

Industry Report on Road & Tunnel Infrastructure in India

Additional Focus on Union Territory of Jammu & Kashmir and
Ladakh

September 2023



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Annexure for Abbreviation used

GDP	Gross Domestic Product
GVA	Gross Value Added
IIP	Index of Industrial Production
PFCE	Private Final Consumption Expenditure
GFCF	Gross fixed capital formation
WPI	Wholesale Price Index
CPI	Consumer Price Index
y-o-y	Year on Year
m-o-m	Month on Month
IMF	International Monetary Fund
RBI	Reserve Bank of India
MOSPI	The Ministry of Statistics and Programme Implementation
Est., Adv. Est	Estimated, Advance Estimates
P, F	Projected, Forecast
USD	US Dollar
INR	Indian Rupee
Mn, Bn, Tn	Million, Billion, Trillion



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Global Macroeconomic Scenario

The global economy is now showing signs of moderate recovery as it posted a growth of 3.3% in CY 2022. But GDP growth will remain at a moderate level of 2.7% in CY 2023 and forecasted to improve to 2.9% in CY 2024. Global banks were carrying a historically high debt burden after COVID. Central banks took tight monetary measures to control inflation and spike in commodity prices. Russia's war with Ukraine further affected the global supply chains and inflated the prices of energy and other food items. These factors coupled with war-related economic sanctions impacted the economic activities in Europe. Any further escalation in the war may further affect the rebound of the economy in Europe.

While China was facing a crisis in the real estate sector and prices of properties were declining, with the reopening of the economy, consumer demand is picking up again. The Chinese authorities have taken a variety of measures, including additional monetary easing, tax relief for corporates, and new vaccination targets for the elderly. The government has also taken steps to help the real estate sector including cracking down on debt-ridden developers, announcing stimulus for the sector and measures to encourage the completion and delivery of unfinished real estate projects. The sector is now witnessing investments from developers and demand from buyers.

Global headline inflation is set to fall from 8.7 % in CY 2022 to 7.0 % in CY 2023, primarily on the back of softening commodity prices. Most of the central banks in the world has been increasing interest rates since CY 2021 to control inflation, and this is having an impact. With the sharp rise in policy rates, vulnerabilities in the banking sector have come into focus. Fears of contagion have risen across the broader financial sector, including non-banking financial institutions with regulators taking action to stabilize the banking system.

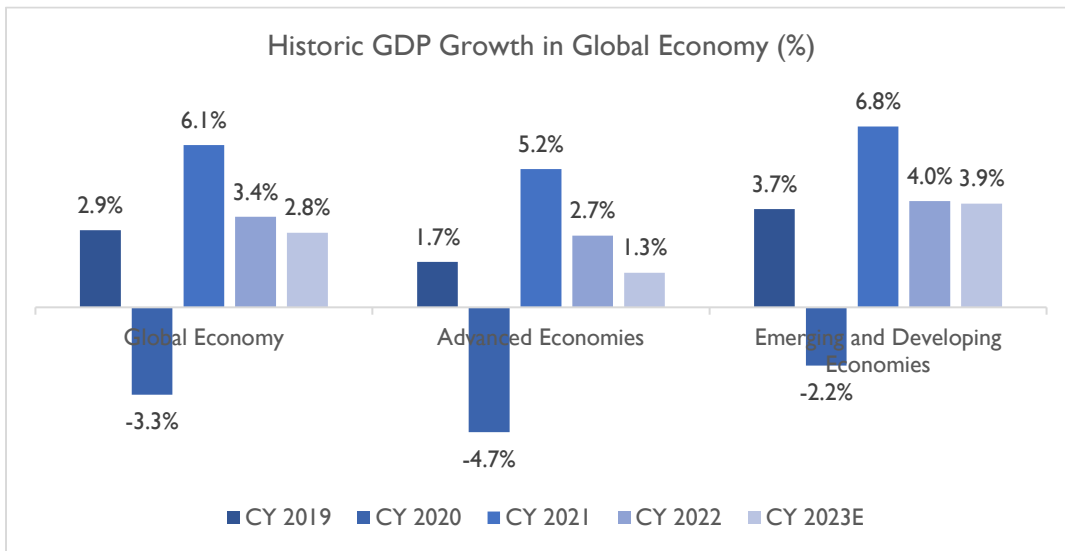
Global GDP Growth Scenario

The global economy started to rise from its lowest levels after countries started to lift the lockdown. The pandemic lockdown was a key factor as it affected economic activities resulting in a recession in the year CY 2020, as the GDP growth touched -3.3%.

In CY 2021 disruption in the supply chain affected most of the advanced economies as well as low-income developing economies. The rapid spread of Delta and the threat of new variants in mid of CY 2021 further increased uncertainty in the global economic environment.

Global economic activities experienced a sharper-than-expected slowdown in CY 2022. One of the highest inflations in decades forced most of the central banks to tighten their fiscal policies. Russia's invasion of Ukraine affected the global food supply resulting in a further increment in the cost of living. As a result, global growth declined from 6.1% in CY 2021 to 3.4% in CY 2022.





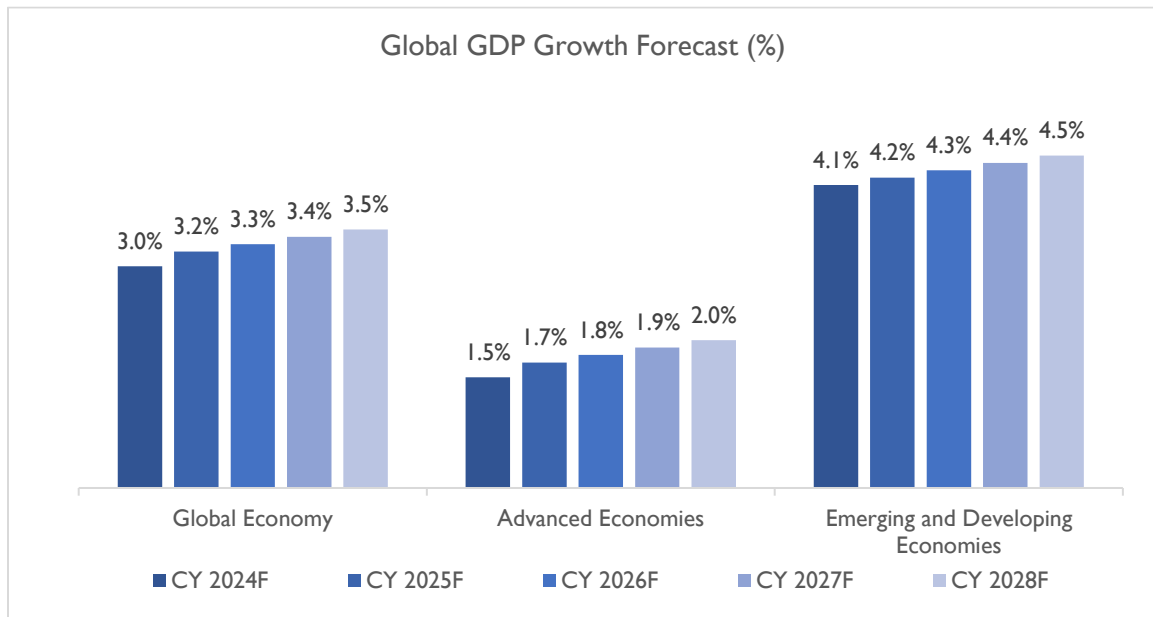
Source – IMF Global GDP Forecast Release 2023

Note: Advanced Economies and Emerging & Developing Economies are as per the classification of the World Economic Outlook (WEO). This classification is not based on strict criteria, economic or otherwise, and it has evolved over time. It comprises of 40 countries under the Advanced Economies including the G7 (the United States, Japan, Germany, France, Italy, the United Kingdom, and Canada) and selected countries from the Euro Zone (Germany, Italy, France etc.). The group of emerging market and developing economies (156) includes all those that are not classified as Advanced Economies (India, China, Brazil, Malaysia etc.)

In the current scenario, global GDP growth is forecasted to record a moderate growth of 2.8% in CY 2023 as compared to 3.4 % growth in CY 2022. While high inflation and rising borrowing costs are affecting private consumption, on the other hand, fiscal consolidation is affecting government consumption.

Flat growth in developed economies will affect the GDP growth in CY 2024 and global GDP is expected to record marginal growth of 3.0% in CY 2024. The current crisis in the housing sector, bank lending, and industrial sectors are affecting the growth of global GDP. Inflation forced central banks to adopt tight monetary policies. After touching the peak, inflationary pressures are slowly easing out. This environment weighs against interest rate cuts by many monetary authorities. The expectation is therefore still for slowing growth in the second half of CY 2023 and the first half of CY 2024.

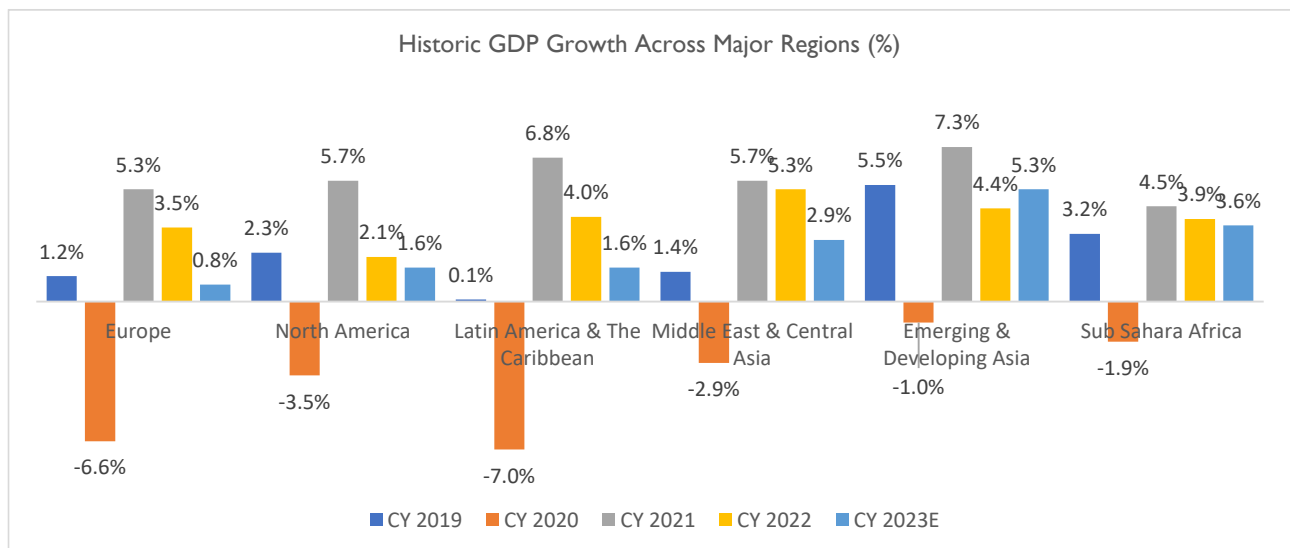




Source – IMF Global GDP Forecast Release 2023, D&B Estimates

GDP Growth Across Major Regions

GDP growth of major regions including the United States, Latin America, Europe, Middle East & Central Asia, and Sub-Saharan Africa, are showing signs of slow growth and recession. Meanwhile, GDP growth in Emerging and Developing Asia (India, China, Indonesia, Malaysia etc.) is expected to increase from 4.4% in CY 2022 to 5.3% in CY 2023.

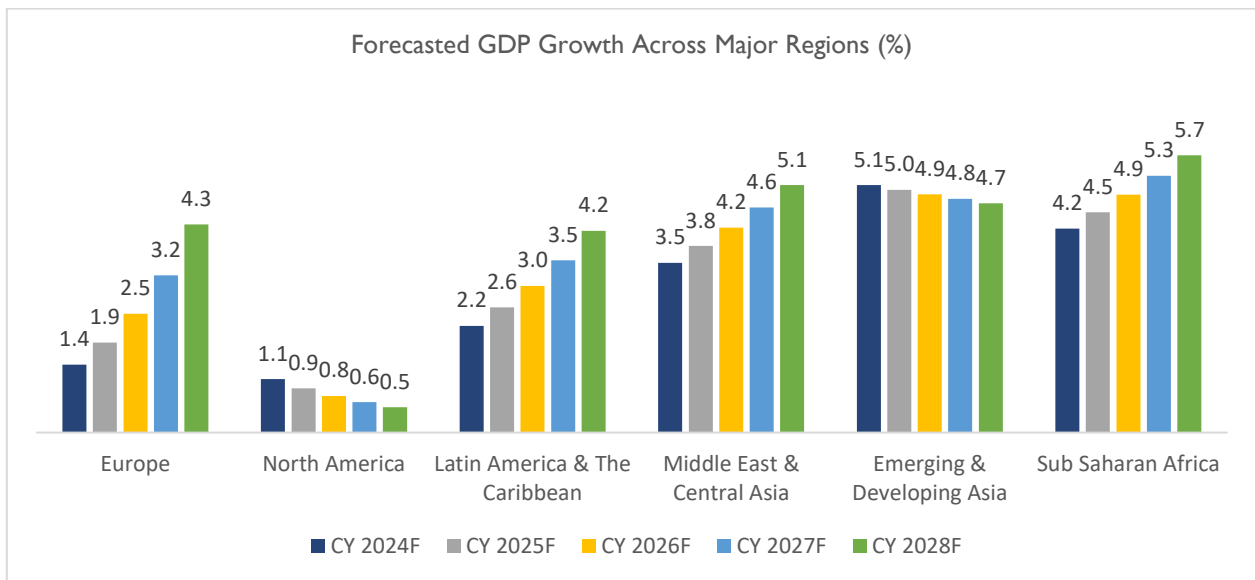


Source-IMF World Economic Outlook 2023

Except for Emerging and Developing Asia, all other regions are expected to record a decline in GDP growth rate in CY 2023 as compared to CY 2022. GDP growth in the United States is expected at 1.6% in CY 2023. Tight monetary and financial conditions coupled with high inflations are the major factors in this subdued growth.



Higher energy prices are curbing consumer demand in Europe's largest economies. Surging inflation and a decline in government spending are further affecting on an overall basis as Europe is expected to record GDP growth of 0.8% in CY 2023 as compared to 3.5% growth in CY 2022. China is expected to see strong increase in its GDP growth after the government has lifted the restrictions of its zero-COVID policy. China is expected to record a 5.4% growth in its GDP in CY 2023. Asian economies are expected to drive most of the global growth in CY 2023, as they will benefit from the ongoing reopening dynamics and less intense inflationary pressures compared to other regions.



Source-IMF, OECD, and World Bank, D&B Estimates



India Macroeconomic Analysis

GDP Growth Scenario

India's economy is showing signs of resilience with GDP growing by 7.2% in FY 2023. Although this translates into a moderation in demand (compared to FY 2022), the GDP growth in FY 2023 represents a return to pre pandemic era growth path. Despite this moderation in growth, India continues to remain one of the fastest growing economies in the world.

Country	GDP Growth (2022)
India	7.2%
United Kingdom	4.1%
Italy	3.7%
Canada	3.4%
China	3.0%
Brazil	2.9%
France	2.6%
United States	2.1%
South Africa	2.0%
Germany	1.8%
Japan	1.0%
Russia	-2.1%

Source: World Bank

GDP growth for India refers to FY 2023 as per MOSPI

Countries considered include - Largest Developed Economies and BRICS (Brazil, Russia, India, China, and South)

Countries have been arranged in descending order of GDP growth

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

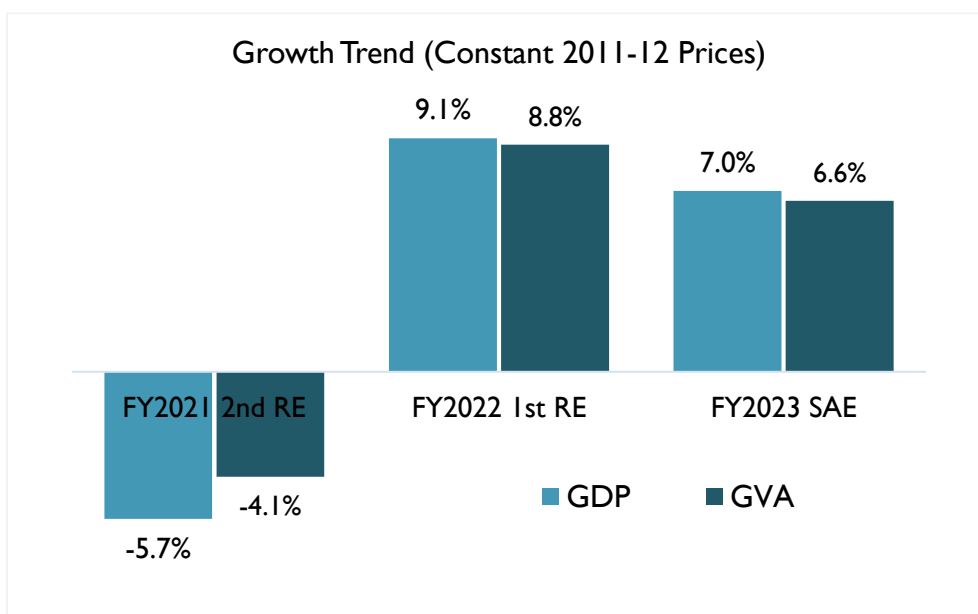
Realizing the need to impart external stimuli, the Government stepped up its spending on infrastructure projects which in turn had a positive impact on economic growth. The capital expenditure of central government increased by nearly 24.5% during FY 2023 as compared to the previous fiscal. The improvement was accentuated further as the Union Budget 2023-2024 announced 37.4% increase in capital expenditure (budget estimates), to the tune of Rs 10 trillion. The announcement also included 30% increase in financial



assistance to states at Rs 1.3 trillion for capex. This has provided the much-needed confidence to private sector, and in turn attracted private investment.

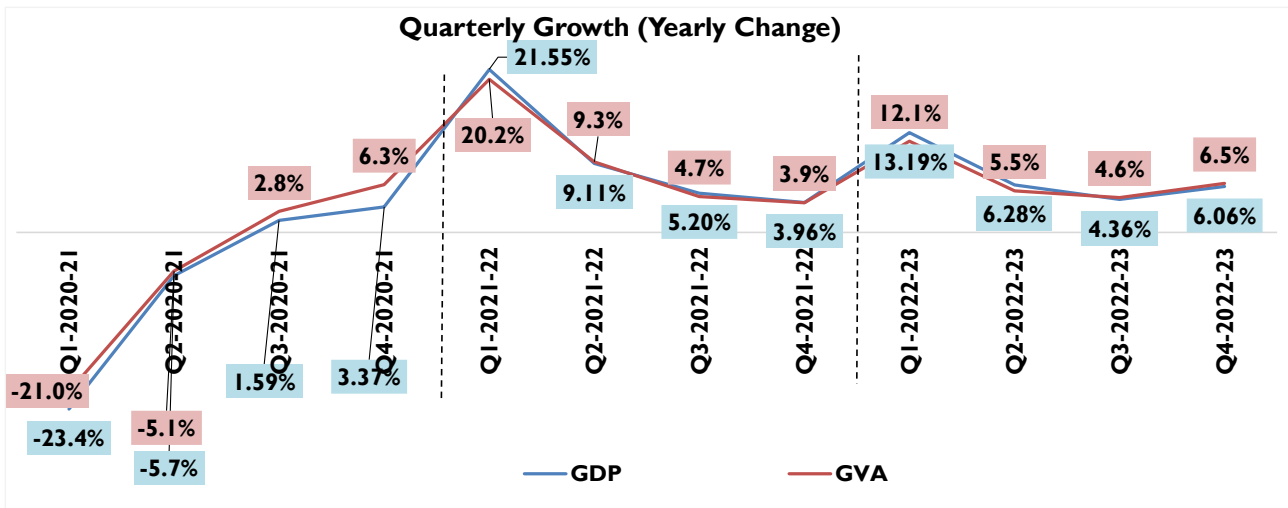
On the lending side, the financial health of major banks has witnessed an improvement which has helped in improving the credit supply. With capacity utilization improving, there would be demand for credit from corporate sector to fund the next round of expansion plans. Banking industry is well poised to address that demand. Underlining the improving credit scenario is the credit growth to micro, small and medium enterprise (MSME) sector as the credit outstanding to the MSME sector by scheduled commercial banks in the financial year FY 2023 grew by 12.3% to Rs 22.6 trillion compared to FY 2022. The extended Emergency Credit Linked Guarantee Scheme (ECLGS) by the Union Government has played a major role in improving this credit supply.

India's GDP in FY 2023 grew by 7.2% compared to 9.1% in the previous fiscal on the back of slowing domestic as well as external demand owing to series of interest rate hikes globally to tackle high inflation. The year-on-year moderation in growth rate is also partly due to a fading impact of pandemic-induced base effects which had contributed towards higher growth in FY 2022. On quarterly basis, the country growth moderated in Q2 and Q3 of FY 2023 which highlights impact of slowing economy on the back of monetary tightening. During Q3 FY 2023, the country's GDP grew by 4.36% against 6.28% y-o-y increase in the corresponding quarter last fiscal. However, the fourth quarter of FY 2023 saw a rebound in growth rate, indicating an optimistic scenario.



Source: Ministry of Statistics & Programme Implementation (MOSPI)
RE stands for Revised Estimates, SAE stands for Second Advance Estimates

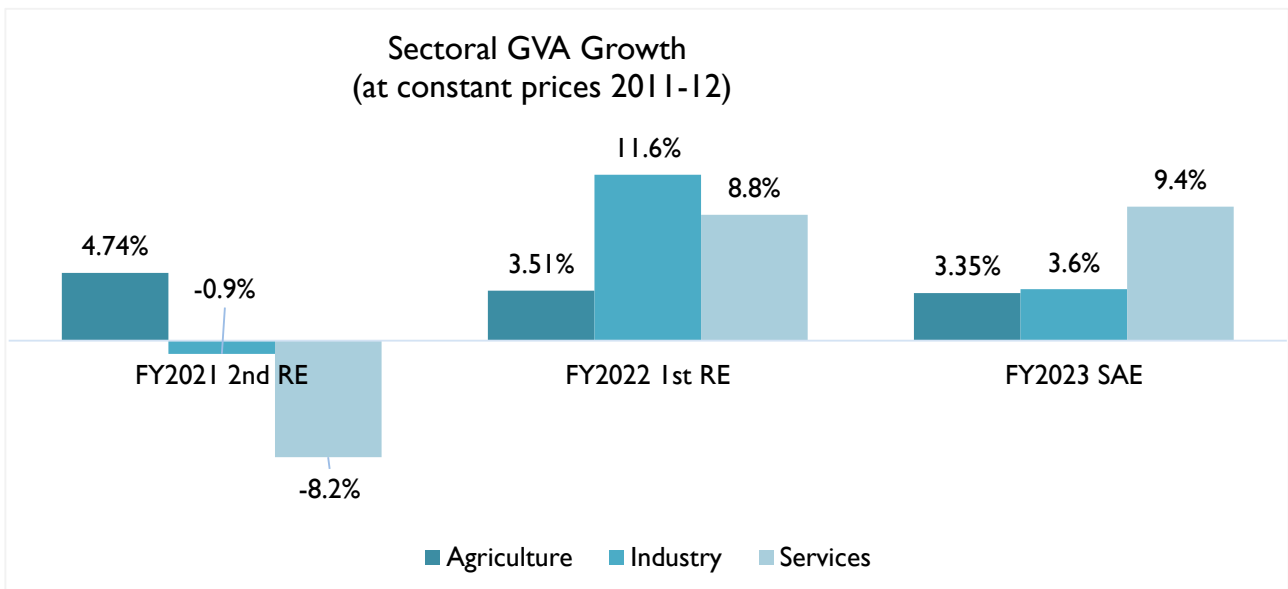




Source: Ministry of Statistics & Programme Implementation (MOSPI)

Sectoral Growth Trend: Annual

Sectoral analysis of GVA reveals growth tapered sharply in industrial sector which is estimated to have grown by just 3.6% in FY 2023 against 11.6% in FY 2022. In the industrial sector, growth across major economic activity such as mining, manufacturing, construction sector slowed registering a growth of 3.4%, 0.6% and 9.1% in FY 2023 against a growth rate of 7.1%, 11.05% and 14.8% recorded in FY 2022, respectively. Utilities sector too observed a marginal moderation in y-o-y growth to 9.2% against a decline of 3.6% in the previous years.

