



Confederation of Indian Industry

THE INDIAN

roads

and HIGHWAYS

Sector



Emerging trends and roadmap for the future.

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FOREWORD

India has become the world's 5th largest economy and has entered into an era where infrastructure is at the core of country's economic development. Infrastructure development is crucial to achieve the Vision of India@2047 to become a \$ 40 trillion economy and be reclassified from a developing economy to a developed economy.

In the recent years, the Government of India together with the States has embarked on a series of measures to accelerate infrastructure development. The National Infrastructure Pipeline (NIP) is a step in this direction. Introduced in the year 2019, the NIP emphasizes social and infrastructure projects including energy, roads, railways, and urban development projects worth INR 102 lakh crores. Under the NIP, the Roads & Highways Sector remains one of the main focus areas with almost 32% of the outlay dedicated to the sector.

The Roads & Highways Sector plays a critical role in the growth of Indian economy as around 64.5% of goods are transported via road and nearly 90% of passenger traffic is by road. The Government of India's efforts to fasten pace of construction in the roads & highways sector is commendable. The Ministry of Road Transport & Highways, Government of India has set an ambitious target of constructing 45 Kms of highways a day this year.

Maintenance of expressways and highways is also going to be a big business in near future. Digitisation can play an important role in keeping the highways well maintained. New techniques for road maintenance are the need of the day.

However, there are certain challenges being faced by the sector that need to be addressed. Apart from the COVID-19 induced challenges in the past, sluggish land acquisition procedures and substantial hikes in land prices are the primary factors that contribute to slow progress in road construction. In addition, the issues associated with the availability of construction materials & machinery, timely completion of projects, trained human resources, and safety concerns amongst others are being faced by the developers.

In order to overcome these challenges there is need to have broad based consultations with active involvement of all the stakeholders to chalk out a long term strategy for Roads and Highways.

PREFACE

India, which already has one of the world's largest road networks, needs an enormous number of new roads throughout the country. India has embarked on a rapid pace of road development since after late 1990s by giving a high priority to highway development. The National Highway Development Programme (NHDP) was the first major programme launched in 1997 to develop a large highway network across the country. The Public Private Partnerships (PPP) was adopted as a means of road and highway development in India starting from 2001, given the larger challenges and the need for leveraging private investments into the sector.

The financial year 2020-21 (FY21) began amidst a global pandemic, the management of which led to countries adopting unprecedented measures that brought the economy to a grinding halt. The lockdown and the corresponding restrictions on local and global movement of people and goods, except for essential goods and services, was an exogenous shock that posed considerable challenges to the economy, created uncertainty, was responsible for extensive loss of livelihoods and led to the displacement of people. The unlocking of the economy in a phased manner has helped the economy to get back on its feet. The rebuilding of the Indian economy is hinged on various reform measures aimed at addressing concerns of businesses and support to livelihoods.

India's Road Sector at a Glance

One of the largest road network in the world

- India has the second-largest road network in the world, spanning a total of 6.4 million kilometres (kms). This road network transports 64.5% of all goods in the country and 90% of India's total passenger traffic uses road network to commute. Road transportation has gradually increased over the years with improvement in connectivity between cities, towns and villages in the country.

Rising budget allocation by the Indian Government

- Under the Union Budget 2023-24, the Government of India has allocated Rs. 2.70 lakh crore to the Ministry of Road Transport and Highways.
- The Government of India has allocated Rs. 111 lakh crore (US\$ 13.14 billion) under the National Infrastructure Pipeline for FY 2019-25. The Roads sector is expected to account for 18% capital expenditure over FY 2019-25.

Growing private sector involvement

- In FY22, private sector invested Rs. 15,164 in roads.
- As on December 2019, 824 projects were recommended for development by Public Private Partnership (PPP) Appraisal Committee.

Expansion of the national highways

- In December 2020, the Ministry of Road Transport and Highways proposed to develop additional 60,000 kms of national highways (in the next five years).
- The ministry also intends to improve connectivity for 100 tourist destinations and construct bypasses for 45 towns/cities.
- In June 2021, the Ministry of Road Transport and Highways constructed 2,284 kms of national highways compared with 1,823 kms in June 2020.

Foreign investment for infrastructure sector

- Indian Government and Asian Development Bank signed US\$ 500 million loan agreement to build the longest bridge across river Ganga, in Bihar. The bridge is expected to be ready by December 2021.

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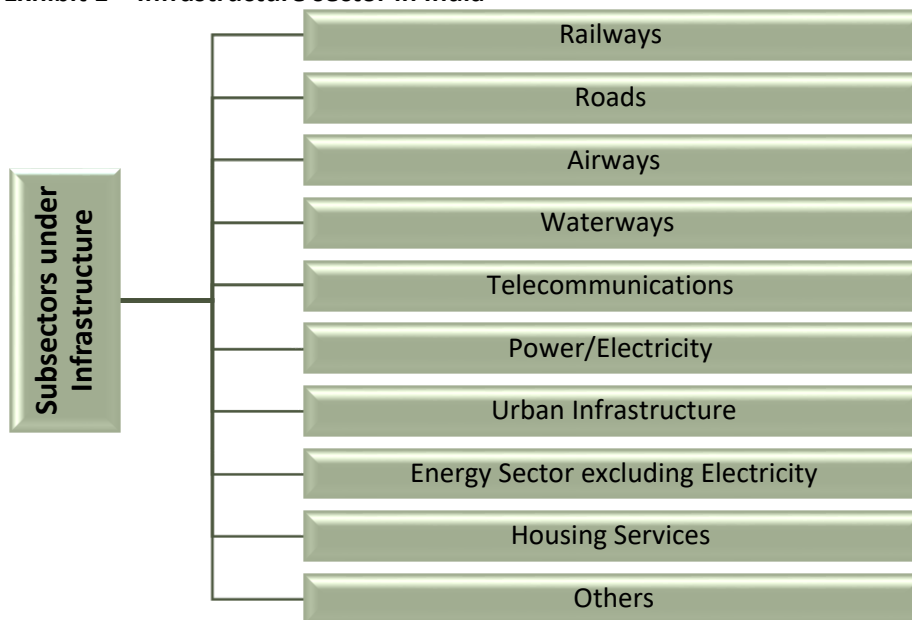
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Chapter 1: Infrastructure Spending and Economic Growth

Investment in the infrastructure involves funding for the construction of the physical assets like bridges, roads, highways, sewage systems, or energy. A stable and steady cash flows in the infrastructure sector with appropriate execution of suitable plans are crucial for the development of any country.

Proper development of infrastructure in a country requires greater amount of investment along with long gestation period. It is believed that greater amount of investment in the infrastructure can affect the capital amount and cause trade and capital deficit in the country.

Exhibit 1 – Infrastructure sector in India



However, Infrastructure spending is expected to have a multiplier effect on overall economic growth, primarily based on the Keynesian theory that aggregate demand can be reactivated by increasing public expenditure. In an increasingly globalising world, availability of good quality infrastructure is a crucial factor in attracting foreign investments. Availability and accessibility of adequate infrastructure in a country on par with international community is an indicator of the presence of high quality of life.

Exhibit 2 – A glimpse of infrastructure supporting economic growth

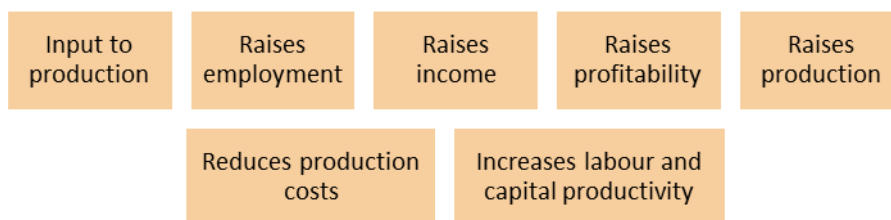
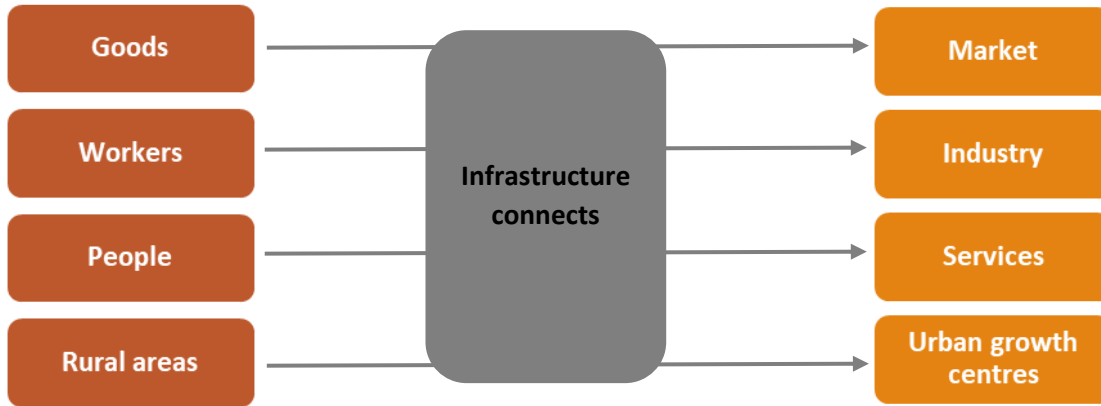
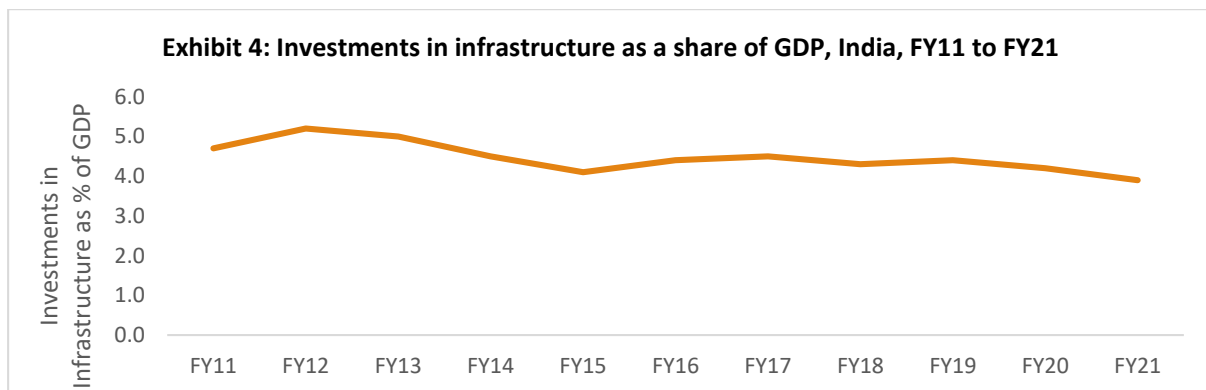


Exhibit 3 – A glimpse of transformation in an economy with the growing infrastructural activities



Infrastructure enables trade, powers businesses, connects workers to their jobs, creates opportunities for struggling communities and protects the nation from an increasingly unpredictable natural environment. From private investment in telecommunication systems, broadband networks, freight railroads, energy projects and pipelines, to publicly spending on transportation, water, buildings and parks, infrastructure is the backbone of a healthy economy.



Source: Statista, LSI Research

In FY21, India’s investment in infrastructure was **4.2%** of its GDP. Between FY11 to FY21, the maximum share of infrastructure investment in GDP was **5.2%** in FY12.

Measuring infrastructure performance is required for decision making purposes to improve the availability and capacity of existing infrastructure and extend it in other directions as well. Therefore, to create and manage good quality infrastructure, we need to have some measures of infrastructure.

Measuring the infrastructure will serve following purposes:

- Assess the condition of the existing assets
- Evaluate the extent to which the infrastructure meets current demand
- Assess whether infrastructure is likely to be able to meet demand in the future

- Benchmarking to compare one infrastructure availability with others.

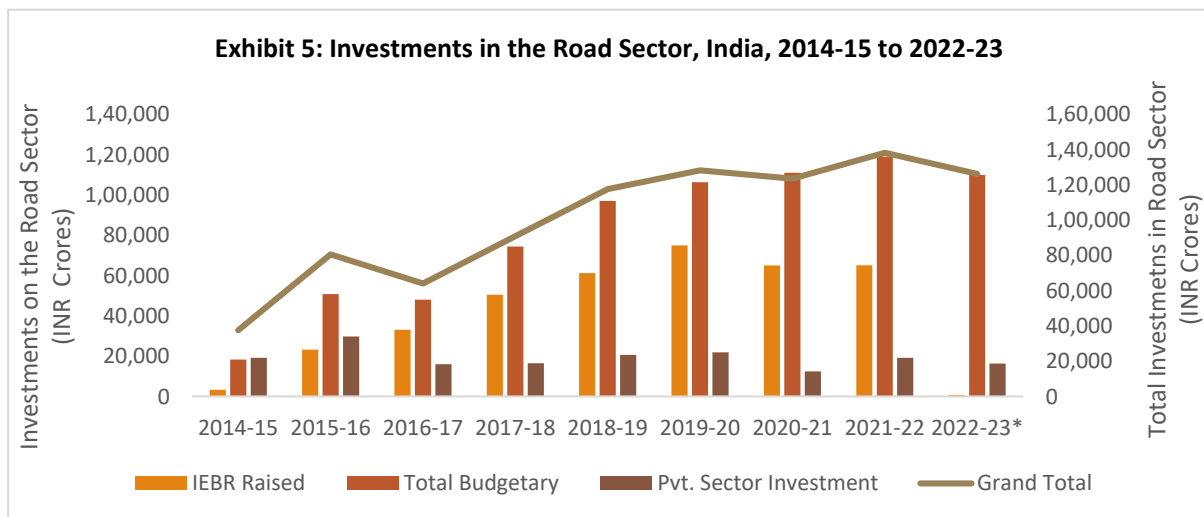
Adequate investment in developing infrastructure in India is necessary for the economy. Inadequate infrastructure not only holds back economic development, it also causes additional costs in terms of time, effort and money of the people for accessing essential social services such as healthcare and education.

Investment in Road Sector and Economic Growth

A well-planned pipeline and well-developed infrastructure can lead to the creation of valuable assets, build investor confidence, increase revenue and finance sources, grow businesses, generate employment, improve ease of living and enable inclusive growth, it added. The world spends more than \$2.5 trillion a year on infrastructure, but \$3.7 trillion a year will be needed through 2035 just to keep pace with projected GDP growth.

Given the significance of road and highway infrastructure to economic development as well as movement of goods and services within the country, there remains a continued need to expand and strengthen the road network across the country.

Road transportation is large consumer of space and has high maintenance costs, both for vehicles and infrastructures. They are mainly linked to light industries where small batches of freight are required to be transported. They are useful for everyday movement of people to their workplaces or to meet every day needs. For efficient road transportation we need good quality roads with proper signage and traffic regulation.



* Till 31.12.2022. Source: MoRTH Annual Report 2022-23, LSI Research

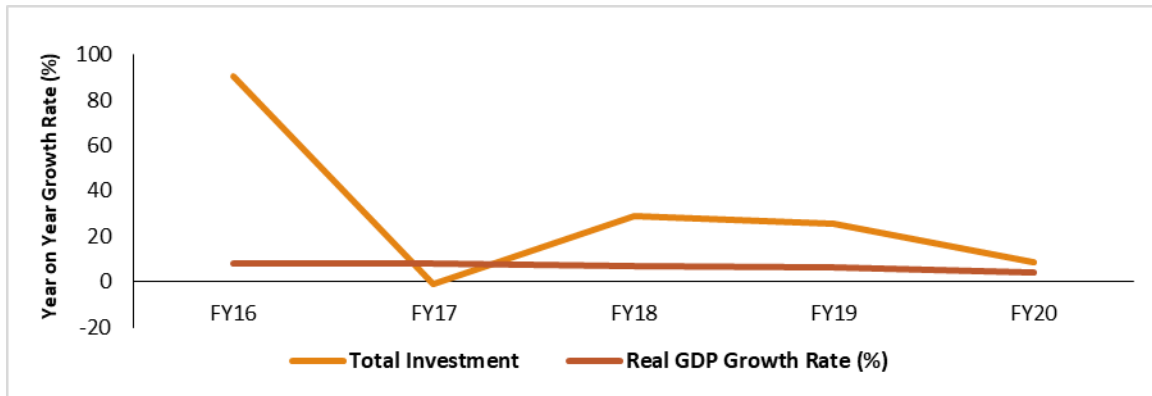
The total road investment had grown at the CAGR of **27.18%** between 2014-15 to 2021-22. Despite the falling trend, the share of budgetary support from the government has been maximum throughout this whole period among all the other components in total road investment.

Exhibit 6 – Share (%) in the total road investment, India, 2014-15 & 2021-22

Year	Total Budgetary Support	IEBR (Internal and Extra Budgetary Resources)	Private Sector Investment
2014-15	48.83	8.89	51.17
2021-22	86.10	47.14	13.90

Source: MoRTH Annual Report 2022-23, LSI Research

Exhibit 7 – Growth in the road investment and economy, India, FY16 to FY20



Source: StatisticsTimes.com, Economic Survey - Union Budget-FY21, LSI Research

Stimulating economic growth and development of road infrastructure in economical lagging regions is the goal of many countries. This is because road infrastructure plays a crucial role by providing mobility for the efficient movements of people and goods, as well as providing accessibility to a wide variety of commercial and social activities. To achieve a sustainable economic growth, focusing on road infrastructure development is crucial.

