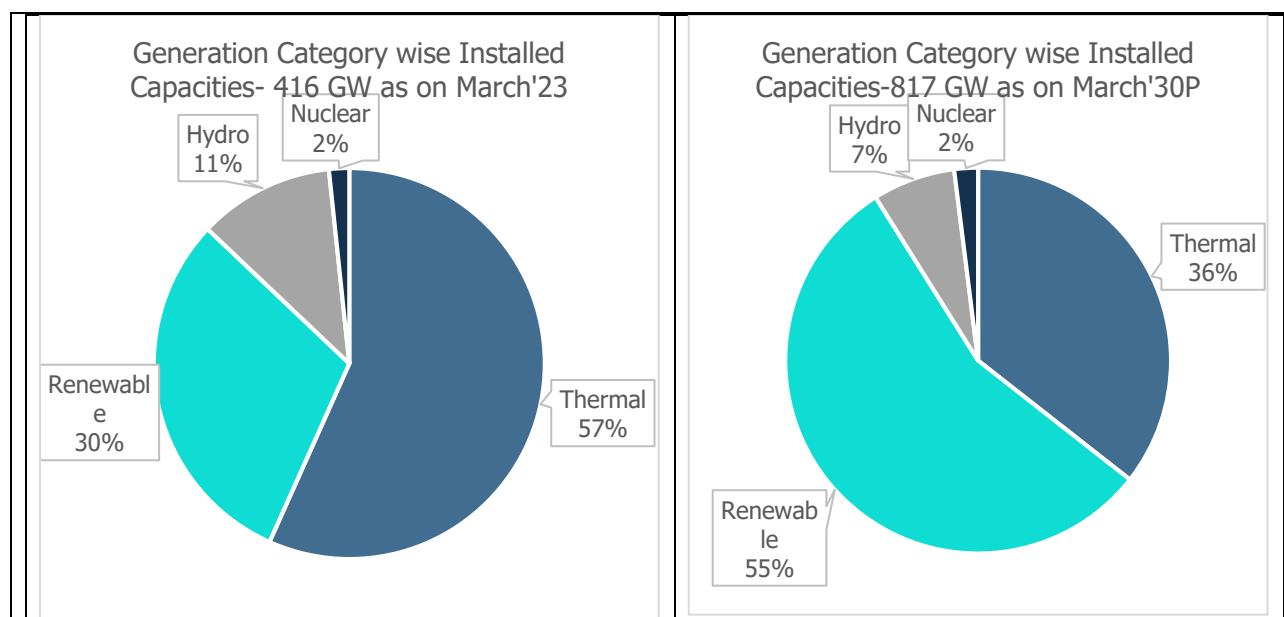
Power Generation

India's electricity sector is one of the most diversified in the world. India's power generation sources range from conventional sources such as coal, lignite, natural gas, oil, nuclear and hydro power to viable unconventional sources such as wind, solar, agricultural and household waste.

Electricity generation in India increased from 1,372 BU in FY19 to 1,618 BU in FY23, implying a compounded annual growth rate (CAGR) of 4.2%. Thermal power forms the largest source of power in the country. About 75% of the electricity consumed in India is generated by thermal power plants with renewables quickly gaining pace.

With the Government of India's ambitious projects and targets, power generated from Renewable Energy Sources (RES), which currently accounts for 27%, is expected to quickly overtake conventional sources. With consistent focus on renewable sector, the percentage share of installed capacity is expected to shift towards renewable capacity.

Chart 37: Share of Installed Capacity as on March'23



Source: CEA, CareEdge Research

The total installed power generation capacity is expected to reach 817 GW as on March 2030. The share of renewable energy is expected to increase from 30% as on March 2023 to 55% in March 2030 while the share of thermal power is expected to reduce from 57% to 36% over the same period.

Power Transmission and Distribution (Check latest PNB)

Transmission and distribution (T&D) sector plays a vital role in the power system value chain. Increase in generation capacity, integration of renewable energy and focus of Government on providing electricity to rural areas, has led to an extensive expansion of the country's T&D system across the country.