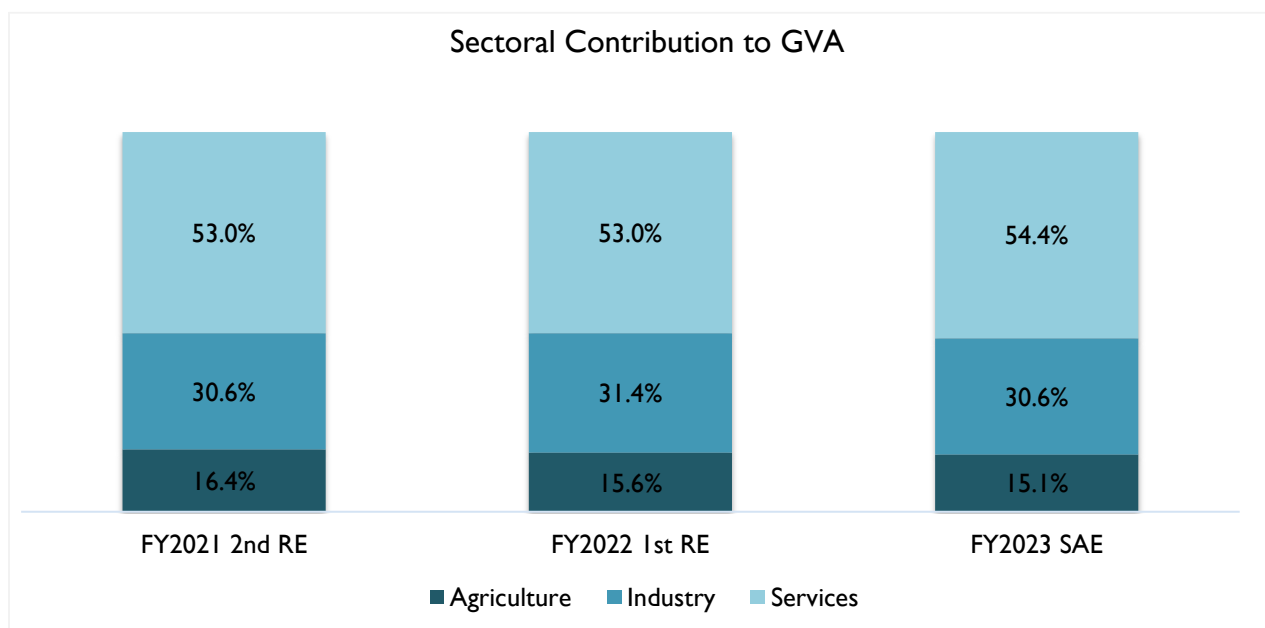


Source: Ministry of Statistics & Programme Implementation (MOSPI)

Talking about the services sectors performance, with major relaxation in covid restriction, progress on covid vaccination and living with virus attitude, business in service sector gradually returned to normalcy in FY 2022. Economic recovery was supported by the service sector as individual mobility returned to pre-pandemic level. The trade, hotel, transport, communication, and broadcasting segment continued to



strengthen and grow by 14.18% in FY 2023 against 13.75% in the previous year and financial services, real estate and professional services sector recorded 6.85% y-o-y growth against 4.73%. However, overall service sector growth was curbed by moderation in public administration and defence services sector which recorded 7.12% yearly increase against 9.7% increase in the previous year.



Source: Ministry of Statistics & Programme Implementation (MOSPI)

Sectoral Growth Trend: Quarterly

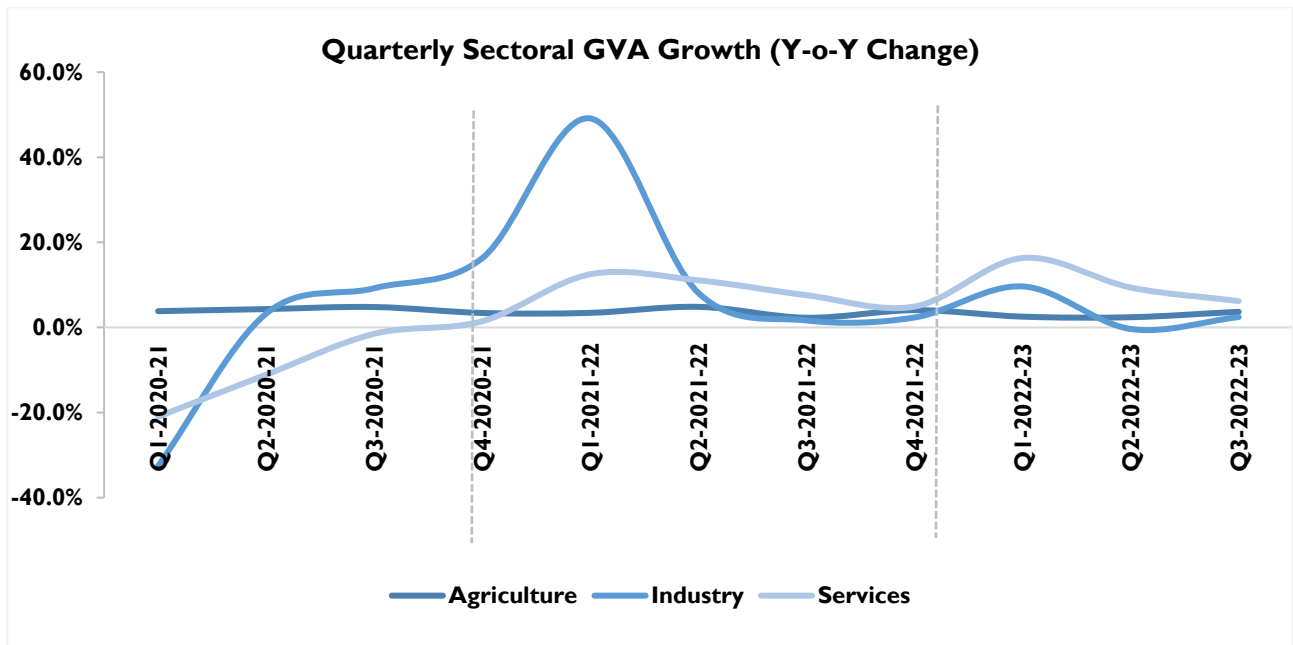
Quarterly GVA number indicated sustained weakness in economic activity during Q3 FY 2023 with manufacturing activity being the worst hit segment amongst the industrial sectors. India's manufacturing sector shrank by 1.1% on-year in Q3 FY 2023, a second straight contraction highlighting the continuing weakness in consumer demand and exports. In Q2 FY 2023, manufacturing sector output was down by 3.57%. While quarterly growth in both agriculture and other sectors within industrial sector strengthened during Q3 FY 2023.

Agriculture sector GVA strengthen in Q3 FY 2023 to register 3.68% yearly growth compared to both corresponding quarter last year (2.28%) and previous quarter (2.4%) in FY 2022. Any growth between 3.5-4% in farm sector is considered above the long-term trend line. Construction sector witnessed 8.39% y-o-y growth in Q3 of FY 2023 against 5.85% y-o-y growth in the previous quarter, mining and quarrying sector, and Electricity, gas, water supply & other utility services sector registered 3.7% and 8.24% y-o-y growth against -0.4% and 5.96%, respectively.

In Q3 FY 2023, yearly growth stood as 0.23%, 5.42% and 5.99% in construction, mining and quarrying and Electricity, gas, water supply & other utility services sector, respectively. Within service sector, quarterly growth moderated across all segments in Q3 FY 2023 against the previous quarter. Trade, hotel, transport, communication, and broadcasting segment observed 9.56% y-o-y growth in Q3 as compared to 15.64% growth in the last quarter. Other services sector broadly classified under Public Admin, Defence & Other



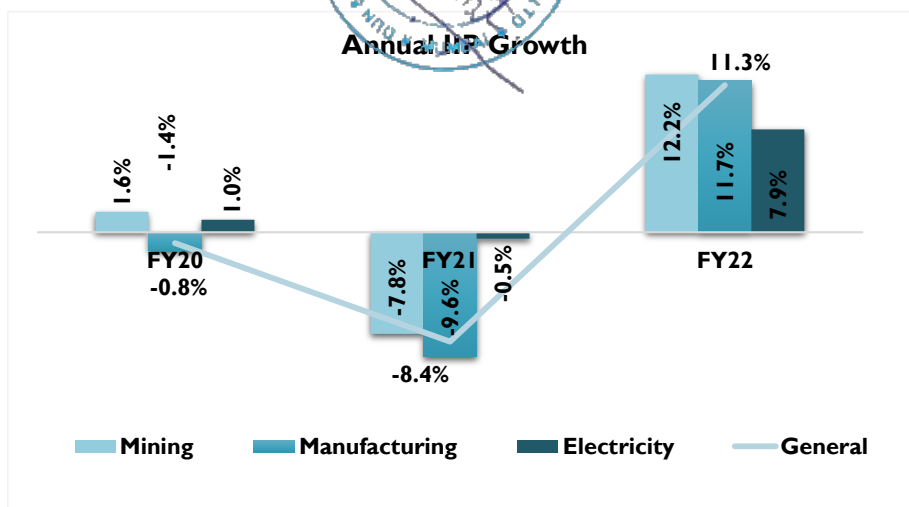
Services and Financial, Real Estate & Professional Services too observed 1.99% and 5.79% growth in Q3 FY 2023 against 5.57% and 7.13% y-o-y change in Q2 FY 2023.



Source: Ministry of Statistics & Programme Implementation (MOSPI)

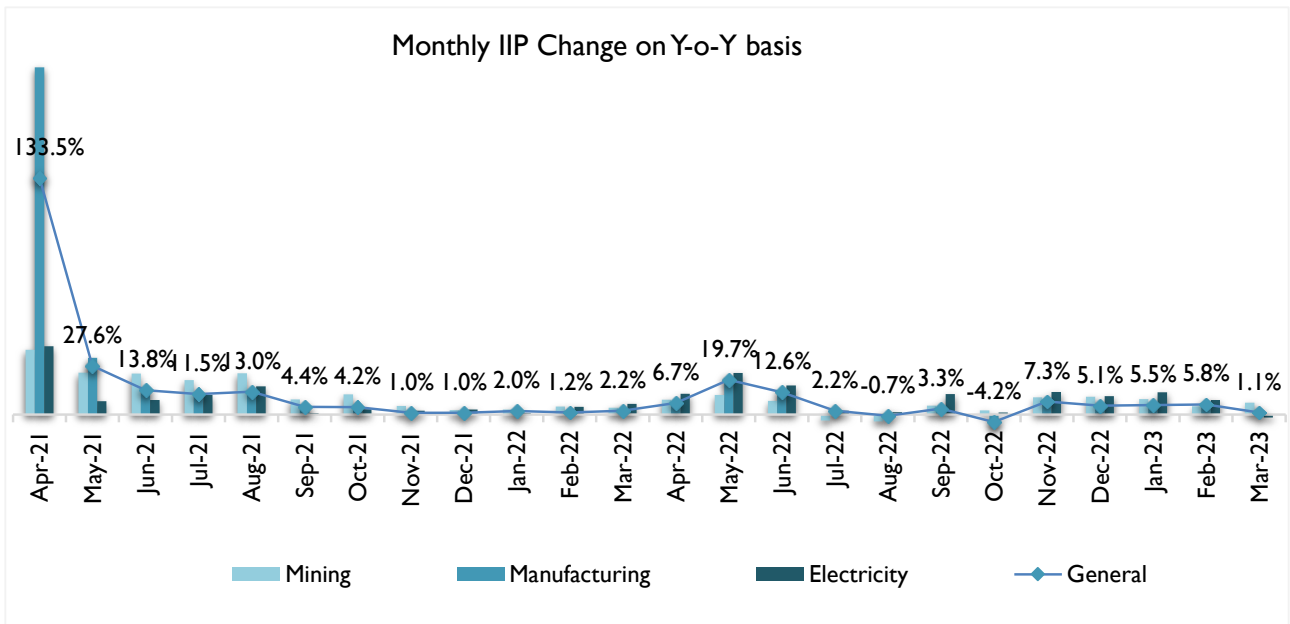
Index of Industrial Production

After experiencing three years of deteriorating industry growth, the country's Index of Industrial Production (IIP) index registered 11.3% y-o-y growth where growth was evenly spread across all sub-segments. Manufacturing index, with 77.6% weightage in overall index, registered 11.7% y-o-y growth in FY 2022 while mining sector index registered the highest growth. Classified based on usage i.e., infrastructure/construction goods, capital good, intermediate good and consumer durable outperformed over the other sector and registered healthy double-digit growth.



Source: Ministry of Statistics & Programme Implementation (MOSPI)

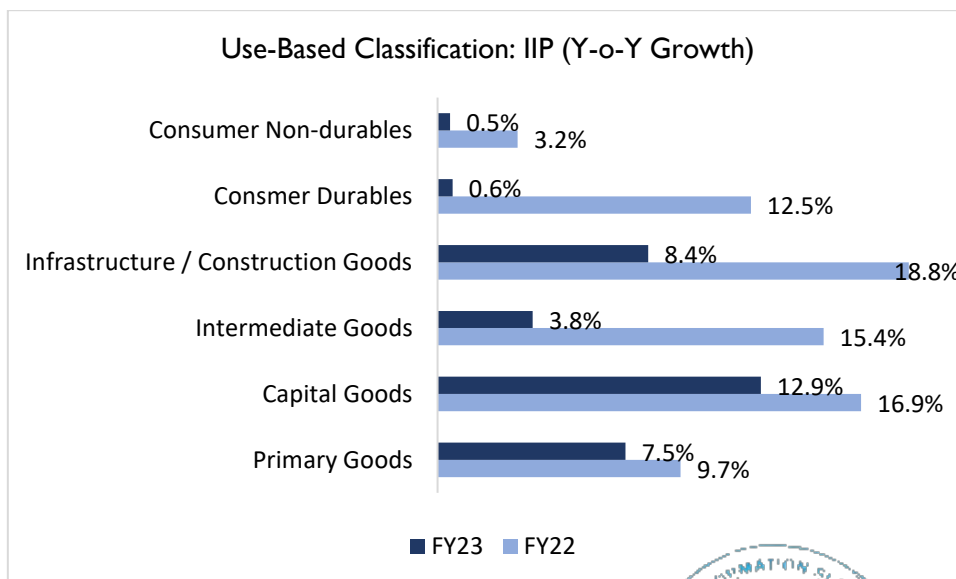




Source: Ministry of Statistics & Programme Implementation (MOSPI)

In FY22, IIP index improved steadily between March to May but moderated sharply in the subsequent three months and it measured lowest in October 2022 while it showed temporary improvement by growing at 7.3% in subsequent. However, IIP again moderated to register 5.1 % y-o-y growth in December 2022. Manufacturing activity which has 77.6% weightage in the overall index, grew by 2.6% in December 2022 while mining activity and electricity index grew by 9.8% and 10.4%, respectively.

On y-o-y basis, monthly IIP growth in December 2022 was relatively higher compared to previous year due to low base effect where overall IIP was adversely affected by onset of third wave of pandemic. Low base effect and year end festive sale are likely to support IIP growth in the coming month. However, moderation in external demand and consequent decline in trade have potential to affect manufacturing sector output and putting downward pressure on overall IIP growth.



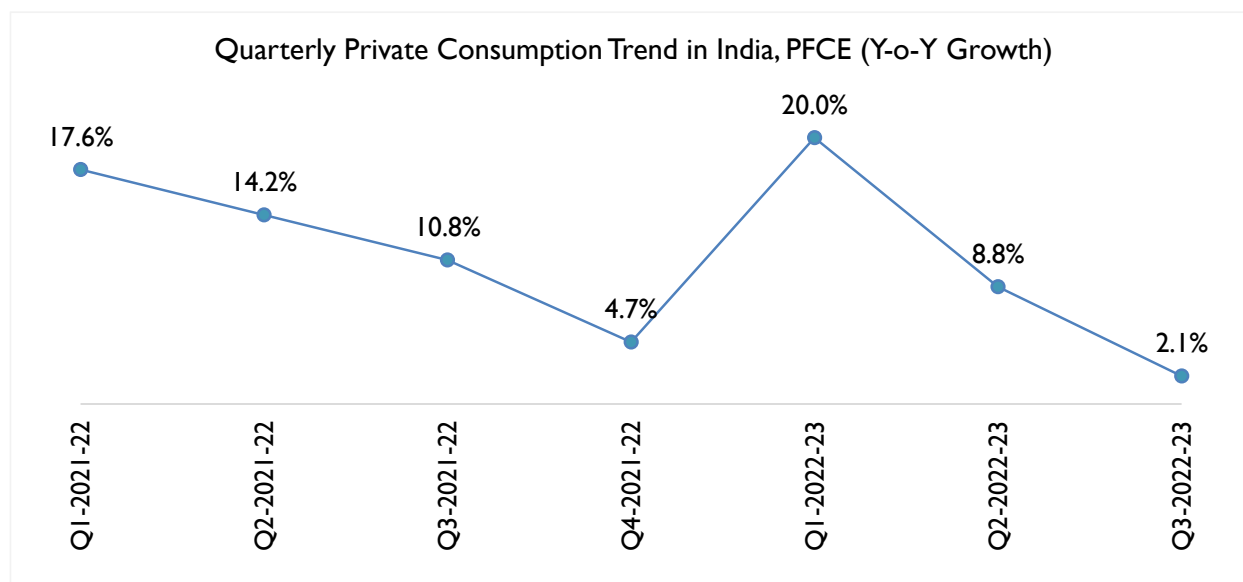
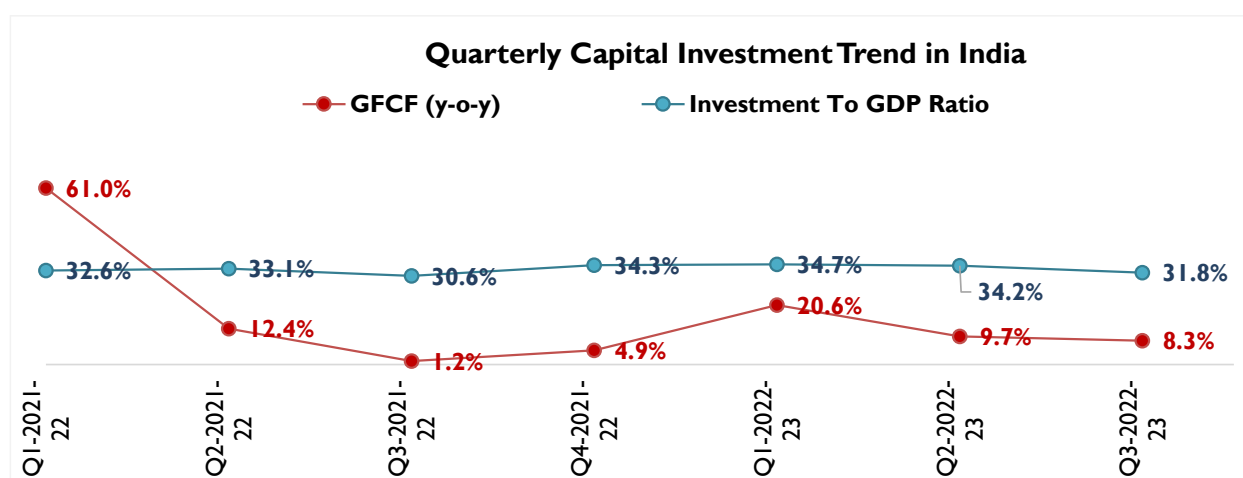
Sources: MOSPI



As per the use-based classification, growth in all segments deteriorated for FY 2023 as compared to FY 2022. Consumer good and intermediate goods were worst hit segments followed by infrastructure / construction Goods. The contracting IIP data points towards adverse operating business climate as global headwinds, high inflation, and monetary tightening started having adverse impact on manufacturing activity in FY 2023.

Investment & Consumption Scenario

Other major indicators such as Gross fixed capital formation (GFCF), a measure of investments, moderated during Q2 FY 2023 and Q3 FY 2023 while 8% y-o-y growth number was encouraging against 1.2% yearly growth in Q3 FY 2022. Despite the festive season demand and largely a covid-free economy, Private Final Consumption Expenditure (PFCE) a realistic proxy to gauge household spending, observed a continued moderation in Q3 FY 2023 where yearly growth softened to 2.1% which was nearly 7% lower compared to Q2 FY 2023.