Creation of road transport infrastructure, through its direct and indirect effects, has a bearing on sustainability of growth and overall development of a country. It provides knowledge spill overs resulting from the whole agglomerated area via network dynamic externalities.

Good transport infrastructure can enhance labour mobility in the same way as good energy infrastructure can deliver low-cost power to fuel industry. When it comes to macroeconomic health, however, large numbers of politicians and economists now make the case that a lot more State-led infrastructure investment is needed to boost growth.

There are two separate arguments for this:

1. Infrastructure spending is a useful tool of Keynesian economics. This says that when an economy is in recession or slowing, and unemployment is high, government spending to finance and/or build infrastructure can help alleviate unemployment directly and have a strong multiplier effect on the economy more generally.
2. Infrastructure spending can actually enhance the productive potential of the economy – improving its supply-side. This argument says that greater State financed investment in

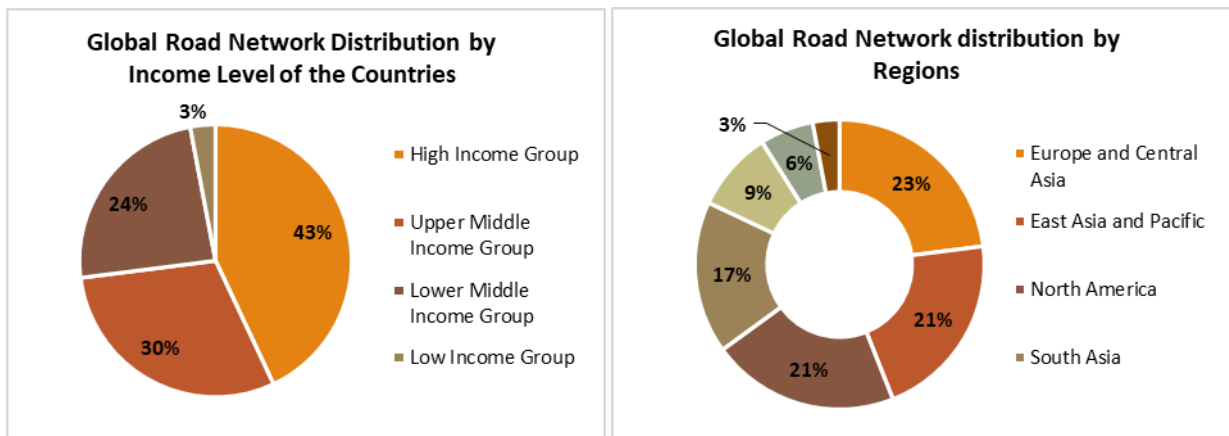
infrastructure can boost the productive potential of the economy by greasing the wheels of economic activity in future.

For the Indian economy, theory 2 will hold good where increase in infrastructure spending calls for more spending to boost the supply-side. They point to low interest rates at the moment and say that this is an opportune time for the government to invest in roads, rail, energy, housing and ports.

Chapter 2: Indian Road Sector – Market Overview

The expansion of the road network is a crucial part of the overall infrastructural growth in any country. Connectivity is an inseparable part for a growing economy. A strong and reliable road network link market places, connects the people, help them to reach faster in the required places, fastens the flow of services across different sectors, improves the supply chain management by allowing the businesses, industrial and agricultural hubs to supply the produced goods in different parts of the country or across the globe.

Exhibit 8 – Global Road network distribution

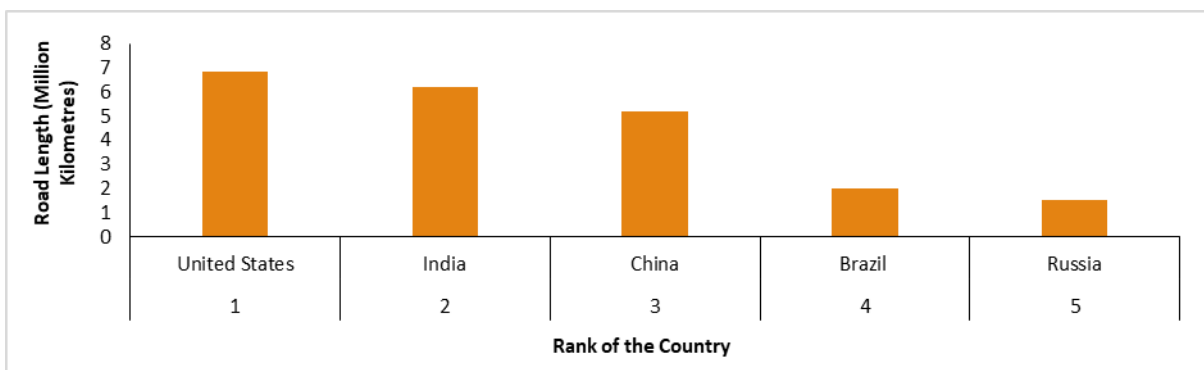


Source: International Road Federation, LSI Research

India, the 7th largest country has the 2nd largest road network in the world. The comparison of road network between India and other countries has been further discussed in Chapter 7.

India has various plans for the expansion of road networks in the country. The government has given a massive push to all forms of physical connectivity through multiple initiatives like Pradhan Mantri Gram Sadak Yojana, industrial corridors, dedicated freight corridors, Bhartamala and Sagarmala projects, UDAN Schemes, National Infrastructure Pipeline etc in the recent years.

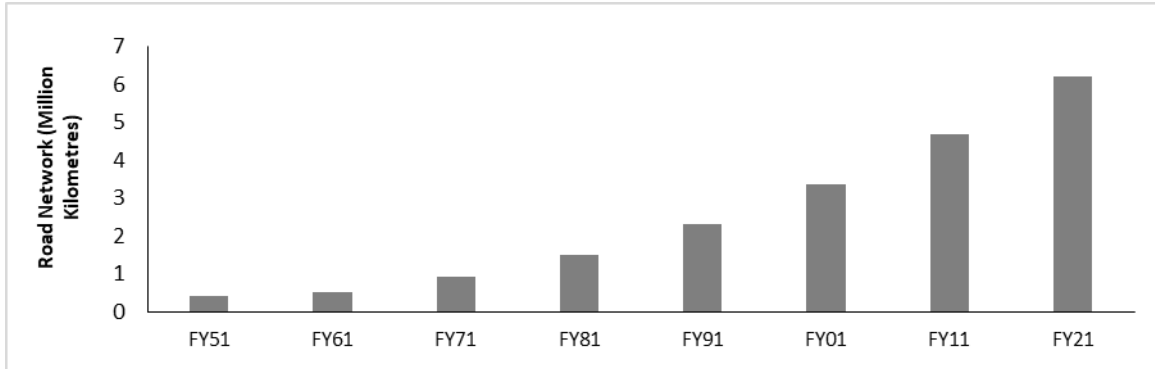
Exhibit 9 – Top 5 countries by largest road networks, Global



Source: International Road Federation, LSI Research

Apart from providing connectivity in terms of enabling movement of passengers and freight, roads act as force multipliers in the economy. The expansion of road network is associated with the bridging of existing infrastructure gaps and creating additional facilities to cater to the increasing population.

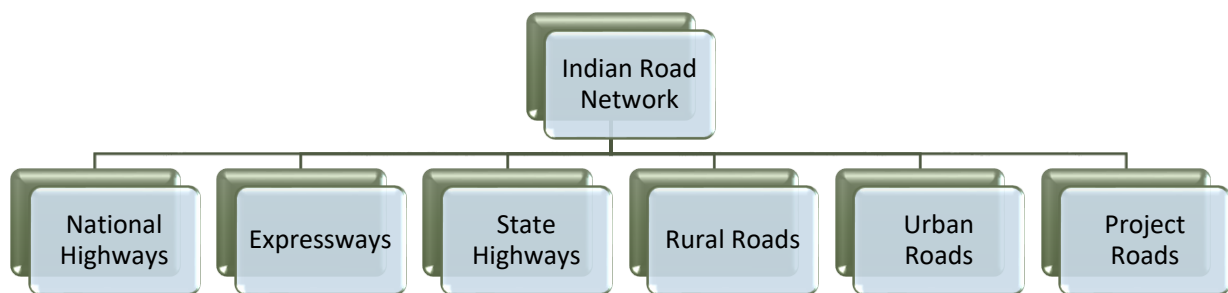
Exhibit 10 – Expansion of road network, India, FY51 to FY21



Source: Ministry of Road Transport and Highways, LSI Research

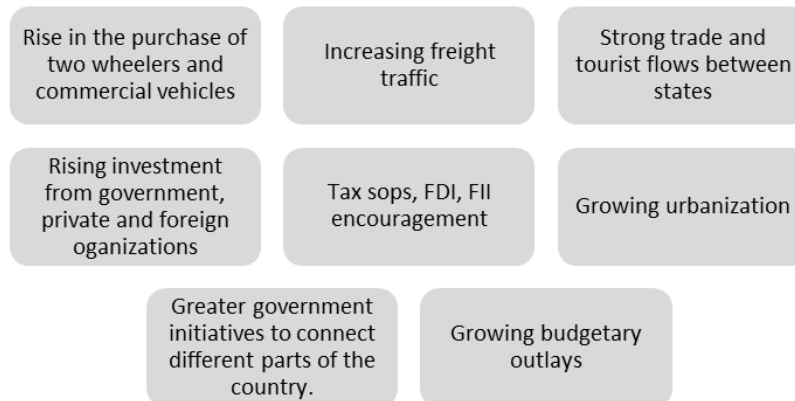
- As of FY21, India has the road length of 6.3 million Kilometre.
- In the post-independence phase, i.e., from FY51 to FY21, the road network has grown at the CAGR of 4% in India.
- India is considered to have the 2nd largest road network in the world.
- With the increasing number of government projects, the road sector is projected to reach \$24.12 billion by 2027.

Exhibit 11 – Types of roads in India



Types of Roads	Length in Km as of 2022-21
National Highways	1,44,955 km
State Highways	1,67,079 km
Other Roads	60,19,757 km
Total	63,31,791 km

Growth drivers in the Indian road sector



A glimpse of the industry trends

Bharatmala project

- With an aim to improve connectivity, especially along the economic corridors, border regions and far-flung areas, the central government, in 2017, launched an ambitious highway development scheme – the Bharatmala project (or Bharatmala Pariyojana). In October 2020, the government said that it had constructed 2,921 kms of highways under Phase 1. Work on Phase 1 is expected to be completed by FY 2026, if work contracts are awarded completely by FY 2023.

Focus on Road Safety

- Road safety has been taken up as a priority. A number of initiatives have been taken regarding this, such as black spots rectification, setting up driver training institutes, SukhadYatra app and toll-free emergency number, capacity building of officers, etc. Trainings have been conducted for NHAI field officers, concessionaires, consultants, contractors, etc. Road safety audit is mandatory in all NHAI projects through independent safety consultants.

Increasing use of Information Technology (IT) applications

- IT applications are being progressively mainstreamed in all aspects of the road sector. A number of IT applications have been developed to aid on ground operations. Some major IT applications are; use of Electronic Toll Collection (ETC), development of Bidder Information Management System, Bhoomirashi, etc. MoRTH, NHAI and NHIDCL have also adopted an e-procuring and e-tendering system for procurement of goods and services. A mobile application system has also been launched for tag purchases and top up of FASTags called MyFASTag.

Emphasis on green initiatives

- A number of green initiatives have also been taken up in the recent years to check the issue of environment pollution. Battery operated vehicles, and vehicles driven on methanol and ethanol have been exempted from permit. A Green Highway Division has been set up by NHAI to carry out plantation along highways and medians. A number of initiatives have been taken in Union Budget 2019-20 to encourage adoption of electric vehicles (EVs), such as reduction of GST on EVs and tax benefits for buying an EV.

Voluntary Vehicle-Fleet Modernization Program

- As per the Voluntary Vehicle-Fleet Modernisation programme (VVMP), the government intends to set up between 400 and 500 automated vehicle fitness testing stations across India via public-private partnerships. The programme will encourage the scrapping of old vehicles. \$1.4 Bn might be invested in this project to create an ecosystem for phasing out unfit and polluting vehicles.

Electronic toll collection

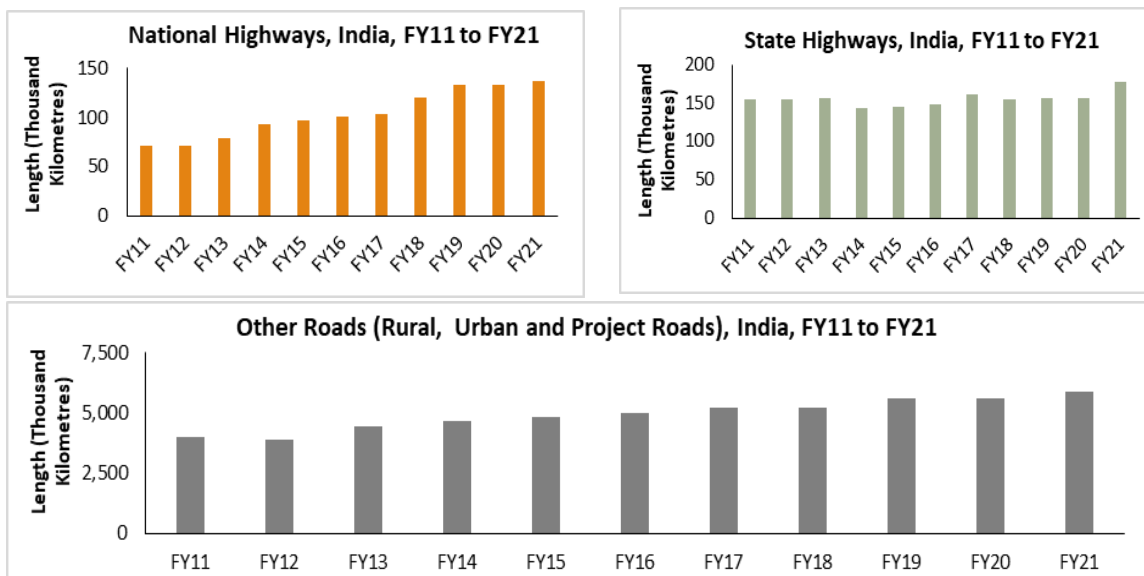
- FASTag is a Radio Frequency Identification Technology (RFID) introduced by the Government of India in October 2017 by the Ministry of Road Transport and Highway. The initiative has helped minimising waiting time at toll plazas and ensure service time of not more than 10 seconds per vehicle even during peak hours. As Per a statement by the NHAI(National Highways Authority of India) in Feb'21, toll collection through FASTag had reached ₹102 crore per day.

Indian road infrastructure and road construction industry, including the equipment and materials, are one of the biggest ingredients in spurring the economy. Expansion of the road sector will not only ensure improvement in the connectivity but also bring down the travel time and freight cost. Focussing on innovation and experimentation to develop products and systems can help India to become a world leader in the sector.

Chapter 3 – State wise performance of the Indian Road Sector

Road infrastructure is the most important of all public assets as it provides access to employment, social, health and education services and plays a crucial role in fighting against poverty. India has the second largest road network in the world. India's road connectivity has improved consistently over the years and road transportation has become a focus of rapid development. Creation and operation of quality road infrastructure continue to be major requirements for enabling overall growth and development of India in a sustained manner.

Exhibit 15 – Expansion of different types of roads in India

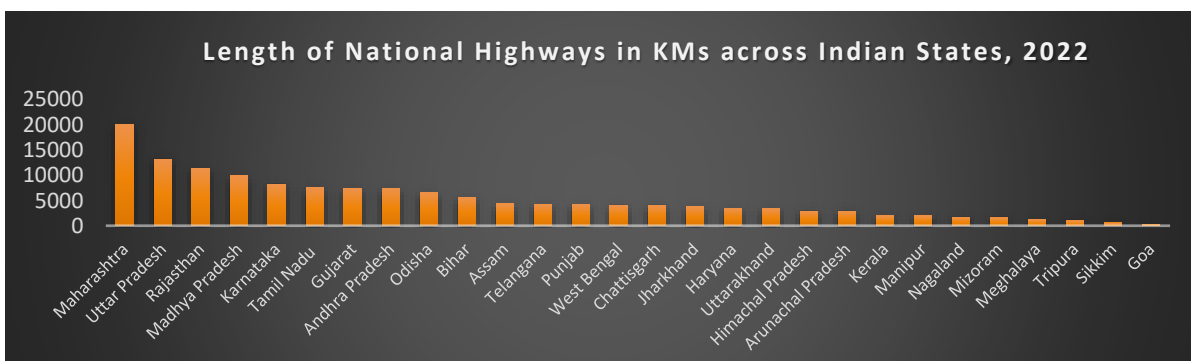


Source: Ministry of Road Transport and Highways, LSI Research

National Highways

National Highways are the backbone of the road infrastructure that connects every major city of India whether ports, capital of states etc. National highways account for 2% of the total road network and carry over 40% of total traffic.

