FICCI

Emerging trends and opportunities in roads and highways sector

June 2021



Infrastructure Advisory

CRISIL
An S&P Global Company

Analytical contacts

CRISIL

Mr Akshay Purkayastha
Director – Transport & Logistics
CRISIL Infrastructure Advisory
Tel: (D) +91 124 672 2491

Mr Anshuman Chauhan
Associate Director – Transport & Logistics
CRISIL Infrastructure Advisory
Tel: (D) +91 124 672 2052

Mr Sidhant Agrawal
Consultant - Transport & Logistics
CRISIL Infrastructure Advisory
Tel: (D) +91 124 672 2509

FICCI

Ms Neerja Singh
Senior Director – Infrastructure (Transport and Urban)
(Roads and Highways, Ports and Shipping, Railways, Urban Development, Real Estate and Smart Cities)
Tel: (D) +91 11 2348 7326

Ms Komal Sharma
Deputy Director – Infrastructure
Tel: (D) +91 11 2348 7519
Email: komal.sharma@ficci.com

Ms Nikika Goyal
Research Associate – Transport Infrastructure
Tel: (D) +91 11 2348 7414
Email: nikika.goyal@ficci.com

Contents

Message from the Minister **5**

Foreword from FICCI **6**

Foreword from FICCI **7**

Foreword from CRISIL **8**

Executive summary **9**

India's roads and highways sector **11**

Background 11

Expressways – creating highway networks of the future 14

MMLPs and WSAs – key areas of road infrastructure improvement 15

Positive impact of the emerging infrastructure developments in the sector **19**

Improvements in logistical efficiency 20

New business opportunities across the national highways network 22

Business-friendly contractual structures – A step forward for attracting private investments **23**

Emerging trends and technologies **29**

Design and implementation 29

Highway operations 30

Way forward **34**

This page is intentionally left blank

Message from the Minister

जनरल (डा.) विजय कुमार सिंह
पीवीएसएम, एवीएसएम, वाईएसएम (से.नि.)
GEN. (DR) VIJAY KUMAR SINGH
PVSM, AVSM, YSM (Retd)

सत्यमेव जयते

राज्य मंत्री
सड़क परिवहन एवं राजमार्ग मंत्रालय
भारत सरकार, नई दिल्ली

Minister of State for
Road Transport & Highways
Government of India, New Delhi



FOREWORD

The National Highways with a total length of 1,36,440 km, serve as the arterial network of the country. MoRTH has achieved record-breaking milestone in constructing highways for the year 2020-21 and aspires to upscale it further in the ongoing financial year. Government initiatives like Bharatmala and Pradhan Mantri Gram Sadak Yojana (PMGSY) have been instrumental in creating a network of roads that connect all cities and villages. Furthermore, the Government has taken various initiatives to boost the confidence of the industry while addressing the concerns related to land acquisition, revival of languishing projects, introduction of innovative project financing and time bound resolution of disputes.

Multi-modal logistics parks (MMLPs) are an important concept in Bharatmala Pariyojana and focuses on facilitating seamless and economical mode of logistics across the nation. The programme includes development of 35 MMLPs at various locations across the country with a view to eradicate logistics related deficiencies in India and to strategically integrate highway projects with other connectivity initiatives like inland waterways, air, railways etc. This coupled with building smart highways and construction of Wayside Amenities (WSA) will be a step towards building superior quality infrastructure which will match global standards. To enhance the commuter's experience, a special focus is being given to road safety, maintenance, riding comfort, removal of choke points, black spots and usages of new technologies.

I congratulate FICCI and CRISIL for preparing a white paper "Emerging Trends and Opportunities in Roads and Highways Sector" which talks about present trends and several areas on how to rejuvenate the investments flowing in from the private sector.

The "Accelerating the Road Infrastructure : New India @75, 2nd edition of Roads and Highways Summit" is being held at an opportune time to gain better understanding of opportunities pertaining to projects' investments in Roads and Highways Sector. I am sure, the deliberations and exchange of views during the summit would help in accomplishing the goal of rejuvenating the Private Sector investments in Roads and Highways Sector.

I wish the summit all the success.

[General (Dr.) V. K. Singh]

Transport Bhawan, 1, Sansad Marg, New Delhi-110 001
Office Tel. : +91-11-23731522, 23715159 Fax : +91-11-23718568, Web : http://www.morth.nic.in

Foreword from FICCI



Mr BVN Rao
Chairman,
FICCI Committee on Transport Infrastructure and
Business Chairman (Transportation & Urban Infra), GMR Group

I am happy to share with you the **FICCI-CRISIL** white paper on **"Emerging Trends and Opportunities in Roads and Highways Sector"** to be released at **"Accelerating the Road Infrastructure: New India @75, 2nd edition of Roads & Highways Summit"** organized by Federation of Indian Chambers of Commerce and Industry.

The government aims to create world-class road infrastructure and enhance user experience by building smart highways and wayside amenities. There is also a special focus on bringing down the cost of logistics by fast tracking the building of multimodal logistics parks (MMLP) projects. Such initiatives will forever change the face of road travel in India.

It is noteworthy that government has shortlisted Transportation as one of the four core sectors under its National Monetization Pipeline plans, as part of its commitment towards building an **Atmanirbhar Bharat**.

Also, despite the Covid-19 pandemic, MoRTH has achieved record-breaking milestone by constructing 37 kms highways per day in year 2020-21. Further, **NHAI has set an ambitious target of building 4,600 Km of new highways in the current fiscal year as opposed to 4192 Km constructed in FY 21**

The FICCI-CRISIL comprehensive white paper focuses on the present trends and technologies and various other initiatives undertaken by GoI to attract private investments/interest into the roads and highways sector.

I hope you will find this paper useful. We welcome your suggestions and feedback.

Foreword from FICCI



Mr Shailesh Pathak
Co-Chairman,
FICCI Transport Infrastructure Committee and
Head- Special Initiatives, Development Projects, Larsen & Toubro

Highways in New India @75 are remarkably different from India @50. Much has improved in the last few years in terms of rapid construction, better maintenance and technology, and streamlined dispute resolution. National Highway length is up 50% since 2014. Land acquisition is now much less problematic. Solutions have been found for stuck PPP projects, so that construction is completed. Affordable Arbitrations and claim settlements have been institutionalised. Successful asset monetisation is leading to long-term global capital funding platforms for Indian Highways.

Most FICCI members in the roads sector are not PPP investors, but road construction companies and those who supply inputs, be it in terms of cement, steel, aggregate etc. or equipment; or those who supply technology solutions, or those who supply advice: consultants for business, financial, legal and other advisors. For our FICCI members, both construction and operations of highways and associated infrastructure are important, as is the road user experience. Electronic toll collections through FASTags have become near universal, which has de-fanged toll plazas of their earlier tension of traffic jams.

We look forward to more initiatives in road safety, better logistics, and much better user experience in terms of road pavement quality and 'rest areas' along not only new expressways, but also existing 4 lane and 6 lane highways. In many ways, the completion of the US Interstates from 1956-1965 led to the road trip culture in America. It is today possible to drive from anywhere to anywhere in India in less than 4 days. With the incipient expressways, this experience would only get better.

Such issues have been well analysed in FICCI-CRISIL's Knowledge Paper for "Accelerating the Road Infrastructure: New India @75, 2nd edition of Roads & Highways Summit". The Paper describes the significant initiatives in Multi Modal Logistics Parks, and plans for way-side amenities. FICCI would appreciate all your comments and suggestions on how we could enable the 'ideas' in the National Infrastructure Plan (NIP) and the National Monetisation Plan (NMP) to get converted into 'cash-flow' and 'infra assets' benefiting the government, the private sector and above all, the road user.

Foreword from CRISIL



Mr Akshay Purkayastha
Director
Transport & Logistics
CRISIL Infrastructure Advisory

The Covid-19 pandemic has adversely affected economic and business activities in India and around the world. During these trying times, government spending on infrastructure, especially on roads and highways, has emerged as a ray of hope for the Indian economy.

The highway construction sector saw a high growth of over 30% last fiscal, vis-à-vis the year before. Toll collections also surpassed pre-pandemic levels by the third quarter of the fiscal. This was the result of multiple government initiatives and extensive budgetary support to the sector.

To enhance resource mobilisation and attract private sector investment for all these initiatives, the Ministry of Road Transport and Highways (MoRTH) and the National Highways Authority of India (NHAI) have made investor-friendly changes in the model concession agreement (MCA) under the hybrid annuity model (HAM), toll-operate-transfer (TOT), and build-operate-transfer (BOT)-toll models. This has boosted investor sentiment as evident from successful TOT bundles 5A and 5B bids and significant interest shown by developers in HAM and EPC bids. In addition, significant progress has been made in reviving the BOT-toll model. These steps will go a long way in achieving a better mix of EPC, HAM and BOT while awarding projects of MoRTH and NHAI.

The Government of India, under the aegis of the MoRTH, is also rolling out new initiatives to develop ancillary and support infrastructure around the highways network. These include developing Multi-Modal Logistics Parks (MMLPs) and Way-side Amenities (WSAs). These initiatives are in line with the MoRTH and NHAI's focus on enhancing user experience and building world-class infrastructure.