Along with this, there has also been an increase in demand for transmission networks to carry bulk power over longer distances, and at the same time optimize losses and improve grid connectivity.

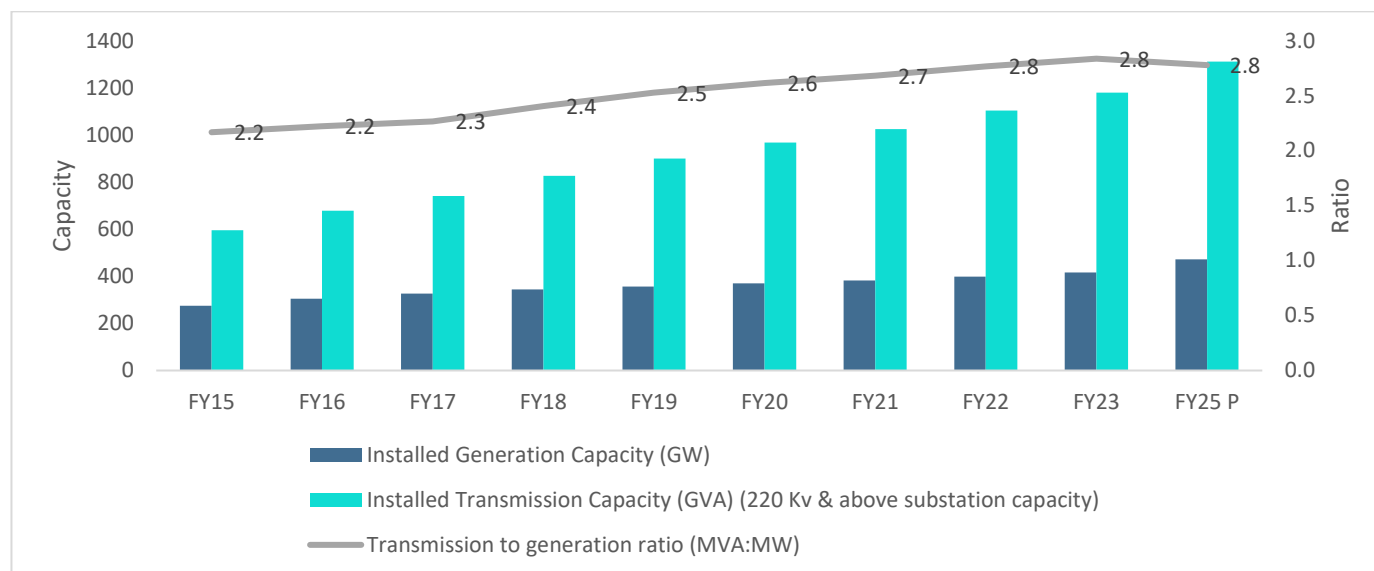
The transmission line network grew at a CAGR of approximately 6% to 4.56 lakh circuit km as on March 2022 from 3.13 lakh circuit km as on March 2015. This growth trend and country's vision of achieving 445 GW by 2030 offers enormous growth opportunities for addition of transmission capacity both at interstate and intra-state levels.

Investments in the transmission sector are expected to reach Rs. 40,00,000 million by FY25. Investments in the sector are backed by a large power generation installed base and the need to further strengthen the transmission system to meet the increasing demand.

Historically, investments in the transmission sector have been low compared to the generation sector, but with increased private participation, the average growth in the transmission sector has been on par with the average growth in the generation capacity for the past five years.

The transmission to generation ratio was 2.2 times as on March 2015 and improved to 2.7 times as on March 2022. The consequence of having a lower ratio leads to line congestion especially in the case of inter-state transmission lines. The ratio is expected to improve further with the government's focus on improving connectivity and reducing congestion.

Chart 38: Trends in Transmission to Generation Ratio



Source: CEA, CareEdge Research

Furthermore, increasing Government focus towards renewable energy sector as well as rural electrification are also expected to drive the investments in the sector. The investment in coal-fired plants has fallen in recent years while the attractiveness for renewable has increased. This is due to low operating costs and priority access to networks. The push from Government to increase the share of renewable for power generation has also led to interest by private players.