It consists of two, four or more lanes built by charcoal and few by cement concrete. This network is owned by the Ministry of Road Transport and Highways. It is constructed and managed by the National Highway Authority of India (NHAI), the National Highways and Infrastructure Development Corporation (NHIDCL) and public works departments (PWDs) of state governments.

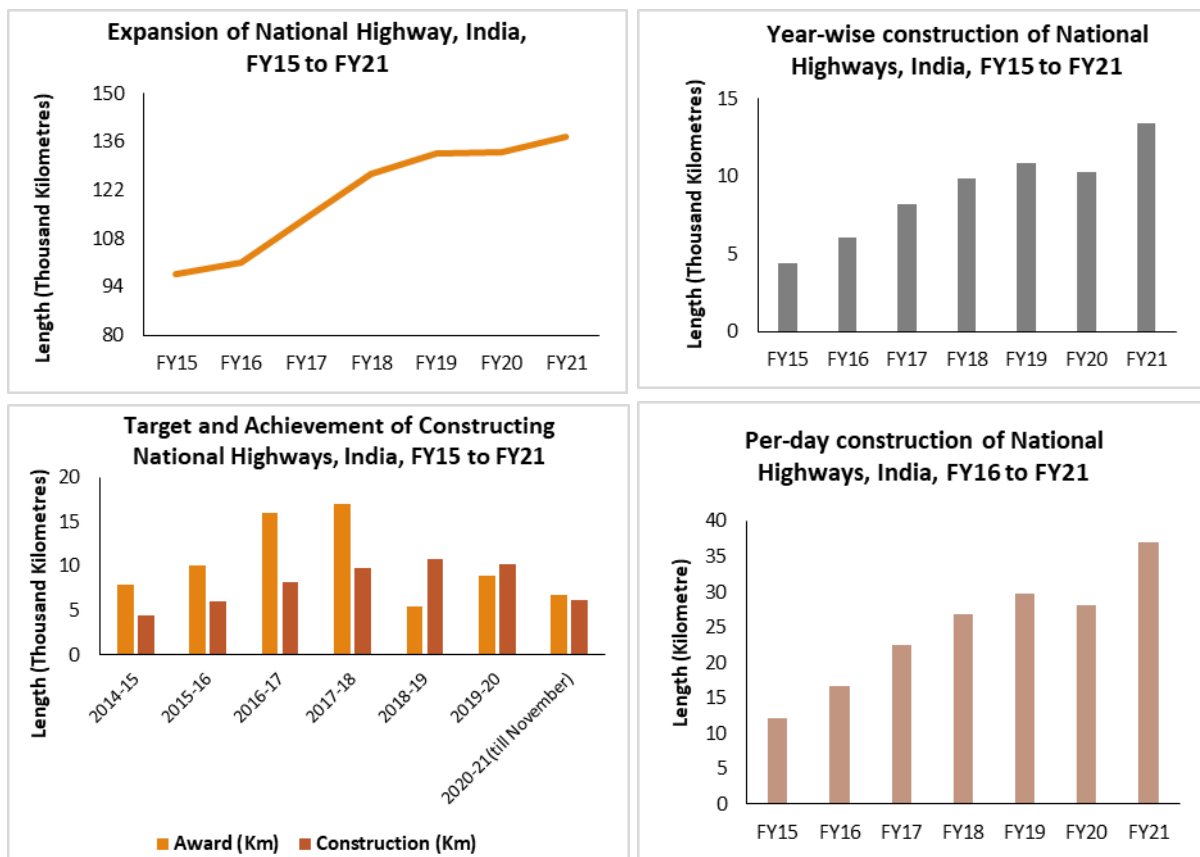


Source: Ministry of Road Transport and Highways, LSI Research

Creation and operation of quality road infrastructure continue to be major requirements for enabling overall growth and development of India in a sustained manner. The road ministry had initiated multiple programmes initiated in the recent past such as National Highways Development Projects (NHDP), Bharatmala Pariyojana scheme, the Special Accelerated Development Programme, National Infrastructure Pipeline (NIP) to bridge critical infrastructure gaps in areas of intense economic activity, places of religious and tourist interests, border areas, backward and tribal areas, coastal areas and trade routes.

The projects have focussed on multimodal integration, road safety, increasing use of Information Technology (IT) applications, augmentation of existing funding sources and emphasis on green initiatives. Also, enhanced passenger facilities and logistics efficiency are major considerations. The proactive sector specific policies rolled out by the Ministry, have fast-tracked the rate of construction of highways in the country.

Exhibit 17: Expansion of national highways, India, till FY21



Source: Ministry of Road Transport and Highways, Press Information Bureau, LSI Research

Major achievements in the expansion of National Highways in the recent past:

- The Ministry has achieved the record-breaking milestone of constructing 37 kilometres highways per day in year 2020-21.
- Over the last 7 years, length of National Highways has gone up by 50% from 91,287 km (as of April 2014) to 1,37,625 km (as on 20 March 2021).
- Total budgetary outlay increased by 5.5 times, from INR 33,414 Cr in Financial Year 2015 to INR 1,83,101 Cr in Financial Year 2022.

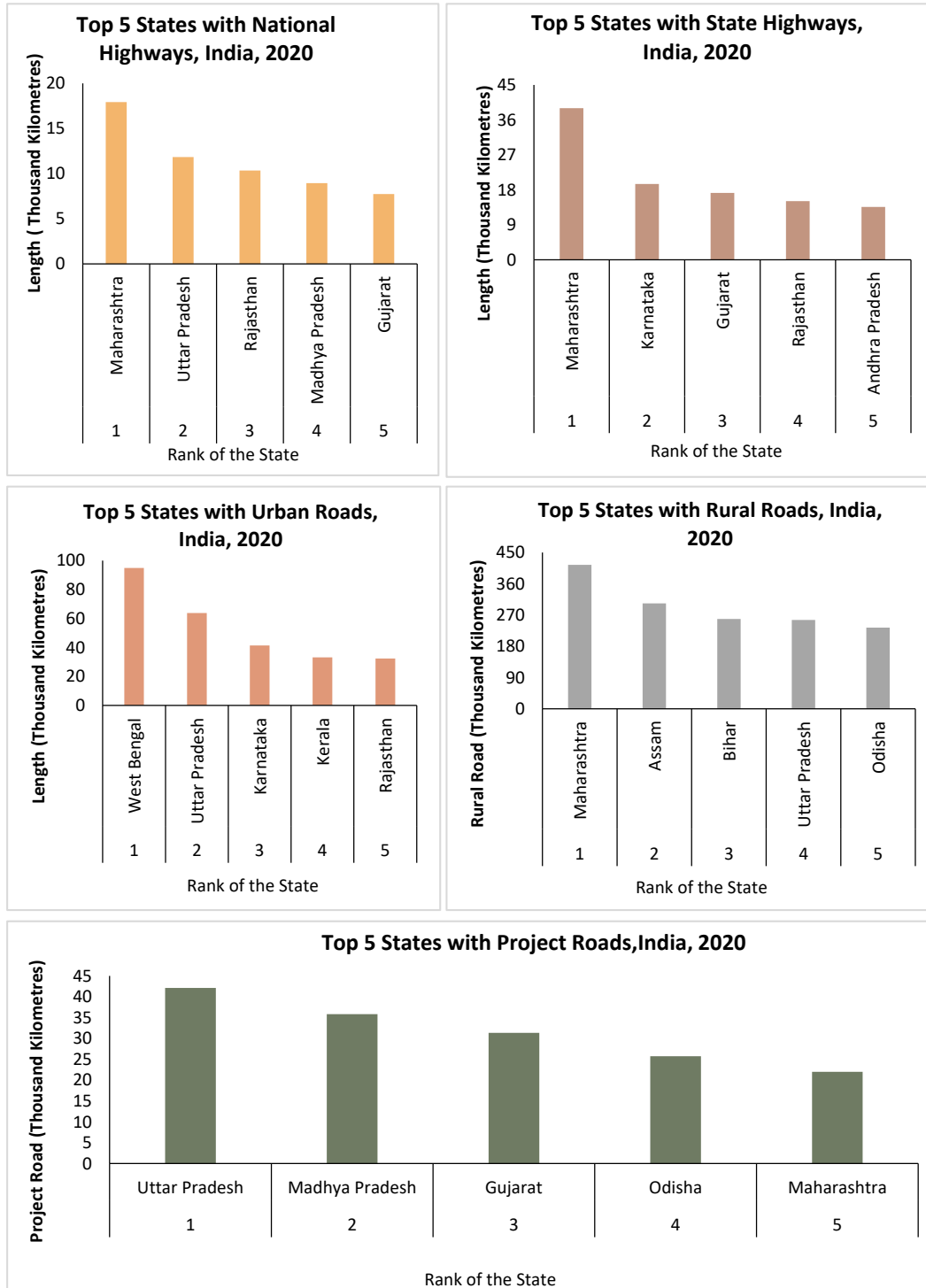
- Sanctioned amount has increased by 126% in FY2021 over Financial Year 2020 despite Covid-19 related impact. Sanctioned length in kilometres has also increased by 9% in FY2021 over FY2020.
- Average annual project award (annual average award length) during FY2015 to FY2021 has increased by 85% compared to FY2010 to FY2014.
- Average annual construction (average annual construction length) during FY2015 to FY2021 has increased by 83% compared to FY2010 to FY2014.
- Cumulative cost of ongoing project works has increased by 54% at the end of FY2021 compared to FY2020 (as on March 31st).
- According to the Ministry of Roads, Transport and Highways (MoRTH), there are 599 National Highways in India. Over a period of time, the numbering of National Highways in India has been renewed.
- National Highway 44 (NH 44) is the longest-running National Highway in India. It is 3,745 km long and covers the North-South Corridor of NHDP. It starts from Srinagar in the north and ends in Kanyakumari in the south.

Major investments from government for the expansion of national highways-

- The government aims to construct 23 new national highways by 2025.
- In August 2021, Union Minister of Road Transport Highways, Mr. Nitin Gadkari sanctioned Rs. 100 crore (US\$ 13 million) to restore roads affected by heavy rains in Konkan and Western Maharashtra. This includes Rs. 52 crore (US\$ 7.0 million) for temporary restoration and Rs. 48 crore (US\$ 6 million) for permanent restoration.
- In August 2021, the central government sanctioned Rs. 600 crore (US\$ 81 million), of the Central Road and Infrastructure Fund (CRIF), for construction of 42 roads and bridges in Uttarakhand.
- In July 2021, the Ministry of Road Transport & Highways allocated Rs. 165 crore (US\$ 22 million) under Economic Importance and Inter State Connectivity Scheme (EIC&ISC) for FY22.
- In July 2021, the Ministry of Road Transport and Highways granted 162 kms road highway (New NH-365BG), as part of the economic corridor under the Bharatmala Pariyojana, with an aim to connect Andhra Pradesh and Telangana via a robust road infrastructure that supports speed of 100kms/hour. The total project cost is Rs. 2,600 crore (US\$ 350 million).
- In July 2021, Andhra Pradesh spent US\$ 296.05 million to build 8,970 kms of roads.
- Under the Union Budget 2021-22, the Government of India has allocated Rs. 108,230 crore (US\$ 14.85 billion) to the Ministry of Road Transport and Highways.
- The NHAI awarded 1,330 km of highways in the first half of FY21, which was 1.6x of the total awards in FY20 and 3.5x of the FY19-levels.
- The National Highways Authority of India (NHAI) is expected to award projects worth ~Rs. 2.25 lakh crore (US\$ 30.3 billion) with a total length of around 5,000 kms in FY22.
- In February 2021, The Minister for MSMEs and Road Transport & Highways Mr. Nitin Gadkari approved construction of the 158-kms ring road worth Rs 10,000 crore (US\$ 1.37) in Telangana.
- In January 2021, the Government of India and New Development Bank (NDB) signed two loan agreements for US\$ 646 million for upgrading the state highway network and district road network in Andhra Pradesh.

Performance of the States on the Road Expansion

Exhibit 18 – Top performing states for the expansion of road sector



Source: Ministry of Road Transport and Highways, LSI Research

Exhibit 19 – The expansion of the surfaced road network



Source: Ministry of Road Transport and Highways, LSI Research

- Due to continuous and ambitious policy interventions, all National Highways and most of the parts of the State Highways in the country are surfaced. More than 65% of Indian States (eg. Andhra Pradesh, Arunachal Pradesh, Bihar, Jharkhand, Odisha, Punjab etc.) have 100% surfaced areas for the state highways.
- For the remaining 35% states (eg. Himachal Pradesh, Assam, Gujarat etc.), more than 90% areas of the state highways are surfaced.
- For the states like Sikkim, Arunachal Pradesh, Nagaland, Tamil Nadu, Meghalaya, more than 90% of the urban roads are surfaced.
- In the case of rural roads, West Bengal, Punjab, Odisha, Rajasthan, Uttar Pradesh have more than 90% surfaced areas for the rural roads.
- In the case of project roads, states like Sikkim, Manipur have more than 90% surfaced areas for the project roads.

The expansion of the road sector has been astounding in the last decade. Construction of new roads, expansion of the surfaced areas have smoothed the connectivity of the country over the years. Among all the states who are among the top 5 contributors in the different categories of roads in India, the presence of **Maharashtra, Uttar Pradesh, Rajasthan, Gujarat, Madhya Pradesh** have been

maximum in the recent years. Uttar Pradesh, Maharashtra, Karnataka and Rajasthan account for more than 45% of NHAI projects under construction, high-value expressways driving investments. These states also account for a significantly high share of more than 420 projects that are under construction and yet to commence construction under the EPC and HAM models of the NHAI.

Maharashtra

India's third-largest state by area, Maharashtra is emboldened with some of the longest highways and busiest roads in India. The road network of the city is methodically-planned and designed to provide the most convenient passenger road transport for the Indians.

The state houses major 17 National Highways that connects it to six other states in the country. Especially, Maharashtra is also the beholder of the mighty Mumbai-Pune Expressway which is the country's first six-lane high-speed access-controlled tolled expressway, along with the NH 8, NH 9, NH3, NH13, NH16, NH50 among others. Maharashtra is also being known for owning the largest bridges in India like the Rajiv Gandhi Setu that bridges Worli and Bandra.

Recent initiatives for road development-

- Maharashtra has a higher share of yet-to-commence-construction projects at 17%, and 12% of under construction projects with a cumulative value of Rs 49,000 crore.
- In October 2020, Asian Development Bank (ADB) and Government of India signed a US\$ 177 million loan to upgrade 450 km of state highways and major district roads in the state.
- Under the State Budget 2021-22, the government spent 5.2% of its budget on roads and bridges, which is higher than the average allocation by states (4.3%) for roads and bridges (Rs. 22,608 crore or US\$ 3.06 billion has been allocated for construction of roads and bridges).
- Two new schemes, **Gramin Sadak Vikas Yojana** and **Nagari Sadak Vikas Yojana**, have been announced for construction of roads in rural and urban areas, respectively. Rs 1,000 crore and Rs 1,501 crore have been allocated for these schemes, respectively.
- Rs 11,049 crore has been allocated towards construction of roads and bridges.
- Maharashtra has allocated 4.3% of its expenditure for roads and bridges in 2020-21, which is similar to the average allocation for roads and bridges by states (4.2%).

Uttar Pradesh

Uttar Pradesh has as many as 31 National Highways of India, including the longest highway in India - NH 44 as well as the NH 11, NH 28, NH 19 and many more. In fact, this state holds one of the largest road networks of the country, just behind Maharashtra. Being at the essence of the state, the road transport network in Uttar Pradesh plays a vital role in connecting the rural, industrial and cultural hubs in and outside the state.

Recent initiatives for road development-

- Uttar Pradesh accounts for 15% of the country's under-construction projects and 5% of the yet-to-commence construction projects with a cumulative value of around Rs 45,000 crore.
- In November 2020, Union minister for road transport, highways and MSMEs Mr. Nitin Gadkari inaugurated and laid the foundation stone of 16 highway projects worth Rs. 7,477 crore (US\$ 1.06 billion) in Uttar Pradesh.

- Purvanchal Expressway, a 341 km world-class expressway from Lucknow to Ghazipur is about to open. It will start from village Chandsarai in the district of Lucknow, and will connect nine districts till village Hyderia in Ghazipur district just 18 km before of UP-Bihar border. These 9 districts are Lucknow, Barabanki, Amethi, Sultanpur, Ayodhya, Ambedkarnagar, Azamgarh, Mau and Ghazipur. This is a six (6) lane world class carriageway and is expandable to eight (8) lanes.
- Initiation of 300 km Bundelkhand Expressway Project from Chitrakoot to Etawah, connecting the seven districts — Chitrakoot, Banda, Mahoba, Hamirpur, Jalaun, Auraiya and Etawah. This four-lane divided carriageway is expandable to six lanes. The scheduled date for completion of this project of March, 2022.
- Gorakhpur Link is a four-lane (expandable to 6 lane) expressway stretching 91.3 km which will be linking four districts of eastern UP — Gorakhpur, Azamgarh, Ambedkarnagar, Sant Kabirnagar to the Purvanchal Expressway is scheduled to be completed by April, 2022.
- With almost 600 km greenfield expressway project, the Uttar Pradesh government is in the process of building India's second longest state expressway of India, the Ganga Expressway Project, starting from Bijauli village of Meerut to Prayagraj, connecting 12 districts of UP along — Meerut, Hapur, Bulandshahr, Amroha, Sambhal, Badaun, Shahjahanpur, Hardoi, Unnao, Rae Bareli, Pratapgarh and Prayagraj. It will be 6 lane expressway expandable to 8 lanes.
- Moreover, Uttar Pradesh is all set to initiate the construction of Herbal roads. The government plans to develop 800 km of roads in the state as a "herbal belt" with trees that provide raw materials for medicine and prevent land erosion. The government had said biodiversity would be promoted and air kept free from pollution and bacteria. According to officials of the Public Works Department (Agra), 610 herbal saplings will be planted in three roads that connect rural areas to Agra city. While 170 saplings will be planted in Bichpuri-Achnera Road, Bah-Kachoraghat Road will get 190 saplings and Shamshabad-Rajakhera Road will get 250 saplings.