The need for a robust and efficient logistics system has been felt deeply since the onset of the pandemic. The government has laid the foundation stone for the first MMLP to be built in India. In addition, more than 30 MMLPs have been planned across India. The infrastructural support thus generated will help reduce the cost of transportation and warehousing, and create a more efficient commercial transport ecosystem.

Development of WSAs is expected to have a positive, far-reaching impact on road users. Also, incorporation of forward-looking designs and technologies such as electric charging stations in these WSAs will help strengthen electric vehicle support infrastructure across India.

The roads and highways sector in India is indeed undergoing a paradigm shift. As the Phase 1 of Bharatmala Pariyojana gets executed, more and more benefits will start flowing into the sector as a whole. The MoRTH and the NHAI have been the leading adopters of technology such as FASTag and are focussing on building smart highways. As we move forward, there are a host of opportunities lined up for all the stakeholders, which should help the sector scale new heights of performance.

Executive summary

The roads and highways sector has recovered from the pandemic blow much faster than anticipated, and the fastest within the transport infrastructure space.

To spell out the improvement, toll collections have surpassed pre-pandemic levels with widespread adoption of FASTag across the country. In addition, the two key performance indicators of highway sector performance – length of road projects awarded and constructed – have shown robust growth in the past year. All these positive parameters are a result of strong government thrust and private sector interest.

As part of Bharatmala Pariyojana, the government has planned for development of greenfield expressways to increase freight and passenger speeds and logistics efficiency between major economic centres. The NHAI has proposed construction of 23 new access controlled highways/ expressways, which are expected to be operationalised by March 2025.

The new expressways are being designed with the goal of minimising the road lengths between major cities, thus reducing travel time and costs. The expressways will be completely access-controlled to ensure unhindered flow of traffic. Superior technical and safety standards for the new expressways will allow speeds of up to 120 km/hour. In a much-needed forward-looking move, a separate lane for electric trucks will be included in some of these expressways.

Access-controlled expressways are expected to offer road users some major benefits such as i) efficient logistics movement due to high speed and short distance, thus enabling time and cost savings, ii) enhanced road safety due to reduced/ negligible trespassing of cross-traffic, and (iii) closed tolling, a more equitable form of tolling where users pay only



for the distance travelled and not for the entire length of the road.

Furthermore, as a part of its endeavour to provide world-class road network and allied infrastructure services, the NHAI intends to develop MMLPs at more than 30 strategic locations across the country in the next five years.

The hub-and-spoke model of freight movement facilitated by these MMLPs will be significantly more efficient than point-to-point freight movement as is currently prevalent. The development of MMLPs at various locations across the country will be instrumental in improving efficiencies in the logistics value chain by providing specialised infrastructure and services. MMLPs will help cut logistics costs, improve freight aggregation, distribution, storage and warehousing, and create various value-added services such as labelling, packaging, tagging, and crating. MMLPs will also help reduce transportation and warehousing cost, road congestion and pollution.

The logistics sector is likely to be the primary beneficiary of the government's initiative to develop MMLPs and greenfield expressway corridors. According to the MoRTH, these initiatives are expected to bring down logistics costs substantially, thereby helping incentivise purchase of Indian goods in the global markets. The MMLPs, coupled with world-class expressways, will allow for freight transportation in larger-sized trucks at accelerated speeds, resulting in lesser carbon emission from movement of goods on a per-tonne-per-kilometre basis and making freight transportation more environment-friendly.

Other allied infrastructure services planned by the government include WSAs across the country's highway network.

The WSAs will augment road safety by providing much-needed resting facilities for travellers, thereby reducing fatigue-related road accidents. The WSAs will include facilities such as fuel stations, restaurants, short-term accommodation, and washrooms for both passengers and truckers, with EV charging stations likely to be added in future. A set of free facilities such as drinking water, emergency telephone services, and parking will also be made available.

The NHAI has identified more than 600 sites for WSAs across 22 states in India spanning more than 3,000 hectares.

The proposed WSAs will increase user satisfaction and also generate widespread employment opportunities for potential investors, developers, restaurateurs, local farmers, and villagers along the corridors and expressways. The sites would also include village *haat/bazaar* to sell local food, fruits, handicrafts and handlooms.

Additionally, under its vision to improve ease of doing business in the sector, the government has introduced various investor-friendly changes in the MCA for the development of highways under the PPP mode. These new, innovative contractual structures for PPP project developments, such as BOT-toll mode, TOT mode and HAM, will be instrumental in attracting private sector interest and realising the full potential of the above-mentioned initiatives.

Further, the growing use of advanced technologies such as drone survey recording, network survey vehicles (NSV) and LiDAR (light detection and ranging) for designing and surveys will only catalyse India's vision of establishing first-world infrastructure.

Smart highways have been designed to support electronic toll collection, e-mobility and solar charging. Moreover, the adoption of latest technologies will be crucial for developing sustainable infrastructure.



India's roads and highways sector

Background

At 62.15 lakh km, India has the second-largest road network in the world, with national highways (NH) constituting 1.36 lakh km.[1] 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.[2] 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.[3]

The largest initiative in the road sector currently underway is the Bharatmala Pariyojana, an umbrella programme for developing NHs in India. Phase-1 has been envisioned to be executed over a period of five years (fiscals 2018-22) at an approved outlay of Rs 5.35 lakh crore. The projects in the programme have been classified as high priority projects as they are expected to carry substantial volumes of traffic and act as the backbone of the NH network. The objective of the programme is to optimise the efficiency of freight and passenger movement across the country by bridging critical infrastructure gaps through the development of greenfield expressways, economic corridors, inter-corridors and feeder routes.

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.[4] The two key performance indicators – length of road projects awarded and constructed – have been encouraging, indicating strong government push and private sector interest.

[1] Annual Report 2020-21, Ministry of Road Transport & Highways
[2] An article on Investment in Road Infra: Business Line, March 11, 2021
[3] Economic Times article dated April 30, 2020
[4] Mint article dated February 26, 2021

Figure 1: Length of NH awarded (unit: km) and pace achieved (unit: km/day)[5]

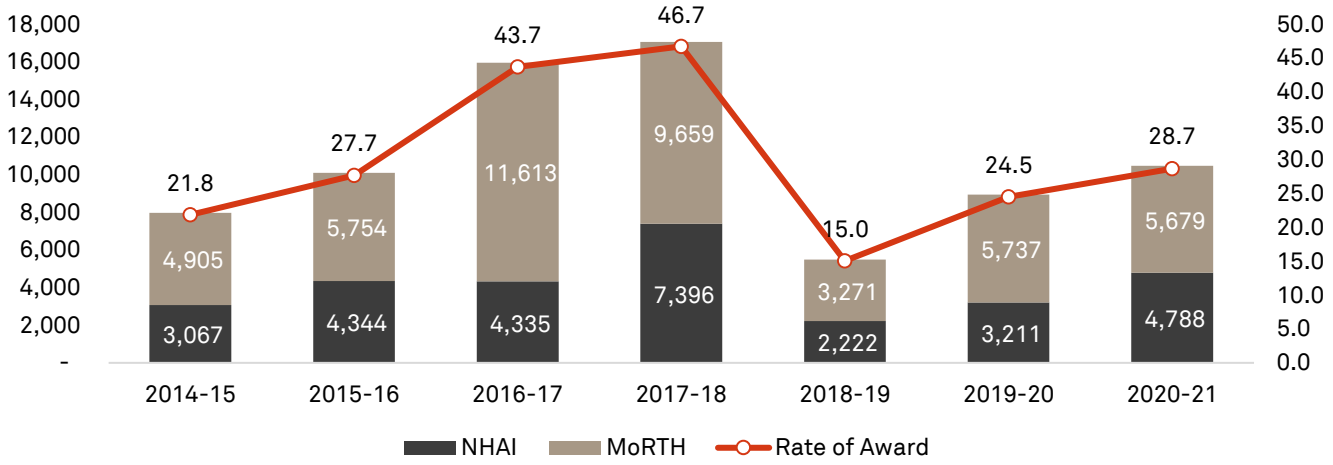
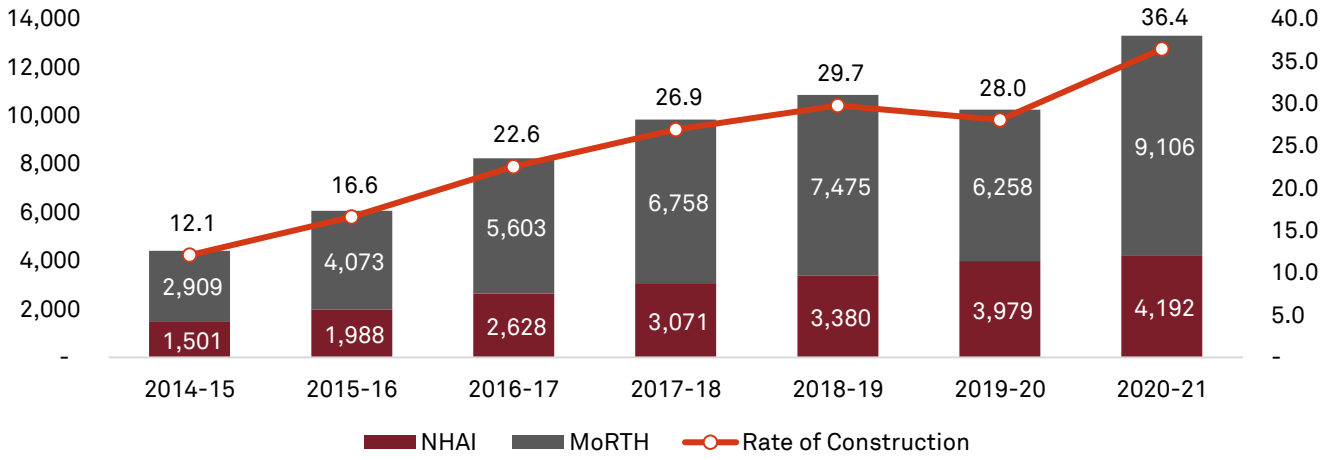