In FY22, there were investments worth USD 14.5 billion in renewable sector, increasing at 125% from the previous year. Currently, the investments in the sector are on a rising trend due to revival of energy demand and commitments by various organizations to exit the fossil fuel investments.

6.2 Key growth drivers for the infrastructural development in power sector

- **Rising gap between interregional power demand and supply**

It is estimated that the generation capacity addition will not be evenly spread across India. Majority of the upcoming renewable capacity is expected to be concentrated in the western and southern regions of India, while thermal capacity is expected to be focused close to the coal mines in the eastern region of India. This would result in increase in interregional import/export demands, which will have to be catered through interregional transmission corridors.

- **Government support**

The Power sector has been supported by the Government through various measures such as increasing the concession period of a transmission asset, relaxing norms to speed up project construction and introduction of the various scheme. The Government introduced a Revamped Distribution Scheme with an outlay of Rs. 30,40,000 million over a period of five years from FY2021-22 to FY2025-26. The objective of the scheme is to improve the quality, reliability and affordability of power supply to consumers through a financially sustainable and operational efficient distribution sector.

Improvement in the financials along with anticipated demand has resulted in various intra-state transmission projects undertaken by the state utilities, which further presents investment opportunities.

- **Upgradation of existing lines**

Upgrading efforts for existing lines can augment capacity without the need for heavy investments and are less likely to give rise to right of way issues. Upgrading transmission networks to higher voltage also increases the power handling capacity of the system and the gestation period for upgrading a line is much less as compared to erecting a new line. Power transmission lines have reaped huge benefits in terms of increased power transmission capacity with such upgrade efforts.

- **Strong renewable energy capacity additions**

Power generation in India is dominated by coal-based generation. The use of other resources, such as renewable energy, is experiencing a staggering growth in installed capacity. Going forward, it is expected that the growth in renewable energy capacity additions will be healthy. Such expansion plans require large scale development in the transmission sector.

- **Cross border power trading in South Asian countries**

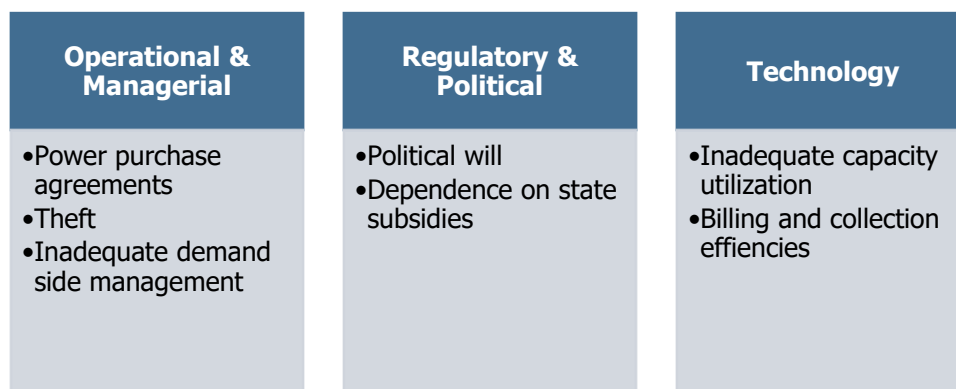
Power deficit in India has been on a declining trajectory. India is expected to further expand its generation capacity (conventional power). India is also evaluating opportunities to tap neighboring countries such as Nepal, Bangladesh, Sri Lanka, Maldives and Bhutan for better integration and synergies by interlinking electricity transmission systems and allowing surplus power to be exported to other grids. These capacity expansion plans are expected to provide opportunities for private players in the transmission sector.

- **Charging Infra for Electric Vehicle**

The global market for electric vehicles (EVs) is growing. As EV adoption grows, readiness of the electricity grid to EV charging demand is critical to achieve rapid and large-scale transition to EVs. Application of smart charging measures can help manage EV charging loads to a certain degree without the need for grid upgrades.

6.3 Challenges pertaining to Power Transmission and Distribution Sector

There are three main heads of challenges faced by the distribution utilities: Operational & Managerial, Regulatory & Political, and Technology.