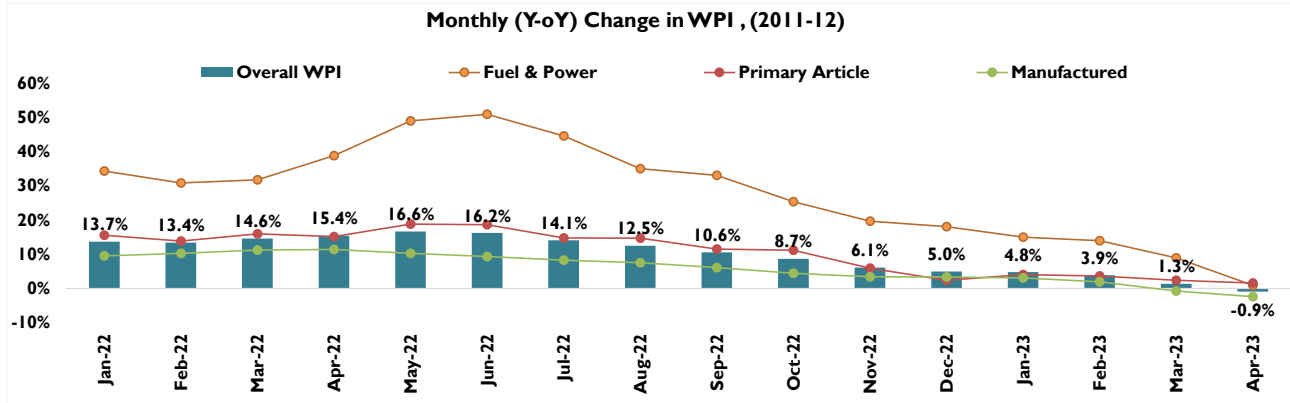


Sources: MOSPI

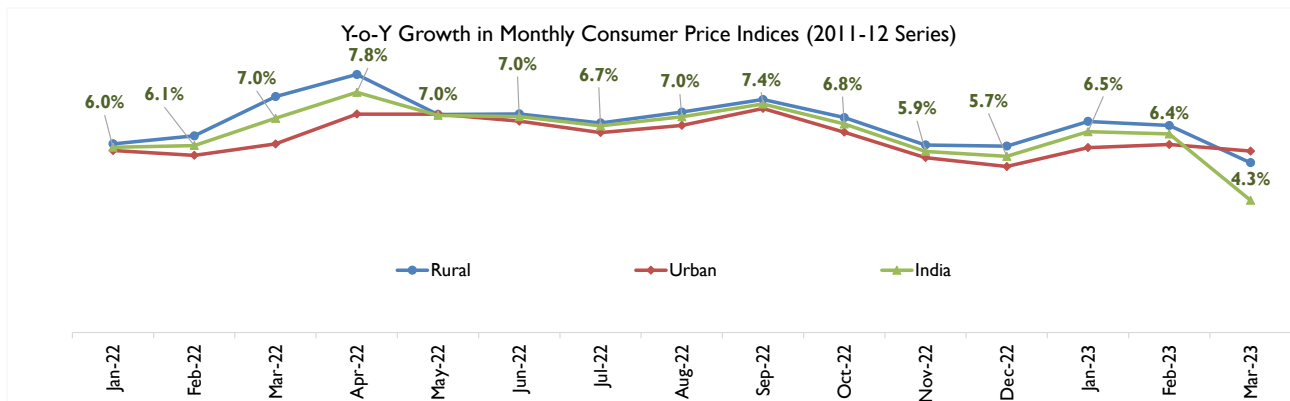


Inflation Scenario

Wholesale Price Index (WPI) is moderating on the back of softening of prices. Compared to April 22, WPI in April 2023 dropped by -0.9%. This is primary on the back of softening of fuel & power prices. Monthly y-o-y change (April 2023 v/s April 2022) for manufactured products was -2.9%, and this too contributed to the moderation in WPI. Softening prices of mineral oils, chemicals & chemical products, textiles, crude petroleum & natural gas, textiles, and food products. contributed towards moderation in WPI inflation.



Source: MOSPI, Office of Economic Advisor



Source: CMIE Economic Outlook

Retail inflation rate (as measured by Consumer Price Index) again jumped above 6% tolerance limit of the central bank in January 2023 after observing mild moderation in the previous two month. The overall CPI grew by 6.5% in January 2023 due to spike in food inflation and CPI food index grew by 5.9% during FY 2023 against 4.2% y-o-y growth in the previous year. Within food index, Cereals and product-led food inflation reached 16.1 per cent in January 2023 from 13.8 per cent in December 2022. As a part of anti-inflationary measure, the RBI has hiked the repo rate by 225 bps since May 2022 to current 6.5% (May 2023), with latest fourth round hike announced on 8 Feb 2023. The Reserve Bank of India has estimated an average inflation rate of 6.5% for FY 2023. Since then, retail inflation appears to be softening, as it grew by 6.4% and 4.3% respectively in February and March of 2023.



Growth Outlook

Amidst the difficult and uncertain external economic environment, the Indian government has delivered a balanced Union Budget which focuses on achieving an inclusive and sustainable growth while adhering to the fiscal glide path. Notwithstanding the external risk, there is a sustained momentum in economic activity supported by domestic drivers. The consumer confidence survey by the Reserve bank of India points towards rising confidence of households both for the current situation as well as the future expectations (for a one-year period).

Rural demand is likely to be boosted by good prospects for agricultural output and discretionary spending is expected to support urban consumption supporting. Resilient domestic financial markets, sturdy growth in credit and the government's thrust on capital expenditure is expected to drive momentum in investment activity. Capacity utilization in the manufacturing sector has surpassed its long period average. Thus, the stance taken by the government to not only emphasize on the top-down approach to growth i.e focusing on substantial capital outlay, but also to place focus on the bottom of the pyramid by trying to unleash the potential of the primary sector in the Union Budget should support India's growth momentum in 2023.

Some of the key factors that would propel India's economic growth in the coming years

Government focus on infrastructure development

Infrastructure development has remained recurring theme in India's economic development. As India aims to grow to a USD 5 trillion economy by 2027, Construction sector that include Infrastructure construction will be critical for boosting economic growth as it is the key growth enabler for several other sector. Infrastructure development provides impetus to other sectors like cement, bitumen, iron and steel, chemicals, bricks, paints, tiles, financial services among others. A unit increase in expenditure in construction sector has a multiplier effect on other sectors with a capacity to generate income as high as five times in other sectors. The sector enjoys intense focus from the Government which is well reflection in higher budgetary allocations. To push the infrastructure development, government has also announced higher budgetary allocation, various arrangement for raising funds through road asset monetization plan and converting of NHAI's existing InvIT into a public one is also planned. With economic targeting to reach USD 5 trillion economy by 2027, demand for various infrastructure facilities such as power, cargo movement, passenger movement is likely to grow which necessitate steady capacity addition in infrastructure facilities. Speedy progress and time-bound completion of infrastructure project would key factor to watch that will determine the sector performance.

The launch of flagship policies like National Infrastructure Pipeline (NIP), and PM Gati Shakti plan have provided the coordination & collaboration that was lacking earlier. Both NIP and PM Gati Shakti are ambitious billion-dollar plans that aim to transform India's infrastructure, elevating it to the next level. These projects are expected to improve freight movement, debottleneck the logistics sector, and improve the industrial production landscape, which would provide the incremental growth in GDP. In its Union Budget FY 2023,



the Government has increased the capital expenditure by 35% to nearly INR 7.5 lakh crore – which indicates the strong Government focus on improving the overall infrastructure landscape in India.

Development of Domestic Manufacturing Capability

The Government launched Production Linked Incentive (PLI) scheme in early 2020, initially aimed at improving domestic manufacturing capability in large scale electronic manufacturing and gradually extended to other sectors. At present it covers 14 sectors, ranging from medical devices to solar PV modules. The PLI scheme provides incentives to companies on incremental sales of products manufactured in India. This incentive structure is aimed to attracting private investment into setting up manufacturing units and thereby beef up the domestic production capabilities. The overall incentives earmarked for PLI scheme is estimated to be INR 2 lakh crore. If fully realizing the PLI scheme would have the ability to add nearly 4% to annual GDP growth, by way of incremental revenue generated from the newly formed manufacturing units.

Strong Domestic Demand

Domestic demand has traditionally been one of the strong drivers of Indian economy. After a brief lull caused by Covid-19 pandemic, the domestic demand is recovering. Consumer confidence surveys by Reserve Bank / other institutions are points to an improvement in consumer confidence index, which is a precursor of improving demand. India has a strong middle-class segment which has been the major driver of domestic demand. Factors like fast paced urbanization and improving income scenario in rural markets are expected to accelerate domestic demand further. This revival is perfectly captured by the private final consumption expenditure (PFCE) metric. PFCE as a percentage of GDP increased to nearly 59.2 during the first half of FY 2023¹, which is the highest level it has achieved during the past few years. Although pent-up demand has played a part in this surge, this is an indication of normalization of demand.

There are two factors that are driving this domestic demand: One the large pool of consumers and second the improvement in purchasing power.

- The share of middle class increased from nearly 14% in 2005 to nearly 30% in 2021 and is expected to cross 60% by 2047 (Placeholder1)². This expanding middle class household segment is fuelling India's growth story and would continue to play a key role in propelling India's economic growth.
- As per National Statistics Office (NSO) India's per capita income (in current prices) stood at INR 1.72 lakhs in FY 2023 which is nearly double of what it was in FY 2015. This increase in per capita income has impacted the purchasing pattern as well as disposable spending pattern in the country. Consumer driven domestic demand is majorly fuelled by this growth in per capita income.

Digitization Reforms

¹ India Economic Survey FY 2023, Full year data is yet to be released.

² As per the survey conducted by People Research on India's Consumer Economy. Households with annual income in the range of INR 5 – 30 lakh is considered as middle class households.



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

Role of Government in Road Development in India

Agencies Involved

The central government, through the Ministry of Road Transport and Highways (MoRTH), serves as the overarching authority for road development in India. It plays a pivotal role in policy formulation, setting the national vision and strategic direction for road infrastructure. The central government allocates funds for the construction and maintenance of national highways and expressways, often tapping into resources like the Central Road and Infrastructure Fund. Regulatory oversight is another crucial responsibility, ensuring that projects adhere to safety and quality standards. Moreover, the central government actively encourages public-private partnerships to attract private investments into road development, thereby diversifying funding sources and accelerating project implementation.

State governments have a critical role in the development of road networks within their respective regions. They are primarily responsible for the construction and maintenance of state highways, district roads, and rural roads. State governments allocate funds from their budgets for these projects, decide on project priorities, and manage land acquisition processes. Effective coordination with local authorities, executing agencies, and the central government is vital for the seamless execution of road projects within their jurisdiction. Additionally, state governments often engage in rural and urban road development to improve connectivity and promote regional economic development.

Quasi-government agencies, like National Highways and Infrastructure Development Corporation, National Highways Authority of India, play a specialized role in road development. NHAI focuses on the development, maintenance, and management of national highways, executing numerous projects under the central government's flagship schemes. State Public Works Departments (PWDs) function as quasi-government agencies, overseeing the construction and maintenance of various road categories within their respective



states. In urban areas, development authorities take charge of planning and constructing road networks to ensure smooth urban mobility. These agencies contribute specialized expertise and resources to enhance the road infrastructure in India, aligning with the broader government vision for connectivity and economic growth.

National Highway and Infrastructure Development Corporation Limited (NHIDCL): NHIDCL is an entity fully owned by the Ministry of Road Transport & Highways (Government of India). The Company is tasked with survey, design, build, operate, maintain & upgradation of national highways and strategic roads³.

Capital Allocation

Currently, roads are financed through a combination of government and private sources. Government funding primarily relies on budgetary allocations, which are financed through taxes, cesses, or dedicated road funds. Among these, the Central Road and Infrastructure Fund (CRIF) stands out as a non-lapsable fund. It is fueled by the road and infrastructure cess imposed on the manufacture and import of petroleum products. The accumulated funds from CRIF are released to entities like the National Highways Authority of India and various state and union territory governments for infrastructure development.

Another source of government funding comes from the Permanent Bridge Fee Fund (PBFF), which draws its financial sustenance from fees levied on the use of specific bridges on national highways, national highway tolls, and revenue shares received from some public-private partnership projects. These funds, too, are allocated to NHAI, enabling the upkeep and expansion of the national highway network. The National Investment Fund (NIF) is yet another critical contributor to road development. This fund receives proceeds from disinvestments and channels them into funding special road development projects, especially in the north-eastern regions of India.

Monetization of national highway projects also plays a significant role in financing road infrastructure. This approach involves transferring the maintenance responsibilities of specific public-funded national highway stretches to private contractors under long-term arrangements. This mechanism generates funds that are subsequently allocated to the enhancement of the nation's highways.

Publicly funded projects typically follow various contract models such as the Engineering Procurement Construction (EPC) or Item Rate contract. These models facilitate the efficient execution of projects, with the Ministry of Road Transport and Highways overseeing the financial management of these ventures through diverse funds, each tailored to serve specific road-related purposes.

Role of NHAI in National Highway Development in India

The National Highways Authority of India (NHAI) is a quasi-government agency responsible for overseeing the development, maintenance, and management of the national highway network in India. Established in 1988 and operating autonomously under the Ministry of Road Transport and Highways, it plays a pivotal role in

³ As per NHIDCL website



the country's infrastructure development by focusing on the construction and expansion of highways, expressways, and important road corridors.

NHAI serves as an advisor to the Central government on National Highway-related matters and formulates and executes schemes for the improvement of National Highways. It's primary role is to plan, design, and execute national highway projects across the country. This includes the development of greenfield highways, widening existing ones, and ensuring their proper maintenance.

NHAI has played a key role in development of National Highway infrastructure by actively undertaking the National Highways Development Project (NHDP). NHDP is India's largest-ever highway initiative, involving the development, maintenance, and management of National Highways. NHAI's mandate extends to the implementation of the NHDP in a phased manner, aligning with the government's commitment to strengthening the national highway network. The agency is entrusted with multiple functions, including collecting tolls and regulating vehicular movement on National Highways, providing consultancy and construction services nationally and internationally, and conducting research to enhance highway development, maintenance, and management.

One of NHAI's notable contributions to highway infrastructure development is its implementation of the Electronic Toll Collection (ETC) system, which has streamlined toll collection processes on highways, reducing travel time and fuel consumption for commuters. The development and operation of FASTag by NPCI and NHAI respectively enables cashless payments and reduces traffic congestion at toll plazas. This system has not only improved the revenue collection process but also enhanced the overall highway user experience.

Furthermore, NHAI plays a crucial role in attracting private investments through Public-Private Partnerships mode. This approach leverages private sector expertise and funding to expedite the construction and expansion of highways. National Highways Authority of India stands as a crucial institution, contributing heavily to develop and maintain highways. It ensures seamless movement of goods and people, enhancing transportation efficiency, supporting economic development, and improving the overall road network in India.



Flagship Programs

Bharatmala Pariyojana

The Bharatmala Pariyojana is a comprehensive program aimed at improving the efficiency of freight and passenger movement across India's highways. The primary objective of the Bharatmala Pariyojana project is to optimize the efficiency of freight and passenger movement across India by addressing critical infrastructure gaps and improving the road network.

The Government of India launched “**Bharatmala Pariyojana**” in **2015**, a new umbrella program to develop highways sector. The highway construction planned to be implemented in Bharatmala Pariyojana is 83,677 km. The scheme aims towards optimizing the efficiency of freight and passenger movement across the country by bridging critical infrastructure gaps through effective interventions. The key objectives of Bharatmala Pariyojana include

- Interconnect 550 districts with highways containing a minimum of 4 lanes.
- Construct 50 corridors across the country curtailing traffic and cluster.
- Interconnect 24 logistics parks.
- Enhance freight transport via national highways to 70%-80%.

The project focuses on developing economic corridors that can efficiently carry a significant portion of the country's freight traffic. These corridors are designed to facilitate the movement of goods and people, thereby boosting trade and commerce. Additionally, to reduce congestion in urban areas, the project includes the development of ring roads, bypasses, and elevated corridors.

The project also includes roads that connect coastal areas and important ports, ensuring efficient movement of goods to and from these maritime hubs. Special attention is given to the development of greenfield expressways, which are modern, high-speed roadways designed to efficiently handle traffic and freight.

In addition to new infrastructure, Bharatmala also focuses on improving the efficiency of existing national corridors, ensuring that they meet modern standards. By enhancing the road network and reducing congestion, the project aims to reduce the overall logistics costs associated with the transportation of goods. Thus, this improved infrastructure is expected to stimulate economic growth by facilitating trade, reducing transportation time and costs, and promoting investment in various sectors.

Bharatmala Phase I

Bharatmala Phase-I consists of Economic Corridors which will span approximately a total of 26,200 kilometers, with 9,000 kilometers being developed in Phase I at a cost of INR 120,000 crore. Inter Corridors and Feeder Routes will cover 8,400 kilometers and 7,600 kilometers respectively. These routes are intended to enhance the effectiveness of economic corridors, Golden Quadrilateral, and North-South and East-West corridors. In Phase-I, 6,000 kilometers of feeder routes will be constructed with an outlay of INR 80,000 crore



National Corridor Efficiency Improvement focuses on 5,000 kilometers with an outlay of INR 1,00,000 crore. Border and International Connectivity Roads totalling 2,000 kilometers, will connect border regions and remote areas, bring the cost to Rs. 25,000. Coastal and Port Connectivity Roads spanning 2,000 kilometers will connect areas along shorelines and important ports, facilitating transportation. This will come at at cost of Rs. 20,0000. Green Field Expressways of length 800 kilometers of such are planned with an outlay of INR 40,000 crore. Lastly, Balance NHDP Works which involves the construction and maintenance of approximately 10,000 kilometers of new roads at a cost of INR 1,50,000 crores.

The development of 74,942 kilometers of national highways under Bharatmala Pariyojana was approved in October 2017. Phase I includes 34,800 kilometers at an estimated cost of INR 535,000 crore, which was to be implemented from 2017-18 to 2021-22. However, as of March 2023, of the total 34,800 kilometers, 26,316 kilometers have been awarded and 13,499 kilometers completed. With cost overruns and changes in project scope and specifications, the project is now expected to be completed by 2027, five years later than initially planned.

Scheme	Length (km)	Cost (Rs. crore)
Economic Corridors	9,000	1,20,000
Inter-Corridors & feeder roads	6,000	80,000
National Corridor Efficiency improvement	5,000	1,00,000
Border & International connectivity roads	2,000	25,000
Coastal & port connectivity roads	2,000	20,000
Expressways	800	40,000
Sub Total	24,800	3,85,000
Ongoing Projects, including NHDP*	10,000	1,50,000
Total	34,800	5,35,000

National Highway Development Project

The National Highways Development Programme (NHDP) was initiated in 1998 with the primary objective of upgrading and developing India's national highways to international standards. This program aimed to create road infrastructure with improved safety features, better riding surfaces, grade separators, and other essential elements.

NHDP was structured into seven phases, each with specific targets:

- Phase I: This phase focused on the construction of the Golden Quadrilateral network, spanning 5,846 kilometers, connecting major cities like Delhi, Chennai, Mumbai, and Kolkata. It also included 981 kilometers of the North-South and East-West corridor, which connected Srinagar in the north to Kanyakumari in the south and Silchar in the east to Porbandar in the west. Phase I also aimed at improving connectivity to ports.



- Phase II: Phase II extended the North-South and East-West corridor by covering 6,161 kilometers of it (out of a total of 7,142 kilometers) and included an additional 486 kilometers of other national highways.
- Phase III: This phase focused on four-laning 12,109 kilometers of high-density national highways that connected state capitals and places of economic, commercial, and tourist importance.
- Phase IV: Phase IV aimed at upgrading 20,000 kilometers of single-lane roads to two-lane standards with paved shoulders.
- Phase V: In this phase, 6,500 kilometers of four-laned highways were targeted for six-laning to further improve traffic flow and capacity.
- Phase VI: Phase VI involved the construction of 1,000 kilometers of expressways that connected major commercial and industrial townships, promoting faster and more efficient transportation.
- Phase VII: The final phase, Phase VII, focused on constructing essential infrastructure like ring roads, by-passes, underpasses, flyovers, etc., comprising 700 kilometers of road network.

The unfinished projects under NHDP were later integrated into the Bharatmala Pariyojana, a broader initiative aimed at further enhancing India's road infrastructure and connectivity.

National Infrastructure Pipeline

The National Infrastructure Pipeline of India is a monumental initiative to reshape India's infrastructure landscape. Covering a multitude of sectors, from energy and transportation to urban development and beyond, the NIP is driven by the primary goal of fostering economic growth, creating employment opportunities, enhancing citizens' quality of life, and ensuring equitable access to essential infrastructure.

Since its inception, the NIP has undergone significant expansion. Initially comprising 6,835 projects, it has now grown to encompass over 9,000 projects spanning 57 sub-sectors. These projects are jointly funded by the Central Government, State Governments, and the private sector, emphasizing collaboration as a key driver of success.

As per the Economic Survey 2023, projects worth INR 108 trillion are currently at various stages of implementation under the National Infrastructure Pipeline. Of these projects, 8,964 are in different phases of execution. A significant portion belongs to the transportation sector, highlighting the program's focus on bolstering India's infrastructure backbone. Additionally, projects span various domains, including communication, energy, logistics, social infrastructure, transport, water and sanitation, and commercial infrastructure, reflecting the comprehensive nature of the NIP. Between the fiscal years 2020 and 2025, approximately 71% of the anticipated infrastructure investments in India are allocated to sectors like energy (24%), roads (18%), urban development (17%), and railways (12%).

Other Major Programs

Connectivity in the Left-Wing Extremism Area



Connectivity in the Left-Wing Extremism (LWE) affected areas of India has been a key focus for the government, recognizing its importance for development and security. To address this vital aspect, several schemes and projects have been undertaken to improve road infrastructure in these regions.

Initially, this initiative approved by the government termed a 'Special Project' aimed at the development of approximately 1,177 kilometers of National Highways (NHs) and 4,276 kilometers of State Roads in LWE-affected areas. The estimated cost for this endeavour stands at around INR 7,300 Crore.

As of December 2022, the efforts to enhance connectivity in LWE-affected areas have yielded impressive results. Under two specific schemes, more than 11,600 kilometers of roads have been constructed to facilitate better access and mobility for the local populace.

The Road Requirement Plan-I (RRP-I) in LWE Affected Areas, implemented through the Ministry of Road Transport and Highways, has played a pivotal role in this endeavour. With 5,361 kilometers of roads sanctioned at an estimated cost of INR 8,585 crores, this scheme has significantly contributed to road network expansion. Notably, 5,065 kilometers of these roads have been successfully constructed, improving accessibility and connectivity in these challenging regions.

Another crucial initiative, the Road Connectivity Project for LWE Affected Areas (RCPLWEA), executed through the Ministry of Rural Development, has made substantial strides. An impressive 12,100 kilometers of roads have been sanctioned under this scheme, with an estimated cost of INR 12,021 crore. Of this extensive network, 6,561 kilometers of roads have already been completed, further enhancing connectivity, and promoting development in LWE-affected regions.

Char Dham Pariyojna

The Ministry has launched the Char Dham Pariyojana, a program aimed at improving connectivity to the sacred Char-Dham pilgrimage sites in Uttarakhand, including Kedarnath, Badrinath, Gangotri, and Yamunotri. The primary objective is to make journeys to these sites safer, faster, and more convenient by widening 889 kilometers of highways connecting them. Additionally, the project includes enhancing the Tanakpur-Pithoragarh segment of National Highway 125, an essential part of the Kailash Mansarovar Yatra route.

This project serves dual purposes. Besides facilitating pilgrimages, it plays a strategic role in national security. These improved roads connect the India-China border to key Army camps in Dehradun and Meerut, housing missile bases and heavy machinery, bolstering national defence.

By December 2022, the Centre had completed the expansion of 578.6 kilometers of roads, marking significant progress in achieving the project's objectives and enhancing connectivity in this crucial region.