Rajasthan

Rajasthan fits the list very well as it is a well-connected state, having as many as 20 National Highways wrapping around, equal to the length of 7,906 km and a transport network of up to 150,876 km, all the ways to enable smooth transportation within many regions of India. The longest road in Rajasthan is the NH 15 lengthening from Punjab to Gujarat. The other major National Highway is the NH 11 that connects Agra in Uttar Pradesh with Bikaner in Rajasthan. It's also worth noting, this is the big tourism Highway in India.

Recent Initiatives for road development –

- Rajasthan has Rs 29,000 crore worth of projects under construction.
- 2,539 kilometres of district and rural roads were strengthened and renovated in the State during the year 2020-21 up to December, 2020.
- Union Minister for Road Transport, Highways and MSMEs Shri Nitin Gadkari inaugurated and laid foundation stone for 18 highway projects in Rajasthan in Dec'20. These projects carry a road length of nearly 1127 kilometers, involving construction value of Rs. 8,341 crores. These projects will ease the transportation of commercial goods within and across the State, will improve connectivity at the borders, enhance employment opportunities, save time and fuel, improve tourism and infra development, and will result in providing connectivity for agricultural produce up to larger markets.
- The Minister informed that there has been 40 per cent growth in road construction in Rajasthan during the last 6 years.

- 186 road works of 7906 kms worth Rs 73,583 crore were approved for the State during last 6 years. Works on 5,154 kms worth Rs 30,000 crore were completed during this period.
- During FY21, 821Km BT roads have been constructed under Pradhan Mantri Gram Sadak Yojana (PMGSY), Missing links, State Road Fund and Rural Roads.
- Widening, strengthening and renewal of 517 Km State Highways and Major District Roads completed under Central Road Fund, State Road Fund, NCR, NABARD and PPP.
- Strengthening and renewal of 2,539 Km other district and village roads completed under rural roads, State Road Fund, NABARD, Urban Roads, PMGSY-III financial incentives.

Gujarat

The state of Gujarat has one of the most extensive and traffic intensive road network in the country. The core network comprises of the National Highways and State Highways, while the balance constitutes the Non-core State Highways, Major District Roads, Other District Roads and Village Roads. The longest highway of Gurajat is the NH 8A which lengthens from Ahmedabad until Narayan Sarovar, making a total span of 618 km.

The national highway network of Gujarat has benefited from the Golden Quadrilateral and North South East West axis of the National Highway Development Program passing through the State. Further, the pioneering PPP Roads, expressways, six laning projects (under advanced phases of NHDP), prudent use of external funding and a relatively better maintenance regime has led to a relatively better-quality national highway network in the state compared to many other parts of the country.

Recent Initiatives for road development

- Recently, the Tarapur Vasad Road, the new six-lane highway has been inaugurated. Gujarat State Road Development Corporation's (GSRDC) 48-km road project costing around Rs 1,005 crore will significantly reduce travel time between Tarapur and Vasad. The travel time between Tarapur and Vasad, the shortest road route between South Gujarat and Saurashtra, will now take just 35 minutes instead of the 120 minutes until now.
- Strengthening and widening of two-lane road with paved shoulders of Bhuj - Bachau Section of SH-42 in the State of Gujarat. The project involves 2/4 laning of Bhuj-Bhachau road of 77 km.
- Construction Of Underpass Across Surat Bhusaval B.G Railway Line Between Tv13 and Tv-15 Between Station Udhna and Chalthan At Udhana Yard Near Saibaba Temple Joining Limbayat And Navagam Dindoli Area Of Surat.

Karnataka-

Road infrastructure is one of the main reasons for Karnataka's social and economic advancement. First-class transport connectivity is vital to maintaining Karnataka's reputation as an industrial and technology hub. An improved road network also connects more remote areas with urban and suburban zones, increasing access to public services such as health care and education.

Recent Initiatives for road development –

- Karnataka has Rs 30,000 crore worth of projects under construction.
- On December 19, 2020, the union minister for Road Transport & Highways Mr. Nitin Gadkari inaugurated and laid the foundation for 33 national highway projects in Karnataka. These projects include 1,197 km long roads worth Rs. 10,904 crore (US\$ 1.48 billion).

- The National Highways Authority of India (NHAI) in Karnataka has taken up 1,980 km of work at an estimated cost of ₹35,280 crore.
- NHAI has taken up Bengaluru-Mysuru, Tumakuru-Shivamogga, Ballari-Hiriyur and Bengaluru-Chennai Expressway roadworks. Work on Bengaluru-Mysuru four-lane highway work was expected to be completed in 2022.
- The PWD had spent ₹8,788 crore in 2019-20, and ₹10,743 crore in 2020-21 and achieved 97% and 99% of progress respectively in spending the allocated amounts. A sum of ₹12,122 crore had been spent for developing 12,125 km of roads.
- Work on a bridge connecting Sigandur-Chowdeshwari temple in Shivamogga district was progressing at an estimated cost of ₹482.84 crore.
- The state government has said it has spent Rs 20,060 crore on Bengaluru roads in the last five years.
- The union minister for Road Transport, Highways, and MSME Nitin Gadkari on Friday announced that construction of 13 highway projects of 847 kilometres at a cost of ₹21,000 crore in the North Karnataka region has been approved.
- A total of 12 major roads -- which see the maximum volume of traffic as compared to other roads in the city -- will be developed and maintained by the Karnataka Road Development Corporation Ltd (KRDC) for the next five years.
- As per the government order, the KRDC will spend Rs 477.29 crore towards taking up initial improvement works that include developing the footpaths, providing cycle and bus lanes wherever possible and making all the 12 roads pothole-free. The government has capped annual maintenance expenditure at Rs 100 crore a year.

Significant growth of Rural roads in India

Apart from the expansion of national highways, the construction of the rural road is significant in India. In the overall road network in India, the share of rural road was 71% till FY22. Presently 65% of India's population resides in its rural areas. Therefore, rural infrastructure needs to be developed to provide basic amenities such as civic services and housing to the rural population. Over the years, rural road development task in India has picked up at a fast pace and government is increasingly focussing on rural roads. This is because there are various economic benefits offered by the rural roads that make them equally important as national highways.

Exhibit 20: Benefits of having developed rural road network

Offers better transportation facilities	Boosts agricultural activities and productivity	Improves mobility and saves time	Makes way for more livelihood opportunities	Offers socio-economic benefits
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Pradhan Mantri Gram Sadak Yojana (PMGSY)

- With an aim to increase the rural road connectivity, the Pradhan Mantri Gram Sadak Yojana (PMGSY), the nationwide centrally sponsored scheme was launched in 2000 to provide good all-weather road connectivity to unconnected villages. The PMGSY is under the authority of the Ministry of Rural Development and was begun on 15 August 2000.
- The project was launched as a one-time special intervention to provide rural connectivity, by way of a single all-weather road, to the eligible unconnected habitations of designated population size (500+ in plain areas and 250+ in North-Eastern States, Himalayan States and Himalayan Union Territories as per 2001 census) in the core network for uplifting the socio-economic condition of the rural population.

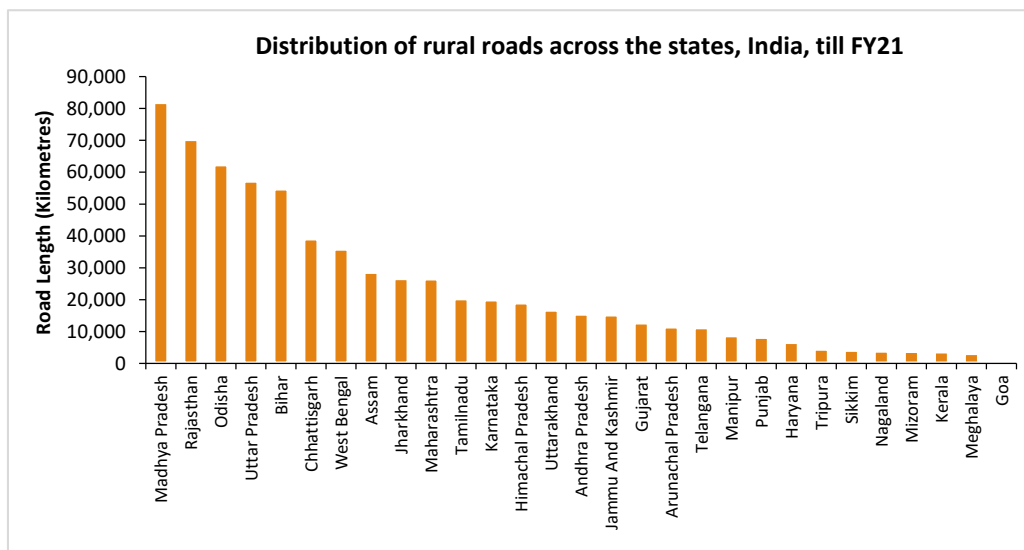
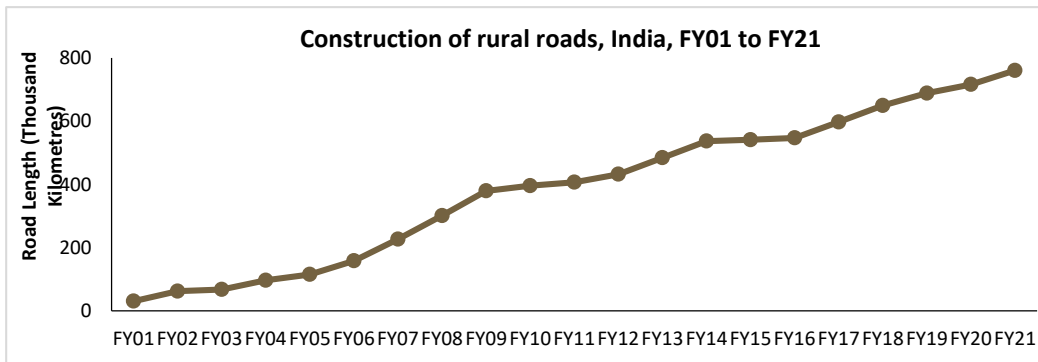
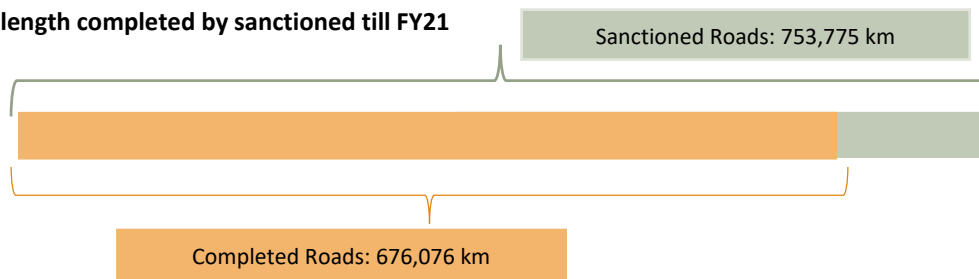
Exhibit 21: PMGSY project at a glance till FY21

Road Sanctioned	•635,265 Kilometre
Sanctioned Feasible Habitations	•172,769
Value of Projects	•₹ 238,235 Crores
Road Completed	•550,604 Kilometre
Connected Habitations	•157,454
Total Expenditure	•₹ 179,537 Crores

Source: Rural Dashboard - PMGSY

Exhibit 22: Expansion of rural road under all the phases of PMGSY

Road length completed by sanctioned till FY21



Source: PMGSY, LSI Research

The spirit and the objective of the Pradhan Mantri Gram Sadak Yojana (PMGSY) is to provide good all-weather road connectivity to the eligible unconnected Habitations. PMGSY not only strives to build roads but good quality roads. The in-built frame work of Quality Management mechanism in PMGSY is a combination of in-house quality control measures and independent verification at state and national levels.

The main features of PMGSY are decentralized and evidence based planning, standards and specifications as per Indian Road Congress (IRC) and Rural Roads Manual, dedicated implementation mechanism at central, state and district level, scrutiny of Detailed Project Reports (DPRs) at multiple levels, strong IT backbone for monitoring and implementation of the programme, three-tier quality management system, unbroken flow of funds, inbuilt mechanism for consultation with public representatives at planning, selection of roads and monitoring stages, etc.

The allocation of funds to the States for implementation of PMGSY depends, inter-alia, on works in hand, pace of expenditure and unspent balance available with the State. The unspent balance with the State as on 1st April, 2021 was Rs. 258.26 crore, out of which the State has spent Rs.227.22 crore as on 15th July, 2021, leaving a balance of Rs. 31.04 crore with the State.

Chapter 4: Policy Initiatives and Investment Plans in the Road Sector

At 62.15 lakh km, India has the second-largest road network in the world, with national highways (NH) constituting 1.36 lakh km. Project awards and construction in the roads and highways sector in India have increased significantly in recent years, highlighting the current government's thrust on the sector. This is also evident in the steadily increasing road sector budget, which stood at Rs 1.18 lakh crore for fiscal 2022. Further, the Task Force on National Infrastructure Pipeline (NIP) had projected a total investment of Rs 111 lakh crore in infra projects for fiscals 2020-25, with ~18% of the targeted investment expected to be made in the road sector in India.

The Government of India has launched major initiatives to upgrade and strengthen National Highways through various phases of the National Highways Development project (NHDP). The status of various programmes up to 31.12.2022 are as under:

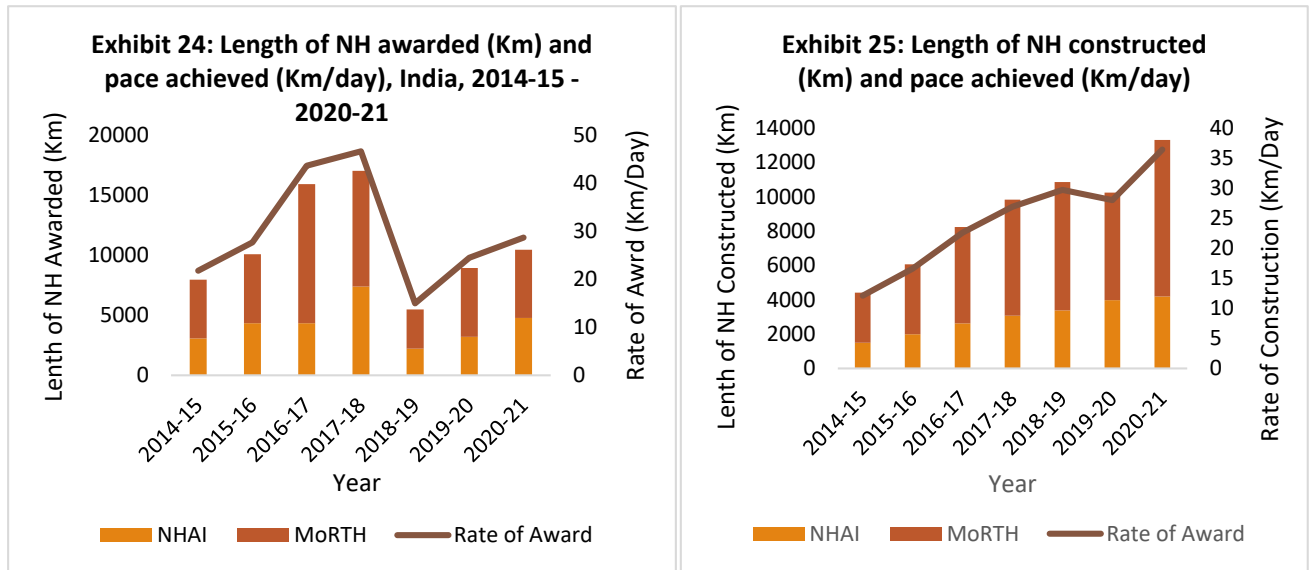
Exhibit 23: Status of various programmes under NHDP as of 31st December, 2022

Components / Scheme	Total Length in km	Length Completed up to 31.03.2022 in km	Length Completed during 01.04.2022 to 31.12.2022 in km	Total Length Completed up to 31.12.2022 in km
A. Bharatmala Pariyojana Phase-I				
Economic Corridors	9,000	2,165	990	3,155
Inter Corridors & Feeder Roads	6,000	883	498	1,381
National Corridor Efficiency Improvement	5,000	1,282	130	1,412
Border & International Road Connectivity	2,000	1,134	79	1,213
Coastal & Port Connectivity Roads	2,000	69	24	93
Expressways	800	621	158	779
Subtotal	24,800	6,154	1,879	8,033
Balance road works under NHDP	10,000	2,788	968	3,756
Grand Total	34,800	8,942	2,847	11,789
B. Other Schemes				
SARDP-NE (Phase A+ Arunachal Pradesh)	6,418	4,212	261	4,473
LWE (including Vijayawada Ranchi Route)	6,085	5,797	31	5,818
EAP (WB+JICA+ADB)	2,855	1,521	243	1,764

Note:

- I. SARDP-NE: Special Accelerated Road Development Programme – North East
- II. Left Wing Extremism affected areas; EAP – East Asia Pacific; WB – World Bank; JICA -Japan International Cooperation Agency; ADB – Asian Development Bank

The effects of the pandemic are evident across all sectors of the Indian economy, but the roads and highways sector has recovered much faster than anticipated. Before the onset of second wave of Covid-19, daily toll collections had surpassed pre-Covid-19 levels with collections reaching the highest-ever mark of Rs 103.94 crore with over 64.5 lakh daily transactions on February 25, 2021. The two key performance indicators – length of road projects awarded and constructed – have been encouraging, indicating strong government push and private sector interest.