Operation & Managerial Challenges

- **Power purchase agreements (PPAs)**

PPAs are bilateral contracts between the discoms and the generators. PPAs have a specific set of terms and conditions setting out the rights and obligations of the generators and the discoms. This includes the price at which electricity would be bought, conditions for adjusting tariffs for select events, mutually agreed conditions for sharing and termination of the PPAs. Generally, the PPAs are long term in nature i.e. around 20-25 years

Power procurement is one of the critical components to be considered by the discoms and makes almost 80% of the discom's expenses. Discoms generally enter into PPAs with the generation companies to avoid variability in the tariff structure. The tariffs rates especially for renewable power have come down considerably in the last 5-7 years, which means that the discoms that had already entered into PPAs at a higher tariff in the past are at a disadvantage.

- **Theft**

India has one of the highest AT&C losses in the world. As per the Central Electricity Authority of India, over 27% of the total power produced is lost due to either dissipation from wires or theft. Meter tampering by households, electricity theft by industrial companies, tapping into bare wires are some of the methods of theft.

- **Inadequate demand side management**

Usually, discoms face a power deficit during the day time and a power surplus during the night. At times of power deficit, the discoms purchase the additional power required from the open market and at time of power surplus, the discoms sell the surplus power on the open market. However, the cost of power sold on the exchange is significantly lower compared to the cost of purchase.

Regulatory & Political Challenges

- **Political will**

There have been several reforms brought in from time to time to improve the commercial viability of the discoms but are yet to make a long lasting impact. The political aspect is visible in the rural areas where the powerful farmer's lobby is hard for the politicians to ignore in a country where majority of the population still makes its living from agriculture. Even now, the discoms continue to make losses due to lack of political will among the State Governments to come out with a strong solution for the problem.

- **Dependence on state subsidies**

Discoms dependency on state subsidies has been rising over the years due to lack of change in tariffs even though the cost of supply has increased. Majority of the agriculture sector and certain section of the domestic consumers are supplied power which is highly subsidized. This exposes the discoms to delays and shortfall of subsidy payments from the State Governments, which results in an increase in subsidy receivables.

Technological Challenges

- **Inadequate capacity utilization of thermal power plants**

Firstly, even though there is enough generation capacity, the distressed condition of the discoms result in suppressed demand for power, which leads to underutilization of capacities. Secondly, substantial fall in solar tariff and a low gestation period possess threat to the economic viability of the thermal power plants. While, growth in solar energy is a positive sign for the country, thermal energy will continue to remain an important source of energy in the future.

- **Billing and collection efficiencies**

Collection efficiency is the measure of proportion of amount that has been collected from consumers w.r.t. amount billed to them. All the consumers are billed on the basis of energy consumed by them which is obtained from meter reading and assessment of unmetered energy of consumers. The billed amount is computed on the basis of tariff fixed by regulatory commission for applicable customer category. However, there are quite a few consumers who have tendency to default in their payments for various reasons. Thus utility is not able to recover entire amount billed by it, resulting in commercial losses.

6.4 Government policies and regulations

Overview

In India, the Electricity Act, 2003 governs the generation, transmission, distribution, exchange, and use of electricity. It also establishes a complex system of bodies to administer the Electricity Act's functions. The Electricity Act, among other things, delicensed all generation activities except hydropower.

Regulatory Capabilities of different bodies:

	Centre		State/Private		
Policy	Ministry of Power		State Government		
Plan	CEA				
Regulations	CERC ; MNRE		SERC		
System Operations	National Load Dispatch Centre, Regional Load Dispatch Centre		State Load Dispatch Centre		
Generation	Central Generation Stations, MNRE, Department of Atomic Energy		State Gencos	CPPs, IPP	Private Licensees in Ahmedabad, Kolkata, Mumbai, Surat, Delhi, Noida
Transmission	Central Transmission Utility (PGCIL)	Transmission Licensee	State Transmission Utility	Transmission Licensee	
Distribution	-		State Distribution Company		Private Discoms
Trading	Trading Licensee	Power Exchanges	Bilateral Markets		
Appeal	Appellate Tribunal (APTEL)				

Electricity generation, distribution, and transmission are regulated and overseen by regulatory bodies at the federal and state levels. They are self-contained entities with responsibilities outlined in the Electricity Act.