Special Accelerated Road Development Programme for the North Eastern States

The Ministry of Road Transport and Highways launched the Special Accelerated Road Development Programme for the North Eastern States (SARDP-NE). This program is designed to enhance the road

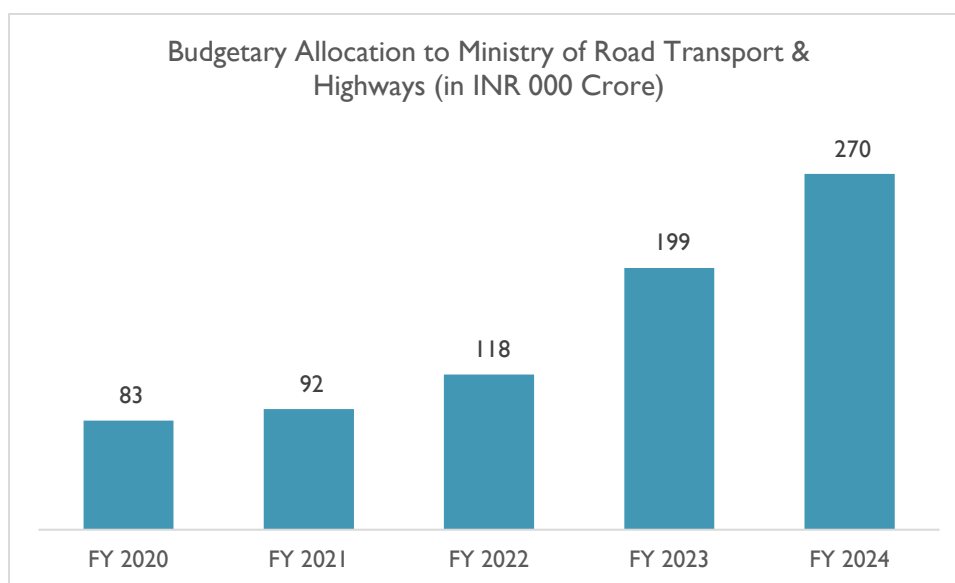


network in the north eastern states of India significantly. Its primary objective is to establish road connectivity to all district headquarters in the north eastern region, with a minimum standard of a 2-lane highway. Additionally, it aims to provide road connectivity to underdeveloped and remote areas, regions of strategic importance, and neighbouring countries.

The SARDP-NE is structured in two phases, labelled as Phase A and Phase B, which includes the Arunachal Package. In total, these phases encompass approximately 10,141 kilometers of road development. Phase A of the SARDP-NE, along with the Arunachal Package, covers 6,418 kilometers, with an estimated cost of INR 33,688 crore.

Budgetary Allocation for Road Projects

The budgetary allocation to the Ministry of Road Transport and Highways (MoRTH) by the Government of India has exhibited a significant and consistent upward trend in recent years, reflecting the government's commitment to infrastructure development and the expansion of road networks. In its latest budget (Union Budget FY 2024), the Government have allocated approximately INR 270,000 crore to MoRTH towards various projects. Compared to this, the annual budgetary allocation that was made during budget announcement FY 2020 was only INR 83,000 crore. The jump from INR 83,000 to INR 270,000 crore of allocation signals the aggressive commitments by the Union Government to develop the road infrastructure in the country.



Source: Union Budget Documents, Government of India



Project Implementation Modes in Road Infrastructure

Over the years, India's road infrastructure construction segment has seen the introduction of multiple project execution models – ranging from Engineering, Procurement & Construction (EPC), Hybrid Annuity Model (HAM), and Build Operate Transport (Toll) models, to name a few. The move by the Government to increase private participation and private investment have played a key role in the formulation and implementation of these multiple models.

Largely, a move to a public private partnership (PPP) model in road construction away from only Government funded model has created a supportive ecosystem for the emergence of multiple project execution models. PPPs offer access to essential expertise for the planning and execution of large-scale projects, making them a versatile tool for fostering infrastructure development and innovation. Build Operate Transport (BOT) was the preferred project execution model in PPP projects.

Engineering, Procurement & Construction (EPC) Model

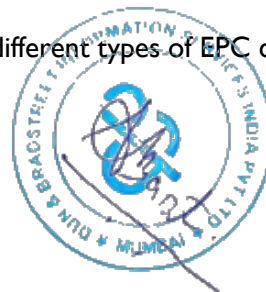
Engineering, Procurement and Construction (EPC) is a project delivery model in which a single contractor is responsible for the entire project lifecycle, from design and engineering to procurement and construction. The EPC contractor is also responsible for meeting the project's budget and schedule requirements.

Stages involved in the EPC model:

- **Project definition and planning:** This stage involves defining the project scope, budget, and schedule. The owner and the EPC contractor will also work together to develop a risk management plan.
- **Engineering:** The EPC contractor will develop the detailed engineering designs for the project. This includes designing the project's layout, selecting the appropriate materials and equipment, and developing construction plans.
- **Procurement:** The EPC contractor will procure all of the materials and equipment required for the project. This may involve bidding out contracts to subcontractors and suppliers.
- **Construction:** The EPC contractor will construct the project according to the engineering designs. This may involve managing multiple subcontractors and suppliers.
- **Commissioning and startup:** The EPC contractor will commission and start up the project, and ensure that it is operating properly. This may involve testing the project's systems and equipment, and training the owner's staff on how to operate the project.
- **Hand over:** The EPC contractor will hand over the completed project to the owner. This may involve providing the owner with all of the necessary documentation for the project.

Types of EPC Contracts:

DBC (Design-Build-Contract) and Item Rate contracts are two different types of EPC contracts.



DBC contracts are lump sum contracts in which the EPC contractor is responsible for the design, engineering, procurement, and construction of the project. The EPC contractor is also responsible for meeting the project's budget and schedule requirements.

Item Rate contracts are contracts in which the EPC contractor is paid for each item of work completed. The price for each item of work is agreed upon in advance between the owner and the EPC contractor.

DBC contracts are typically used for complex projects where the design is not yet fully developed. Item Rate contracts are typically used for projects where the design is fully developed and the scope of work is well-defined.

Advantages of DBC contracts:

- DBC contracts can help to reduce risks for the owner, as the EPC contractor is responsible for the entire project lifecycle.
- DBC contracts can also help to improve coordination between the design and construction phases of the project.
- DBC contracts can be more efficient and cost-effective than Item Rate contracts for complex projects.
- Disadvantages of DBC contracts:
- DBC contracts can be more expensive than Item Rate contracts, as the EPC contractor assumes more risk.
- DBC contracts can also be more complex to administer, as the EPC contractor is responsible for more aspects of the project.

Advantages of Item Rate contracts:

- Item Rate contracts are typically less expensive than DBC contracts.
- Item Rate contracts are also less complex to administer than DBC contracts.
- Disadvantages of Item Rate contracts:
- Item Rate contracts can be more risky for the owner, as the EPC contractor is not responsible for the design of the project.
- Item Rate contracts can also lead to disputes between the owner and the EPC contractor over the scope of work and the price of change orders.

The best type of EPC contract will depend on the specific needs of project. If there is a complex project where the design is not yet fully developed, then a DBC contract may be the best option. If a project where the design is fully developed and the scope of work is well-defined, then an Item Rate contract may be the best option. It is important to consult with a qualified professional to discuss the best type of EPC contract for the project.



Build Operate Transport (BOT) Model

BOT is a conventional PPP (public private partnership) model wherein the private partner is granted the concession to finance, build, and operate the project for a specified time (20-to-30-year concession period). The developer recoups their investment during this period by way of user charges / toll chargers. At the end of the concession period the developer hands over the project back to the public sector.

During O&M (Operation & maintenance) period, government and O&M by the concessionaire will manage toll collection. Under this model, amount financed by the concessionaire during construction period will be recovered by the government through annuity payment (biannually for 15 years) along with interest payment based (on reducing balance method @ Bank rate +x%). Thus, lender of the project will be at comfort with assured annuity payment and private sector will not have to bear traffic risk. Over the years, BOT route has witnessed several innovations, spawning several variants.

Build Operate Transfer (BOT) Model & Variants	
Build Operate Transfer (BOT)	The BOT model adheres to a classic PPP structure where the private partner takes charge of the entire project lifecycle, from design and construction to operation, before eventually returning the facility to the public sector. Crucially, the private sector partner assumes the responsibility for financing and upkeep, making it particularly suitable for greenfield projects. Furthermore, the public sector permits the private entity to charge users for the services provided, ensuring financial sustainability
Build Own Operate (BOO)	In the BOO approach, a private entity retains ownership of the newly constructed facility. The public sector, in turn, agrees to procure the goods and services delivered by the project under mutually acceptable terms and conditions. This arrangement allows the private sector to maintain ownership while facilitating public access to essential services.
Build Own Operate Transfer (BOOT)	In this variation of the BOT model, the project eventually transitions to the government or a private operator after the agreed-upon period. The BOOT concept is commonly employed in the construction of highways and ports, exemplifying its utility in facilitating private sector involvement in infrastructure development.
Build Lease Transfer (BLT)	Under the BLT model, the asset is leased to the public entity for a defined period, while ownership remains with the private company. Unlike some other models, the



	public sector assumes responsibility for financing the investment, making it a unique partnership structure.
Build Own Lease Transfer (BOLT)	In the BOLT strategy, the government grants a building concession to a private company, potentially including the design phase. The facility may initially be owned by a private business, which can subsequently lease it to the public sector. Ultimately, ownership of the facility is transferred back to the government after the lease term expires.
Design Build Finance Operate (DBFO)	The DBFO model places the private party in full control of the project, encompassing design, construction, financing, and operation throughout the concession period. This comprehensive approach streamlines accountability and can be particularly attractive to clients seeking a single point of responsibility for project delivery and operation.
Lease Develop Operate (LDO)	Primarily employed in the development of airport facilities, the LDO model retains public ownership of the newly constructed infrastructure while establishing a lease agreement with the private promoter. Payments are made to the public sector under the terms of this lease, making it a valuable tool for enhancing airport infrastructure.
Design Construct Manage Finance (DCMF)	Under the DCMF model, private sector entities construct and manage the asset for a predetermined period, which can span from 20 to 50 years. The government compensates the contractor for the asset's use during this time, potentially diverting public spending from significant infrastructure projects to fund other public initiatives. This model finds application in various sectors, including jails, courts, and public hospitals.

Hybrid Annuity Model (HAM)

To boost and attract investment in road infrastructure project, government introduced new Hybrid Annuity Model (HAM) which is a mix of Engineering, Procurement and Construction (EPC) and Build-Operate-Transfer (BOT) formats, with the government and private companies sharing the total project cost in the ratio of 40:60 respectively.

Under HAM, the concessionaire is responsible for design, building, finance (60% of the project cost) and then transfer the project at end of operation period (15years). During O&M (Operation & maintenance) period, government and O&M by the concessionaire will manage toll collection. Under this model, amount financed by the concessionaire during construction period will be recovered by the government through annuity



payment (biannually for 15 years) along with interest payment based (on reducing balance method @ Bank rate +x%). Thus, lender of the project will be at comfort with assured annuity payment and private sector will not have to bear traffic risk. It will also reduce the initial capital outflow of the authority as against the investment made under EPC model.

Toll Operate Transfer (TOT) Model

The Toll-Operate-Transfer (TOT) model represents an innovative approach to capitalize on operational national highway projects. Investors participating in TOT offer a lump sum payment in exchange for the long-term rights to collect tolls, backed by a robust tolling system. In this framework, the highest bidder secures the privilege to operate and maintain existing road assets for a 20 to 30-year period, with the corresponding entitlement to toll revenues until that point.

One of TOT's primary advantages lies in its appeal to investors, as it obviates the need to initiate infrastructure projects from the ground up. This model effectively addresses the risk-sharing deficiencies often found in traditional Build-Operate-Transfer (BOT) agreements. Moreover, it serves as a consistent source of fresh funds for further investment in critical infrastructure.

The Indian government has embraced the TOT model as a means to bolster economic growth, envisioning the monetization of substantial infrastructure assets across sectors in the coming years through its Asset Monetization Programme. Specifically, under the asset monetization, the government aims to generate ₹85,000 crore by 2024-25. The monetization strategy for highways revolves around the TOT model, facilitating the infusion of private investment into the nation's infrastructure.

Structure of the Model

The government has granted approval for the National Highways Authority of India to undertake this initiative for public-funded NH projects that have been operational and generating toll revenues for a minimum of two years after the Completion of Development. The authorization process is subject to the approval of the Competent Authority within the Ministry of Road Transport and Highways and NHAI, with individual cases being evaluated on a case-by-case basis.

Under the TOT Model, the right to collect and appropriate fees for selected operational National Highway projects, financed through public funding, is transferred to concessionaires, which can include developers and investors. In exchange for this right, these concessionaires make an upfront lump-sum payment to NHAI. The selection of projects for such rights assignment is based on their toll revenue potential. The concessionaires are responsible for the Operation & Maintenance obligations of these projects throughout the predetermined concession period.

To ensure transparency and uniformity in the selection of concessionaires, a transparent and standardized procurement process is adhered to, guided by a pre-defined and approved implementation framework. This approach not only facilitates the monetization of public-funded NH projects but also guarantees efficient



management and maintenance of these assets, all while injecting private sector investment to support further infrastructure development in the nation.

Monetization Route & Status

The Ministry of Road Transport and Highways and the National Highway Authority of India have adopted various monetization avenues to enhance infrastructure development, with a focus on highways and associated assets. Currently, these monetization modes encompass three distinct approaches: the Toll-Operate-Transfer (TOT) model, Infrastructure Investment Trust (InvIT), and project-based financing, ensuring opportunities for all types of investors.

In FY 2024, MoRTH aims to mobilize substantial funds INR 15,000 crore is slated to be raised through project-based financing, which involves securitizing future toll revenues from high-speed corridors. Additionally, around INR 10,000 crore is planned to be generated through InvIT, an investment instrument resembling mutual funds, designed to accumulate capital from investors and invest in assets providing long-term cash flows. Furthermore, another INR 10,000 crore is targeted to be raised through bids under the TOT model, reflecting the government's commitment to leveraging this approach for infrastructure development.

MoRTH has already realized considerable success in asset monetization. By February 28, 2023, it had raised a total of INR 67,997 crore through various monetization methods over the past four years. Within this framework, approximately INR 26,366 crore has been raised by monetizing 1,614 kilometres of highways through the TOT model.

Current Status of TOT Projects

The National Highway Authority of India (NHAI) has adopted an ambitious plan for the toll-operate-transfer model in FY 2024. NHAI intends to invite bids for two bundles of TOT projects every quarter during this period. Bids for TOT bundles 13 and 14 were already invited in June, and the awards for these bundles are expected to be finalized by the end of September. Subsequently, TOT bundles 15 and 16 have been identified and are currently in the finalization process.

The NHAI aims to raise approximately INR 7,500 crore from the asset monetization of TOT bundles 13 and 14. Furthermore, the projects under TOT bundle 15 are valued at around INR 1,500-2,000 crore, while those in TOT bundle 16 have a higher valuation, ranging from INR 6,000-8,000 crore.

NHAI has been instrumental in these efforts, having awarded six TOT bundles, namely ToT-1, 3, 5A1, 5A2, 7, and 9, resulting in the collection of Rs 26,366 crore from bids solicited for 11 TOT bundles. However, some TOT bundles, specifically bundles 2, 4, 6, 8, and 10, were annulled due to lower bids compared to the initial estimated concession value determined by NHAI.

While NHAI is actively pursuing TOT model projects, there have been some challenges in awarding contracts. Earlier this year, bids were invited for TOT bundles 11 and 12 with the aim of raising a total of Rs 7,000



crore. However, these bundles received lower-than-expected bids, resulting in a limited number of participants. In fact, it's anticipated that bundles 11 and 12 may be annulled due to the insufficient response from bidders.

Nevertheless, NHAI remains committed to advancing infrastructure development through the TOT model, with plans to open bids for TOT bundles 13 and 14 by the end of September. These bundles encompass various critical road projects, including the Kota Bypass on National Highway 76, the Gwalior-Jhansi route on NH75, the Delhi-Meerut Expressway on NNH-334, the Delhi-Hapur section on NH-24, and the Binjabahal-Teleibani road on NH6, illustrating the continued effort to leverage the TOT model for the nation's infrastructure growth.

Amendments & Changes

As per the latest report by Ministry of Road Transport and Highways, certain amendments have been introduced to the Model Concession Agreements (MCA) and Request for Proposal (RFP) of road construction models, reflecting a proactive approach to enhance implementation efficiency and address industry demands.

Under the Hybrid Annuity Mode, changes have been implemented to bolster bidder eligibility criteria. The Standard RFP document now incorporates provisions related to technical capacity thresholds, focusing on similar work experience for EPC projects involving Major Bridges and Tunnels. This amendment enables the National Highways Authority of India to secure concessionaires with pertinent experience for HAM projects involving such critical components.

Modifications have also been made to the HAM project's RFP and MCA clauses to streamline the project award process. The amendment allows for the Lowest Quoted Bid Project Cost (BPC) to serve as the basis for awarding HAM Projects. Additionally, Operation and Maintenance costs are now fixed as in EPC projects. This change promotes transparency and efficiency by immediately identifying the winner after opening financial bids, aligning with the transparent process of the EPC mode.

In the realm of the Build-Operate-Transfer (Toll) model, changes have been introduced in the Model Concession Agreement. These changes permit a reduction in the ownership transfer timeline from 2 years to 1 year after the Commercial Operation Date (COD). This adjustment is set to free up equity and funds of construction companies, facilitating their involvement in other projects without undue financial constraints.

Additionally, the Ministry has taken measures to enhance contracting flexibility and ensure quality. Performance Security has been reduced from 5-10% to 3% of the contract value for existing contracts. However, additional performance security may be realized for abnormally low bids. Retention money release has been linked to work execution, and Performance Guarantee may be released on a pro-rata basis for HAM/BOT Contracts if the Concessionaire is compliant.



Moreover, additional changes were implemented to provide relief to contractors until October 31, 2022. These include the possibility of granting time extensions to Contractors/Concessionaires on a case-by-case basis. A waiver of penalties for the delay in submitting Performance Security/Bank Guarantee has been extended for new contracts initiated from April 2021 to June 2021, allowing a one-month grace period from the due dates. Consultants (I.E./ A.E./S.C.) are also eligible for time extensions on a case-by-case basis.

For BOT/ TOT Concessionaires, the reduction in user fee collection mandates a proportional extension of the concession period as outlined in the Concession Agreement. Similarly, for all National Highway Tolling Contracts, a reduction in fee collection can be offset in accordance with the User Fee Collection Contracts. Additionally, the achievement of Financial Closure for Concession Agreements entered between April-June 2021 may be extended by one month from the due dates, based on project location considerations.



HAM v/s BOT Project Execution Models

Comparative Analysis

The evolution of the infrastructure development models in India, specifically the Build-Operate-Transfer (BOT) and the Hybrid Annuity Model (HAM), has been marked by innovative solutions to address the challenges and limitations faced by traditional approaches. The BOT model, initially designed to harness private sector participation, allowed private players to not only construct but also operate and maintain roads for a predetermined period before handing them back to the government. This model aimed to leverage private investment and expertise to expedite infrastructure growth, with private entities arranging finances through toll revenue or annuity fees.

However, the BOT model encountered roadblocks over time. Private players faced significant financial burdens as they were required to fully finance the projects themselves, resulting in constraints due to the reluctance of banks to provide loans for such ventures. Moreover, the model's reliance on toll collection and traffic revenue exposed developers to the inherent risks of fluctuating passenger flows. This necessitated a shift towards a more sustainable and mutually beneficial model.

The Hybrid Annuity Model (HAM), introduced in 2016, merged elements of both the BOT-Annuity and the Engineering, Procurement, and Construction (EPC) models. Under HAM, the government assumed a more active role by sharing project costs, addressing the financing challenges that deterred private players under the BOT model. The government's contribution of 40% of the total project cost eased the financial burden on private developers and was paid out in ten equal instalments based on project milestones. This payment assurance significantly lowered the risk of investing in these projects, fostering increased participation.

HAM also brought stability to private developers by offering a fixed annuity payment, reducing their dependence on unpredictable passenger traffic. This assurance prompted private entities to shift their focus from solely revenue generation to effective construction and maintenance, ensuring the longevity and quality of the infrastructure. Additionally, the government's continued involvement in toll collection and maintenance ensured that road quality and service standards were upheld throughout the concession period.

While both the BOT and HAM models aimed to drive infrastructure development, HAM proved to be a more sustainable and attractive proposition for private players and the government alike. By mitigating the financial stress on private players and offering revenue certainty, HAM not only accelerated project implementation but also positively impacted road quality, user experience, and economic growth.

Key Challenges & Constraints

While both models have their advantages, each of them also comes with certain challenges. **Challenges under BOT:**

- Profit Element in Equity Portion: In the BOT model, the private sector bears the risk associated with project financing. However, to compensate for this risk, a profit element is incorporated into the



equity portion of financing, leading to higher costs compared to debt. This premium for risk-sharing can contribute to elevated overall project costs.

- **Complex Deal Closure and Upfront Expenses:** The preparation and closure of a BOT financing deal are often time-consuming and entail significant upfront expenses. The involvement of multiple entities and the requirement for a complex legal and institutional framework can hinder the timely execution of such deals. Consequently, the BOT model might not be suitable for small-scale projects due to the resource-intensive nature of the process.
- **Institutional Capacity Development:** The realization of the full benefits of the BOT model depends on the development of robust institutional capacity. This involves establishing transparent and equitable bidding and evaluation procedures, as well as mechanisms for dispute resolution during project implementation. Developing such institutional capacity takes time and can impact the efficiency of project execution.

Challenges under HAM:

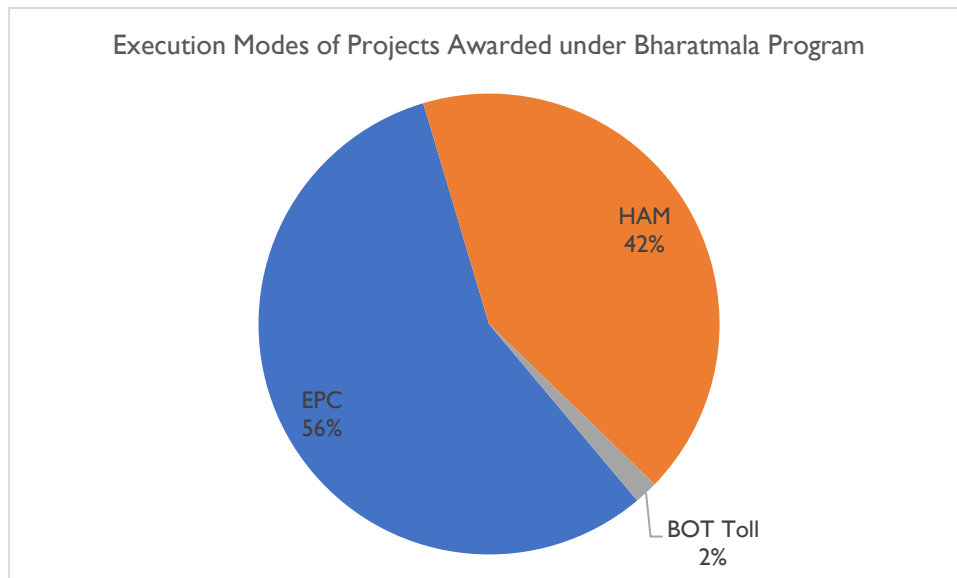
- **Debt Financing:** HAM projects rely significantly on debt financing for a substantial portion of the project cost. The availability, terms, and interest rates of debt financing can greatly impact the feasibility and financial viability of projects, influencing developer participation and project execution.
- **Bid Sensitivity:** The financial viability of HAM projects is extremely sensitive to the bid amounts quoted by developers during the bidding process. An overly aggressive bid might lead to financial strain during project execution, potentially affecting the quality of work or causing delays. Conversely, an excessively conservative bid might deter government approval, emphasizing the need for precise bid estimation to ensure project success.