Figure 2: Length of NH constructed (unit: km) and pace achieved (unit: km/day)[6]



Note: Length of NH awarded and constructed by MoRTH includes implementing agencies such as the state government (state PWDs), the Border Roads Organisation (BRO) and the National Highway and Infrastructure Development Corporation Limited (NHIDCL)

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[7] compared with 8,948 km in fiscal 2020[8]. The length of NH constructed last fiscal stood at ~13,300 km[9], 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. The introduction of investor-friendly changes in the MCA for highway building under the HAM and BOT toll models, and the

[5] Annual reports of NHAI, MoRTH and CRISIL analysis
[6] Footnote 5
[7] Financial express article date April 12, 2021
[8] PIB dated 17th January 2021
[9] Statement by Union Minister of RTH, April 02, 2021

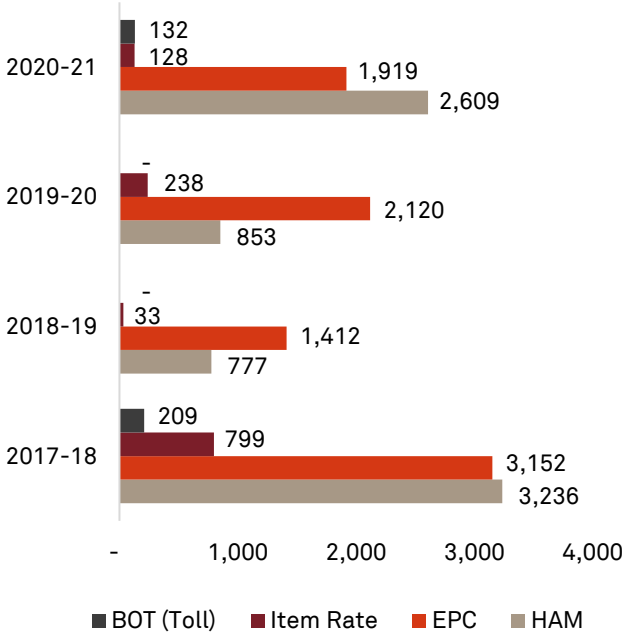
government's thrust on greenfield corridors and expressways are expected to further drive sector growth. The positive impact of these initiatives on investor interest is evident in the award price of TOT bundles 5A1 and 5A2 which was ~Rs 630 crore more than the base price for the NHAI's fifth round of TOT auctions of Rs 1,621 crore.

That said, measuring the progress with these raw numbers may not paint an accurate picture. For instance, the quality of road construction varies widely across the country. To address this issue, the use of plastic in pavement construction is being encouraged to improve efficiency and road quality.

The portfolio mix of the various models used for project awards has been a focus area for the government in recent years. While the portfolio mix initially envisioned under Phase-1 of Bharatmala Pariyojana comprised HAM, EPC and BOT toll projects in a 50:40:10 ratio, the interest in BOT toll projects from the private sector has been lower than expected. With ~35,000 km of highways planned under the Phase-1, 3,500 km of highways were planned to be awarded under the BOT toll mode. However, only four projects for ~341 km have been awarded under BOT toll since fiscal 2017, including two projects for 132 km being awarded in the last fiscal. A key reason for the lack of private sector interest in BOT-toll projects is believed to be the financial stress caused to the developers owing to delays in construction and lower-than-estimated revenue. Such challenges have diverted private sector interest towards investments in HAM and EPC projects where revenue risks are minimal.

The EPC and HAM models, albeit less risky for private players compared with the BOT toll model, constrain government finances. To achieve the ambitious roads and highways development programme, an optimum mix of HAM, EPC and BOT toll models is necessary to ensure that the risks are adequately distributed among government and private players, so as to attract higher investment and participation. Figure 3 shows the mix of project award by the NHAI during the last four fiscals.

Figure 3: Mode-wise length of NH awarded (unit: km)[10]



Bharatmala Pariyojana, Setu Bharatam, and the Char Dham Highway project have been focussing on following an integrated approach towards building critical infrastructure. India's road sector is getting ready to embark in a new direction by enhancing user experience while building world-class infrastructure. Allied infrastructure such as WSA have been planned by the government and will provide much needed rest stops and emergency facilities to road users. Greenfield expressway corridors have also been planned to increase the speed and efficiency of freight and passenger movements between major economic centres. Furthermore, as a part of its endeavour to provide world class infrastructure and related services for the highway network, the NHAI intends to develop MMLPs at 35 strategic locations across the country. Put together, initiatives such as MMLPs and greenfield expressway corridors are expected to reduce logistics costs significantly in the country. In addition, allied infrastructure such as WSAs will

[10] Footnote 5

likely generate employment opportunities and increase user satisfaction. The following sections look into each of the above initiatives in detail.

Expressways – creating highway networks of the future

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.

Apart from the projects under Bharatmala, the NHAI has proposed construction of 23 new highways with a combined length of ~7,800 km, including a network of expressways and economic corridors, which are expected to be operationalised by March 2025. Four expressways, including Delhi-Mumbai, Ahmedabad-Dholera and Amritsar-Jamnagar, are scheduled for completion by March 2023. Nine more are expected to be operationalised by March 2024. This network of expressways spans the country connecting Surat, Solapur, Lucknow, Vizag, Chennai, Bengaluru, Vijayawada, Raipur, Kota, Kharagpur and Siliguri. The construction is expected to take place in a phased manner, with the last stretch of nine greenfield projects to be completed by March 2025. Total capital outlay of Rs 3.3 lakh crore is to be achieved through Special Purpose Vehicles (SPVs) to ensure inexpensive financing and reduced risk for investors.[11]

A new initiative for expressways is closed tolling, which is a more equitable form of tolling where users pay only for the distance travelled and not for the entire road length. Distance-based tolling is easily implemented in a closed toll system where no movements can be made toll-free.

The table below lists the upcoming expressways/corridors with expected completion schedule:[12]

Expressway (approx. length in km)	Expected completion schedule
Delhi – Mumbai (1,350)	March 2023
Ahmedabad – Dholera (110)	March 2023
Delhi – Amritsar – Katra (650)	March 2024
Bengaluru – Chennai (272)	March 2024
Kanpur – Lucknow (63)	March 2024
Ambala – Kotputli (310)	March 2023
Amritsar – Jamnagar (762)	March 2023
UER II in Delhi (75)	March 2024
Raipur – Visakhapatnam (464)	March 2024
Delhi – Saharanpur – Dehradun (169)	March 2024
B'luru Satellite Town Ring Road (281)	March 2024
Surat – Solapur (464)	March 2025
Chennai – Salem (277)	March 2025
Durg – Raipur – Arang (92)	March 2024
Chitoor – Thatchur (125)	March 2024
Kharagpur – Siliguri (235)	March 2025
Solapur – Kurnool (318)	March 2025
Indore – Hyderabad (713)	March 2025
Hyderabad – Visakhapatnam (221)	March 2025
Kota – Indore (136)	March 2024
Hyderabad – Raipur (330)	March 2025
Nagpur – Vijayawada (457)	March 2025

[11] An article on 23 New Expressways: Times of India, August 13, 2020
[12] NHAI & Times of India article dated August 13, 2020

Case study – Delhi-Mumbai Greenfield Expressway (DME)

The Delhi-Mumbai greenfield expressway (DME)[13] will be the **longest** expressway in India. With a design speed of 120 km/hr, it is expected to reduce travel time between the two cities to 12 hours from the current 24 hours. In addition, the expressway will also improve connectivity with other economic hubs, including Jaipur, Bhopal, Indore, and Ahmedabad.

The expressway will have an **eight-lane** configuration with provisions to expand to 12 lanes in the future. A right of way of 100 m, with a 22 m median, has been planned to enable inside future expansion. On expansion to 12 lanes, a 7 m median will be maintained. Perpetual pavement design has been adopted for the Delhi-Vadodara section of the corridor and rigid pavement design has been adopted for Vadodara-Mumbai section of the corridor. Further, the corridor will be completely access controlled with closed tolling.