Key Policy initiatives for development of power transmission sector:

- **National Electricity Policy**

Some of transmission related provisions of the National Electricity Policy, which have implication with regard to the National Electricity Plan, are:

- Adequate and timely investments and also efficient and coordinated action to develop a robust and integrated power system for the country.
- Augmenting transmission capacity keeping in view the massive increase in generation and also for development of power market.

- (iii) While planning new generation capacities, requirement of associated transmission capacity would need to be worked out simultaneously in order to avoid mismatch between generation capacity and transmission facilities.

The policy emphasizes the following to meet the above objective:

- (i) The Central Government would facilitate the continued development of the National Grid for providing adequate infrastructure for inter-state transmission of power and to ensure that underutilized generation capacity is facilitated to generate electricity for its transmission from surplus regions to deficit regions.
- (ii) The Central Transmission Utility (CTU) and State Transmission Utility (STU) have the key responsibility of network planning and development based on the National Electricity Plan in coordination with all concerned agencies as provided in the Act. The CTU is responsible for the national and regional transmission system planning and development. The STU is responsible for planning and development of the intra-state transmission system. The CTU would need to coordinate with the STUs for achievement of the shared objective of eliminating transmission constraints in cost effective manner.
- (iii) Open access in transmission has been introduced to promote competition amongst the generating companies who can now sell power to different distribution licensees across the country. This should lead to availability of cheaper power.

- **Tariff Policy**

- (i) Objective:

The tariff policy, as transmission is concerned, seeks to achieve the following objectives:

- a. Ensuring optimal development of the transmission network ahead of generation with adequate margin for reliability and to promote efficient utilization of generation and transmission assets in the country;
- b. Attracting the required investments in the transmission sector and providing adequate returns.

- (ii) Transmission Pricing

- a. A suitable transmission tariff framework for all inter-State transmission, including transmission of electricity across the territory of an intervening State as well as conveyance within the State which is incidental to such interstate transmission, has been implemented with the objective of promoting effective utilization of all assets across the country and accelerated development of new transmission capacities that are required.
- b. The National Electricity Policy mandates that the national tariff framework implemented should consider the factors distance, direction and quantum of power flow. This has been developed by CERC taking into consideration the advice of the CEA. Sharing of transmission charges shall be done in accordance with such tariff mechanism as amended from time to time.
- c. Transmission charges, under this framework, can be determined on MW per circuit kilometre basis, zonal postage stamp basis, or some other pragmatic variant, the ultimate objective being to get the transmission system users to share the total transmission cost in proportion to their respective utilization of the transmission system. The 'utilization' factor should duly capture the advantage of reliability reaped by all. The spread between minimum and maximum transmission rates should be such as not to inhibit planned development/augmentation of the transmission system but should discourage non-optimal transmission investment.

- (iii) CERC Regulations

Central commission has issued regulations which entitle distribution licensees, generators, electricity traders and permitted open access customers to seek access to the inter-state transmission system. As per the present

regulations access to the transmission system can be sought on short, medium- or long-term basis. The Central Transmission Utility (CTU) is the nodal agency for providing medium term (for a period equal to or exceeding 3 months but not exceeding 5 years) and long term (period exceeding 7 years) access that are typically required by a generating station or a trader on its behalf. The Long Term Access (LTA) is to be granted through the transmission planning route. The nodal agency for grant of short term open access (for a period less than 3 months) is the Regional Load Dispatch Centre. The nodal agency for providing transmission access to the power exchanges is the National Load Dispatch Centre. The Medium Term Open Access (MTOA) and Short Term Open Access (STOA) are to be granted using margins in the system and as such no additional transmission envisaged for this purpose as per the regulation.