Execution Mode: Prevalent Scenario

Projects Under Bharatmala Programme

Road construction projects under the program are executed by three modes: EPC, HAM and BOT. Out of this EPC and HAM accounts for 57% and 42% of the total road projects awarded (in kms) while only 2% is under the BOT route.



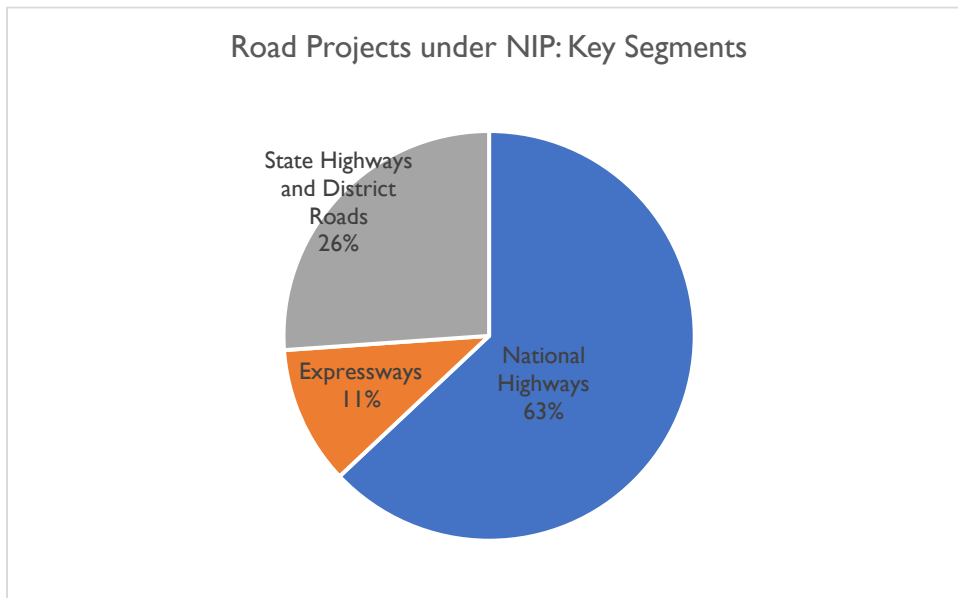
Source: MoRTH, 100% equals approximately 24,760 kms of awarded road projects

National Infrastructure Pipeline

The NIP unfolds a diverse range of projects spanning the infrastructure sector, each with its unique set of goals and objectives. Within this extensive framework, a substantial portion is dedicated to the roads sector, which forms the lifeline of India's logistics and transportation network. Over the period from FY20 to FY25, the NIP has allocated a total value of Rs 2,033,823 crore to the roads sector.

The road infrastructure segment is categorized into distinct project types, each with its strategic importance. Among the various project categories, National Highways projects take the lion's share, accounting for 63% of the resources allocated to the roads sector within the NIP. These projects aim to upgrade and expand the existing national highway network, enhancing their efficiency and capacity. The overall capital expenditure of Rs 1,280,640 crore is expected to be made from FY20 to FY25 to improve the existing and developing new national highways.





Source: Ministry of Finance, Government of India

Expressways, on the other hand, constitute another 11% of road infrastructure projects within the NIP. Over the period from FY20 to FY25, an estimated capital expenditure of INR 2,22,150 crore is earmarked for developing these expressways. Notable among these projects are the Delhi-Mumbai Expressway, Chennai-Bengaluru Expressway, Mumbai-Nagpur Super Expressway, Ganga Expressway, Purvanchal Expressway, and Bundelkhand Expressway. These expressways are poised to reduce travel times and enhance logistics, thus facilitating the movement of goods and people across the country.

The NIP also recognizes the significance of improving intra-state connectivity. To this end, it allocates an estimated total capital expenditure of INR 5,31,027 over the five-year period from FY20 to FY25 for the development of state highways and district roads. Some notable initiatives include the Versova-Bandra Sea Link, the development of the Chennai Peripheral Ring Road (in multiple phases), the upgradation of high-priority state highways in Tamil Nadu, inner ring roads across cities in Andhra Pradesh, and the widening and strengthening of state highways in West Bengal.

A total of 1,820 road projects are getting implemented under NIP, between the time period FY 2020 – 25. Nearly 53% of these projects are already under various stages of implementation while remaining are either under development or under conceptualization.

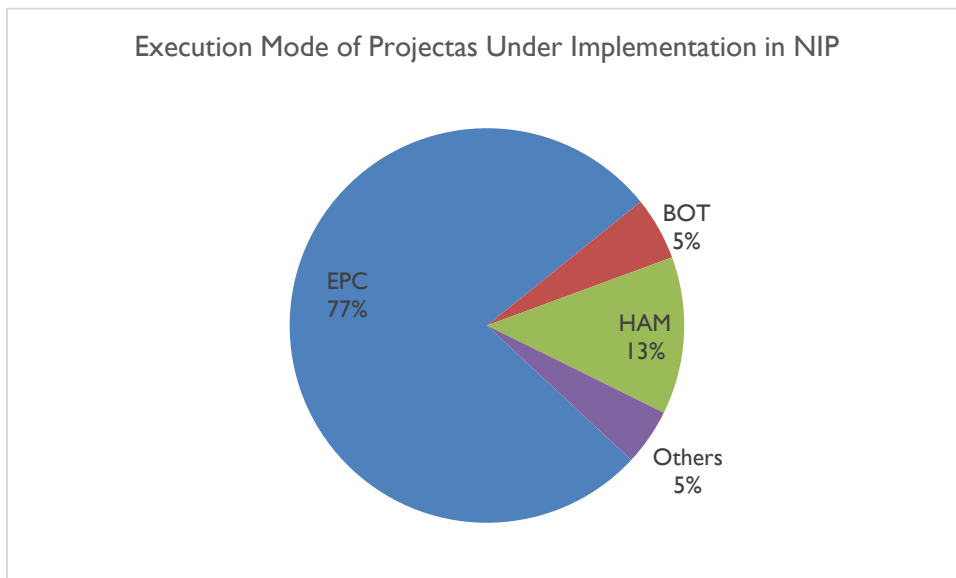
Projects Under NIP	
Under Implementation	968
Under Development	423
Under Conceptualization Stage	352



Uncategorized	77
Total	1820

Source: Ministry of Finance

Out of the total projects getting implemented, nearly 77% is getting done through EPC route while nearly 13% is getting done through HAM. The remaining 10% is getting executed through BOT / Item Rate contract / Annuity / SPV / Toll. While most projects follow the EPC route, there are exceptions that require innovative implementation models. For instance, the Mumbai-Vadodara section of the Delhi-Mumbai Expressway is being developed under the non-specified Public-Private Partnership (PPP) route. The Uttar Pradesh government has taken the lead in implementing projects like the Ganga Expressway, Bundelkhand Expressway, and Purvanchal Expressway under the EPC route. These projects are pivotal in transforming the state's transportation infrastructure and promoting economic activities.



Source: Ministry of Finance

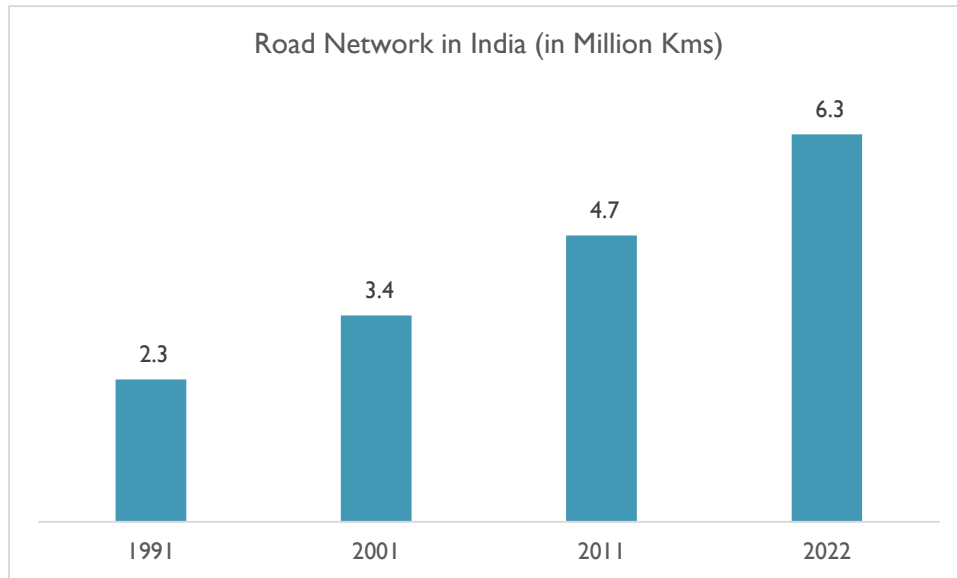
Projects which are currently under development are planned to have only two modes of implementation: HAM and EPC. EPC takes more than 71% share in this aspect, while HAM comprises of remaining 29%. The NIP recognizes the potential of the hybrid annuity model (HAM) for certain projects. Thus, 239 projects under this model are in the conceptualization stage. Notable among them are projects such as the Dighi Ports-Dabhol-Guhaghar-Jaigad Ports-Deogad-Malwan-Vengurla and Arunda Link in Maharashtra with an estimated investment of Rs 9,660 crore, the Chennai-Salem Link in Tamil Nadu with an investment of Rs 9,680 crore, the Kappirikkad-Edapally road link in Kerala with Rs 11,430 crore, and the Kabrai-Kanpur Link in Uttar Pradesh with an investment of Rs 5,760 crore. These projects are expected to gain momentum in the coming years and contribute to India's infrastructure development.



Road Infrastructure in India

India has a road network spanning approximately 6.4 million kms, making it the second largest in the world. This network – which comprises of national highways, state highways, district roads, and rural road – carries approximately 65% of country's freight traffic and nearly 90% of passenger traffic.

India also has the second largest highway network in the world⁴, after the United States, spanning approximately 145,000 kms. The national highways however accounts for less than 2.5% of the total road network in India. Despite this, national highways account for 40% of the total traffic volume.



Source: Ministry of Road Transport & Highways, Government of India

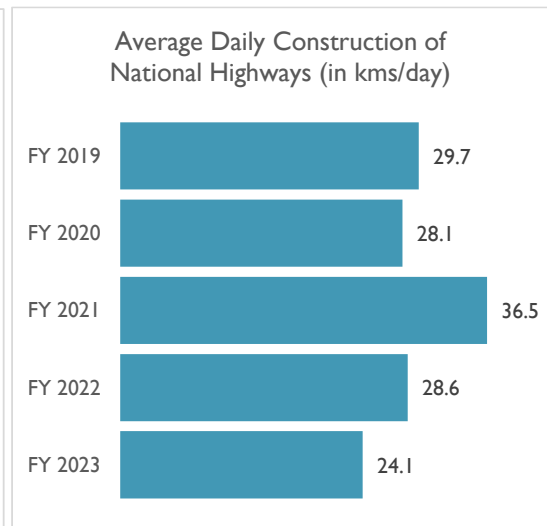
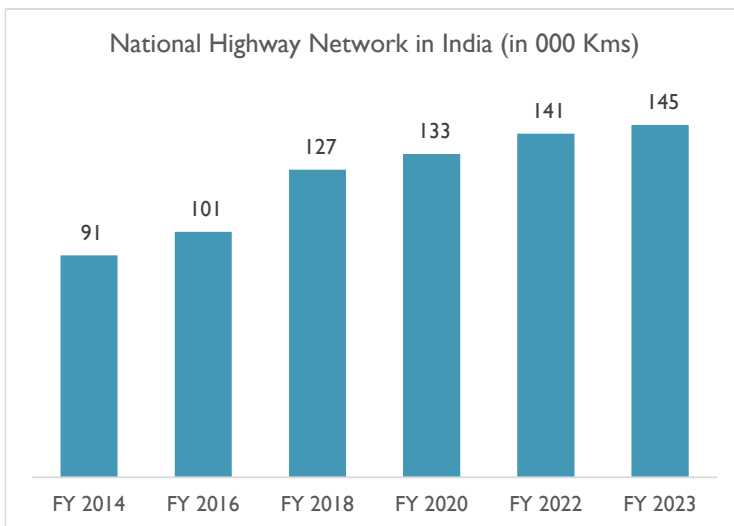
National Highway Network in India.

Implementation of favourable policy measures / programs, and aggressive push by the Government to increase the road network has accelerated the pace of road construction in the country. The switch to a corridor-based highway development strategy adopted by the Government, beginning 2014 – 15, has improved the pace of construction. The annual addition in road network reached its fastest during FY 2021, when the pandemic induced a lockdown in the country. Between FY 2015 and FY 2023, nearly 54,000 kms of road was added to the national highway network in the country, thereby taking it from approximately 91,000 kms to its present stretch of approximately 145,000 kms.

Average daily construction rate reached its highest level of nearly 36.5 kms/day in FY 2021, as the industry was benefitted by the lockdown measures imposed after the spread of Covid-19 pandemic. Since then, the average daily rate has dipped, to nearly 24 kms in FY 2023.

⁴ Referring to National Highways





Source: Ministry of Road Transport & Highways, Government of India, D&B Research, Average Daily Construction for FY 2023 is for period 1st April 2021 to 28 February 2023

Growth Trend

Over the years, the national highway network has undergone remarkable growth, evolving from a modest collection of roads to a vast expanse of well-connected highways. The pattern of growth in the network is characterized by distinct phases, where each phase has contributed to the network's growth and transformation. Among these, the Golden Quadrilateral and the North-South and East-West Corridors stand out as iconic examples that have played a pivotal role in shaping the expansion and connectivity of the network.

The Golden Quadrilateral program, initiated in the early 2000s, was a massive undertaking that aimed to connect several major industrial, agricultural, and cultural centers of India by connecting the four major metropolitan cities of Delhi, Mumbai, Chennai, and Kolkata through a network of high-quality highways. This project not only drastically reduced travel time between these economic centers but also spurred economic growth and trade across the regions it covered. The successful completion of the Golden Quadrilateral represented a significant leap forward in India's highway development efforts and showcased the country's capacity to undertake and execute ambitious infrastructure projects.

Similarly, the North-South and East-West Corridors are envisioned to enhance connectivity between the northern and southern regions, as well as between the eastern and western parts of the country, making them the largest ongoing highway project in India. These corridors are bringing together the previously disconnected areas into the fold of the national highway network, opening up new avenues for trade, tourism, and development.

In terms of individual states, Maharashtra boasts the most extensive network of national highways, encompassing a total distance of approximately 18,500 kilometres and accommodating 102 national highways within its borders. Uttar Pradesh secures the second position with a road span of nearly 12,300 kilometres and 88 national highways within the state limits. Following closely is Rajasthan, which possesses approximately

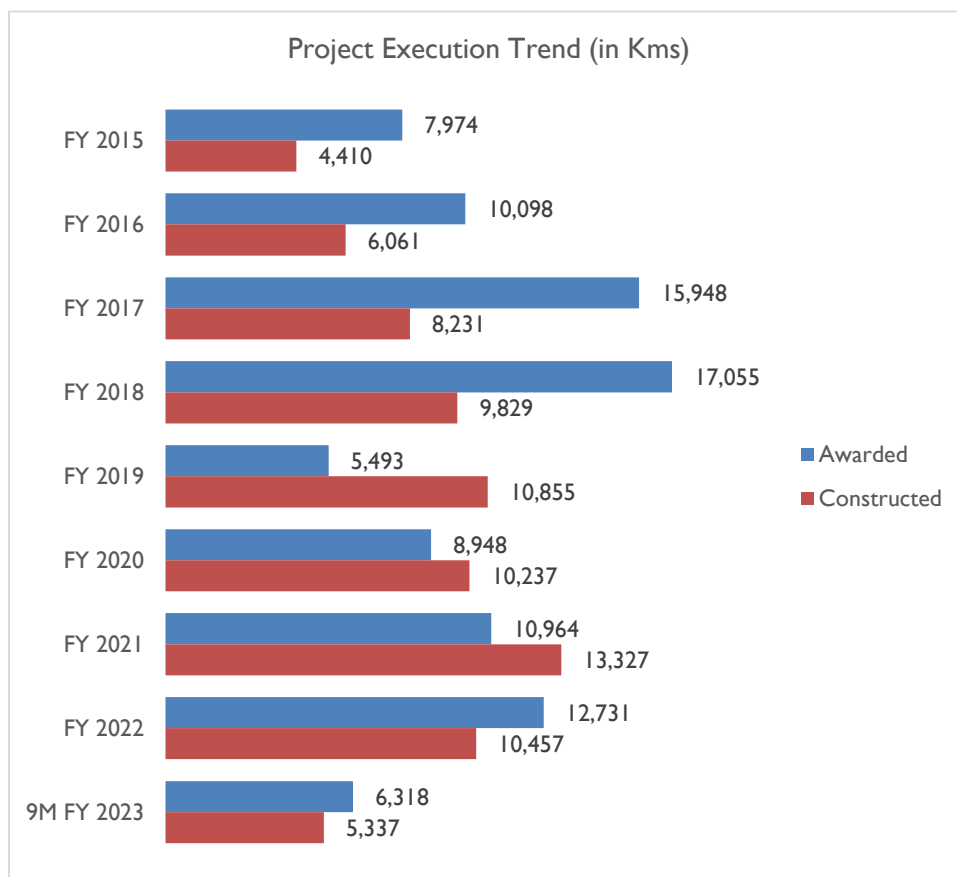


10,700 kilometres of highways hosting 52 national highways, while Madhya Pradesh boasts 9,000 kilometres and 46 national highways. Coming in fifth, Andhra Pradesh encompasses 8,00 kilometres of highways hosting 47 national highways.

States which have the highest concentration of national highway network	
State	National Highway (in Kms)
Maharashtra	18,500
Uttar Pradesh	12,300
Rajasthan	10,700
Madhya Pradesh	9,000
Andhra Pradesh	8.700

Source: Ministry of Road Transport & Highways, Government of India

Project Execution Trends in National Highway Construction



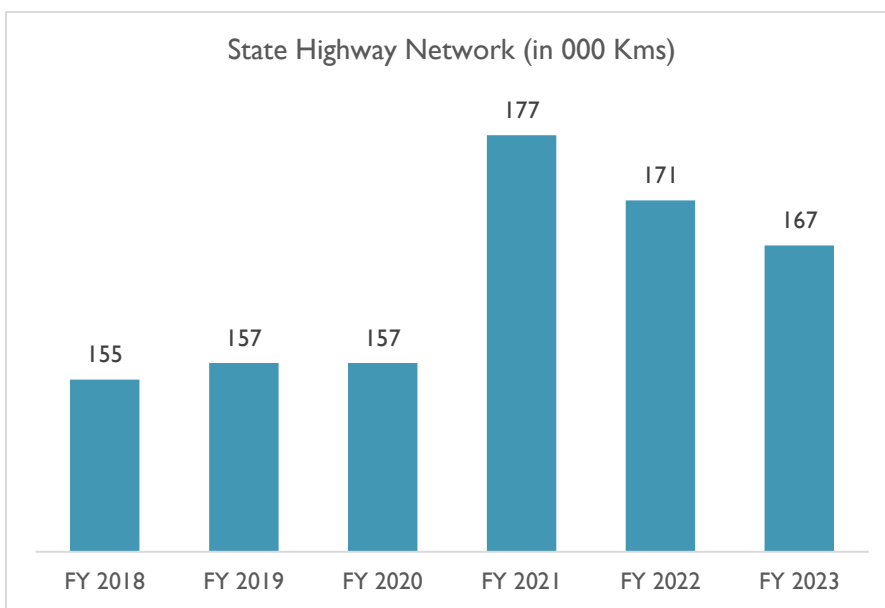
Source: Ministry of Road Transport & Highways, Government of India



Growth in Other Road Network

State Highways, the next major strategically important segment of Indian road infrastructure, accounted for nearly 3% of total network. Towards the end of FY 2023, the total network of state highways in India stood at approximately 167,000 kms. The total size of state highway network has seen a slight dip in the last couple of years as some of those state roads were reclassified and brought under the national highway segment – due to its strategic importance.

It is clear that national and state highways – two of the strategically important segment of Indian road infrastructure – accounts for less than 6% of the total road network in the country. The remaining 94% is accounted by other roads that are classified as district roads / rural roads / urban roads / project roads – depending on its location / program under which it was constructed / nature of paving.



Source: Ministry of Road Transport & Highways, Government of India



Key Demand Drivers

Growth in Population

Roads play a pivotal role in connecting not just major cities but also remote towns and even the smallest villages, serving as vital conduits for both vehicles and people. India, with its staggering population exceeding 1.428 billion individuals in 2023, represents a significant fraction of the global populace, constituting approximately 17.2% of the world's total inhabitants. Given this demographic enormity, the continuous development and enhancement of road infrastructure become nothing short of imperative.

Over the past 25 years, India's population has been on a persistent growth trajectory, averaging a 1.39% annual increase. Notably, in 1998, this growth rate reached 1.88%, while by 2022, it had moderated to 0.68%. This demographic expansion, while exhibiting fluctuations, highlights the nation's ongoing demographic dynamics. As the population continues to expand, so does the concurrent surge in demand for efficient transportation services and seamless connectivity.

In this context, the significance of robust and extensive road networks gains greater importance. These networks not only facilitate the movement of goods, services, and individuals but also catalyze economic development by fostering trade, tourism, and regional integration.

Urbanization

As per the handbook of urban statistics 2022, India's urban population has been on a steady rise, with urban dwellers accounting for over 469 million in 2021, a number projected to soar to over 558 million by 2031 and further exceed to 600 million by 2036.

This rapid urbanization represents the transformation occurring within Indian cities, as millions flock to urban centers in search of opportunities and a higher standard of living. However, this urban influx has given rise to a host of challenges, chief among them being increased congestion in urban areas. As more people gravitate towards cities, the existing road networks are under tremendous strain, resulting in traffic bottlenecks, longer commute times, and heightened pollution levels.

In response to this urban congestion, the development of road infrastructure has become an urgent imperative. The burgeoning urban population in India highlights the role of road infrastructure development, facilitating not only the movement of people and goods but also in alleviating the challenges posed by urban congestion.