The Delhi-Vadodara section of the expressway comprises 31 packages. Of the 31 packages, 28 packages of length ~760 km had been awarded at a cost of ~Rs 37,430 crore, till March 31, 2021. In addition, bids have been invited for the remaining three packages with a length of 84 km. The Vadodara-Mumbai section of the expressway comprises 18 packages. Of the 18 packages, 11 packages of length ~293 km had been awarded at a cost of ~Rs 26,840 crore till March 31, 2021. With one package being implemented by Maharashtra State Road Development Corporation (MSRDC), bids have been invited for five packages with a total length of 129 km. A detailed project report for the remaining one package of length 10 km is currently underway.

The expressway will include a **separate lane for electric trucks**, which is a much needed forward-looking move. Another focus area is to build green infrastructure and upgrade existing backward areas. The government has committed to spend Rs 7 lakh crore to building green infrastructure using modern technology.[14] The development of the proposed Delhi–Mumbai expressway will generate **substantive employment opportunities** across the country. In addition, by improving connectivity to hitherto unconnected/poorly connected and under developed areas in the country, the corridor will trigger economic activities in such regions. It has been estimated that a total number of 4,076 person-days are required for the construction of one kilometre of highways.[15] Hence, the total number of person-days expected to be generated from the construction of the Delhi-Mumbai greenfield expressway is around 54.86 lakh person-days.

MMLPs and WSAs – key areas of road infrastructure improvement

The government of India's push for development of allied infrastructure facilities in highways sector – such as MMLPs and WSAs – is expected to help achieve the following objectives:

i. enabling dramatic changes in user experience

ii. creating first-world logistics infrastructure across the highway network

Such facilities will be instrumental in realising the government's vision of creating a world-class roads and highways network in India.

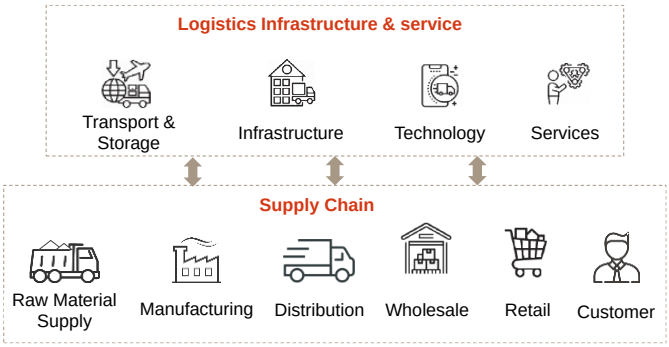
MMLPs

The logistics and supply chain market in India is expected to touch $307 billion by the end of

[13] NHAI and news articles
[14] An article on Delhi-Mumbai Expressway: Mint, March 2021
[15] NHAI and CRISIL Analysis

calendar year (CY) 2021.[16] The industry has been growing at a CAGR of 10.5% since CY2017, and is further expected to expand with the Covid-19 vaccine distribution.[17] The logistics industry has evolved significantly over time. Compared with the traditional logistics industry that comprised scattered and single-operation activities, modern logistics is systematic and integrated. Through extensive application of information technology and industry expertise, modern logistics systems provide a full range of one-stop service that supports the entire supply chain from transport and freight, warehousing management, and order processing to delivery and customer service.

Figure 4: Logistics as interplay of infrastructure, services, and technology



Source: Asian Development Bank

The Indian logistics sector encounters significant challenges leading to high cost and low efficiency. In order to support seamless intermodal transfers and enhance last mile connectivity, the Logistics Wing within the Department of Commerce, Ministry of Commerce and Industry had released a draft of the National Logistics Policy in public domain in February 2019. Its main objective was to reduce logistics cost as a percentage of GDP to about 10%, optimise the modal mix, improve last mile connectivity, and enhance the logistics value chain through digitisation, standardisation, and modernisation of warehousing among others. The policy also emphasises on the development of MMLPs for enabling seamless multimodal freight transfer, providing world-class storage and handling, as well as delivering value-added freight services.

The development of MMLPs at 35 strategic locations across the country has been envisaged by the NHAI as a key policy measure to rationalise logistics costs in India and improve its competitiveness. The pandemic has brought forth the need for greater supply chain regionalisation. The development of MMLPs at strategic locations across regions can help develop supply chain in a more agile and cross-functional way.

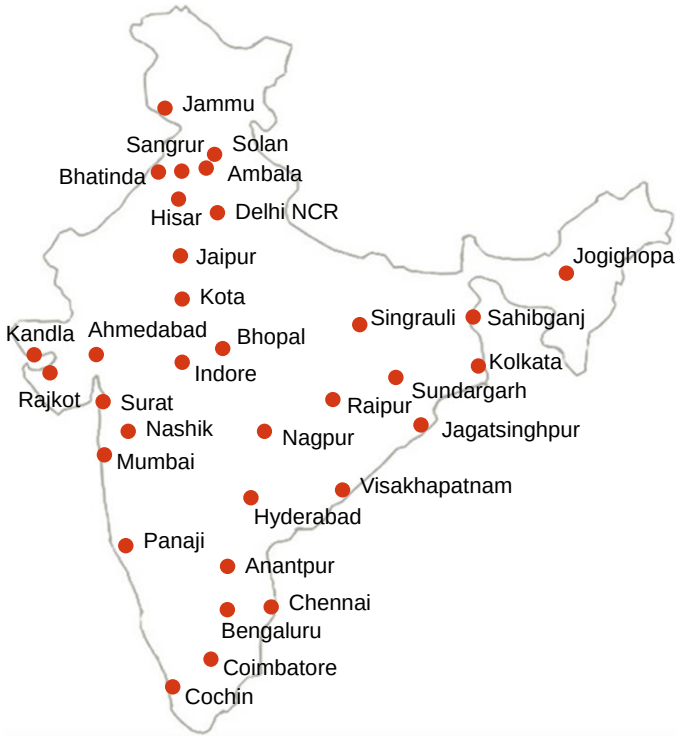


[16] Indian Retailer Bureau, January 14, 2021
[17] Financial express article dated January 31, 2021

Currently, freight movement in India happens on point-to-point routes on smaller-sized trucks, leading to higher logistics costs. MMLPs act as freight aggregation and disaggregation centres and will enable a hub-and-spoke model of freight movement, in contrast to the point-to-point freight movement currently prevalent in India. Further, these MMLPs enable the use of larger trucks/rail movement between hubs which have lower per-ton-per-km cost compared to smaller trucks. Furthermore, MMLPs could improve the utilisation and performance of inland container depots (ICDs) and container freight stations where they exist.

A network of 35 MMLPs (Figure 5) has been identified to cater to 50% of the road freight movement in the country. The development of these 35 multimodal logistics parks has been approved by the cabinet as a part of the National Corridor Efficiency Enhancement Component (NCEEP) of Bharatmala Pariyojana. 15 of these multimodal logistics parks were identified for development in Phase-1.

Figure 5: Locations of the proposed MMLPs



[18] MoRTH

Logistics parks are expected to provide four key benefits as summarised below:

Reduction in transportation cost

Logistics parks will drive a ~10% reduction in transportation cost for the top 15 nodes by enabling freight movement for larger sized trucks and rail. Larger sized trucks have ~60%[18] lower freight cost on a per ton per km basis compared with smaller sized trucks.

Reduction in pollution

Increased freight movement for higher sized trucks and rail will enable a ~12% reduction in CO_2 emissions for the top 15 nodes. Larger sized vehicles, on account of lower fuel consumption per ton per km, will result in lower CO_2 emissions.

Reduction in congestion

Increased freight movement for larger sized trucks and rail will result in a ~20% reduction in freight vehicles catering to the demands of the top 15 nodes. In addition, shifting warehouses and wholesale markets, currently being operated inside the city, to logistics parks would free up urban spaces, thereby reducing congestion.

Reduction in warehousing cost

Shifting warehouses currently being operated inside city limits to logistics parks will reduce warehousing cost, driven by lower rentals in logistics parks situated outside city limits. In addition, modern and mechanized storage solutions provided by logistics parks will enable a reduction in storage and handling losses.

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.

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.[19] 130 of these 600 sites are expected to be operational during fiscal 2022.[20] 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.

Some of the world-class facilities that are proposed to be developed in the WSA shown below.

Permissible uses for all sites

Fuel station	Food court / Dhaba	Hotel & Convention center
Guest & Meeting rooms	Banquet & Wedding halls	Warehouse / Logistics facility
Automobile showrooms	Auto workshops	Retail arcade & Speciality restaurants
Convenience stores & ATM	Truck user zone & parking	Truckers Dormitory/ Self Services

Mandatory facilities for all sites

Washrooms & drinking water	Ample bus & car parking
Electric charging station	Children play area & landscaping
Medical facilities with doctors on call	Village Haat (Gram Bazaar), Local craft shops

All upcoming WSAs would include "Village Haat/ Bazaar" which will offer specific area handicrafts and handlooms by local artisans besides local food and fruits. This is expected to provide an impetus to bring significant economic development to the villages along the highways.