Key Policy initiatives for development of power distribution sector:

- **Revamped Distribution Sector Scheme (RDSS)**

The Ministry of Power (MoP) in June 2021 came out with the RDSS scheme in line with the announcement made by the finance minister in the recent union budget. The scheme is aimed at improving the operational efficiency and financial sustainability of the state discoms and power departments. The reforms based and results linked RDSS has an outlay of Rs. 30,37,600 million including an estimated Central Government grant of Rs. 9,76,300 million. The implementation of the scheme would be based on the action plan designed for each state instead of a “one-size-fits-all” approach. Assistance would be provided on the basis of an agreed upon evaluation framework tied to the financial performance of the discoms (excluding private sector power distribution companies). REC and PFC have been designated as the nodal agencies for facilitating the scheme.

The scheme would be made up of two parts: Part A, consisting of metering and distribution infrastructure works, and Part B, consisting of training and capacity building as well as other enabling and supporting activities. All ongoing approved projects under schemes such as the Integrated Power Development Scheme (IPDS), the Deendayal Upadhyaya Gram Jyoti Yojana (DDUGJY) and the Prime Minister’s Development Package (PMDP)-2015 (for the union territories [UTs] of Jammu & Kashmir and Ladakh) would be subsumed in this scheme.

The five-year scheme, i.e. FY 21-22 to 2025-26 has the following key objectives:

- a. Reduction in AT&C losses to pan-Indian levels of 12-15 per cent by 2024-25
- b. Reduction in the ACS-ARR gap to zero by 2024-25
- c. Developing institutional capabilities for modern discoms
- d. Improvement in the quality, reliability and affordability of power supply to consumers through a financially sustainable and operationally efficient distribution segment.

- **Integrated Power Development Scheme (IPDS)**

The scheme launched in 2014 was aimed at providing quality and reliable power supply in the urban areas. As of July 2021, projects worth Rs. 3,13,140 million have been sanctioned under IPDS, against which, Rs. 159,160 million have been released towards projects and Rs. 2,190 million released for enabling activities. The objectives of the scheme were:

- a. Strengthening of sub-transmission and distribution networks in urban areas.
- b. Metering of distribution transformers/feeders/consumers in urban areas.
- c. IT enablement of the distribution sector
- d. Strengthen the distribution networks to achieve the targets mentioned under the RAPDRP

- **Rural Electrification:**

The government of India has taken joint initiative with the state governments for providing Power for All (PFA) to all households/homes, industrial and commercial consumers including supply of power to agricultural consumers. PFA initiative along with rural electrification across various states aims to ensure 24X7 electricity access, enhance the satisfaction levels of the consumers, improve quality of life of people and increase economic activities resulting in development. This is one of the key drivers for the growing power demand.

Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY) was launched in December 2014 with the objective of electrification of all un-electrified villages as per Census 2011 by the Government of India. Similarly, Pradhan Mantri Sahak Bijli Har Ghar Yojana- SAUBHAGYA was launched in October 2017 for electrification of rural and urban poor households in the country.

Following have been achieved so far:

1. All 5,97,464 (Census 2011) inhabited villages stood electrified as on 28.04.2018
2. SAUBHAGYA Scheme:
 - a. Under this scheme, projects worth Rs. 1,40,820 million were sanctioned with a closure cost of Rs. 92,460 million. Against this central grant of Rs. 63,050 million were released up to March 2022.
 - b. Under the SAUBHAGYA scheme as on March 2019, all households were reported electrified by the states except 18,734 households in Left Wing Extremists (LWE) affected areas of Chhattisgarh.
 - c. Subsequently the seven states namely Assam, Chhattisgarh, Jharkhand, Karnataka, Manipur, Rajasthan and Uttar Pradesh had reported 19.09 lakh unelectrified household that were unwilling, later as on March 2021 these households expressed willingness and the states reported 100% electrification.
 - d. Post March 2021, around 11.84 lakh households remain to be electrified as reported by the states against which 4.43 lakh households have been electrified.
 - e. Under the SAUBHAGYA scheme, a total of 28 million households were electrified as on March 2021 and as on March 2022, the schemes stand closed.
3. For 24X7 power supply:
 - In Urban areas, 20 states comprising of 24 DISCOMs having more than 20 average hours of power supply in a day has been achieved.
 - In Rural areas, 17 states and 1 union territory (UT) comprising of 35 DISCOMs having more than 20 hours of power supply in a day has been achieved.
4. The present status of power availability has reached 22 ½ hours on average in rural areas and 23 ½ hours in urban areas.