Growth in Economic Activity

India's growing economic activities are propelling the development and expansion of road infrastructure across the nation. As the Indian economy continues its robust growth trajectory, it relies heavily on the presence of efficient transportation networks to facilitate the movement of goods and people. Roads play a vital role in opening up areas and stimulating economic and social development. They are essential for linking



producers to markets, connecting workers to jobs, providing access to education and healthcare, and supporting overall development.

The development of roads, particularly in rural and remote regions of India, assumes great importance in overall progress and inclusivity. According to data from the Ministry of Rural Development, approximately 91% of rural habitations in India are now interconnected by roads. This extensive road network serves as a lifeline, granting rural communities access to essential services such as healthcare, education, and markets. It not only facilitates the transportation of agricultural produce from farms to markets but also enables people in these areas to access healthcare facilities, send their children to schools, and engage in economic activities beyond traditional agriculture.

Trade Expansion

India's trade landscape has witnessed substantial growth, as evidenced by the positive trajectory of overall exports (Merchandise and Services combined) in FY 2022-23, projecting a significant 13.84% growth over the previous fiscal year. This growing trade expansion is reflected in the rising trade figures. In the fiscal year 2022-23, India's total trade is estimated at USD 770.18 billion, a notable increase from the previous year's USD 676.53 billion. This surge in trade activities highlights the necessity for a robust road infrastructure network to ensure the smooth and efficient flow of goods to ports and airports.

In addition, India's Foreign Trade Policy for 2023 aims for dynamic openness and consultative feedback, with a clear objective of achieving USD 2 trillion in exports by 2030. To realize this ambitious goal, a well-connected and modernized road network is crucial, enabling the timely and seamless transportation of export goods.



Slope Stabilization

Slope stabilization refers to the application of various methods to solidify and stabilize a slope that is either inherently unstable or insufficiently stable. It includes a set of engineering techniques and measures aimed at preventing or mitigating the erosion, instability, and potential hazards associated with sloping terrain.

Importance of Slope stabilization

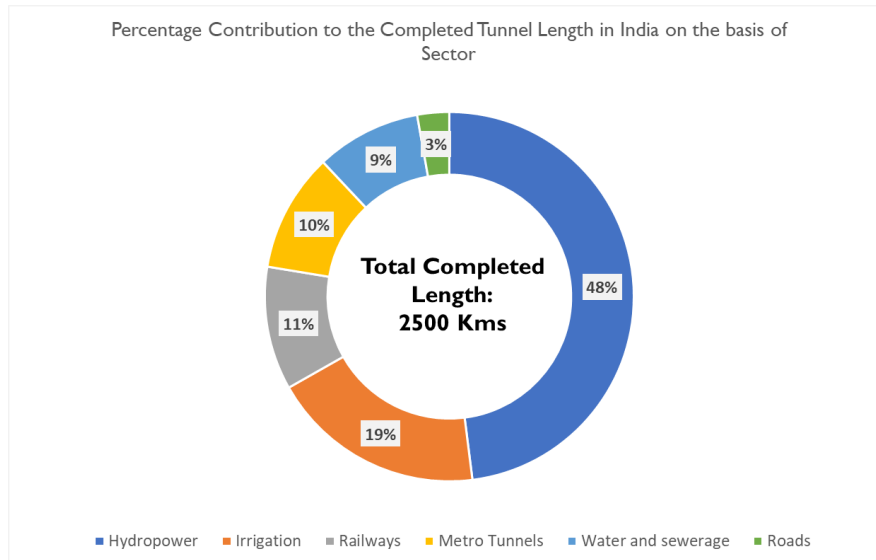
1. **Safety:** Slope failures, such as landslides and rockfalls, pose significant risks to road users and nearby communities. Stabilization measures help prevent these hazards, enhancing road safety.
2. **Water Flow Direction:** On steep slopes, water runoff tends to follow the path of least resistance, which is often downhill. If a slope is unstable, it can lead to erosion, landslides, or slippage of soil and rocks. This not only disrupts the road's structure but also channels water in unpredictable ways, increasing the velocity of runoff. High velocity water runoff in a hilly area can cause flash flooding, trigger or enhance impending landslides, and cause severe erosion of soil and terrain.
3. **Erosion Control:** Stable slopes with proper vegetation and erosion control measures help slow down and regulate the flow of rainwater. When slopes are stable, they prevent excessive soil erosion, which can carry sediment into drainage systems and water bodies, contributing to increased runoff velocity.
4. **Preserving Infrastructure:** Without effective slope stabilization, roads in hilly areas are vulnerable to erosion and landslides, which can lead to costly damage and disruption to several aspects. Stabilization measures protect the road infrastructure, minimizing maintenance and repair costs.
5. **Accessibility:** Roads in hilly regions are lifelines for communities, facilitating access to essential services like healthcare, education, and markets. Stabilization ensures uninterrupted connectivity, especially in remote areas.
6. **Environmental Conservation:** Properly designed and executed slope stabilization methods also consider environmental factors. They help prevent soil erosion, protect ecosystems, and reduce the sedimentation of water bodies.

Common slope stabilization techniques include retaining walls, rock bolts, slope reinforcement with geosynthetics, geometric techniques, hydrological techniques, chemical and mechanical stabilization techniques including vegetation management, and drainage systems.



Tunnel Infrastructure in India

India has a completed tunnel length of approximately 2,500 kms spanning across the country⁵. Hydropower sector dominates by contributing highest share of over 1200 Kms to the completed tunnel length, followed by irrigation, railways, metro tunnels, water and sewerage accounting for the more than 470 km, 270 km, 240 Km, 230 km of the completed tunnel length respectively and roads holding a share of 60 Km.



Source: India Infrastructure Research

With rapid urbanization, tunnel construction across the country has become an integral part of the entire infrastructure in India. The key sectors propelling the growth of tunnel construction in past few years are roads and highways, hydropower, urban rail, irrigation, and water. The tunnelling activity has spurred due to expansion of metro rail sector, roads and highway tunnels are also fuelling the demand especially in the hilly regions coupled with government initiatives such as Pradhan Mantri Krishi Sinchayee Yojana, the Jawaharlal Nehru National Urban Renewal Mission for exploitation of water resources and the interlinking of Rivers Programme which has given a boost to tunnel construction in the country for purposes like irrigation, water supply and sewerage.

Tunnel Construction: Techniques

With advancing tunnel techniques and underground space engineering, the tunnel construction in the country is becoming faster and more efficient. Upcoming supply is expected to be added by deploying techniques such as DBM, NATM and TBMs for tunnel construction.

Drill and Blast Method (DBM): This is the most widely used tunnelling technique in India, accounting for over 60% of all tunnel projects. More than 200 Kms of tunnel length is expected to be added as upcoming supply deploying DBM techniques. It involves drilling holes into the rock face and then blasting them with explosives to break up the rock. The broken rock is then removed from the tunnel using excavators and dump trucks.

⁵ India Infrastructure Research



New Austrian Tunnelling Method (NATM): NATM is a flexible tunnelling method that can be used to excavate tunnels in a variety of ground conditions, including unstable rock and soft ground. More than 200 Kms of tunnel length is expected to be added as upcoming supply deploying NATM technique. It involves excavating the tunnel in small sections and then supporting the tunnel walls and roof with temporary supports, such as rock bolts and shotcrete.

Tunnel Boring Machine (TBM): TBMs are used to excavate tunnels through a variety of ground conditions, including hard rock, soft rock, and soil. More than 350 Kms of tunnel length is expected to be added as upcoming supply deploying TBM technique. They are large, rotating machines that have a cutting head at the front. The cutting head breaks up the rock or soil and then transports it out of the tunnel on a conveyor belt.

Microtunnelling: Microtunnelling is a trenchless construction method that is used to install pipelines and sewers beneath roads, railways, runways, harbors, rivers, and environmentally sensitive areas. Microtunnelling machines are small, remote-controlled machines that can excavate tunnels with diameters of up to 3 meters.

The choice of tunnelling technique depends on a variety of factors, including the ground conditions, the tunnel diameter, the tunnel length, and the cost. In recent years, there has been a growing trend towards the use of TBMs in tunnel construction in India. This is due to the fact that TBMs offer a number of advantages over traditional methods, such as DBM, including: Increased speed and efficiency, Reduced environmental impact, Improved safety, Higher quality tunnels. However, TBMs are also more expensive than traditional methods, and they may not be suitable for all tunnel projects.

Recent Advances

In recent years, contractors have begun to explore modern techniques and innovative materials for tunnel construction. These include:

Advanced features such as video surveillance, integrated tunnel control systems, entrance detection control, wireless communication systems, electrical fire signaling systems, SOS call boxes, sequential excavation, and ground freezing. Innovative materials such as fiber bolts, lining stress controllers, geosynthetics, and steel anchors. The Zoila tunnel in India is a prime example of a smart tunnel with safety features such as a fully transverse ventilation system, CCTV monitoring, emergency lighting, traffic logging equipment, and a tunnel radio system.

In addition, new technologies are being used in tunnel construction for better geological and geotechnical investigations. Aerial and photogrammetry-based surveys are being conducted, and GPS-based systems with high accuracy levels are being used to map difficult terrain.

New and innovative materials are also being used to improve the durability and strength of tunnels. The application of unique and cutting-edge materials has become essential due to the increasing complexity of tunnel construction, especially in the Himalayan and peninsular regions. Tunnel contractors have begun utilizing a variety of innovative materials, such as mechanical single bolts, expanding friction bolts, self-drilling



rock bolts, steel- and fiber-reinforced polymer active anchors, and steel passive anchors, for increased construction efficiency.

Growth drivers

The growth of tunnel construction in India is being driven by a number of factors, including:

Government investment in infrastructure: The Indian government is investing heavily in infrastructure development, including roads, railways, and metro systems. This is driving a demand for new tunnels to connect different parts of the country and improve transportation efficiency.

Rapid urbanization: India is one of the fastest urbanizing countries in the world. This is leading to increased demand for new infrastructure in urban areas, including tunnels to reduce traffic congestion and improve connectivity.

Development of hydropower projects: India has a vast hydropower potential, and the government is developing a number of hydropower projects. This is driving a demand for new tunnels to divert water and generate electricity.

Geopolitical factors: India borders several countries with which it has complex geopolitical relationships. The construction of tunnels in border areas can help to improve connectivity and security.

In addition to these general growth drivers, there are a number of specific factors that are contributing to the growth of tunnel construction in different sectors in India. For example, the growing popularity of metro rail systems is driving a demand for new tunnels in urban areas. The development of new highways and expressways is also driving a demand for new tunnels to cross mountains and rivers.

The Indian government has recognized the importance of tunnel construction for the country's development. It has launched a number of initiatives to promote tunnel construction, such as the Tunneling Association of India (TAI) and the National Tunnel Development Authority (NTDA). These initiatives are helping to create a more conducive environment for tunnel construction and attract investment in the sector.

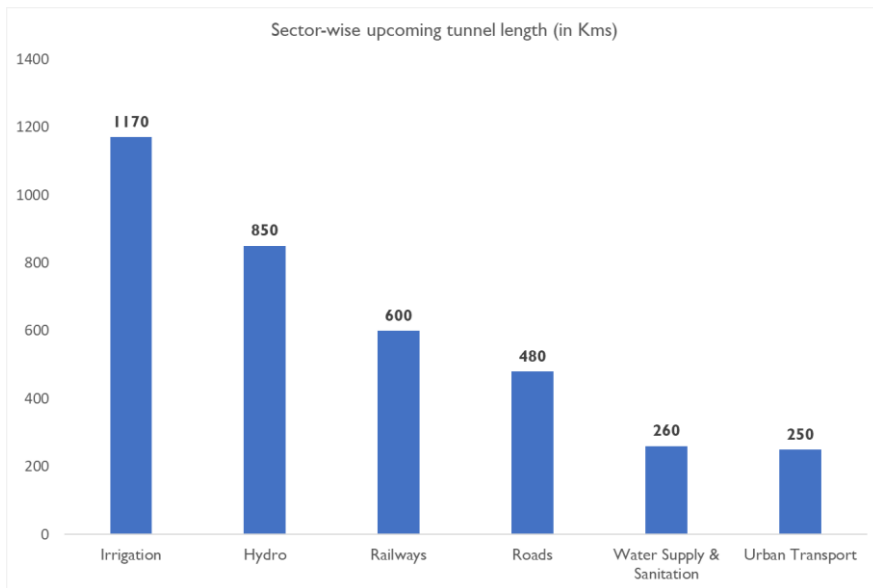
The growth of tunnel construction in India is expected to continue in the coming years. The government has ambitious plans for infrastructure development, and tunnel construction will play a key role in achieving these goals.

Upcoming Supply

With more focus on Indian Infrastructure, the tunnelling sector is expected to propel with a strong pipeline network of 1300 tunnels, spanning around the country with a length of more than 3,600 km. When compared state-wise in terms of upcoming tunnels, Jammu & Kashmir is the leader with around 200 tunnels upcoming, followed by Maharashtra (around 140 tunnels), Himachal Pradesh (more than 100 tunnels), Andhra Pradesh (around 90 tunnels) and Arunachal Pradesh (around 80 tunnels). In terms of upcoming length, Maharashtra has the maximum share with over 1,100 km, followed by Jammu & Kashmir with over 460 km and Uttarakhand with more than 280 km.

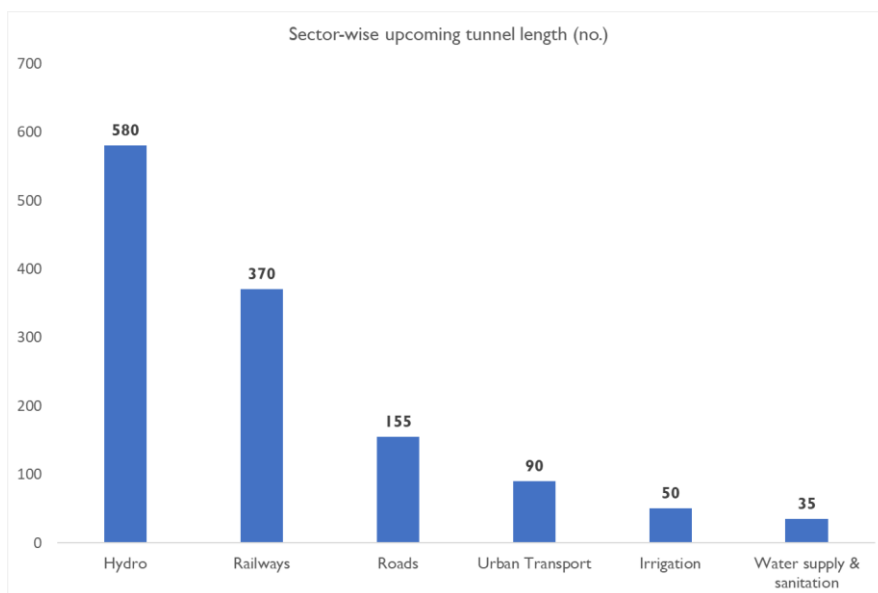


When compared sector-wise in terms of upcoming length, Irrigation sector dominates by contributing highest share of over 1170 Kms, followed by hydro (around 850 Kms) , railway, (around 600 kms), roads (around 480 Kms), water and sewerage (around 260 kms), urban transport (around 250 kms) .



Source: India Infrastructure Research

When compared sector-wise in terms of upcoming length, Hydro sector dominates by contributing highest share of over 580 tunnels, followed by railways (around 370 tunnels) , roads (around 155 tunnels), urban transport (around 90 tunnels), irrigation (around 50 tunnels), and water and sewerage (around 35 tunnels).



Source: India Infrastructure Research



Challenges face during Tunnel Construction in India

India is a rapidly developing country, and there is a growing demand for tunnels to support infrastructure development. However, there are a number of challenges and pain points associated with tunnel construction in India, including:

Complex geology: India has a wide range of geological conditions, from hard rock to soft soil. This can make it difficult to choose the right tunnel construction technique for each project.

Difficult terrain: Many of India's tunnel projects are located in difficult terrain, such as mountains and jungles. This can make it difficult to transport equipment and materials to the project site.

Environmental concerns: Tunnel construction can have a significant impact on the environment. In India, it is important to consider the impact of tunnel projects on forests, wildlife, and water resources.

Lack of skilled labor: India has a shortage of skilled tunnel construction workers. This can lead to delays and cost overruns on projects.

Financial constraints: Tunnel construction is a capital-intensive activity. India faces a number of financial challenges, which can make it difficult to secure funding for tunnel projects.

In addition to these general challenges, there are a number of specific pain points associated with tunnel construction in India. For example, the Indian Railways has a history of tunnel construction delays and cost overruns. This is due to a number of factors, including complex geology, difficult terrain, and environmental concerns.

The Indian government is aware of the challenges associated with tunnel construction, and it is taking steps to address them. For example, the government has established a number of training institutes to train skilled tunnel construction workers. The government is also working to improve the regulatory environment for tunnel construction.

Despite the challenges, tunnel construction is a vital part of India's infrastructure development. Modern tunnel construction techniques are helping to overcome the challenges and accelerate the development of tunnels in India

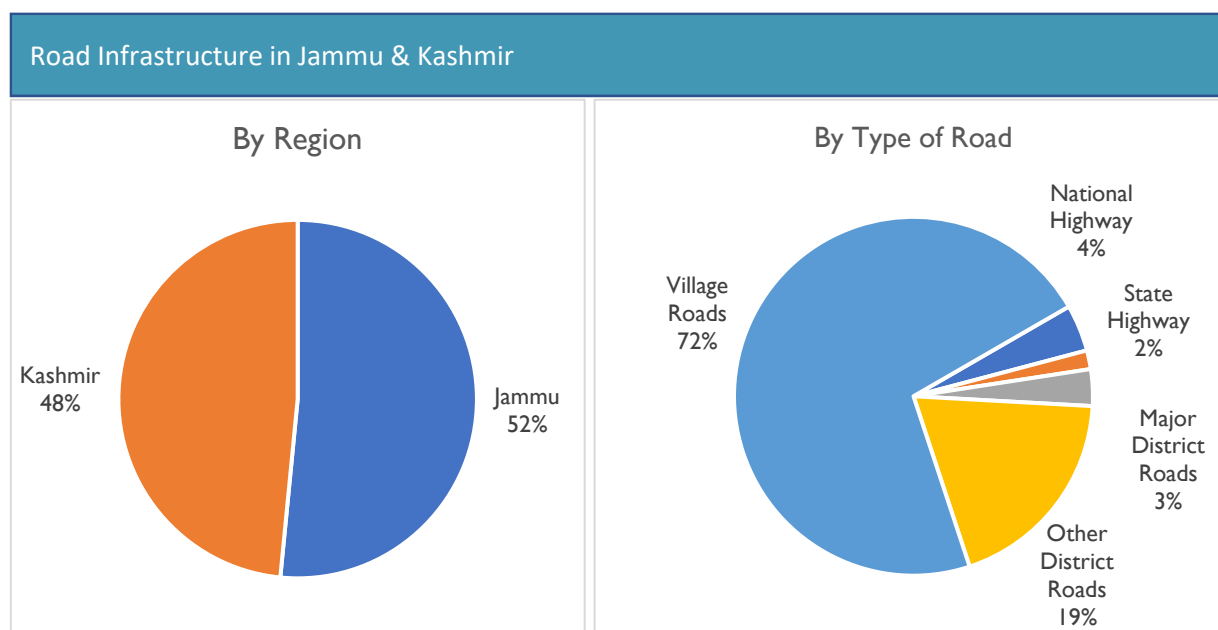


Road Infrastructure in Union Territories Jammu & Kashmir and Ladakh

As Union Territory of Jammu and Kashmir has been rapidly emerging as one of the fastest-developing economies in the country, the Indian Government, recognizing the significance of infrastructure development in the region and particularly in border regions, has initiated and are coming up with various infrastructure development projects.

As of 2022, the region boasts an extensive network of roads spanning over 41,000 kilometers. This transformation has played a pivotal role in not only enhancing economic growth but also in fostering connectivity that has bridged geographical and developmental gaps within the region.

Managed by the Ministry of Road Transport and Highways, the primary road system consists of expressways and national highways. National Highways, totalling 1,735 kilometers, play a pivotal role in connecting and unifying major regions within the UT. While they make up a relatively small portion of the road network in terms of length, they bear a substantial share of the total traffic flow across the Union Territory. These roads serve as crucial links for transportation, connecting major regions within the UT and facilitating trade and movement of goods.



Source: Public Works (R&B) Department, Government of J&K, 100% Equals approximately 41,000 kms

The secondary system of roads, comprising State Highways (SHs) and Major District Roads (MDRs), plays a complementary role in the transportation network. State Highways provide essential linkages to National Highways, district headquarters, key towns, and tourist destinations. Major District Roads, on the other hand, serve as connectors within districts, linking production areas with markets and rural regions with urban centers. State Highways total a length of approximately 696 kilometers while Major District Roads have an expanse of 1359 kilometers. These roads are the lifeblood of local economies, facilitating the movement of raw materials and finished products, thereby contributing significantly to both rural and industrial development.



In the past, Jammu and Kashmir, with its predominantly rural-oriented economy and a substantial rural population, lacked the tertiary system of rural road connectivity. A significant number of habitations did not have access to all-weather roads, which adversely affected the quality of life for rural residents. Under the Pradhan Mantri Gram Sadak Yojana (PMGSY) program, a concerted effort was made to develop rural roads. This initiative encompassed both Other District Roads (ODR) and Village Roads (VR).

Now, ODRs, with a total length of over 7,838 kilometers, serve as lifelines for rural areas of production, ensuring the efficient transportation of goods to market centers, blocks, tehsils, and main roads. Simultaneously, VRs, with the longest expanse of 29,512 kilometers, contribute to enhancing last-mile connectivity within villages, bringing essential services closer to rural communities.