Figure 6: Regional design components and village haat

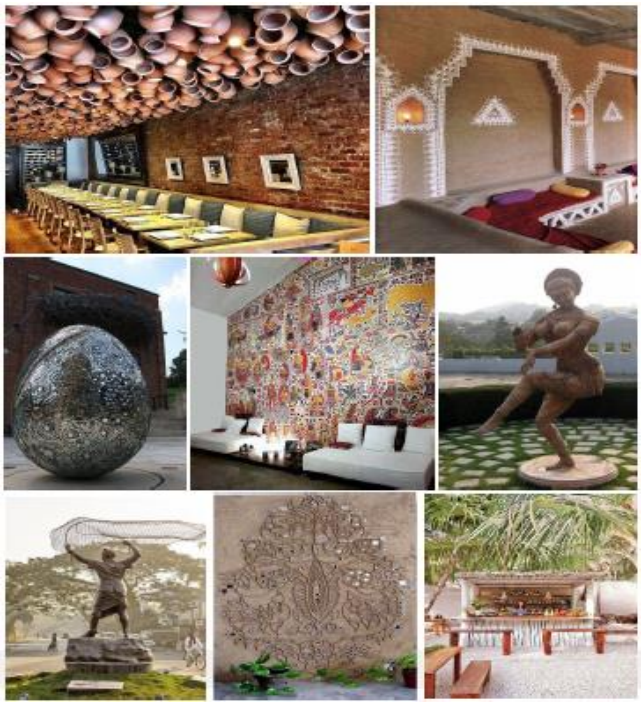


Image source: NHAI

[19] NHAI

[20] An article on wayside amenities: Mint, March 24, 2021



Positive impact of the emerging infrastructure developments in the sector

In the past few years, the roads sector in India has seen multiple progressive and timely interventions by the Union Government. Budgetary outlay for the sector has increased and the rate of road project awards by the MoRTH and associated entities has gained significant momentum in the past decade. India has made significant progress in highway development with keen focus on allied infrastructure development, such as MMLPs, WSAs and freight terminals. Development of such allied infrastructure facilities will enable multi-fold benefits, including, but not limited to, efficient intermodal freight movement, improving the logistical efficiency, world-class WSAs to crores of travellers every day and impetus to electric-vehicle (EV) charging infrastructure across the highway network.

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. Furthermore, in case of development of WSAs, the proposed lease tenure would provide flexible project-development options for developers.

Expressways – enabling dramatic changes in user experience

Some of the prime benefits that the access-controlled expressways would offer to road users are:

i. Efficient logistics movement due to high speed and short distance, thus enabling time and cost savings

ii. Seamless connectivity between major economic centres in the hinterland with coastal roads and ports

iii. Enhanced road safety due to reduced/ negligible trespassing of cross-traffic

iv. Ideal for long-distance traffic, as spacing between entry and exit is always between 20 km and 25 km

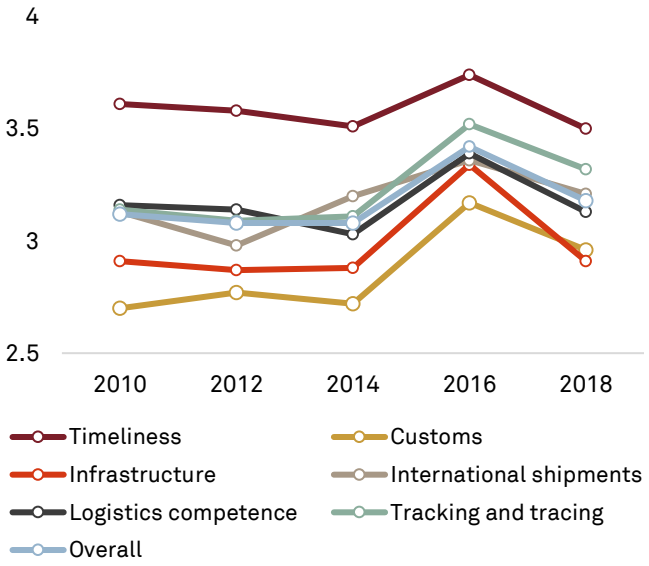
A new initiative for expressways is ‘closed tolling’, which is a more equitable form of tolling, where users pay only for the distance travelled and not for the entire road length. Distance-based tolling is easily implemented in a closed-toll system, where no movements can be made toll-free.

Improvements in logistical efficiency

Existing impediments in the logistics sector in India

India has consistently ranked low in the Logistics Performance Index (LPI), published by the World Bank. The LPI objectively measures the comparative performance of all countries across the world in the logistics sector. India had improved its LPI rank from 54 to 36 between 2014 and 2016, due to improvements in infrastructure, Make In India programme, as well as technological and digital improvements in the logistics supply chain. However, its rank dropped down to 44 again in 2018[21], highlighting need for further improvements. The primary reasons for India's low LPI score are infrastructural inefficiencies in the logistics sector, resulting in high logistics costs. Much of the higher cost could be attributed to absence of efficient intermodal and multimodal transport systems.

Figure 7: Evolution of India's LPI score[22]



Impact of Greenfield Expressways on logistical efficiency

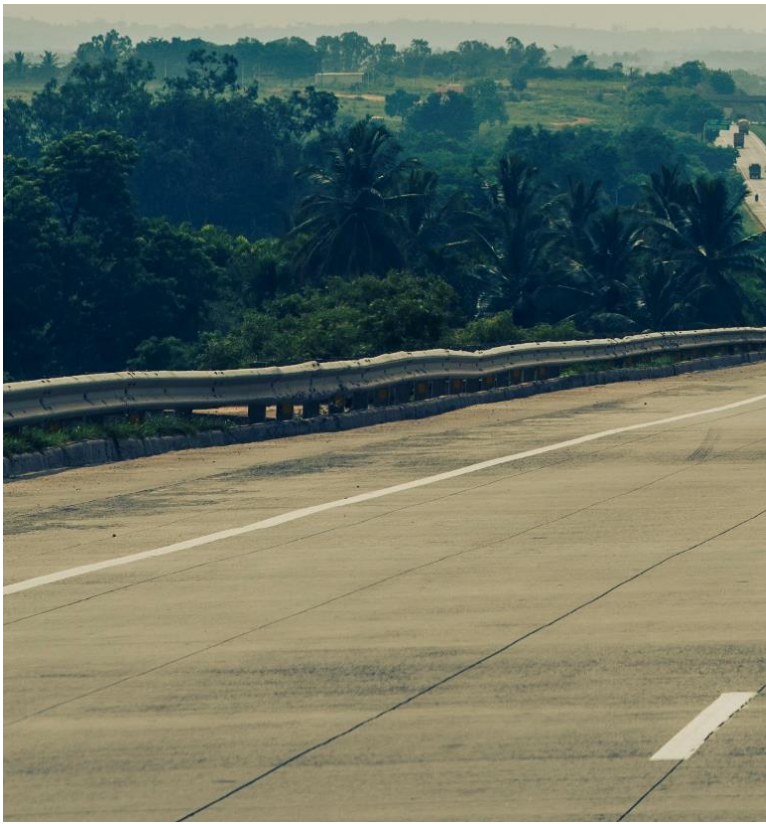
Development of high-class expressways will improve the country's logistical efficiency in the following ways:

Consistent road infrastructure

A nationwide network of four- to eight-lane expressways would allow for smooth flow of goods and cargo, thereby reducing freight costs. In addition, consistent infrastructure along the key routes would help reduce congestion on Indian roads.

Capacity for a more efficient fleet mix

India's fleet mix is characterised by smaller, inefficient trucks. Historically, 16T and 25T GVW trucks have been the highest-selling categories in India, compared with China, where 26-39.9T truck categories lead the market. Trucks with higher payload are more efficient than the trucks with lower payloads (freight cost on a per-tonne per-km basis for a 9 MT truck is Rs 3.5, 2.5x that for a 40 MT truck). The proposed 4-8 lane expressway network would allow for freight movement in larger-sized trucks with high payload capacity.

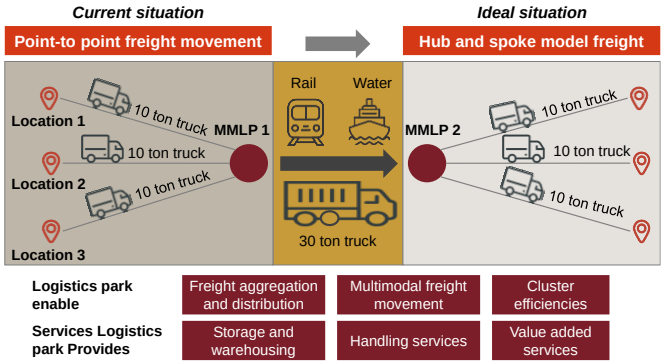


[21] World Bank
[22] World Bank

Impact of MMLPs on logistical efficiency

Developing multimodal logistics parks is a part of the government's Logistics Efficiency Enhancement Program. The figure below illustrates the key functionalities that the proposed MMLPs are expected to serve:

Figure 8: Key functionalities of logistics parks



Freight aggregation and distribution

MMLPs will provide hubs for freight aggregation and efficient distribution. Logistics parks would enable line haul freight movement (between hubs) on larger sized trucks and thereby aiding in reduction of freight transportation cost.