Schemes like Integrated Power Development Scheme (IPDS) with an outlay of Rs. 3,26,120 million including a budgetary support of Rs. 2,53,540 million from the Government of India have been approved. Other schemes like Deendayal Upadhyaya Gram Jyoti Yojana, Pradhan Mantri Sahaj Har Ghar Yojana, etc. have also been announced.

7. Peer Comparison

For peer comparison, CARE Edge has considered infrastructure companies operating under various business segments similar to EMS Limited. However, it may be noted that these peers are not exclusive to the segments under which they are mentioned. They do operate under other segments as well.

Companies considered for comparison under Water supply and waste water treatment

Amount in Rs Million

Particulars	VA Tech Wabag Ltd	JWIL Infra Limited
	Consolidated (FY23)	Standalone (FY22)
Net Sales	29604.8	7894.0
Y-o-Y Growth (%)	-0.6%	28.4%
Net Sales 5 Year CAGR (%)	-3.1%	19.5%
EBITDA	3714.2	796.0
Y-o-Y Growth (%)	37.9%	11.0%
EBITDA Margin (%)	12.5%	10.1%
EBIT Margin (%)	2.8%	9.9%
PBT	168.3	494.0
PBT Margin (%)	0.6%	6.3%
Profit After Tax	109.3	330.0
PAT 5 Year CAGR (%)	-40.3%	Not Applicable
PAT Margin (%)	0.4%	4.2%
ROE (%)	0.7%	16.7%
ROCE (%)	4.4%	21.2%
Asset Turnover (times)	0.7	1.3
Current Ratio (times)	1.3	2.1
Total Debt/Equity (times)	0.1	0.9
Interest Coverage (times)	1.3	2.7
Debtors Day	174.6	127
Inventory Days	4.5	1.1
Payable Days	299.6	141.4
Net Working Capital Days	-120.5	-13.3
Gross Block	1298.5	135.0
Gross block T/O	0	0.0
Total Debt/EBITDA	0.6	2.3

Companies considered for comparison under Roads, Urban infrastructure, Power and Railway sector

Amount in Rs Million

Particulars	Simplex Infrastructures Limited	RPP Infra Projects Limited	IVRCL Infrastructures & Projects Limited
	Consolidated (FY23)	Consolidated (FY22)	
Net Sales	18,738.3	8,017.0	8,846.0
Y-o-Y Growth (%)	-8.4%	56.2%	16.4%
Net Sales 5 Year CAGR (%)	-20.1%	17.0%	-19.4%
EBITDA	194.8	404.0	1,940.0
Y-o-Y Growth (%)	15.5%	-16.3%	-119.6%
EBITDA Margin (%)	1.0%	5.0%	21.9%
EBIT Margin (%)	-0.04%	4.0%	0.5%
PBT	-8245.6	112	-22,696.8
PBT Margin (%)	-44.0%	1.0%	-257%
Profit After Tax	-4709.8	54.0	-22709
PAT 5 Year CAGR (%)	Not Applicable	-25.1%	21.9%
PAT Margin (%)	-25.1%	0.7%	-256.7%
ROE (%)	-159.5%	1.8%	0.0%
ROCE (%)	3.8%	7.9%	0.5%
Asset Turnover (times)	0.2	1.2	0.1
Current Ratio (times)	0.9	1.6	0.1
Total Debt/Equity (times)	19.8	0.3	-1
Interest Coverage (times)	0	1.5	0
Debtors Day	267.9	84.9	324.9
Inventory Days	69.5	6.8	426.9
Payable Days	Not available	244.8	0
Net Working Capital Days	Not available	-153.1	751.8
Gross Block	Not available	1,145	40,893
Gross block T/O	Not available	0.1	4.6
Total Debt/EBITDA	59.6	2.3	8.2

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