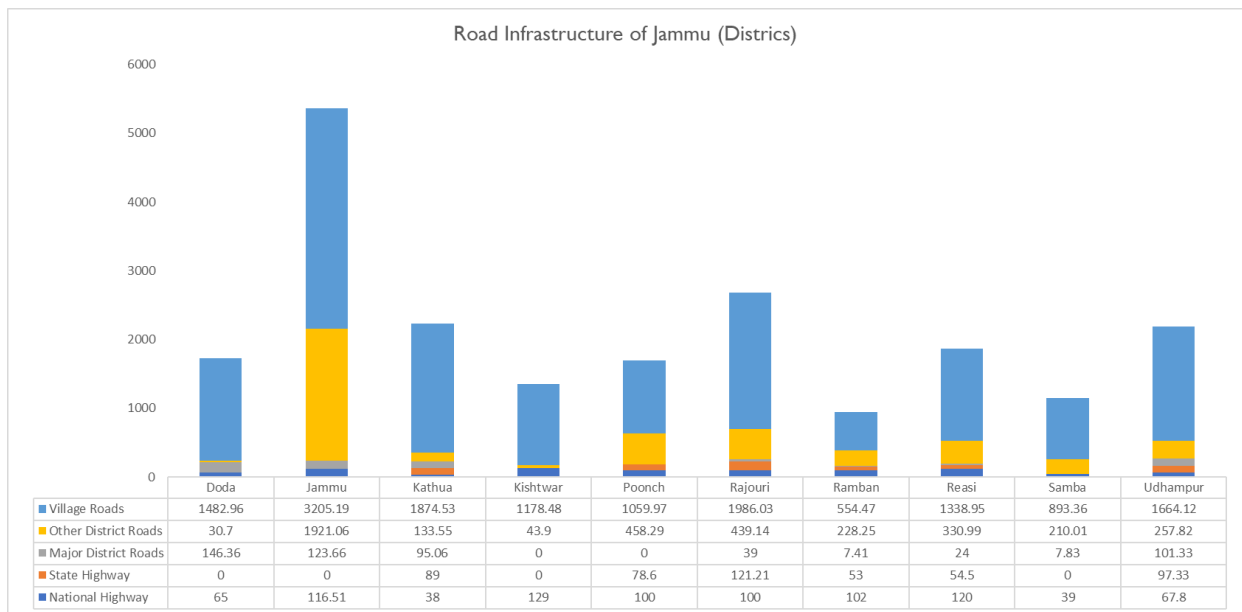
Road Infrastructure in Jammu

The road infrastructure in Jammu is diversified among various departments and organizations, contributing significantly to its connectivity and development. Jammu's road network includes a total of 877 kilometers of National Highways, 494 kilometers of State Highways, 545 kilometers of Major District Roads, and 4053 kilometers of Other District Roads. Additionally, there are 15,238 kilometers of Village Roads that further extend the reach of the road infrastructure into rural areas. In total, the road network in Jammu spans an impressive 21,207 kilometers, reflecting the region's commitment to connectivity and development across various road categories.

Pradhan Mantri Gram Sadak Yojana (PMGSY) program in Jammu plays a crucial role, primarily focusing on Village Roads with 6441.87 kilometers and Other District Roads encompassing 436 kilometers. The total length under PMGSY in Jammu amounts to 6,878.02 kilometers, resulting in construction and management of 32.4% of the total roads. Furthermore, Municipal Roads in Jammu contribute 514 kilometers or 2.4% share, primarily in urban areas.

Jammu has 10 districts under its belt, with Jammu district having the largest expanse of 5366 kilometers. This is followed by Rajouri (2,685 kilometers), Kathua (2,230 kilometers), and Udhampur (2188 kilometers) districts. Together, they contribute to approximately 60% of the total road expanse in Jammu.





Source: Public Works (R&B) Department, Government of J&K

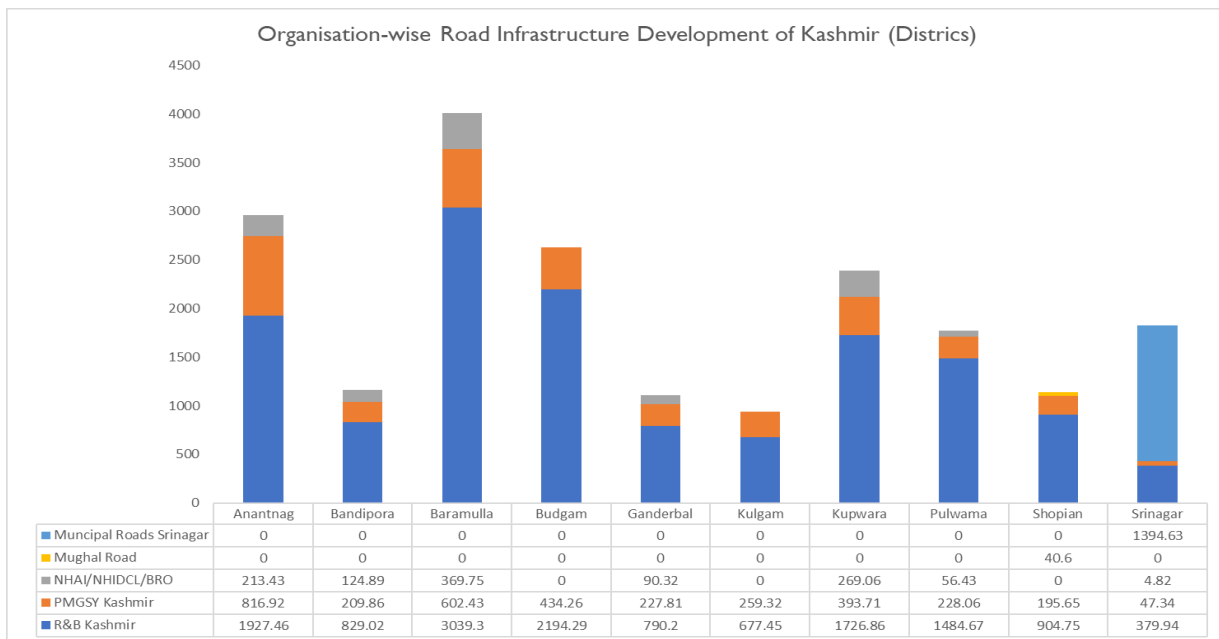
Majority of the construction work in Jammu and Kathua district has been done by R&B Jammu, whereas Rajouri and Udhampur districts have seen major contributions from PMGSY programme. The age-old Mughal Road passes through only one district: Poonch.

Road Infrastructure in Kashmir

Kashmir's road network includes a total of 858 kilometers of National Highways, 202 kilometers of State Highways, 814 kilometers of Major District Roads, and 3,785 kilometers of Other District Roads. In addition, there are 14,274 kilometers of Village. This comprehensive road infrastructure totals 19,933 kilometers.

Kashmir has 10 districts under its belt, with Baramulla district having the largest expanse of 4011 kilometers. This is followed by Anantnag (2,958 kilometers), Budgam (2,629 kilometers), and Kupwara (2,390 kilometers) districts. Together, they contribute to over 60% of the total road expanse in Kashmir. Majority of the construction work in all the districts in Kashmir has been done by R&B Kashmir, whereas the PMGSY Kashmir Programme has been the second biggest contributor to the road network. The age-old Mughal Road passes through only one district in Kashmir: Shopian.





Source: Public Works (R&B) Department, Government of J&K

Government Focus

In recent years, the Union Territory of Jammu and Kashmir (J&K) has witnessed a remarkable transformation in its road infrastructure. The Government of India, with a focused approach, has undertaken substantial efforts to improve connectivity and reduce travel time across the region.

The journey towards improving road infrastructure in Jammu and Kashmir gained momentum after 2019. The government's dedicated attention to major highways has significantly reduced travel time between key destinations in the Union Territory. Previously, the journey from Jammu to Kishtwar, which once took 7.5 hours, has now been streamlined to a mere 5 hours. Similarly, travel between Jammu and Srinagar, which previously ranged from 7 to 12 hours, has been condensed to a more manageable 5.5 hours. The benefits extend to Srinagar to Gulmarg routes, which have seen travel times decrease from 3 hours to just 1.5 hours. Moreover, the extended layover of trucks on the road has been significantly reduced from 24-72 hours to a mere 12 hours, marking a substantial improvement for the transportation of goods and services.

Over the period of 2020-2022, road and tunnel infrastructure have been prioritized, with approximately one lakh crore being allocated for the construction of a robust road network. In 2021, Jammu and Kashmir set a new record by constructing 6,450 kilometers of road length, earning it the third rank in the country for the longest road length.

An important aspect of this transformation is the marked increase in the percentage of blacktop roads. The total road length in J&K has surged to 41,141 kilometers, with blacktop roads constituting 74 percent, compared to 66 percent in 2019. Additionally, to strengthen the transport system, 169 bridges have been constructed during the years of 2020 to 2022.



Notably, the average road macadamization rate in J&K has surged to 20.6 kilometers per day over the past years, up from a mere 6.54 kilometers per day before 2019. These statistics reflect the significant progress taking place in the region's road development efforts.

The significance of these efforts was brought out by Jammu and Kashmir achieving the third position in terms of road network development, following Madhya Pradesh and Rajasthan. Udhampur district stood out, securing the top position nationally for successfully implementing the PMGSY in 2020-21 by constructing 560.49 kilometers of roads. This achievement marked a significant indicator of progress.

The Pradhan Mantri Gram Sadak Yojana (PMGSY) has played a pivotal role in these achievements. According to the Ministry of Rural Development, a total of 2,967 projects have been completed under the Pradhan Mantri Gram Sadak Yojana (PMGSY), covering a distance of 17,798 km and connecting 2,096 habitations. Since the abrogation of Article 370 in Jammu and Kashmir in August 2019, the union territory has shown improvement in the annual construction of roads. It held the ninth rank in Financial Year (FY) 2016-17, 11th rank in FY 2017-18, 12th rank in FY 2018-19, and then improved to the ninth rank in FY 2019-20. In the following years, it further improved to the third rank in both FY 2020-21 and FY 2021-22.

Beyond these notable achievements, the government has also paid particular attention to addressing the issue of potholes on roads. Under the Pothole Free Road Programme, a target of 5900 kilometers was set for the year 2021-22. Remarkably, 4600 kilometers of road length has already been made pothole-free, demonstrating a clear commitment to ensuring the quality of road infrastructure.

The approval of PMGSY-III, allocating 1,276 kilometers and Rs 1,357 crore for J&K, further emphasizes the government's commitment to providing all-weather road connectivity to previously unconnected habitations. This milestone marks yet another significant step in improving rural connectivity within J&K, supported by the Central Government's backing of the Union Territory's efforts to enhance rural infrastructure.

The inauguration of numerous development projects by the Lieutenant Governor in both the Jammu and Kashmir divisions signifies a commitment to enhancing the prosperity and well-being of citizens in remote areas. These projects encompass a wide range of initiatives, including road connectivity, which contributes to enhancing tourism potential and connecting crucial commercial centers. The inauguration comprised 75 development projects worth Rs 186.14 crore, underlining the multi-faceted approach to improving infrastructure in the region.

In addition to PMGSY, several other schemes and initiatives have been instrumental in advancing road infrastructure in Jammu and Kashmir. The Central Road and Infrastructure Fund, NABARD, road sector projects, and schemes dedicated to cities and towns, macadamisation, languishing projects, and pothole-free roads have all played crucial roles in the construction, improvement, and upgrade of roads and bridges.

In addition to these achievements, it's the government has taken significant steps to connect even more habitations through road networks. All habitations with over 1000 population (as per the 2011 census) have been provided road connectivity, contributing to greater accessibility and mobility for a larger portion of the



population. Furthermore, there is an ongoing commitment to provide road connectivity for habitations with a population of 500 by 2022-23, demonstrating a focus on improving transportation infrastructure.

The development of road infrastructure has effectively bridged the gap between urban and rural areas in Jammu and Kashmir. It has resulted in reduced travel time, making essential amenities such as healthcare, education, and markets more accessible. This improved connectivity ensures that the benefits of development reach every corner of the region.

Key Demand Drivers

The expansion of the road network in Jammu and Kashmir is influenced by several key external factors that play a significant role in driving infrastructure development in the region. These factors include:

- **Strategic Importance:** Jammu and Kashmir holds immense strategic importance for India due to its proximity to international borders. It shares borders with Pakistan, Afghanistan and China, and the development of road networks in this region is crucial for national security. The challenging terrains of the region, including mountainous areas, demand efficient road infrastructure to ensure the rapid mobilization of troops and equipment. In times of conflict or border tensions, these roads become essential for troop movement and reinforcement, enabling a quicker response to any security threats.
- **Tourism Industry:** J&K's natural beauty make it a prime tourist destination. Expanding and improving road networks in the region is vital for the growth of tourism. Accessible roads allow more tourists to visit, boosting the tourism industry and, consequently, the local economy. This improved connectivity enhances the appeal of the region as a tourist hotspot, generating revenue and employment opportunities in hospitality and related sectors.
- **Economic Development:** Road infrastructure is a cornerstone of economic development. Improved connectivity through well-maintained roads enables the transportation of goods and commodities. This promotes trade not only within the region but also with other parts of India. Additionally, better road networks attract investment in various sectors, including manufacturing and agriculture. As economic activity increases, it leads to job creation and improved economic opportunities for the local population, ultimately raising their standard of living.
- **Trade and Commerce:** J&K's geographic location places it in a strategically advantageous position for trade. It can serve as a trade hub connecting northern India with Central Asia and beyond. Well-developed road networks facilitate the smooth flow of goods, reducing transportation costs and making the region more attractive for businesses looking to expand their market reach. This increased trade activity benefits the local economy and strengthens the overall trade network between different regions.
- **Government Initiatives:** The Indian government recognizes the significance of infrastructure development, particularly in border regions like J&K. Initiatives such as the Pradhan Mantri Gram Sadak Yojana allocate funds for rural road development. These projects aim to improve road



connectivity in remote and underserved areas of J&K, enhancing accessibility for its residents and fostering overall development.

- **International Relations:** Bilateral and regional relations play a pivotal role in driving infrastructure development. Efforts to strengthen diplomatic ties with neighboring countries can lead to cross-border road connectivity projects. These initiatives promote economic cooperation, trade, and cultural exchanges. For example, road links with countries like Nepal or Bangladesh can boost regional trade, while cross-border roads with China and Pakistan can enhance diplomatic and economic relations, reducing tensions through increased connectivity and cooperation.

Upcoming Projects in the State

In the recent years, J&K has received a boost in road infrastructure development. In recent years, the government's relentless focus on improving road infrastructure in the Union Territory of Jammu and Kashmir (J&K) has ushered in a wave of transformation, revolutionizing connectivity and fostering economic prosperity across the region. This remarkable journey commenced in earnest after 2019 when the government directed its attention towards major highways, resulting in a considerable reduction in travel time between significant destinations within J&K.

Major Upcoming Projects	
<p>Jammu and Srinagar MetroLite</p>	<p>The Jammu and Kashmir administration has put forth a comprehensive plan to introduce the MetroLite system in its cities. This initiative encompasses a 25 km MetroLite line in Srinagar and a 23 km MetroLite line in Jammu. The Jammu Light Rail System, spanning 23 km, will stretch from Bantalab to Bari Brahmana, with 22 stations along the route. In contrast, the Srinagar Light Rail System will cover a 25 km distance, divided into two 12.5 km segments from Indira Nagar to HMT Junction and Hazuri Bagh Osmanabad, respectively, hosting a total of 24 stations, with 12 stations on each corridor.</p> <p>The Jammu MetroLite project, estimated at Rs. 4,825 crores in Phase I, will encompass 23 km of track, two elevated lines with 22 stations, and an interchange station at the Exhibition Grounds. In Phase 2, both lines will be extended, resulting in a total route length of 43.50 km, comprising four metro lines with 40 stations. The anticipated completion date for the Jammu metro is 2026.</p> <p>Similarly, the Srinagar MetroLite project, valued at Rs. 5,734 crores in Phase I, will involve 25 km of track, two elevated lines with 24 stations, and an interchange station at the Exhibition Grounds. Phase 2 will witness extensions of both lines, leading to a total route length of 35 km, featuring three metro</p>



	<p>lines with 34 stations. The projected completion date for the Srinagar metro aligns with that of Jammu, set for 2026.</p> <p>Phase I of the combined Jammu and Srinagar MetroLite projects will require a total investment of Rs. 10,599 crores, with funding support from the Japan International Cooperation Agency (JICA), providing Rs. 5,734 crores for Srinagar and Rs. 4,825 crores for Jammu.</p>
<p>Amarnath Marg Project</p>	<p>The 110-kilometer-long four-lane road project, known as Amarnath Marg, has received approval for construction in the Pahalgam region of Jammu and Kashmir. This project, with an estimated cost of Rs 5300 Crores, is a significant development. It's part of a broader effort to complete the four-laning of the Srinagar-Jammu National Highway, which, once finished, will significantly reduce travel time between the two capital cities to just three-and-a-half hours.</p> <p>Within this project, a 73-kilometer stretch from Khannabal to Chandanwari will be constructed at an estimated cost of Rs 1800 Crores. Additionally, a 10.8-kilometer-long tunnel will be built along the Sheshnag to Panjtarni route. These improvements will dramatically decrease the travel time from Srinagar to the Amarnath cave shrine, making it possible to reach the shrine in just 8-9 hours, a significant improvement from the previous three days.</p>
<p>Upgradation of Khellani Tunnel</p>	<p>The Uni-Directional Khellani Tunnel, located in the Doda district, is set to undergo a crucial upgrade to transform it into a two-lane structure. This project encompasses several improvements, including the addition of a paved shoulder and enhancements to its approach road on National Highway-244. The total length of this transformative endeavor spans 2.419 kilometers and falls under Package 3.</p> <p>The improved tunnel will ensure year-round accessibility. This development is expected to bring substantial economic benefits to the local community and residents of the region. Moreover, the Khellani Tunnel is an integral part of the Sudh Mahadev-Goha-Khellani-Chatroo-Khanabal National Highway. This highway will not only serve as an alternate route to Batote-Kishtwar but also provide all-weather connectivity to the Doda region. Importantly, it will shorten the distance between Doda and Kishtwar by 30 kilometers, thereby facilitating more efficient transportation and regional development.</p>



<p>Srinagar-Baramulla-Uri National Highway work</p>	<p>The Srinagar-Baramulla-Uri (SBU) highway is set to undergo significant development, with plans to transform it into a four-lane road from Narbal to Baramulla, and a double-lane road from Baramulla to Uri. The estimated cost for this project stands at approximately Rs. 823.45 crores. In addition to widening the highway, the project encompasses the construction of two vital bypasses at Pattan and Baramulla, as well as flyovers at Sangrama and Delina, all of which are expected to play a pivotal role in enhancing the flow of traffic and ensuring smoother transportation.</p> <p>The land acquisition process for this extensive project will involve more than 49 villages, with nine villages falling within the Narbal to Pattan stretch, another nine villages between Tappar and Sangrama, and seven villages designated for the construction of bypasses at Pattan and Baramulla. A total land area of 96.1497 hectares is slated for acquisition, with the majority of it, amounting to 57.553 hectares, earmarked for the development of the Pattan and Baramulla bypasses.</p>
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Road Infrastructure in Ladakh

Overview

Ladakh being a border area is of significant importance for national security as well as a popular tourist location thus underscoring the key role of developing a robust road infrastructure. Ladakh is connected to the mainland namely through two roads - Leh-Srinagar National Highway and Leh-Manali road. These two roads remain open only during the months of summer season and remain closed for more than 7 months during winter due to closure of the passes (Zojila, Rotang Pass, Baralacha, Changla). Leh District is connected to the Block Headquarter by roads, through a network of roads and Border Roads Organization (BRO) maintains most of the highway connecting the block head quarter and PWD maintains a road length of 1060 Kms. As some of the roads to the block head quarter passes through the world's highest motorable roads, it is frequently closed due to the avalanches and snowfall in the passes.



Since becoming a Union Territory in Oct 2019, the government has undertaken various development projects in Ladakh to promote national security, economic growth, infrastructure development and tourism destination. Some of the key road developments comprise -

- 195 km of road have been constructed and blacktopped in Ladakh under the Pradhan Mantri Gram Sadak Yojana (PMGSY) scheme, providing connectivity to villages.
- In addition to the PMGSY, nearly 500 km of roads were being built by different organisations in Ladakh as on Jan 2022.
- This is in addition to the 255 km of strategic roads to be upgraded and built by the BRO for rapid mobilisation of troops in Ladakh.
- Further, at least 10 bridges and eight tunnels were under construction for improving connectivity.
- About 150 km of operational roads & tracks have been constructed in the area of Northern Command of the Indian Army (as of Dec 2022)

The administration has initiated several infrastructure development projects in Ladakh, including the construction of new roads, bridges, and tunnels. For all-weather connectivity, the 14.15-km-long Zojila Pass Tunnel is under construction and the widening of the all-important, 230-kilometre Kargil-Zaskar National Highway is in progress along with the construction of several tunnels and bridges.

According to the FY 2022 Annual Report of the Ministry of Road Transport & Highways, there are 8 stretches with a length of 230 km at total project cost of Rs. 22.8 billion under construction by the National Highways & Infrastructure Development Corporation (NHIDCL).

2021 and 2022 Developments

In August 2021, BRO constructed the highest motorable road in Eastern Ladakh at 19,300 feet to boost the socio-economic condition and promote tourism in the region.

Following an MoU, signed in Sep 2021, between the Ladakh Administration and the BRO, five projects involving construction/improvement of roads and tunnels were assigned to BRO for development of connectivity in the hilly region. These included preparation of greenfield alignment and upgradation of major single lane roads to double-lane (NHDL specification) and tunnelling works. Upgradation of 4 major single lane roads which are used extensively by travelers to reach sought after tourist destinations had also commenced –

- 78 Km road Khalse to Batallik
- 50 Km road Kargil to Dumgil which also includes construction of a tunnel at Hambotingla to ensure seamless connectivity from Kargil to Batallik
- 70 km road Khalsar to Shyokvia Agham
- 31 Km Tangtse to Lukung



In Dec 2022, Rail India Technical and Economic Service (RITES) presented the Detailed Project Reports (DPRS) basis the completion of preliminary survey work and feasibility assessment for the construction tunnels of Namkila, Fotula, Hambotingla, Khardungla and Kela.

As of Dec 2022, a road was being created to afford substitute connectivity to Western Ladakh and the Zaskar Valley straight from the Manali road axis. Of this 298 km road, 65% work was completed, and the remaining expected to be completed by 2026. The road also consists of a 4.1-km twin-tube Shinkun La tunnel for establishing all-weather connectivity to Ladakh from Himachal Pradesh.

2023 Developments

- In Aug 2023, in a fresh infrastructure thrust at forbidding heights, the BRO started the construction of a high-altitude road at more than 19,000 feet in Ladakh’s Demchok sector to provide connectivity to one of the military’s farthest outposts in the sensitive sector, Fukche, which is three km from the contested Line of Actual Control (LAC).
- In June 2023, under Project HIMANK, the Ministry of Defence had invited bids for the construction of 30 Km road Sumdo Nidder Rhongo through the EPC mode with an estimated project value of Rs 1,121 million.
- In Feb 2023, the Union Cabinet approved the construction of the 4.1-km Shinkun La tunnel on the Nimu-Padam-Darcha road link to provide all-weather connectivity to the border areas of Ladakh. The tunnel is expected to be completed by Dec 2025 at a cost of Rs. 16.8 billion. Once completed, this tunnel is expected to be a game changer as it will enable swift all-weather movement of the army and heavy equipment. It will have significant implications for the deployment of forces and equipment in the Kargil-Siachen sector or Eastern Ladakh, as well as for all-weather development work in the region.

Outlook

After acquiring the UT status, Ladakh is witnessing rapid development in terms of connectivity through all-weather roads, ropeways, rails, and tunnels, bridges etc. Work on infrastructure projects like roads and tunnels has gained momentum. To oversee the infrastructure development in Ladakh, the government sanctioned the formation of an Integrated Multi-Purpose Infrastructure Development Corporation in July 2021 which will work as the leading construction agency for infrastructure development in Ladakh. The Vision document ‘Vision 2050 for UT of Ladakh’ also outlines the challenges and aspirations/development strategies of Ladakh in areas of agriculture & horticulture, industries & manufacturing, tourism, connectivity and transport (roads, highways, public transport), power and energy, water supply and waste management, education, healthcare etc.