Multi-modal freight transportation

MMLPs with road and rail connectivity enable multimodal freight transportation. This aids freight transportation on line haul (between hubs) to shift from road to rail and waterways (wherever possible), thereby reducing the freight cost.

Storage and warehousing

The MMLPs would provide mechanised warehouses and specialised storage solutions, such as cold storage, mechanised material handling and intermodal transfer container terminals, and bulk and break-bulk cargo terminals.

Under-developed material handling infrastructure

The warehousing landscape in India is characterised by the presence of large number of private/ unorganised warehouses, resulting in smaller sized warehouses with very low investment in this sector. Smaller sized unorganised warehouses with limited mechanisation results in higher storage and handling losses, thereby increasing the supply chain costs.



The MORTH estimates that logistics parks would drive about 10% reduction in transportation cost for the top 15 nodes by enabling freight movement on higher-sized trucks and rail, which will also result in lower carbon dioxide emissions and less congestion in cities[23]. Shifting warehouses and wholesale markets, currently inside the city, to logistics parks (driven by lower rentals) would reduce urban congestion. In addition, modern and mechanised storage solutions provided by logistics parks would cut down storage and handling losses.

New business opportunities across the national highways network

Development of greenfield expressway corridors, MMLPs and WSAs would open up new kinds of business opportunities for potential investors and developers, restaurateurs, villagers along the corridors and expressways and local famers.

Drawing huge opportunities for investors, developers, operators and retailers, the NHAI will develop more than 600 WSAs along the national highways across 22 states in India. The proposed WSAs will help promote local economy by generating employment opportunities and help local people to market their unique produce/ handicrafts at village *haats* developed. Facilities such as EV charging stations will help in promoting the use of electric vehicles, thus reducing pollution.

Case study – Development of WSAs along Delhi-Mumbai Expressway (DME)

The NH-8 section of the Golden Quadrilateral, connecting Delhi and Mumbai, is one the **busiest** and most critical routes of the national highways network. It connects Delhi (the political capital in the north of the country) with Mumbai (the economic capital and the busiest port of the country). Currently, this route witnesses an average traffic of approximately **85,000 Passenger Car Units (PCUs) per day** (FY18). This traffic has been steadily increasing and it is expected that NH-8 will reach its design capacity by the middle of 2020s. Based on this, an alternative greenfield alignment has been proposed to connect Delhi to Vadodara via Sohna – Ferozpur Jhirkha – Dausa – Kota – Ratlam – Godhra and further linking up with Vadodara Mumbai corridor to create seamless connectivity between Delhi and Mumbai.

As a part of its endeavour to provide world-class traveller facilities, i.e., WSAs for DME, NHAI has selected **94 suitable sites in vicinity of major cities** and towns with area more than 650 Ha. All upcoming WSAs along the expressway would include **"Village Haat/ Bazaar"**, which will offer area-**specific handicrafts and handlooms by local artisans besides local food** and fruits. All in all, the development of these sites will bring **economic development to the villages along the highways**. This initiative would also go a long way in providing **employment to local youth, especially farmers** in all corners of the country.

An approved master plan for WSA along the expressway is illustrated in the figure below.

Figure 9: Approved master plan for WSA along DME



[23] MoRTH



Business-friendly contractual structures – A step forward for attracting private investments

The government has introduced various investor-friendly changes in the 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

BOT (toll) has taken a back seat in the way NHAI has gone about the bidding of roads in past few years. The struggle with sharing of risk between stakeholders and the participants undergoes various tweaking to make the model concession agreements palatable to all stakeholders. To address the incremental concerns, the ministry approved the revised MCA of BOT-toll projects in 2020. Considering the key challenges faced by stakeholders, a few changes in the BOT (toll) framework have been introduced. 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 CY2016, is the government's decision to double the frequency of payment of upfront construction support (40% of the project cost) to 10 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, 2020[25]. 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

[24] MoRTH Annual Report 2020-21
[25] MoRTH Annual Report 2020-21

~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:[27]

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

[26] Invest India
[27] MoRTH Annual Report 2020-21

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.

Contractual structures for WSAs

The NHAI is developing 23 new highways, including a network of expressways and economic corridors, spanning ~7,800 km at an estimated cost of ~Rs 3.3 lakh crore[28]. Land parcels have already been acquired along a few greenfield access-controlled corridors, such as Delhi–Mumbai expressway, Amritsar–Jamnagar Economic Corridor and Ambala–Kotputli corridor, primarily for the purpose of development of road-user WSAs. The NHAI has already called for bids for the appointment of lessee for development and operation of these WSAs. The lease agreement for the development and operation of WSAs has already been approved by the competent authority.

For land parcels along greenfield access-controlled corridors, the warm shell is being constructed by NHAI through the highway contractors. The lessee will be responsible to develop a fully functional facility from the warm shell, as provided by the lessor (NHAI), capable of immediate effective commencement of day-to-day operations of user facilities for usage and convenience of expressway users. The lessee is required to make the facility operational by installing the necessary fixtures, furniture, furnishing and equipment in the warm shell constructed by the lessor (NHAI) by following the site-specific layout and façade drawings provided by the lessor (NHAI). However, land parcels along existing brownfield national highways projects will be handed over to the lessee on an 'as is where is' basis for construction, development and operationalisation of WSAs by the lessee. Further, the NHAI is also exploring the possibility of commercialisation of these land parcels by developing facilities, such as commercial spaces and logistic parks, in addition to the road user WSAs, wherever possible.

Of the various contracting options, such as (i) fixed rental agreement, (ii) minimum guarantee and revenue share; and (iii) pure revenue share, the second option, i.e., the hybrid option with minimum guarantee and revenue share, is the most optimal choice for both the lessor and the lessee. The minimum guarantee component provides the authority a steady stream of revenue from lessees. The revenue-share component enables the authority to get a share of upside in revenue from WSAs. From the viewpoint of a lessee, the hybrid model with a fixed minimum guarantee and revenue share de-risks lessees, as the lessee is protected from the potential uncertainty in revenue with limited minimum guarantee compared with a higher minimum guarantee expected in the current model. The de-risking makes the project more attractive, potentially attracting higher number of interested bidders, which, in turn, will lead to better price discovery for the authority.

In case of land parcels along the brownfield corridor, where access enforcement is not possible by the authority, the level of future competition is unrestricted and the risks for lessees' future cashflow is higher. In such a scenario, the lessees will be constrained in bidding aggressively for a minimum guarantee, which translates to a fixed expenditure for the lessee, irrespective of the business potential of the site. Therefore, the bidding parameter for land parcels along brownfield corridor will be in the proportion of revenue share for both fuel and non-fuel facilities, whereas the minimum guarantee will be a pre-defined fixed value as determined by the authority in the lease agreement. Since revenue share is the bidding parameter, which is linked to the actual performance of the site, the bidders will be more aggressive in this case than the current model with

[28] Times of India, 13th August 2020

minimum guarantee as the bidding parameter.

In case of land parcels along greenfield access-controlled corridors, the level of competition is restricted and the unknown risks to revenue (as of future competition) for the lessee is minimised, as the access will be controlled by the authority. This reduces the uncertainty in future revenue for the lessees and even with minimum guarantee as the bidding parameter, the lessee is expected to bid aggressively. Therefore, in case of land parcels along the greenfield corridor, the bidding parameter will be the minimum guaranteed payment, whereas a proportion of the revenue share for both fuel and non-fuel facilities will be a pre-defined fixed value as determined by the authority and defined in the lease agreement.

In line with the above, the following bidding parameters govern the appointment of WSA developer:

Sr. No.	Type of land parcel	*Contracting model: Minimum Guarantee and Revenue Share*	
		Bidding Parameter	**Predefined fixed value**
1	Along brownfield corridor	Revenue share	Lease rental
2	Along greenfield corridor	Lease rental	Revenue share

The period of lease will not be more than 30 years for sites with no constructed asset, i.e. in cases where the WSA will have to be completely developed by the private party/ developer. On the other hand, for sites where the authority has already undertaken construction of WSA, the lease period will not be more than 15 years.



Emerging trends and technologies

Despite constraints posed by the Covid-19 pandemic, the pace of highways construction in the country has touched a record 37 km per day in fiscal 2021[29]. The NHAI awarded 141 projects (4,788 km) worth Rs 1.71 lakh crore in fiscal 2021 and is planning to award projects worth around Rs 2.25 lakh crore in the current fiscal[30]. In planning the development and construction of a road, it is important to recognise the close relationship between adoption and implementation of new and emerging technologies in road construction. Technological advancements made in this area have quickened the speed of construction and lowered the project lifecycle cost.

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

[29] Hindu article dated April 02, 2021
[30] Financial Express article date April 10, 2021

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.