Source: FICCI – CRISIL Report

The NHAI awarded projects for highway stretches of 4,788 km last fiscal compared with 3,211 km in fiscal 2020. Overall, MoRTH, including NHAI and other implementing agencies, awarded projects for highway stretch spanning ~10,500 in the last fiscal compared with 8,948 km in fiscal 2020. The length of NH constructed last fiscal stood at ~13,300 km, up around 30% on-year. This takes the pace of highway construction to a record of ~36.4 km per day. The upward growth trend in awards and construction is expected to continue in the current and future fiscals.

Government’s Initiatives

Bharatmala Pariyojana

The Public Investment Board (PIB) recommended the proposal during its meeting held on 16th June, 2017. Cabinet Committee on Economic Affairs (CCEA) approved the Bharatmala Pariyojana Phase-I on 24th October, 2017.

The Ministry has taken up detailed review of NHs network with a view to develop the road connectivity to Border areas, development of Coastal roads including road connectivity for non-Major ports, improvement in the efficiency of National Corridors, development of Economic Corridors, Inter Corridors and Feeder Routes along with integration with Sagarmala, etc., under Bharatmala Pariyojana. The Bharatmala Pariyojana envisages development of about 26,000 km length of Economic Corridors, which along with Golden Quadrilateral (GQ) and North-South and East-West (NS-EW) Corridors are expected to carry majority of the Freight Traffic on roads. Further, about 8,000 km of Inter Corridors and about 7,500 km of Feeder Routes have been identified for improving effectiveness of Economic Corridors, GQ and NS-EW Corridors. The programme envisages development of Ring

Roads / bypasses and elevated corridors to decongest the traffic passing through cities and enhance logistic efficiency; 28 cities have been identified for Ring Roads; 125 choke points and 66 congestion points have been identified for their improvements. Further, in order to reduce congestion on proposed Corridors, enhance logistic efficiency and reduce logistics costs of freight movements, 35 locations have been identified for development of Multi Modal Logistics Parks.

Multimodal Logistics Parks

Integration of Multi transport mode has also been built into the Bharatmala Programme and includes development of 35 Multi-modal Logistics Parks (MMLPs) at various locations across the country. These MMLPs are being developed on a 'Hub and Spoke' model and being implemented by NHAI and NHIDCL (in North-East India). The development of these MMLPs is one of the endeavours to eradicate Logistics related deficiencies in India, to draw the associated costs down and to strategically integrate highway projects and other connectivity initiatives like inland waterways, railways etc. in tandem with the freight distribution ecosystem.

These MMLPs shall act as regional inter-modal freight-handling facilities with mechanized material handling provisions which shall contain warehouses, specialized cold chain facilities, freight / container terminals and bulk / break-bulk cargo terminals. The MMLPs are planned to foster intermodal connectivity with inclusions such as dedicated Railway line / Spur, access from prominent Highway(s) / Expressway(s) to allow movement of commercial vehicles and connectivity to an Airport or a Seaport (or Inland waterway Terminal).

Development of dedicated National Highway Connectivity for Ports

A separate company under the NHAI named 'National Highways Logistics Management Limited' (NHLML) has been incorporated to carry out development of the MMLPs and works related to National Highway connectivity for ports.

The Ministry of Road and Highways is also committed to enhance the ports logistics ecosystem and is working hand-in-hand with the Ministry of Ports, Shipping and Waterways to develop dedicated first mile national highway connectivity for certain identified ports and IWT terminals having congestion. Out of 2,026 km road development for ports as identified by the Ministry of Ports, Shipping and Waterways, the work of 652 km is entrusted to NHLML for developing dedicated 4-lane highway connectivity for selected major ports of the country. The remaining length of port connectivity roads is already being undertaken under other components of the Bharatmala Pariyojana. This effort is expected to eradicate multiple traffic related issues such as removal of congestion points in city locations; reduction in delays caused due to restrictions on commercial vehicles movement during certain hours of the day as per state / Local Urban regulations and Reduction in road accidents through separation of Commercial and Passenger vehicle traffic etc.

Expressway

Expressways are highways that are completely access controlled to ensure unhindered flow of traffic, i.e. vehicles can enter/exit the roads from only a limited number of points. They are meant to be the highest class of roads in India, and are expected to transform user experience significantly. They are designed with superior technical and safety standards to allow speeds of up to 120 km/hr. Expressways are currently being planned to minimise road lengths between two given points via greenfield diversions, access ramps, and overpasses, thus reducing travel times and costs.

MoRTH is developing 27 Greenfield corridors of 9,860 km length at a total capital cost of Rs. 4,08,437 crore. Ambala - Kotputli corridor has been opened to public traffic and sections of Delhi Mumbai Expressway (Delhi - Dausa, Vadodara - Ankleshwar, Jhalawar (Rajasthan) - MP/Gujarat Border) and Amritsar - Jamnagar Corridor (Bikaner to Pachpadra (Jodhpur)) will be dedicated to the nation in the coming months.

A new national masterplan for new Expressways for next 25 years during “Amrit Kaal” to improve efficiency of passenger and freight movement in the country is under progress.

Exhibit 26: Summary of Greenfield Corridors being developed by MoRTH

Type	Number of Corridors	Length (Km)	Total Capital Cost (Rs. Cr.)
Expressways	5	2,489	1,63,930
Access- Controlled	22	7,371	2,44,508
Total	27	9,860	4,08,437

Source: Annual Report 2022-23, Ministry of Roads, Transports & Highways

The table below shows the list of upcoming expressways/corridors with expected completion date.

Exhibit 27 (a): List of Greenfield Expressways being developed by MoRTH

Sr. No.	Corridor Name	Length (km)	Total Capital Cost (Rs. Cr.)	Target Completion Year
1	Delhi – Mumbai Expressway	1,386	1,01,420	FY 24-25
2	Ahmedabad - Dholera	109	4,192	FY 24-25
3	Bengaluru – Chennai	262	16,730	FY 24-25
4	Delhi – Amritsar - Katra	669	37,524	FY 24-25
5	Kanpur – Lucknow Expressway	63	4,063	FY 24-25
	Expressways Total	2,489	1,63,930	

Source: Annual Report 2022-23, Ministry of Roads, Transports & Highways

Exhibit 27 (b) : List of Access Controlled Corridors being developed by MoRTH

Sr. No.	Corridor Name	Length (km)	Total Capital Cost (Rs. Cr.)	Target Completion Year
1	Ambala – Kotputli	313	11,375	Completed
2	Amritsar - Bhatinda - Jamnagar	917	22,757	FY 24-25
3	Raipur - Vishakhapatnam	465	16,513	FY 24-25
4	Hyderabad Vishakhapatnam	222	5,921	FY 24-25
15	UER II	75	7,010	FY 23-24
6	Chennai - Salem	277	7,232	FY 25-26
7	Chittor - Thatchur	116	4,754	FY 24-25
8	Bangalore Ring Road	280	11,022	FY 25-26
9	Delhi - Saharanpur - Dehradun	239	12,601	FY 24-25
10	Durg Raipur Arang	92	3,333	FY 25-26
11	Hyderabad - Raipur	335	10,118	FY 25-26
12	Surat - Nashik - Ahmednagar - Solapur	719	23,921	FY 25-26
13	Solapur - Kurnool - Chennai	340	10,817	FY 25-26
14	Indore - Hyderabad	525	13,759	FY 24-25
15	Kharagpur - Siliguri	235	8,635	FY 25-26
16	Kota Indore (Garoth to Ujjain)	135	2,594	FY 24-25
17	Nagpur - Vijayawada	401	14,055	FY 25-26
18	Sanchore - Deesa - Mehsana - Ahmedabad	212	7,790	FY 25-26
19	Bengaluru - Kadappa - Vijayawada EXP	342	13,559	FY 25-26
20	Varanasi - Ranchi - Kolkata	612	22,490	FY 25-26
21	Atal Progressway	412	12,140	FY 25-26
22	Mohali - Sirhind - Khanna Bypass - Malerkotla - Barnala	108	2,111	FY 25-26
Access Controlled Total		7,371	2,44,508	

Source: Annual Report 2022-23, Ministry of Roads, Transports & Highways

Way Side Amenities (WSAs)

WSAs envisioned by the government will enable improved road safety by providing adequate resting facilities for road users, thereby reducing fatigue-related road accidents. These WSAs will typically provide facilities such as fuel station, restaurants, short-term accommodation, and washrooms for both passengers and truckers. In addition, they are expected to provide free facilities for highway users such as drinking water, emergency telephone services, and parking. The Highway Nest (Mini) project has been launched by National Highways Authority of India (NHAI) for providing facilities for the convenience of highway users. The Highway Nest (Mini) is under construction at all the 372 toll plazas on upside and downside of National Highways approximately at a distance of 200-250 m from the toll plazas. Highway Nest (Mini) will provide for drinking water, tea/coffee, packaged food/eatables and toilets for ladies/gents and physically challenged persons.

Under its vision to provide world class traveller facilities for the road users, the NHAI has identified more than 600 sites across 22 states in India, spanning more than 3000 hectares in total. 130 of these

600 sites are expected to be operational during fiscal 2022. The envisaged area for each WSA has been derived using pre-established demand from highway and non-highway traffic in prime locations across India. In order to provide greater stimulus for participation of private developers, the authority is providing i) encumbrance free sites with clear land title and no Change of Land Use (CLU) requirement and ii) attractive lease tenure with flexible project development options for developers.

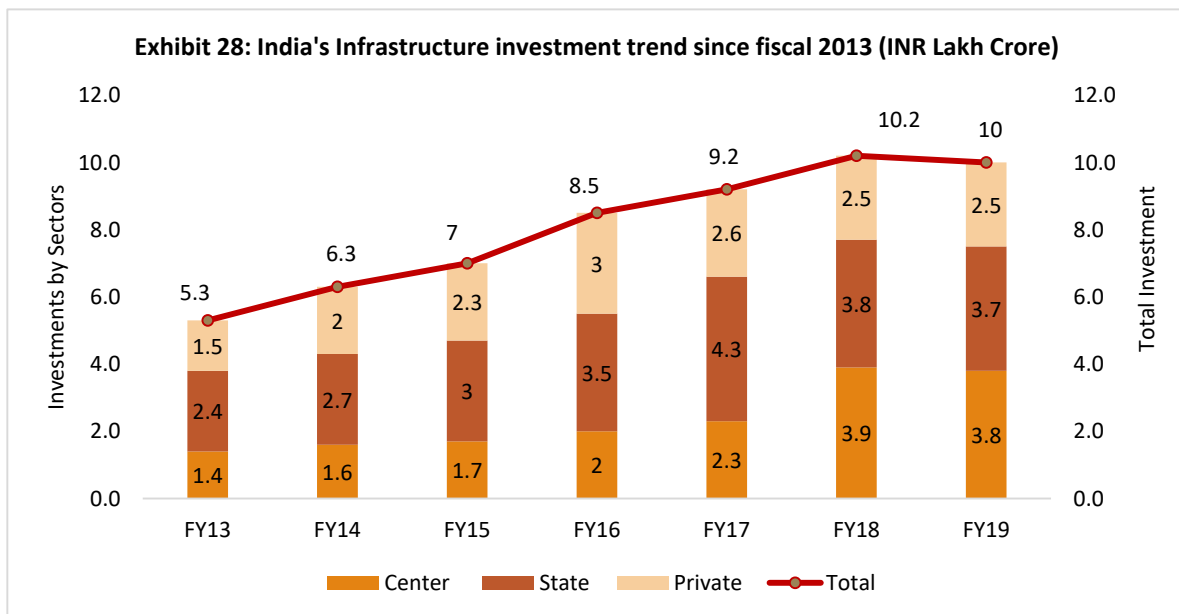
National Infrastructure Pipeline (NIP)

As per the Global Infrastructure Outlook 2017 published by Oxford Economics, the estimated global infrastructure investment requirement is \$94 trillion during the period 2016 to 2040. Out of this envisaged infrastructure investment, ~50% is required in Asia alone (with China, India and Japan being major contributors), and with roads and electricity sub-sectors constituting ~67% of these investment needs. Another study has estimated that while the demand of infrastructure is growing at about \$4 trillion per annum, the supply of infrastructure is growing at only \$2.7 trillion annually, leading to a deficit of \$1-1.5 trillion on a per annum basis.

It is estimated that India would need to spend \$4.51 trillion on infrastructure by 2030 to realise the vision of a \$5 trillion economy by 2025, and to continue on an escalated trajectory until 2030. The endeavour of the NIP would be to make this happen in an efficient manner.

Historical trend in infrastructure investment in India

As per estimates, India’s infrastructure investment for fiscals 2018 and 2019 are ~Rs 10.2 lakh crore and ~Rs 10 lakh crore respectively. During the above period, infrastructure investment was predominantly made by the public sector (i.e. Centre and state governments with a share of ~70%), while the share of private sector was ~30% (the share of private sector during last two years was ~25%). The trend in India’s infrastructure investment since fiscal 2013 is highlighted in Exhibit 28.



Source: Appraisal documents for five-year plans, CRIS estimates (Investments mentioned are at current prices)

Power, roads and bridges, urban, digital infrastructure and railways sub-sectors together constituted ~85% of the total infrastructure investment in India during fiscals 2013 to 2019. The Centre and states were the major funding sources for sectors such as power and roads and bridges, with moderate participation from the private sector. Digital sector investments were largely driven by the private sector, while investments in the irrigation sector were predominantly made by the state governments.

Benefits of National Infrastructure Pipeline

The key benefits of the NIP to all stakeholders in India are outlined below in Exhibit 28.

Exhibit 29: Key benefits of NIP

	Economy Well-planned NIP will enable more infrastructure projects, power business, create jobs, improve ease of living, and provide equitable access to infrastructure for all, thereby making growth more inclusive
	Government Well-developed infrastructure enhances level of economic activity, creates additional fiscal space by improving revenue base of the government, and ensures quality of expenditure focused on productive areas
	Developers Provides better prepared projects, reduces aggressive bids/failure in project delivery, ensures enhanced access to sources of finance as a result of increased investor confidence
	Banks/financial institutions/investors Builds investor confidence as identified projects are better prepared, exposures less likely to suffer stress given active project monitoring by competent authority, thereby ensuring better returns

Source: National Infrastructure Pipeline, Report of the Task Force, Department of Economic Affairs, Ministry of Finance, GoI

Constituents of NIP

The NIP has been made on a best effort basis by aggregating the information provided by various stakeholders including line ministries, departments, state governments and private sector across infrastructure sub-sectors identified in the Harmonised Master List of Infrastructure.

To draw up the NIP, a bottom-up approach was adopted wherein all projects costing greater than Rs 100 crore per project under construction, proposed greenfield projects, brownfield projects and those at the conceptualisation stage were sought to be captured. The investment details of fiscal 2020 are estimates and those for fiscals 2021 to 2025 are projections.

The NIP could see more updates as some states are yet to share details. The implementation of projects included in NIP will depend on multiple factors such as clearances, timely approvals, and financing. The actual expenditure may vary from the estimates/projections and NIP shall be updated accordingly. Exhibit 29 shows the key constituents of the NIP.

Exhibit 30: Constituents of NIP



Source: National Infrastructure Pipeline, Report of the Task Force, Department of Economic Affairs, Ministry of Finance, GoI

NIP: Sector-wise summary

The total capital expenditure in infrastructure sectors in India during fiscals 2020 to 2025 is projected at ~Rs 111 lakh crore. The sector wise annual projected capital expenditure is detailed in Exhibit 30.