Current Scenario	Future Scenario
- Only 2 roads connecting Ladakh to rest of India, with limited access during winter season	- Connectivity by all-weather roads by 2030



<ul style="list-style-type: none"> - Approx. 4300 Km of Road Length (39% under PWD & 61% under BRO) - 54% villages (25% population) do not have access to 'Pucca Roads - Majority of roads with intermediate / 2 lane configuration (6-10 mt.) 	<ul style="list-style-type: none"> - Upgradation in capacities of regional road network - Construction of roads and tunnels at strategic and high altitude locations to strengthen national security in progress - Vision 2050 for sustainable development across key areas including building strong road network
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Source: Vision 2050 for UT of Ladakh



Government Agencies Involved

The following government agencies in Jammu and Kashmir are responsible for tunnel and road infrastructure:

- **Public Works (R&B) Department, Jammu and Kashmir:** The R&B Department is responsible for the construction and maintenance of roads and bridges in the Union Territory. The department also oversees the construction of tunnels.
- **Jammu and Kashmir Roads and Buildings Development Corporation:** The JKR&BDC is a public sector undertaking responsible for the construction of major road and bridge projects in Jammu and Kashmir. The corporation has also executed several tunnel projects in the UT.
- **Jammu and Kashmir Infrastructure Development Corporation:** The J&KIDC is another public sector undertaking responsible for the development of infrastructure projects in Jammu and Kashmir. The corporation has also executed several road and tunnel projects in the UT.

Objectives of these agencies:

- To provide safe and efficient road and tunnel connectivity to the people of Jammu and Kashmir.
- To improve the economic development of the Union Territory by providing better connectivity to remote areas.
- To reduce travel time and costs.
- To boost tourism and trade in Jammu and Kashmir.

How they are executing these objectives:

The R&B Department, JKR&BDC, and J&KIDC are executing their objectives by:

- Constructing new roads and bridges.
- Widening and improving existing roads.
- Constructing tunnels to improve connectivity to remote areas and reduce travel time.
- Upgrading road safety features.
- Maintaining roads and bridges in good condition.

Examples of programs and how they are being executed:

- **Zojila Tunnel:** The Zojila Tunnel is a 13.14 km long tunnel under construction that will connect the Kashmir Valley with the Ladakh region. The tunnel is being constructed by the JKR&BDC at a cost of Rs 6800 crore. The tunnel is expected to be completed in 2025 and will provide all-weather connectivity to the Ladakh region.
- **Katra-Qazigund Expressway:** The Katra-Qazigund Expressway is a 200 km long expressway under construction that will connect Katra, the base camp of Vaishno Devi Shrine, with Qazigund, a town on the Srinagar-Jammu National Highway. The expressway is being constructed by the R&B



Department at a cost of Rs 23,000 crore. The expressway is expected to be completed in 2024 and will reduce travel time between Katra and Qazigund from 7 hours to 3 hours.

- **Chenani-Nashri Tunnel:** The Chenani-Nashri Tunnel is a 9.28 km long tunnel that connects the Chenani and Nashri villages in Jammu and Kashmir. The tunnel is the longest tunnel in India and was opened to traffic in 2017. The tunnel has reduced travel time between Jammu and Srinagar from 6 hours to 3 hours.
- These are just a few examples of the many road and tunnel projects that are being executed in Jammu and Kashmir. The government is investing heavily in the development of road and tunnel infrastructure in the Union Territory to improve connectivity and boost economic development.

Border Programs in the Region

The Government of India has launched several border programs in Jammu and Kashmir (J&K) for tunnel and road infrastructure. These programs are aimed at improving connectivity to remote and border areas, boosting economic development, and enhancing national security.

The following are some of the key border programs for tunnel and road infrastructure in J&K:

Border Infrastructure and Management Scheme (BIMS): The BIMS is a flagship program of the Government of India for the development of infrastructure in border areas. The program includes the construction and improvement of roads, bridges, tunnels, and other infrastructure projects.

Prime Minister's Development Package (PMDP): The PMDP is a special package of Rs 80,000 crore announced by the Prime Minister of India for the development of J&K. The package includes several projects for the development of road and tunnel infrastructure in the UT.

Bharat Mala Pariyojana (BMP): The BMP is a highway development program launched by the Government of India in 2015. The program includes the construction of several new highways and the improvement of existing highways across the country. The BMP also includes several projects for the development of road and tunnel infrastructure in J&K.

Objectives of these programs:

- To improve connectivity to remote and border areas in J&K.
- To boost economic development in border areas.
- To enhance national security by improving the mobility of security forces.
- To provide better social and educational facilities to the people living in border areas.

How they are executing these objectives:

The BIMS, PMDP, and BMP are being executed by the Ministry of Home Affairs (MHA), Ministry of Road Transport and Highways (MoRTH), and other relevant ministries and departments. The MHA is responsible for the overall coordination of these programs. The MoRTH is responsible for the construction and



improvement of roads and highways. Other relevant ministries and departments are responsible for the construction of bridges, tunnels, and other infrastructure projects.

Ongoing and Upcoming Projects

Railway projects:

Katra-Banihal Railway Project: This 111 km long railway line is under construction and will connect Katra, the base camp of Vaishno Devi Shrine, with Banihal, a town on the Jammu-Srinagar National Highway. The project includes the construction of 27 tunnels with a total length of 32 km. The project is expected to be completed in 2024.

Baramulla-Kupwara Railway Project: This 39 km long railway line is under construction and will connect Baramulla, a town in North Kashmir, with Kupwara, a district headquarters in North Kashmir. The project includes the construction of 12 tunnels with a total length of 10 km. The project is expected to be completed in 2025.

Udhampur-Srinagar-Baramulla Railway Line (USBRL): This 272 km long railway line is under construction and will connect Udhampur, a town in Jammu, with Baramulla, a town in North Kashmir. The project includes the construction of 75 tunnels with a total length of 164 km. The project is expected to be completed in 2027.

Hydro projects:

Pakal Dul Hydroelectric Power Project: This 1000 MW hydroelectric power project is under construction on the Chenab River in Kishtwar District, Jammu and Kashmir. The project includes the construction of a 300 m high dam and a 12.7 km long headrace tunnel. The project is expected to be completed in 2026.

Ratle Hydroelectric Power Project: This 850 MW hydroelectric power project is under construction on the Chenab River in Kishtwar District, Jammu and Kashmir. The project includes the construction of a 133 m high dam and a 10.6 km long headrace tunnel. The project is expected to be completed in 2023.

Sawalkot Hydroelectric Power Project: This 1856 MW hydroelectric power project is under construction on the Chenab River in Kishtwar District, Jammu and Kashmir. The project includes the construction of a 161 m high dam and a 10.8 km long headrace tunnel. The project is expected to be completed in 2030.

Urban transport projects:

Srinagar Ring Road Project: This 50 km long ring road is under construction around the city of Srinagar. The project includes the construction of 15 tunnels with a total length of 12 km. The project is expected to be completed in 2026.



Jammu Ring Road Project: This 55 km long ring road is under construction around the city of Jammu. The project includes the construction of 10 tunnels with a total length of 8 km. The project is expected to be completed in 2025.

Irrigation projects:

Ravi-Tawi Irrigation Project: This major irrigation project is under construction in Jammu and Kashmir. The project includes the construction of a canal system to irrigate over 100,000 hectares of land in the Jammu Division. The project also includes the construction of several tunnels and road stabilization works. The project is expected to be completed in 2027.

Tawi-Manasbal Irrigation Project: This medium irrigation project is under construction in Jammu and Kashmir. The project includes the construction of a canal system to irrigate over 50,000 hectares of land in the Kashmir Division. The project also includes the construction of several tunnels and road stabilization works. The project is expected to be completed in 2025.

Water supply and sanitation projects:

Jammu and Kashmir Urban Sector Development Investment Programme: This major urban development program is under implementation in Jammu and Kashmir. The program includes the construction of water supply and sanitation infrastructure in several cities and towns across the UT. The program also includes the construction of several tunnels and road stabilization works.

Key Challenges

The following are some of the key challenges faced during road infrastructure projects in Jammu and Kashmir:

Difficult terrain: Jammu and Kashmir is a mountainous region with a difficult terrain. This makes it challenging to construct roads and bridges, especially in remote areas. Construction workers often have to work in hazardous conditions, and it can take a long time to complete projects. The use of heavy machinery is also limited in some areas due to the steep slopes and narrow valleys.

Extreme weather conditions: Jammu and Kashmir experiences extreme weather conditions, including heavy snowfall, landslides, and avalanches. This can damage roads and bridges and make it difficult to carry out construction and maintenance work. Heavy snowfall can block roads for long periods of time, and landslides and avalanches can damage roads and bridges beyond repair.

Security concerns: Jammu and Kashmir is a sensitive region facing security challenges. This can make it difficult to mobilize resources and manpower for road infrastructure projects. Contractors may be hesitant to work in the region due to the risk of attacks, and local workers may be reluctant to work on projects located in remote areas.

Land acquisition: Land acquisition is a major challenge for road infrastructure projects in Jammu and Kashmir. This is due to the fact that the land is mostly owned by private individuals and communities, and it



can be difficult to negotiate compensation agreements. In some cases, projects may have to be abandoned due to land acquisition issues.

Environmental concerns: Jammu and Kashmir is a fragile ecosystem. This means that road infrastructure projects need to be carefully planned and executed to minimize environmental damage. For example, projects may have to avoid sensitive areas such as forests and wetlands.

Despite the challenges, significant progress has been made in developing road infrastructure in Jammu and Kashmir in recent years. The government is committed to improving connectivity in the region and to providing better roads and bridges for the people of Jammu and Kashmir.

Growth Prospects in Indian Road Infrastructure

The Indian Road sector is experiencing significant growth and is set to expand further in the future. The government has recognized the importance of improving transportation infrastructure and has taken initiatives to enhance the road network in the country. It is estimated that India will need to spend \$4.51 trillion on infrastructure by 2030 to achieve its vision of becoming a \$5 trillion economy by 2025. In line with this, the National Infrastructure Pipeline (NIP) has allocated a total capital investment of Rs 20.34 trillion for the highways sector by 2025.

Under the NIP, the government has already allocated INR 20.33 trillion for road infrastructure development during the period of FY 2020-2025. The budget for 2023-24 includes 100 critical transport infrastructure projects to improve last- and first-mile connectivity for various sectors such as ports, coal, steel, fertilizers, and food grains. These projects, with an investment of Rs 75,000 crore, including Rs 15,000 crore from private sources, have been prioritized.

The government has set ambitious targets for the highway sector, with plans to spend approximately Rs 17 trillion within the five-year period of FY 2020-2025. This investment will be focused on the construction of expressways, economic corridors, coastal and port connectivity highways, and border roads or strategic highways. The aim is to increase the total highways network to two lakh kilometers by 2025.

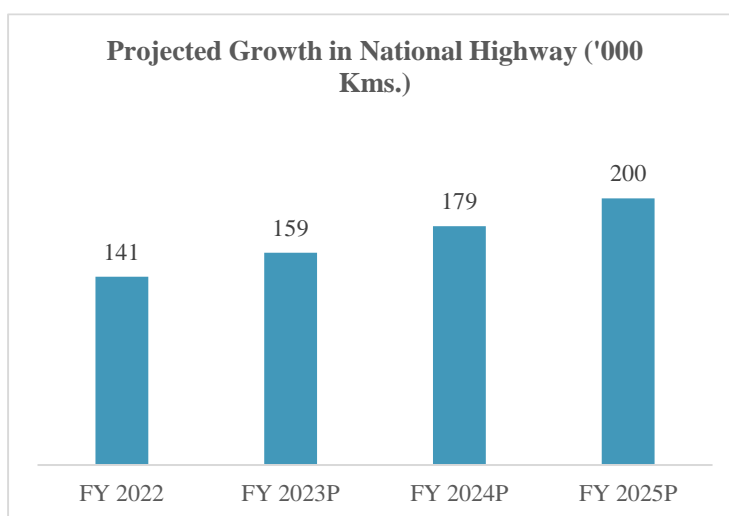
Furthermore, the government is emphasizing the need to adopt green technology in road construction. The National Rural Infrastructure Development Agency is targeting the construction of 50,000 km of rural roads by 2030, with a focus on utilizing green technology. In addition, the government plans to construct 26 Green Highways in India by 2024, highlighting its commitment to sustainable infrastructure development.

The growth potential of the Indian road sector is immense. The highway construction industry is projected to experience a significant growth rate of 133% by 2025. India aims to achieve a target of 60 km of road construction per day, already building a record-breaking 30 km per day. The government has also set specific targets for expressways and expects to see reduced travel time between major cities such as Delhi, Dehradun, Haridwar, Jaipur, Chandigarh, and Amritsar.



The Indian Road sector is poised for substantial growth in the coming years. With increased capital expenditure, improved infrastructure, and a focus on sustainability, India aims to enhance connectivity, boost economic development, and create more efficient transportation systems. The government's commitment to the development of the road sector will play a vital role in realizing its vision for a \$5 trillion economy and meeting the growing infrastructure needs of the country.

The Government has taken various measures to reduce delays and fast track many stuck projects to increase the per day construction target in the current fiscal . In the Union Budget 2023, the government has proposed an outlay of nearly INR 1,991.1 Bn Bn for the Ministry of Road Transport and Highways. This is 51.8% higher than the revised estimates for 2021-22. The increasing government expenditure on the road network development in the country will give boost to the industry in coming years.



Source: Dun & Bradstreet Research

Undeterred by ongoing challenges, the Ministry has set an ambitious target of constructing 18,000 kms of national highway in FY 2023 increasing the per day construction target to 40 Kms per day. NHAI Chief also conveyed that all the balance work of Bharatmala phase-I will be tendered out by FY 2024 that will push the road construction. As per the target specified, the total national highway length that is planned to be achieved by FY 2025 is 2,00,000 kms which translate into a CAGR of 12.2% between FY 2022-25.





Competitive Landscape: Notable Players

Road infrastructure sector is highly fragmented with many large and small players. Large players dominate the construction of highways as road projects need high up-front capital investment, have long gestation period and uncertain returns have made highway development segment unattractive to smaller players. Moreover, stringent technical ability norms, experience and operational and financial parameters defined by NHAI for participating in PPP projects, limit entry of small player in large highway construction projects.

Consequently, large players like dominate National highway development whereas small players dominate in construction of urban / rural / district roads as the bidding norms set by state agencies are relatively less stringent. In addition, the scope for these projects is limited making it unviable for larger companies that dominate the large-scale road development projects. Subsequently, smaller contract firms dominate this segment.

Annual Financial Comparison of Major Players

Companies	Revenue in (INR Bn)			Net Profit (INR Bn)		
	FY 22	FY 23	Y-o-Y Change	FY 22	FY 23	Y-o-Y Change
G R Infraprojects Ltd	79.3	81.5	2.9%	7.6	8.5	12.0%
P N C Infratech Ltd	60.8	69.8	14.8%	4.5	6.1	36.5%
I R B Infrastructure Developers Ltd	25.7	41.5	61.4%	3.2	3.7	16.4%
H G Infra Engg. Ltd.	35.8	43.8	22.4%	3.4	4.2	24.4%
K N R Constructions Ltd	32.7	37.4	14.4%	3.8	5.0	30.7%

Source: CMIE Prowess IQ

Key Financial Parameters

Year	Raw material expenses	Power & Fuel	Salaries & Wages	SGA Expenses	Interest Expense	PBDIT Margin	Net Margin
FY 2019	43.0%	0.1%	5.1%	0.0%	2.7%	20.6%	10.7%
FY 2020	33.0%	0.2%	5.2%	0.0%	3.2%	20.2%	9.7%
FY 2021	37.4%	0.1%	5.0%	0.1%	3.6%	19.7%	9.0%
FY 2022	42.9%	0.2%	5.2%	0.0%	3.8%	20.8%	9.6%
FY 2023	40.3%	0.1%	5.1%	0.0%	2.1%	18.2%	10.1%

Source: CMIE Prowess IQ, Based on sample of 5 companies

On cost front, raw material expense and other expenses such as land acquisition cost, maintenance, and transportation have stood as the largest component in the cost structure. Cement, Steel, aluminum are major



raw material costs for the road construction companies. Aluminium, Billet, Channel, Rebar, steel round, wire rod, are major metal product that are used in road, highway, bridges, and tunnel construction.

The Cost of raw material consumed grew substantially in FY 2022 and 23 which reflect higher input consumption to fulfill the project completion, cost overrun due to delay in completion of previously announced projects and on the back of increasing prices of key input material used.

Notable Players in UT of J&K and Ladakh

Company	Brief
Jammu And Kashmir Projects Construction Corporation Limited	<p>The J&K Projects Construction Corporation Ltd., a government-owned company was established in 1965, Over the years, this corporation has executed several infrastructure projects in the domains of bridges and buildings.</p> <p>Some of the notable projects executed by the firm include:</p> <ul style="list-style-type: none"> • WatalbaghBobsipora Bridge at Ganderbal • PalporaShalteng Bridge at Srinagar. • VethporaSoiteng Bridge at Srinagar. • Bridge over NallahVishowKelamGund to Ashimji, Kulgam • Jetty Bridge at Baramulla • Bridge over RiverUjh at Jothana, Kathua. • Shiva Dal Bridge at Doda.
SRM Contractors	<p>SRM Contractors Private Limited, established on September 4th, 2008, in Jammu, has emerged as a key player in infrastructure construction industry in UT of J&K and Ladakh. The Company has a executed several road, tunnel and slope stabilisation projects. The Company, over its 15 years of experience has developed technical capabilities to execute projects in hilly / challenging terrain in the region.</p> <p>They undertake various infrastructure works for government departments, including the J&K Economic Reconstruction Agency, J&K Rural Roads Development Agency (JKRRDA), Konkan Railway Corp. Ltd., Border Roads Organization, and PW (R&B) Department, Jammu. Their projects are primarily concentrated in the Jammu and Ladakh regions of Jammu and Kashmir.</p> <p>Some of their notable projects include:</p> <ul style="list-style-type: none"> • Construction of Tunnel T-15, Part Tunnel T-14 including Bridge No. 61 (between km 73.785 to 86.848 km approx) on Katra-



Banihal section of Udhampur-Srinagar-Baramulla New BG Railway Line Project (Package T-15)

- Rehabilitation and up-gradation to 2 lane with paved shoulder from design km 74.350 to km 90.150 (package IV) under 13 TF on Akhnoor - Poonch road (NH- 144A) in the state of Jammu & Kashmir under BRO on EPC mode.
- Construction of wider section of Tunnel for a length of 85m (appox) from km 42/977.50 to 43/062.50 in Tunnel no. 5 (Portal- I) and ancillary work on the Katra-Dharam Section of the Udhampur-Srinagar-Baramulla New BG Railway Line Project, Jammu & Kashmir
- Design and construction of Reinforced Earth Embankments at Bridge no. 40, 41 & 42 on Katra-Dharam section of Udhampur-Srinagar-Baramulla Rail link Project in the state of Jammu & Kashmir. The contract which was valued at INR 9,643.28 lakh involved slope stabilisation work.

Some of the notable upcoming projects include:

- Construction Of Realignment between Pandrass- Pashkyum (Net Length-27.10 Km) on Road Zozila-Kargil-Leh (NH-1) To 2 Lane Specifications I.E. Drass Realignment (9.30 Km), Kharboo Realignment (6.30 Km) & Kargil Alignment (11.50 Km) under Project Vijayak (Bro) in the Union Territory. of Ladakh on Epc Mode.
- Widening and up-gradation to 2-lane with paved shoulder configuration and geometric improvement from km 0.000 to km 16.990 on Chenani – Sudhmahadev section of NH-244 in the state of Jammu & Kashmir
- Construction Of Cut and Cover Tunnel Having 520 Mtrs Length Between Km 51+950 to Km 52+500 And 400 Mtrs Length between km 52+550 To Km 52+950 including Minor Bridge on D-S-DBO Road Under Project Himank in Ladakh (Union Territory) On EPC Mode (Net Tunnel Length 920 Mtrs).
- Construction of Reinforced Earth Wall and Road Work for our Project i.e. Construction of Proposed Buildings including Main Station Building, DG Room, Guest House, RPF & GRP Barracks, RPF & GRP Posts and Road for Sumber Station Yard of USBRL Project, J&K. (Package: Buildings & Roads/Sumber Station Yard)

SGF Infra Private Limited

SGF Infra started operations in the bridge construction space, and has since then diversified into other civil construction projects spanning roads and highways.

Some of their noteworthy projects include:

- Design and Construction of a 135-meter-long steel bridge of Class A Loading over River Chenab at Dhamkund, Ramban.
- Construction of a 74-meter Span Steel Girder Through-Type Motorable Bridge on Chassana to Kalaban Road.



	<ul style="list-style-type: none"> • Design and Construction of a 30-meter Span Pmt Steel Girder Bridge with RCC Decking over Nagrah Nallah (Nagrah Bridge) on Dul Galhar Road under I 18 RCC/35 BRTF of Project Beacon in J&K State. • Design and construction of an 80-meter-long bridge with Steel Super Structure over Kunnore Nallah on Sanku Sapila Mulabek road in 126 RCC/762 BRTF under Project Vijayak in J&K. • Construction of a road from Bhimdas Package JK14-94 Stage I Gagger to Phase VII. • Design, Fabrication, Launching, and Commissioning of the Construction of a 60-meter Span Double Lane steel girder Motorable Bridge with RCC decking over the Indus River at Choglamsar. • Design and Construction of an 80-meter-span single-lane steel truss Motorable Bridge over River Shayok at Thang Nobra. • Construction of a road from Dagair to Panaya under Package No. JK05-62 in Block Khour, Phase VII.
<p>MCCS Infra Pvt. Ltd.</p>	<p>MCCS Infra Private Limited is operating in the civil construction project space in the region for the past two decades. The Company has executed projects including tunnel construction, the development of bridges, and sub stations.</p> <p>Some of their notable projects include</p> <ul style="list-style-type: none"> • Construction of BG (single line) Tunnel T-39 P2 on the Karalee section of the Udhampur-Srinagar-Baramulla Rail link Project • Construction of piers at Bridge No.61 and the development of roadway and structures in the Udhampur section
<p>Jehlum Construction Co</p>	<p>Jehlum Construction Co. (JCC) is a partnership firm formed in 2010, headquartered in Srinagar, Jammu & Kashmir. JCC specializes in civil works, focusing on the construction of roads, bridges, tunnels, ports, harbors, and runways.</p>
<p>New Jehlum Construction Co</p>	<p>New Jehlum Construction Co. (NJCC) was established in 1996 and is based in Jammu. NJCC primarily engages in the construction, improvement, widening, and strengthening of roads, catering to both state and central government departments. Their clientele includes esteemed organizations such as the Public Works Department (Jammu</p>



and Kashmir), Border Roads Organisation (BRO), and the National Highways Authority of India.