Figure 10: Road asset mapping using LiDAR data

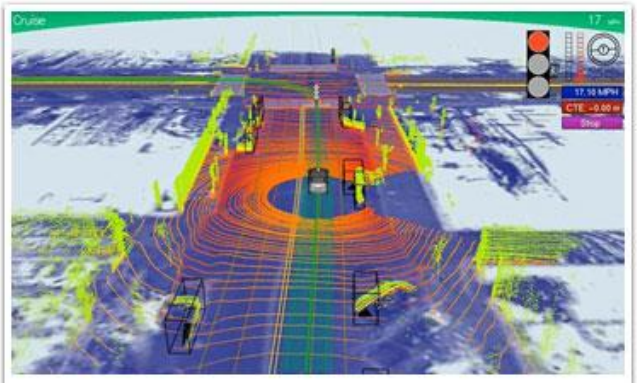


Image Source: Ceinsys Tech. Ltd.

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. These technologies have reduced the dependency on labour at site or compensated for labour and raw material shortage, reduced the need for supervision, helped improve the utilisation of resources, and helped manage projects more effectively in real time from remote locations.

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. A substantial increase in budgetary allocation and the provision to raise more funds from the market to build and expand highways may accelerate road construction, but maintenance of larger sections of the NHs remains a challenge for the implementing agencies. 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 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. Such initiatives will help tackle existing challenges and ensure proper maintenance of NHs.



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. Case study – The Ray – Ecosystem of smart road technologies

The Ray is an ecosystem of smart road technologies being built in a collaboration between the Ray C. Anderson Foundation, Interface, a multinational carpeting manufacturer, the Georgia Conservancy, and Georgia Tech's School of Architecture. The Ray has been implementing new ideas and technologies to create a regenerative highway ecosystem on the 18-mile stretch of I-85, and several pilot projects are already underway. Some of the technologies involved are described here:

Tire Safety Check Station (WheelRight): It measures the pressure and tread depth of the tires on vehicles traveling up to 10 miles per hour. The system has a monitor connected to an automatic number-plate recognition system.
Solar-powered vehicle charging: Located along The Ray are several solar-powered Photovoltaic for Electric Vehicle charging stations, which is a significant advancement in creating the infrastructure needed to support EVs.
Solar-paved highways: The Ray is the testing ground for Wattway's pilot project in the US – A pavement that uses traditional solar cells, protected in a patented frame, allowing the road surface to generate clean energy.

Smart studs (future plan): Solar-powered smart studs illuminate in different colours and patterns to communicate a variety of crucial alerts to drivers and passengers. **EV charging lanes (future plan):** By wiring roads to create an electromagnetic field that transmits energy to a receiver that supplies the car's battery, drivers could get the power they need while still in motion — no stopping is required.

In India, the concept of smart highways have 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).

As per a recent statement by Gurugram Metropolitan Development Authority (GMDA), it is planning to set up smart traffic signals at new traffic locations across the city and convert the existing signals into smart ones wherever necessary. The move is likely to ease traffic movement and keep constant vigil over the functioning of traffic signals. A smart traffic signal is automated and, unlike manual or conventional signals, it takes into account the volume of traffic on a real-time basis. The GMDA's long-term aim is to link all of the city's traffic signals to their Integrated Command and Control Centre (ICCC), from where they can also monitor their functioning.

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. The digital system has been developed by the National Payments Corporation of India (NPCI) and is based on the National Electronic Toll Collection (NETC) programme. It offers an interoperable nationwide toll payment solution, including clearing house services for settlement and dispute management.

FASTag is a device that employs radio frequency identification (RFID) technology for making toll payments directly, while the vehicle is in motion. A FASTag (RFID tag) is affixed on the windscreen of the vehicle and enables a customer to make the toll payments directly from the account linked to FASTag.

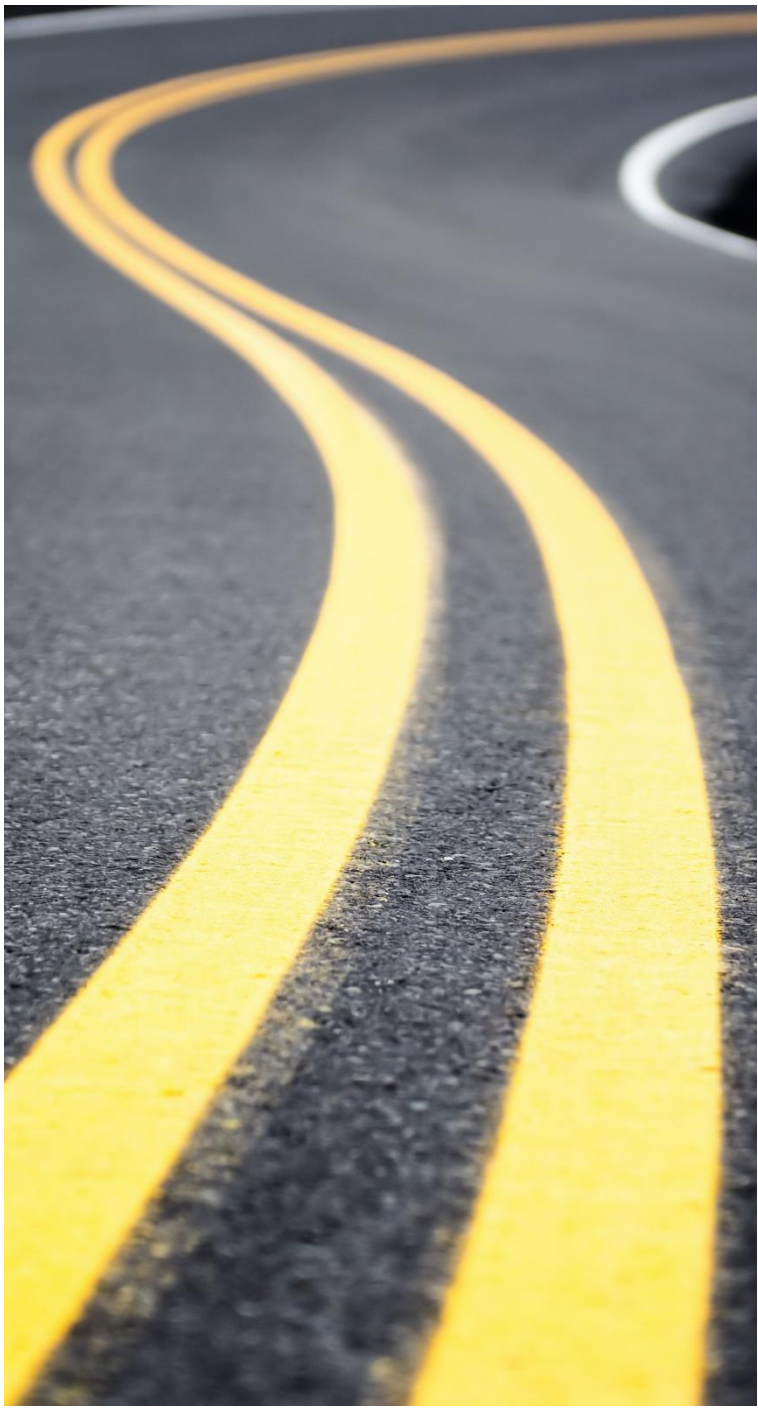
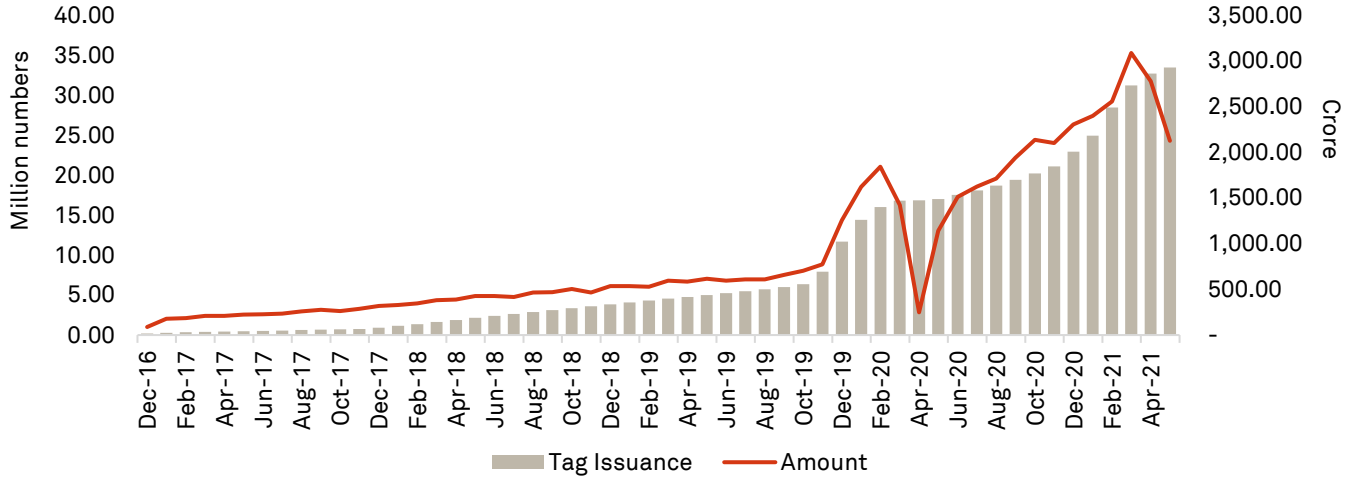


Figure 11: NETC FASTtag issuances and amount collected[31]



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.