Exhibit 31: Sector-wise annual capital expenditure in infrastructure (Rs crore)

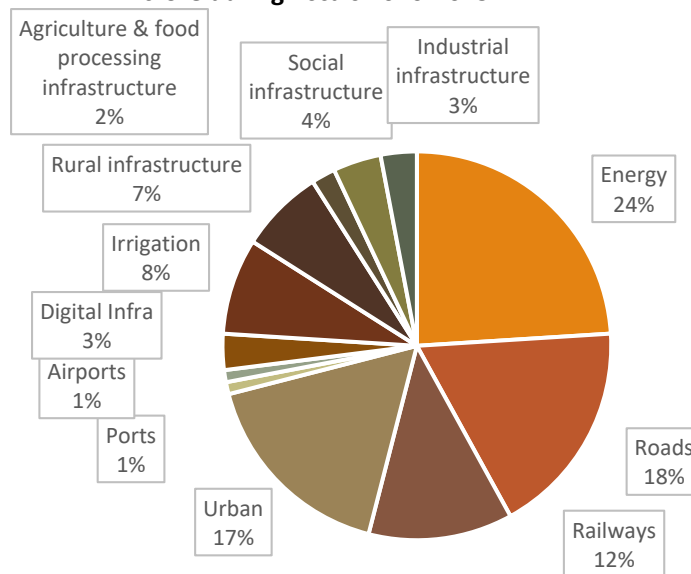
Ministry/ department	FY20	FY21	FY22	FY23	FY24	FY25	No phasing	FY20-FY25
Energy								
Power	164,140	225,551	221,734	223,487	225,236	211,002	139,279	1,410,428
Renewable energy	30,500	151,000	144,000	170,000	217,000	217,000	0	929,500
Atomic energy	11,635	21,462	28,324	33,124	32,674	28,284	0	155,503
Petroleum and natural gas	27,332	43,510	48,314	41,523	22,858	10,535	499	194,572
Total energy	233,607	441,522	442,372	468,134	497,768	466,821	139,778	2,690,003
Roads								
Roads	332,559	383,283	356,966	252,780	240,761	332,659	134,815	2,033,823
Total roads	332,559	383,283	356,966	252,780	240,761	332,659	134,815	2,033,823
Railways								
Railways	133,387	262,465	308,800	273,831	221,209	167,870	0	1,367,563
Total railways	133,387	262,465	308,800	273,831	221,209	167,870	0	1,367,563
Ports								
Ports	13,357	18,104	20,649	15,863	7,724	10,002	35,495	121,194
Total ports	13,357	18,104	20,649	15,863	7,724	10,002	35,495	121,194
Airports								
Airports	18,667	21,655	24,820	21,334	25,386	5,141	26,445	143,448
Total airports	18,667	21,655	24,820	21,334	25,386	5,141	26,445	143,448
Urban								
Atal Mission for Rejuvenation and Urban Transformation, Smart Cities, MRTS, Affordable Housing, Jal Jeevan Mission	298,174	462,208	404,134	234,858	217,164	159,862	142,867	1,919,267
Total urban	298,174	462,208	404,134	234,858	217,164	159,862	142,867	1,919,267

Source: National Infrastructure Pipeline, Report of the Task Force, Department of Economic Affairs, Ministry of Finance, GoI

Sector-wise break-up of NIP

During the fiscals 2020 to 2025, sectors such as energy (24%), roads (18%), urban (17%) and railways (12%) amount to ~71% of the projected infrastructure investments in India. This is highlighted in Exhibit

Exhibit 32: Sector-wise break-up of capital expenditure of Rs 111 lakh crore during fiscals 2020-2025

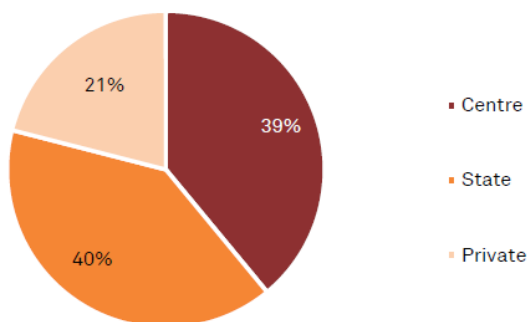


Source: National Infrastructure Pipeline. Report of the Task Force. Department of Economic Affairs. Ministry of Finance.

More about NIP

The Centre (39%) and state (40%) are expected to have almost equal share in implementing the NIP in India, followed by the private sector (21%). This is highlighted in Exhibit 32.

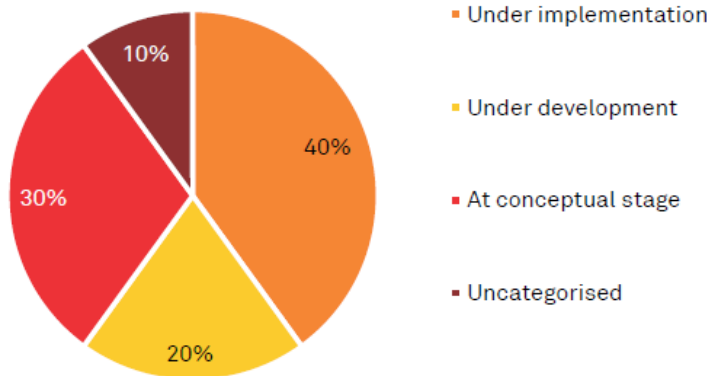
Exhibit 33: Shares in NIP Implementation



Source: PIRF submitted by ministries/ departments/state governments/private sector

Out of the total NIP of Rs 111 lakh crore, Rs 44 lakh crore (40%) worth of projects are under implementation, Rs 34 lakh crore (30%) worth of projects are at the conceptualisation stage, and Rs 22 lakh crore (20%) worth of projects are under development. Information regarding project stage are unavailable for projects worth Rs 11 lakh crore (10%). It is expected that greater clarity will be available in the next few months on these and updated in the subsequent NIP publications.

Exhibit 34: Stages of NIP Implementation



Source: PIRF submitted by ministries/ departments/state government

Minister for Road Transport & Highways and Micro, Small and Medium Enterprises, Shri Nitin Gadkari said that the Government is giving utmost priority to the development of infrastructure and has set a target of road construction of worth Rs.15 lakh crores in next two years. A target of 40 kilometres per day of highways construction in current fiscal has been set. Also the Government is permitting 100% FDI in road sector.

National Monetisation Pipeline (NMP)

Union Minister for Finance and Corporate Affairs, Smt Nirmala Sitharaman, launched the asset monetisation pipeline of Central ministries and public sector entities: 'National Monetisation Pipeline (NMP Volumes 1 & 2)'. NITI Aayog has developed the pipeline, in consultation with infrastructure line ministries, based on the mandate for 'Asset Monetisation' under Union Budget 2021-22. NMP estimates aggregate monetisation potential of Rs 6.0 lakh crores through core assets of the Central Government, over a four-year period, from FY 2022 to FY 2025. As per the finance minister this entire NMP is talking about brownfield projects where investments have already been made, where there is a completed asset which is either languishing or it is not fully monetised or is under-utilised. So, by bringing in private participation in this better monetising will be possible and this will ensure further investment in infrastructure building.

Roads, railways and power sector assets will comprise over 66% of the total estimated value of the assets to be monetised, with the remaining upcoming sectors including telecom, mining, aviation, ports, natural gas and petroleum product pipelines, warehouses and stadiums. In terms of annual phasing by value, 15% of assets with an indicative value of Rs 0.88 lakh crore are envisaged for rollout in the current financial year. The NMP will run co-terminus with the National Infrastructure Pipeline

of Rs 100 lakh crore announced in December 2019. The estimated amount to be raised through monetisation is around 14% of the proposed outlay for the Centre of Rs 43 lakh crore under NIP. In the roads sector, the government has already monetised 1,400 km of national highways worth Rs 17,000 crore.

Asset monetisation, based on the philosophy of Creation through Monetisation, is aimed at tapping private sector investment for new infrastructure creation. This is necessary for creating employment opportunities, thereby enabling high economic growth and seamlessly integrating the rural and semi-urban areas for overall public welfare.

India's GDP is expected to gradually move upwards in the five years starting from fiscal 2020 anchored on the clean-up of financial sector balance sheets, reversing the deleveraging phase with corporates starting to leverage for funding capex, leading to growth and payoff from policies and reforms such as Goods and Services Tax and Insolvency and Bankruptcy Code, 2016. Capacity utilisation is expected to catch up, resulting in an improvement in the investment cycle. It is a given that infrastructure development is a critical factor for boosting the economy, providing improved growth prospects. In order to improve India's global competitiveness, creating new and upgrading existing infrastructure will be critical along with introducing a slew of reforms.

Infrastructure development is labour intensive, leading to increase in employment opportunities and thus, fueling domestic demand. All of this together can aid in initiating a virtuous cycle of higher investments, growth and employment generation in the economy.

Chapter 5: Financing of Road Projects & Investment Opportunities

Traditionally, financing for development of National Highways in India was from the budgetary resources of the Government of India. In order to augment the available resources, loans have also been raised from multilateral agencies like World Bank, Asian Development Bank (ADB) and Japan Bank of International Cooperation (JBIC).

Presently, the development and maintenance of National Highways is financed by following modes:

1. Government's general budgetary sources
2. Dedicated accruals under the Central Road Fund (by levy of cess on fuel)
3. Lending by international institutions:
 - World Bank
 - ADB
 - JBIC
4. Private financing under PPP frameworks
 - Build Operate and Transfer (BOT Toll) mode on Design Build Finance Operate and Transfer (DBFOT) basis - Investment by private firm and return through levy and retention of user fee
 - Build Operate and Transfer (BOT Annuity) mode on DBFOT basis - Investment by private firm and return through semi-annual payments from NHAI as per bid.
 - Special Purpose Vehicle – SPV (with equity participation by NHAI)
 - Operations, Maintenance and transfer (OMT)
 - Market Borrowings
 - Toll-Operate-Transfer (TOT) Model
 - Hybrid Annuity Model (HAM)
 - NHAI InVits

NHAI also has a provision for providing grant up to 40% of the project cost to make projects commercially viable. However, the quantum of grant is decided on a case-to-case basis and typically constitutes the bid parameter in BOT projects generally not viable based on toll revenues alone. The disbursement of such grant is subject to provisions of the project concession agreements.

Public Funded Projects

The traditional method of executing public funded projects was by item rate contract. This method was, however prone to time and cost overruns. This method has since been replaced by new EPC (Engineering, Procurement & Construction) contracts. Projects which are not viable as BOT (Toll) projects, such as those in the remote areas, are now carried out as EPC projects. This EPC contract agreement relies on assigning the responsibility for investigations, design and construction to a contractor for a lump sum price determined through competitive bidding. The EPC agreement incorporates international best practices and provides a contractual framework the specifies the allocation of risks and rewards, equity of obligations between the Government and the contractor,

precision and predictability of costs, force majeure, termination and dispute resolution apart from transparent and fair procedures.

BOT (Toll)

Private developers/ operators, who invest in toll-able highway projects, are entitled to collect and retain toll revenues for the tenure of the project concession period. The tolls are prescribed by NHAI on a per vehicle per km basis for different types of vehicles. The Government in the year 1995 passed the necessary legislation on collection of toll.

A Model Concession Agreement (MCA) has been developed to facilitate speedy award of contracts. This framework has been successfully used for award of BOT concessions. The MCA has been revised recently and current projects are being awarded under the revised MCA.

BOT (Annuity)

The concessionaire bids for annuity payments from NHAI that would cover his cost (construction, operations and maintenance) and an expected return on the investment. The bidder quoting the lowest annuity is awarded the project. The annuities are paid semi-annually by NHAI to the concessionaire and linked to performance covenants. The concessionaire does not bear the traffic/ tolling risk in these contracts.

Operate, Maintain and Transfer (OMT) Concession

NHAI has recently taken up award of select highway projects to private sector players under an OMT Concession. Till recently, the tasks of toll collection and highway maintenance were entrusted with tolling agents/ operators and subcontractors, respectively. These tasks have been integrated under the OMT concession. Under the concession private operators would be eligible to collect tolls on these stretches for maintaining highways and providing essential services (such as emergency/ safety services).

Special Purpose Vehicle for Port Connectivity

NHAI has also taken up development of port connectivity projects by setting up Special Purpose Vehicles (SPVs) wherein NHAI contributes up to 30% of the project cost as equity. The SPVs also have equity participation by port trusts, State Governments or their representative entities. The SPVs also raise loans for financing the projects. SPVs are authorised to collect user fee on the developed stretches to cover repayment of debts and for meeting the costs of operations and maintenance.

International Competitive Bidding Process

General procedure for selection of concessionaires adopted by NHAI is a two-stage bidding process. Projects are awarded as per the model documents - Request for Qualification (RFQ), Request for Proposal (RFP) and Concession Agreement - provided by the Ministry of Finance. NHAI amends the model documents based on project specific requirements.

The processes involved in both stages are set out as follows:

Stage 1: Pre-qualification on the basis of Technical and Financial expertise of the firm and its track record in similar projects which meets the minimum criteria set out in the RFQ Document. The current process of pre-

qualification shortlists the top 6 applicants with highest technical score, based on the pre-qualification criteria. Notice inviting tenders is posted on the web site and published in leading newspapers.

Stage 2: Commercial bids from pre-qualified bidders are invited through issue of RFP. Generally, the duration between Stage 1 and 2 is about 30-45 days. Wide publicity is given to NHAI tenders so as to attract attention of leading contractors/ developers/consultants. The Government has put in place appropriate policy, institutional and regulatory mechanisms including a set of fiscal and financial incentives to encourage increased private sector participation in road sector.

Opportunities for Private Investors/ Developers

More than 60% of the projected investment requirement for the NHDP is expected to be privately financed, primarily through the BOT/DBFOT (Toll) route, offering enormous opportunities. With a large number of new projects on offer under PPP in the road sector, there exists several investment opportunities for investors and companies with diverse business lines such as engineering companies, civil work contractors, O&M contractors, toll operators, construction equipment manufacturers etc. and other stakeholders such as advisors, financiers and sector professionals. Only about 15% of the total highways in India are 4-laned and the sheer potential for investments in this sector is likely to create opportunities in the core construction industry which may also be attractive for foreign players.

The opportunity for private players in the road sector can be broadly categorised in two segments:

- a) Infrastructure Development
- b) Logistics and Services.

Model Concession Agreement (MCA) for PPP

The highways sector in India has witnessed significant investment in recent years. For sustaining the interest of private participants, a clear risk-sharing and regulatory framework has been spelt out in the Model Concession Agreement (MCA). The MCA has been developed to facilitate speedy award of contracts. This framework has been successfully used for award of BOT concessions. The MCA has been revised recently and current projects are being awarded under the revised MCA. This framework addresses the issues, which are typically important for PPP, such as unbundling of risks and rewards, symmetry of obligations between the principal parties, equitable sharing of costs and obligations, and risk mitigation options under various scenarios including force majeure and termination, under transparent and fair procedures.

A Special Mention: Hybrid Annuity Model for PPP Projects

In India, road projects are awarded via one of the three models: Build-Operate-Transfer (BOT)-Annuity, BOT-Toll, and EPC (engineering, procurement and construction) contract. After the BOT model of Public Private Partnership (PPP), an advanced version of the Model Concession Agreement (MCA), presently called as Hybrid Annuity Model (HAM) is paving the way for road projects. HAM provides a government grant of 40% of the total project cost and rest of the investment is compensated through semi-annual annuity payments on completion of the project. Tolling rights rest with the government.

The hybrid model is a win-win situation for the government and developers. This comes as a welcome step in the situation of dismal performance of highway construction projects awarded under MCA.

Overview of the HAM

- I. MoRTH is promoting innovative project implementation models like HAM to encourage investments in the highway sector.
- II. This model has been adopted for implementation of highway projects in order to maximize the quantum of kms implemented within the available financial resources of the government.
- III. Bid parameter is Life Cycle Cost i.e. (NPV of the quoted Bid Project Cost + NPV of the O&M cost for the entire O&M period).
- IV. Concessionaire receives 40% of Project Cost from Authority during construction period as “Construction Support” thereby reducing his exposure and risk.
- V. Concessionaire is responsible for designing, building, financing (60% of the Project Cost), Operating and transferring the project at the end of operations period (15 years).
- VI. Amount financed by concessionaire during construction period is to be recovered from Authority through annuity payments along with interest payments (@ Bank rate + x%) on reducing balance method.
- VII. O&M responsibilities are with the concessionaire with separate provisions for O&M payments
- VIII. Provision exists for inflation adjusted project cost over time.

Major advantages of the Model

Exhibit 35: The advantages of the Hybrid Annuity Model



Source: MoRTH, LSI Research

New developments in the road financing models

The government has introduced various investor-friendly changes in the Model Concession Agreement (MCA) for the development of highways under the PPP mode. Some of the important policy decisions related to the BOT (toll) model, TOT model and HAM taken during 2020 are detailed below.

BOT (toll) projects

Considering the key challenges faced by stakeholders, a few changes in the BOT (toll) framework have been introduced in 2020. The changes had been proposed keeping in mind the reforms related to project preparation and conditions precedents, dispute resolution, limitation of liability, ease-of-doing business, incorporation of new policies – such as a policy for harmonious substitution, policy for resolution of stuck projects – and other miscellaneous reforms, such as the use of latest technology for traffic and road-condition monitoring and additional performance security.

Incrementally, the revised MCA is a positive development towards reviving the BOT (toll) project, a dominant mode of execution until fiscal 2013, which lost interest, due to lower traffic than the projections, alternative roads and a decline in economic activity. Under the revised MCA, the revenue potential of a project would be reassessed every five years during the concession period, as against every 10 years done previously. Earlier, the traffic potential of the project was tested in the 9th, 10th and 11th year from the date of signing the concession agreement. This is a positive development, as the concession period can now be extended with more certainty than before, in case of a shortfall in the revenue target, thus reducing the risk of lower traffic. As a result, the debt obligations can be managed more prudently and reduce the liquidity risk of the project. Further, the appointed date for the project would be given only after 90% of the required land is available, compared with the earlier requirement of 80%. The revised norm is a positive development, given the additional certainty it adds to land availability and reduce the risk of project de-scope and eases the process of tying up project debt. Some of the other changes, such as limiting the liability to 100% of total project cost, inclusion of a dispute resolution board and timely redressal within 90 days are welcome steps.

HAM projects

The changes introduced in the provisions of HAM MCA will usher in new easier rules for road developers. Among the measures taken to revive interest in HAM, which came into existence in 2016, is the government's decision to double the frequency of payment of upfront construction support (40% of the project cost) to ten from five earlier. The measure will help concessionaires better manage their working capital requirements and should also provide more comfort to lenders in the event of termination. For the remaining 60% of the project cost paid to the developer as annuities over the operations period, along with interest thereon, the new rules say interest will be due and payable on the reducing balance of completion cost at an interest rate equal to the average of one-year marginal cost of funds-based lending rate (MCLR) of the top five scheduled commercial banks plus 1.25%. Earlier, the interest rate was linked to the Reserve Bank of India (RBI) bank rate plus 300 basis points. The interest on annuities for HAM projects is sizeable, amounting to around 45% of overall inflows during the concession period. Linking the interest rate to MCLR will increase the overall inflows for a HAM project.

The move to change the way interest is calculated on annuities paid to developers and reduce the equity lock-in period post the construction period to six months from two years and the inclusion of a dispute resolution board are other positives expected to boost investor interest. Overall, the new HAM agreement has incorporated all the issues which cropped up during the past few years since 2016. All the new clauses are likely to result in a better environment for road developers – less working capital, faster dispute resolution, and more inflows.

In another move to attract more participation in the construction of highways, the government had relaxed technical and financial qualifications for bidders of national highway projects under HAM. Under the modified

rules, a bidder will be qualified to bid for a HAM project if it has a minimum net worth of 15% of the estimated project cost (EPC) at the close of the preceding financial year, as against 25% earlier. The capital cost of the project should be more than 5% of the amount specified as the estimated project cost, as against more than 10% earlier. Further, no prior experience of the bidder is required for constructing tunnels up to 200 meters and bridges up to 60 meters length. The widening of the scope for technical bids and relaxation in financial capacity will certainly enhance competition in the highways sector.

TOT projects

The MoRTH devised the TOT model to recycle and raise funds from the monetisation of its operational road assets. The model securitises toll revenue being generated by the existing government-owned road assets and utilises the proceeds to finance the development of new road assets. One of the key benefits to private investors is the minimisation of revenue risk with the establishment of revenue streams. There are no construction risks such as land acquisition delays, contingencies and cost escalations. Moreover, estimation of traffic becomes easier than with a greenfield project since the operational history of the asset is well established. This enables private investors to perform a more robust due diligence and establish willingness to pay while bidding for the project.

The NHAI has successfully monetised brownfield asset bundles 1 and 3 under the TOT model over the last few years and has more bundles in the pipeline. The concession of the first bundle (~681 km) of TOT commenced from August 29, 2018, with the Rs 9,681.50 crore received from the concessionaire having been deposited in the Consolidated Fund of India (CFI)²⁴. Later, ~566 km of NHs were monetised under TOT Bundle-3, amounting to Rs 5,011 crore. The appointed date for the same was declared on October 20, 2020. The concession fee of Rs 5,011 crore was realised on October 19, 2020²⁵. Recently TOT bundles 5A1 and 5A2 were auctioned for ~Rs 630 crore more than the base price of Rs 1,621 crore.

Earlier, the TOT model considered existing projects that have been generating revenue for a minimum period of two years. The proposed amendments have reduced this period to 1 year of revenue generation, so as to expand the ambit of the TOT model. Another significant change in the existing model is that the NHAI now would have the power to vary the concession period of the projects to 15-30 years, as opposed to the current concession period of 30 years.

The floor price or the initial estimated concession value (IECV) will now be disclosed by NHAI only after receipt of technical bids and after declaring the selected bidder. The highest bidder will take the bundle on a long-term lease. The decision to let the bidders discover the price should smooth NHAI's asset monetisation programme, crucial for its highway development and addressing overburdened debt repayment obligations.

With these changes incorporated, NHAI, in September last year, invited bids for the fifth TOT bundle package, its smallest-ever tender for asset monetisation in two packages with a total length of ~160 km. Both packages got awarded with around Rs 630 crore more than the base price for its fifth round of TOT auctions. Moreover, in the 2021-22 budget, the government has set a target of Rs 10,000 crore for the NHAI to raise by monetising its operational stretches in the current fiscal year. As per recent media releases in May 2021, the NHAI plans to offer 1,500 km — 32 projects — under the TOT model this financial year as it chalks out a fresh monetisation plan.

Infrastructure Investment Trusts

Over the last few years, India has introduced newer and easier investment opportunities for a wider range of retail investors via Infrastructure investment trusts (InvITs). InvITs are institutions similar to mutual funds that pool investments from various categories of investors and invest them in completed, revenue-generating infrastructure projects, thereby generating investor returns. Structured like mutual funds, InvITs have a trustee, sponsor(s), investment manager and project manager. While the trustee (certified by the Securities and Exchange Board of India or SEBI) is responsible for inspecting the performance of an InvIT, sponsor(s) are the promoters of the company that set up the InvIT. As of May 2021, India has 15 InvITs that are either public or private.²⁶

Starting with the IRB public InvIT in 2017, the InvIT model has gained traction over the last few years, with around five deals materialising in the roads and highways sector. SEBI had come up with amendments for both publicly and privately-issued InvITs in March 2019 to encourage investments. Some of the major amendments were:

- Publicly-issued InvITs would be in multiples of a lot, each consisting of 100 units. Value of allotment lot would be Rs 1 lakh
- Leverage limit of publicly issued InvITs was increased from 49% to 70% of InvIT assets
- For privately-placed, unlisted InvITs, leverage was to be determined by the issuer after consultations with investor(s). The underlying assets could be completed, under-construction, or both.

Later, under the measures announced in Union Budget 2021-22, investments in InvITs were made more attractive, while deepening their capital raising avenues. As per the announcement, the trusts can raise debt capital at competitive rates, while dividend payment to InvITs is exempt from tax deducted at source (TDS). Abolishment of TDS on dividend payments to InvITs should ease compliance and enhance the efficiency of these channels.

In order to enhance the NHAI's resource mobilisation, the Cabinet had accorded approval authorising the NHAI to set up an InvIT to monetise completed NHs with a toll collection track record of at least one year. This will be India's first government-sponsored InvIT. Building on this momentum, the NHAI is ready to come out with its own InvIT, the current status of which is as under:

- I. SBI Caps has been appointed as transaction advisor
- II. IDBI Trustee Services Limited has been appointed as trustee
- III. Company secretary has been appointed to form SPVs and Trust
- IV. Registration application for NHAI InvIT has been submitted to SEBI
- V. SPVs have been incorporated
- VI. The NHAI Board has approved investments in the two newly-incorporated SPVs
- VII. The investment manager of the NHAI InvIT has been appointed and accorded the name of "National Highways Infra Investment Managers Private Limited" (NHIIMPL). NHIIMPL has also been incorporated under the Companies Act, 2013. The management structure of the Board of Investment Manager and the appointees thereon have been approved.

Given the various investment opportunities in the road construction sector, there are certain challenges which hinder the smooth functioning of the sector and result in delay in the road building process. In the next sections some critical challenges are discussed along with recommendations to handle them.

Challenges in the Road Construction Sector

Enhancement of the Infrastructure sector has been one of the key drivers for India's propelling economic growth in the recent past. However, the expansion of the infrastructural development has also been hindered because of several challenges. Some of the them are as follows-

- **Land Acquisition:**

Land acquisition turns out to be one of the biggest bottlenecks for the road construction in India and has continuously been an area resulting into severe delay in executing these projects. Throughout India, dispute over state acquisition of land that deprives people of their land rights spans various dimensions of economic, social, and political life. The political and social contestation over land acquisition stems from the inherently coercive nature of the land acquisition process, which creates a severe imbalance of power between the state and land losers. Complex compensation policies, consent of affected families, comprehensive rehabilitation and resettlement, return of unused land, etc. have always affected many transparent land related acts in the country. In various cases, the application law appears to be too restrictive that it halted various development initiatives.

- **Quality of Roads:**

Despite being one of the largest road networks in the world, the quality of Indian roads is not always considered to be satisfying. While major national highways and expressways in India are of international quality, the secondary and tertiary road networks leave a lot to be desired. Around 30% of the country's population lacked access to all-weather roads. Given India's vast diversity, each state has varying terrain, populations and implementation capacity, making for a unique set of challenges. The difficult terrain in the smaller upland states is compounded by the weak capacity of the construction industry, leading to lower quality of works and higher costs. Moreover, due to changes in lifestyle the number of vehicles has increased significantly in the urban areas in the recent past. Due to this, the overloading on the roads affect the road surface severely. Otherwise, lack of proper planning and execution, increasing costs of projects, lesser attention towards quality control of the used materials, inefficient allocation of resources are some of the crucial reasons behind the falling quality of the Indian roads.

- **Complex Regulatory Issues:**

Road development process requires a number of approvals such as environmental clearance, forest clearance, railways clearance, etc. Each of these activities take considerable time and non-adherence to timelines result in cost overruns due to delays. Managing problems of sub-contractors and holding them accountable is also a major issue faced.

- **Construction stage:**

There is a lower appetite for private developers to absorb construction risk as well as traffic risk based on legacies – e.g. languishing projects and projects needing premium payment deferment.

- **Financial Issues:**

Road sector projects are increasingly facing financial closure issues. Reasons include wariness of banks to lend, high share of NPAs, asset liability mismatch and banks reaching infrastructure lending caps.

- **Uncertainty in Returns:**

There is uncertainty on equity returns in existing operational PPP projects along with difficulties faced in servicing debt. This is due to uncertainty of toll revenue collection and variation of collected toll revenue compared to projected levels.

- **Project-development issues:**

All state government authorised projects are always not backed by a state support agreement, which results in low interest in such projects.

How to overcome the challenges?

1. **Identify the involvement of the stakeholders-** The government needs to play a role in developing infrastructure, from limiting impacts on public health and the environment, to providing the capital for projects that are not attractive to private investors. In other areas, private companies tend to structure projects in a way that maximizes the chances of success in terms of customer satisfaction and financial viability.

2. **Developing appropriate model for infrastructure projects-** Announcing large projects may make good headlines but the outcomes tend to fall short of expectations. Infrastructure development must meet the needs of local communities, and requires effective implementation on the ground. This is difficult to achieve with a centralized model.
3. **Attracting foreign investment-** India's savings rate is high, insurance companies and pension funds are eager to invest in infrastructure, international investors and multilateral development banks are also ready to contribute. What India is missing is well structured projects and transparency. Its high long-term sovereign rates are a hurdle. Corruption is a major problem: it cannot be mitigated; it must be eliminated. Anything short of that might not be helpful for the benefits of economic growth and development in the country.
4. **Greater importance on Road Safety-** Road safety is expected to garner more focus in the future. Addressing of black spots, reduced response time to accidents, improving safety features in vehicles, etc. should be the parts of the priority areas.
5. **Adoption of IT based solutions-** Widespread solutions in the road infrastructure monitoring and evaluation for improving the performance of road construction, incorporating technological initiatives in the public transport, upgradation in the system of IT based alerts in the vehicles such as intersection collision avoidance systems, dynamic curve warning systems and automatic crash detection, etc. for increasing the safety measures are important.
6. **Adoption of sustainable transport system-** Greater adoption of electric mobility to accelerate the sustainable approach for a better economy. Investment in battery charging infrastructure, energy storage solutions, smart grids, use of biofuels etc. can be helpful to execute this process.
7. **Exploring financing mechanisms –** Attracting the internal extra budgetary resources, raising capital through debt instruments, exploring the other monetisation techniques can be helpful to strengthen the allocation of finance in the road projects.

Although the disruptions caused by the Covid-19 pandemic dominated in 2020, it shaped the year in roads and highways sector, specifically in terms of changes in the provisions of MCA for PPPs. The government introduced various investor-friendly changes in the MCA for the development of highways under the PPP mode, such as BOT, TOT and HAM.

Chapter 6: Emerging Trends & Technologies in the Road Sector

The importance of technological advancements is growing leaps and bounds, with Covid-19 having accelerated the motions. The pandemic has led to reverse mass migration of construction workers, making technology more appealing to construction companies. This has prompted greater reliance on tech-savvy equipment with agencies trying to achieve speed with more automated machines to reduce their engagement of labour and achieve better workmanship. Moreover, the growing demand for better quality of roads will necessitate more digitalisation for benefits, such as higher productivity, cost control, perfect predictability, efficiency, quality, safety, keeping projects on track and timely completion. Some of the advancements made in the road sector are discussed below.

Design and implementation

The Government of India has been very proactive in integrating new and emerging technologies over the lifecycle of the road asset. During the planning and design stage of the project, surveys are being conducted with the help of satellite imagery, using drones and LiDAR (Light Detection and Ranging). LiDAR is a remote sensing technology that uses laser pulse for scanning and measuring three dimensions of an object with a 3D data capture. It performs point-cloud scanning by bombarding millions of laser points and measures the reflected scan. LiDAR can be mounted on various platforms such as terrestrial, mobile and airborne, depending upon the object to be scanned. The planning and estimation of the projects are being undertaken along with LiDAR, AutoCAD and other software.

LiDAR also plays an important role in Detailed Project Reports (DPRs) for road expansion or new road development, along with a 360-degree view panoramic camera. LiDAR captures all road assets such as sign boards, signals, toll plazas, buildings, utility poles, cables and dividers with 3D geo-references along with true pictures. The entire 3D model is developed on the basis of these inputs with high accuracy. It further helps decision makers to take effective and robust decisions.

During implementation and road construction stage, IOT sensors are being incorporated to get a better on-ground view of the project without being on the site. Digital tools and technologies fitted into construction equipment, such as telematics, GPS, data collection, condition monitoring, secure remote maintenance and connectivity options are being extensively used in the road construction sector to measure the real-time progress of projects. Road construction got more tech savvy with the use of precast and prefab construction, composite construction, the use of geo textiles, geo composites and geo grids in various road construction elements and the use of raw material, such as plastic, pond and fly ash.

In another tryst with technology to cut lengthy administrative processes, while bringing better transparency and project progress tracking on a real-time basis, the NHAI became the country's first government-backed construction sector organisation to go 'fully digital' with its cloud-based Data Lake software. The integration of IOT and project management software with Data Lake was done primarily to improve the efficiency in the implementation phase and identify bottlenecks/delays in various project approvals and other administrative processes within the organisation. In terms of next steps, artificial intelligence (AI) is being incorporated in Data Lake, which will use the data and create an efficient advance-alert mechanism in various aspects of construction progress, material handling and road safety.

Highway operations

Technology-based initiatives are increasingly being adopted to improve the operation and maintenance of highways in India. To enhance transparency, uniformity and to leverage the latest technology, the NHAI has recently made mandatory the use of drones for monthly video recordings of NH projects during the development, construction, operation and maintenance stages. Apart from this, mandatory deployment of Network Survey Vehicles (NSVs) to carry out road condition surveys on the national highways will enhance the overall quality of the highways as NSVs use the latest survey techniques such as high-resolution digital cameras

for 360-degree imagery, laser road profilometers and other technology to measure distress in road surfaces. Given below are the some of the other key technology-based initiatives to improve the operation and management of highways in India.