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[32]. 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[33]. 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[34]. FASTag implementation has also reduced the waiting time at national highways fee plazas significantly, resulting in enhanced user experience through automation. This will also enable correct valuation of road assets in the future and will encourage more investors to invest in the highway infrastructure of the country.

In another tryst with technology 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.

[31] National Payments Corporation of India
[32] CNBC article dated December 18, 2019
[33] Mint article dated February 26, 2021
[34] Footnote 33

Way forward



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.

The business prospects for the roads and highways sector in India seem highly promising in the near future, with strong government push and private sector interest being reflected in the current pace of project awards and construction. However, the rising debt levels of NHAI indicate a need for exploring alternate financing options for future projects.

Asset monetisation will gather pace in the roads sector as engineering, procurement and construction (EPC) companies are expected to deliver significant number of completed projects for the NHAI and MoRTH to operate. Accelerating the programmes for InvITs and asset monetisation would go a long way in creating a financially sustainable road development ecosystem. However, for monetisation to be attractive, the underlying assets will have to be intrinsically good, with good growth prospects backed by attractive data and pricing. In addition, robust management and strong governance is essential to attract investors, particularly in InvITs.

The development of MMLPs at various locations across the country will be instrumental in improving efficiencies in the logistics value chain. The logistics sector will be the primary beneficiary of MMLPs and greenfield expressway corridors. That said, for this to work, the proposed MMLPs will need to be well-integrated with both the state and national highway network. Last-mile connectivity challenges have bedevilled a number of logistics projects in the country, such as ports, which has created unnecessary bottlenecks.

The government's keen focus on development of world-class allied infrastructure facilities, such as WSAs, is commendable. This will not only enhance user experience, but also generate widespread employment for the local population. It is important that these WSAs be developed in a holistic manner, incorporating best practices from around the world. Efforts should be made to attract large real estate and infrastructure developers who have the financial heft and vision to provide such facilities.

In addition to MMLPs and WSAs, new infrastructure avenues such as development of utility/ optic fibre ducts along highway corridors should be explored. This will not only provide an additional source of revenue to MoRTH and NHAI, but also ensure that our highways are ready for a data-driven future.

Expediting the execution of Bharatmala-Phase 1 will be crucial in providing expressway connectivity along with MMLPs and WSAs. Some of the effective ways for this would be (i) close monitoring and tracking, (ii) rule-based prioritisation of projects with high viability and award readiness, and (iii) structured review of projects to ensure timely execution.

Evaluating the operational performance and efficiency of contractors and developers will also be vital going forward. A holistic framework with identified and measurable KPIs to grade the operational performance of contractors in a transparent manner will help in inculcating an objective, performance-based culture in the sector. Similar evaluations could be conducted for overall projects as well.

The new, innovative contractual structures for PPP projects will be instrumental in attracting private sector interest and realising the full potential of the proposed initiatives. The various investor-friendly changes introduced in the MCA for the development of highways under the PPP mode are a step forward towards increasing private sector participation in the Indian roads sector. Sector regulators such as MoRTH and NHAI should ensure that this positive momentum is maintained going forward.



About FICCI

Established in 1927, FICCI is the largest and oldest apex business organization in India. Its history is closely interwoven with India's struggle for independence, its industrialization, and its emergence as one of the most rapidly growing global economies. A non-government, not-for-profit organization, FICCI is the voice of India's business and industry. From influencing policy to encouraging debate, engaging with policymakers and civil society, FICCI articulates the views and concerns of industry. The organization serves its members from the Indian private and public corporate sectors and multinational companies, drawing its strength from diverse regional chambers of commerce and industry across states, reaching out to more than 2,50,000 companies. FICCI provides a platform for networking and consensus building within and across sectors and is the first port of call for Indian industry, policymakers, and the international business community.

About CRISIL Limited

CRISIL is a leading, agile and innovative global analytics company driven by its mission of making markets function better.

It is India's foremost provider of ratings, data, research, analytics and solutions, with a strong track record of growth, culture of innovation and global footprint.

It has delivered independent opinions, actionable insights, and efficient solutions to over 100,000 customers.

It is majority owned by S&P Global Inc, a leading provider of transparent and independent ratings, benchmarks, analytics and data to the capital and commodity markets worldwide.

About CRISIL Infrastructure Advisory

CRISIL Infrastructure Advisory is a leading advisor to regulators and governments, multilateral agencies, investors, and large public and private sector firms. We help shape public policy and enable infrastructure development. Our services span a wide array of infrastructure development activities. Our work in the areas of policy formulation, regulation, design and implementation of public-private partnership (PPP) frameworks and infrastructure financing mechanisms helps create a vibrant ecosystem for infrastructure development. Our services at the project level include bid process management, valuations and due diligence to enable investment decisions. We are known for our core values of independence and analytical rigour combined with deep domain expertise. Our teams have expertise across the complete range of infrastructure sectors - urban development, energy, transport and logistics, natural resources, education, and healthcare. We have a rich understanding of PPP and financing related issues. We operate in India and 22 other emerging economies in Asia, Africa, and the Middle East. CRISIL Infrastructure Advisory is a division of CRISIL Risk and Infrastructure Solutions Limited, a wholly owned subsidiary of CRISIL Limited.

CRISIL Privacy

CRISIL respects your privacy. We may use your contact information, such as your name, address, and email id to fulfil your request and service your account and to provide you with additional information from CRISIL. For further information on CRISIL's privacy policy please visit www.crisil.com.

Disclaimer

This report is prepared by CRISIL Risk and Infrastructure Solutions Limited (CRIS). This report may have been prepared by CRIS at the request of a client of CRIS (client). This report may include or refer to information and materials provided by the client and/or obtained by CRIS from sources that CRIS considers reliable (together, "materials"). In preparing this report, CRIS does not independently validate any such materials and assumes those materials are accurate. CRIS does not guarantee the accuracy, adequacy or completeness of any material contained in or referred to in the report. While CRIS takes reasonable care in preparing the report, CRIS shall not be responsible for any errors or omissions in or for the results obtained from the use of or the decisions made based on, the report. The user takes full responsibility for the use of and the decisions made based on the report. While portions of materials are included in the report, CRIS makes all reasonable attempts to attribute credits to the source of the materials; however, even if a particular source of a material is not so attributed, CRIS stakes no claim to any such material in the form as provided to or made accessible to CRIS. No third party whose material is included or referenced in this report under credit to it, assumes any liability towards the user with respect to such material. Neither CRIS nor its directors, employees and representatives accept any liability with regard to any access, use of or reliance on, the report and that CRIS expressly disclaim all such liability. The Report is (i) not intended to and does not constitute an investment, legal, accounting or tax advice or any solicitation, whatsoever (ii) not an audit, rating or due diligence nor a recommendation of any sort whether to hold, invest in or divest from any securities, instruments or facilities of any kind or otherwise enter into any deal or transaction with the entity to which the Report pertains (iii) not a substitute for the skill, judgment and experience of the client for making any decisions. Any third party brands, names or trademarks contained in the report belong to the relevant third parties. The report contains CRIS' view as at the date of the report based on available material. CRIS does not assume an obligation to update the report where updated materials are available or to notify anyone that an updated report is available. CRIS operates independently of, and does not have access to information obtained by CRISIL Limited's Ratings Division / CRISIL Limited's Research Division (CRISIL), which may, in their regular operations, obtain information of a confidential nature. The views expressed in this Report are that of CRIS and not of CRISIL's Ratings Division / Research Division. No part of this Report may be published/reproduced in any form without CRIS's prior written approval. This report may not be reproduced or redistributed or communicated directly or indirectly in any form or published or copied in whole or in part except as authorized by CRIS. Unless CRIS has expressly agreed in writing, this report is not intended for use outside India. By accessing and/or using any part of the report, the user accepts the foregoing disclaimers and exclusion of liability which operates to the benefit. CRISIL or its associates may have other commercial transactions with the company/entity.

Federation of Indian Chambers of Commerce and Industry (FICCI)
Federation House, Tansen Marg, New Delhi 110 001
Tel: +91 11 2373 8760/70 | Fax: +91 11 2332 0714 | Web: www.ficci.in



Argentina | China | Hong Kong | **India** | Poland | Singapore | UK | USA | UAE
CRISIL Risk and Infrastructure Solutions Limited *(A subsidiary of CRISIL Limited)*
CRISIL House, Central Avenue, Hiranandani Business Park, Powai, Mumbai – 400076. India
Phone: + 91 22 3342 3000 | Fax: + 91 22 3342 3001 | www.crisil.com
/company/crisil @CRISILLimited /CRISILLimited /user/CRISILLimited Follow us on @lifeatcrisil

CRISIL
An S&P Global Company