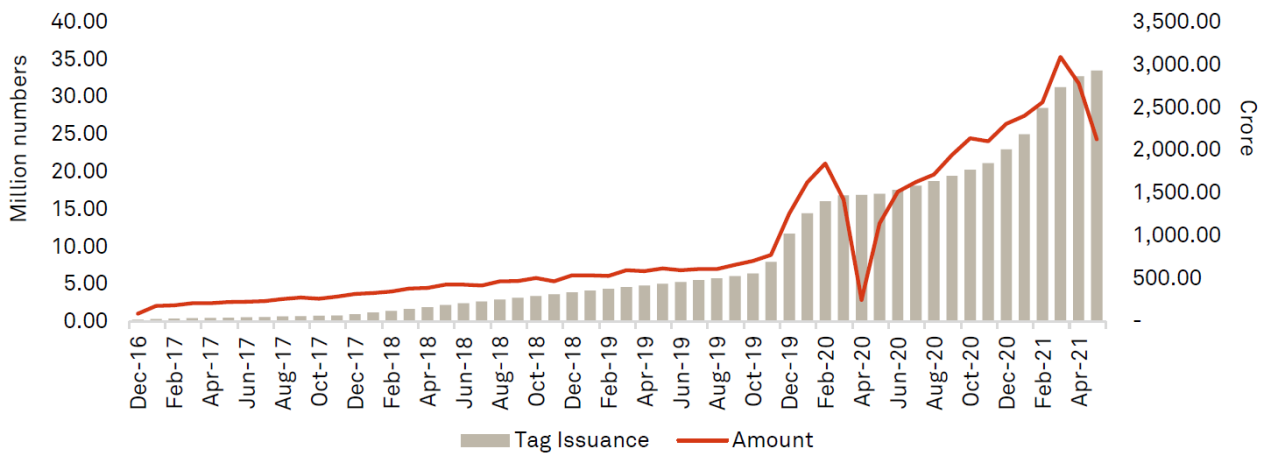
Smart Highways

Smart highways have the opportunity to turn from serving a singular purpose of being the backbone of a country’s transportation system to providing additional value through solar powered vehicle charging, electric vehicle charging lanes, safety feature implementation and gathering of key data points for both road users and transportation administrators. Such data related to goods and people movement will have tremendous applicability. In India, the concept of smart highways has gained significant momentum with Eastern Peripheral Expressway (EPE), India’s first smart and green highway of 135 km length, inaugurated by Prime Minister Narendra Modi in 2018. Some of the various components of smart highways included solar powered plants, closed tolling system, rainwater harvesting, weigh-in-motion (WIMs) equipment, intelligent traffic management and video incident detection system (VIDS).

FASTag-ing Highways and GPS-based toll collection

As a part of the government’s Digital India initiative, Electronic Toll Collection (ETC) through the implementation of FASTag has become mandatory from February 16, 2021, on all national highways. Following this, toll collection through FASTag has seen consistent growth. There has been a significant increase in FASTag issuance in the country – from 2,08,761 in December 2016 to 3,34,48,613 in May 2021.

Exhibit 36: NETC FASTtag issuances and amount collected



Source: Emerging Trends & Opportunities in Roads and Highways, A FICCI-CRISIL Report, June 2021

Electronic toll collection via FASTags has plugged revenue leakages substantially, leading to significant increase in daily toll collections. During the first three quarters of fiscal 2019-20, the average daily toll income for the NHAI rose sharply to Rs 80-85 crore in December 2019, from Rs 60-65 crore during the April-June quarter of fiscal 2019-20 — an over 40% jump. Most recently, given the mandatory toll collection through electronic FASTags from February 16, 2021, daily toll collections have breached the Rs 100 crore mark, recording the highest-ever collection of Rs 103.94 crore with over 64.5 lakh daily transactions on February 25, 2021. The smooth implementation of FASTag has witnessed growth of 20% in terms of electronic toll collection transactions and 27% in terms of collection of user fee through FASTag. FASTag implementation has also reduced the waiting time at national highways fee plazas significantly, resulting in enhanced user experience through automation.

To ensure seamless vehicle movement through toll plazas, GPS-based toll collection is likely to be implemented within a year in India, as per a statement by Union Minister of Road Transport and Highways, Nitin Gadkari in March'2021. Both the Ministry of Road Transport and Highways and the Indian Highways Management Company Ltd (IHMCL) have swung into action ever since the Union Minister made the announcement in the Lok Sabha in March. While the ministry is conducting a pilot project on global positioning-based electronic tolling on the Delhi-Mumbai National Highway, the IHMCL has invited bids for consultant for GNSS-based tolling.

With the GPS-based toll collection, the physical toll booths will be removed and tolls at highways will be collected based on GPS imaging (on vehicles). This move aims to ensure a fully seamless, toll barrier-free movement for vehicles, enhanced audit control and centralised user accounts for the toll operator, along with adherence to green norms by curtailing the idling fuel wastage.

We expect to see a paradigm shift in highway construction in India from the conventional practice of merely widening the existing highways to construction of new, modern highways that are sustainable and developed using advanced technologies.

The highways of the future will include greenfield access-controlled expressways and economic corridors, and offer quality services to highway users – both for passenger and freight transport. Increasing use of technological advancements and a greater emphasis on sustainability, e-mobility and eco-friendly construction will be some of the key future trends.

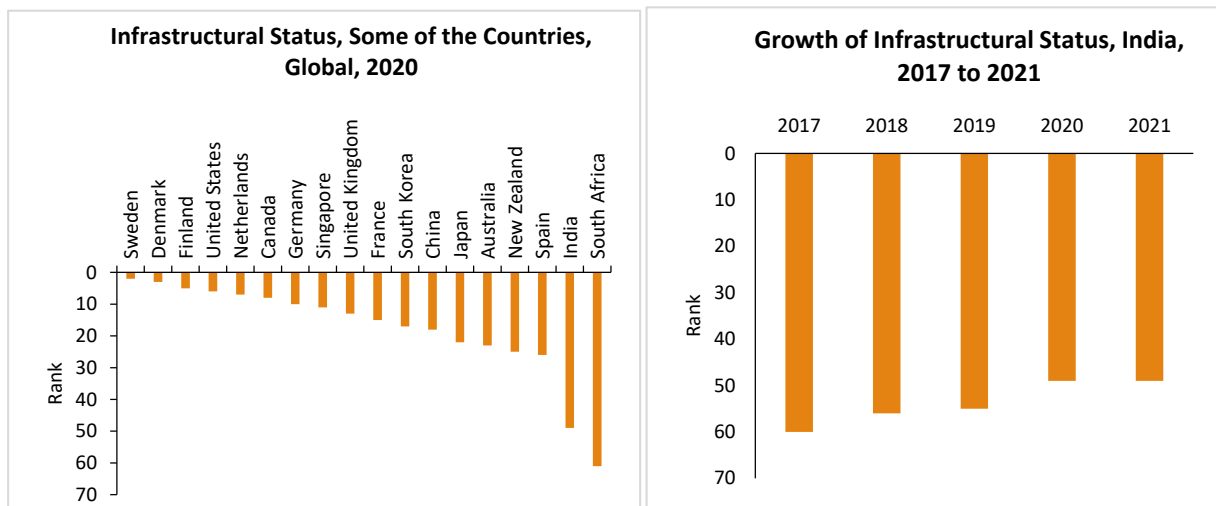
Chapter 7: Global Comparison of Road Networks

Well functioning infrastructure is a cornerstone of a modern society. As well as serving an important role in facilitating business transitions, infrastructure increases a country’s efficiency and improves the standard of living of its citizens. Economic growth allows for additional infrastructure investment while infrastructure is a necessary component in improving economic conditions.

Infrastructure comes in various forms depending on what is required by the society in question. Countries well equipped with roads, rail and port facilities are better positioned to gain from trade domestically and internationally.

Top-performing economies are characterized by varying degrees of investment in innovation, diversified economic activities, and supportive public policy.

Exhibit 37: Infrastructural status across the economies



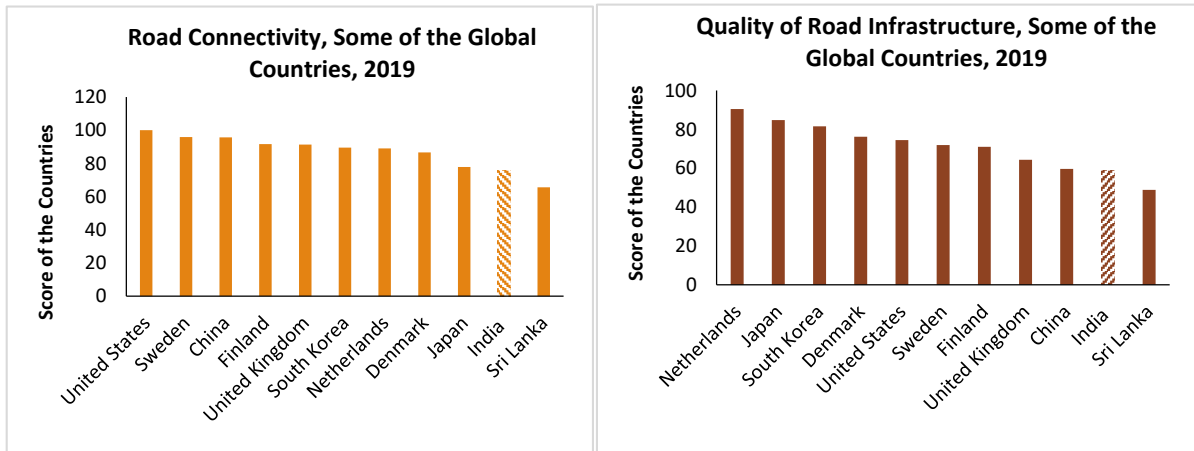
Source: IMD World Competitiveness Ranking 2021

Apparently, it seems that India’s road infrastructure is better. The cumulative road network is more than 6 million kms. However, the quality of India’s road infrastructure is very poor: only 3% of these roads are national highways, and 75% of highways are only two-lane. Roads are congested and road maintenance is under-funded. At the same time, 40% of the roads are dirt roads, and over 30% of villages have no access to all-weather roads.

India is the fastest growing large emerging market in the world, surpassing China. Improvement in infrastructure picked up extensively in the last few years, when the government increased public investment and sped up approval procedures to attract private resources. Though the performance of the country still remains low in terms of infrastructure, it has experienced one of the most important and significant improvements in India.

Many explanations have been given for India’s inadequate road investment, including lack of funds and poor project management. The country is moving towards closing the infrastructure gaps. Though the economy has significantly improved its physical infrastructure, the lack of adequate infrastructure still remains a bottleneck. Further investments are necessary, especially to connect rural areas. In addition, road building requires coordination between states and central government to get around obstacles like land acquisition, planning permission and vetting of tenders – all of which can delay projects and lead to huge cost overruns.

Exhibit 38: India’s status in road infrastructure in the global platform



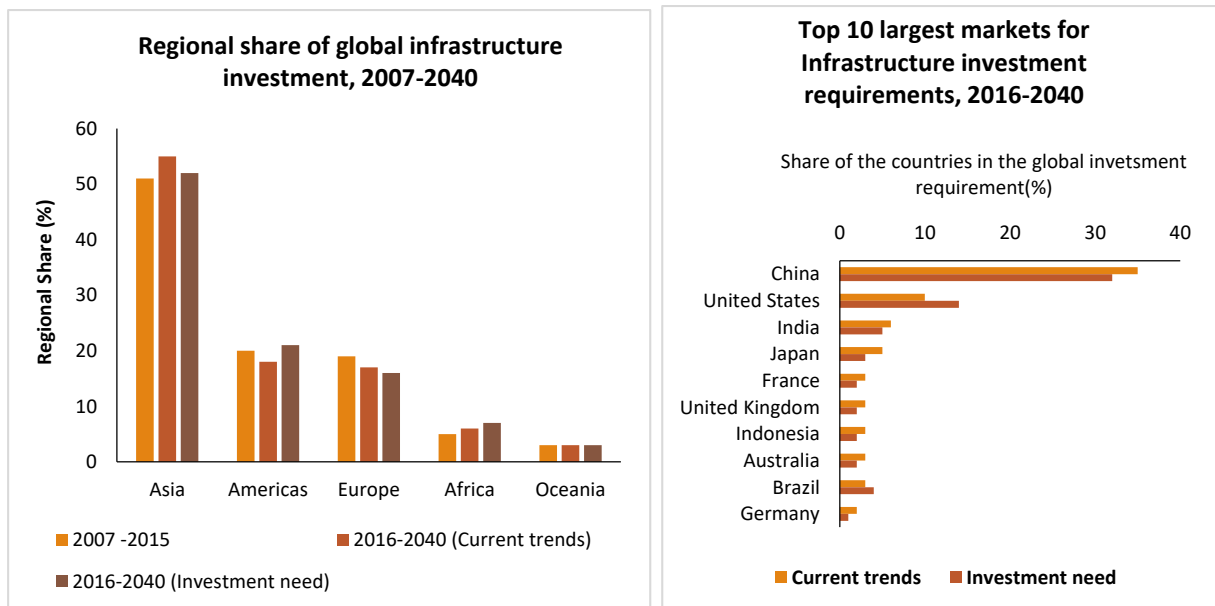
Source: The Global Competitiveness Report 2019, The World Economic Forum

Note: The 2019 edition covers 141 economies, which account for 99% of the world’s GDP. Infrastructure was among one of the 12 pillars chosen to explain the status of any nation in the report. A country’s performance is reported as a ‘progress score’ on a 0-to-100 scale, where 100 represents the ‘frontier’, an ideal state where an issue ceases to be a constraint to productivity growth. Each country should aim to move closer to the frontier on each component of the index.

Investing in road infrastructure can catalyse growth in two ways. It increases employment, incomes and therefore demand throughout an economy. For a country like India with relatively low incomes and an excess supply of labour, road-building can unlock growth quickly – particularly as a way of recovering from the COVID collapse.

It is worth pointing out that improvements to India’s roads have already increased productivity for companies over the past two decades. It has been estimated that a 1% increase in road density raised productivity by about 0.25%. This gives a sense of what could be achieved with greater investment.

Exhibit 39: Investment in infrastructure across the regions and countries



Source: Oxford Economics

Infrastructure investment is of major importance in both developed and developing economies. For the latter, the impact can be highly helpful to transform an economy and the prospects for its citizens as roads are built and utilities put in place.

Good quality roads and railways, for example, make it easier, cheaper and faster to transport goods and people, while airports and sea ports connect firms across international boundaries, facilitating trade and investment. Reliable electricity, water and telecoms infrastructures enable firms to function efficiently and without disruption, and support wider goals, such as those related to the environment. All this means that even in the most advanced economies, if infrastructure capacity does not increase in line with economic and demographic growth, it can instead act as a drag on progress.

Asia expects to dominate the global infrastructure market in the years ahead as it does at present. Asia accounts for close to 55% of global infrastructure investment needs to 2040, compared to 22% for the Americas, the next largest region. Indeed, just four countries account for more than half of global infrastructure investment requirements to 2040: China, the US, India and Japan.

China alone is estimated to account for 30% of global infrastructure needs. This is equivalent to a total of \$26 trillion between 2016 and 2040. China's requirement increases only slightly to \$28 trillion under the investment need scenario, reflecting that China is already investing strongly in infrastructure and the extent of uplift required to match its best performing peers is less than in many other countries. This means that its share of global investment is lower under the more ambitious scenario.

Despite the current economic slowdown, India's enormous need for infrastructure makes it one of the biggest and most important infrastructure markets in Asia. In terms of future needs, the second largest infrastructure market in Asia after China is India. The country's GDP per head currently stands at \$1,600 and is forecast to rise to \$4,800 by 2040, which is still some way below the current level in China of \$8,000. As such, while population growth in India is expected to drive significant demand for infrastructure in India over the next 25 years, in absolute terms this infrastructure requirement will be substantially lower than in China, which is at a more advanced stage of development.

Availability of infrastructure finance remains constrained as the recent improvement in the health of the banking sector has been offset by a decline in the health of the non-banking sector. According to experts, In India, \$291 billion of investment in infrastructure is needed by 2030. However, the overall size of the economy means that the challenge appears relatively affordable relative to GDP: the requirement is equivalent to 0.6% for India. The country might need to invest \$3.9 trillion under current trends, increasing to \$4.5 trillion under the investment need scenario.

Recognizing the need for easy access to low-cost capital, the government has proposed a number of measures to enhance the sources of capital for infrastructure financing.

Market participants noted that borrowing costs are expected to fall marginally in the coming months owing to the decline in key policy rates to reverse the economic slowdown in the country.

Road-building has to go hand in hand with investing in technology to reduce emissions, including more electric and hybrid vehicles and a charging network to make electric cars viable. This needs to not only be an investment priority for India but for players like the US who have been working to assist developing countries to decarbonise.

Concluding Remarks

Despite having multiple challenges, India is planning to construct 40km of highways every day in the current financial year, and intends to increase its highways by a third in the next few years. Given a large pool of unemployed labour, the conditions are ideal to do this. If India is to tap the potential of infrastructure development to stimulate growth, it needs to both make the green transition part of the programme and to look at the obstacles to making road-building succeed. With a state-of-the-art road network, India could achieve so much more.

Increased industrial activities, along with increasing number of two and four wheelers expect to support the growth in road transport infrastructure projects. The Government's policy to increase private sector participation has proved to be a boon for the infrastructure industry with many private players entering the business through the public-private partnership (PPP) model.

With vaccines around the corner, there is increased hope that the pandemic could soon be under better control. When policymakers across countries work together and implement high-quality, smart spending on infrastructure, the impact of their individual actions can be amplified and provide further support for all economies.

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As India strategizes for the next 25 years to India@100, Indian industry must scale the competitiveness ladder to drive growth. It must also internalize the tenets of sustainability and climate action and accelerate its globalisation journey for leadership in a changing world. The role played by Indian industry will be central to the country's progress and success as a nation. CII, with the Theme for 2023-24 as 'Towards a Competitive and Sustainable India@100: Growth, Inclusiveness, Globalisation, Building Trust' has prioritized 6 action themes that will catalyze the journey of the country towards the vision of India@100.

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