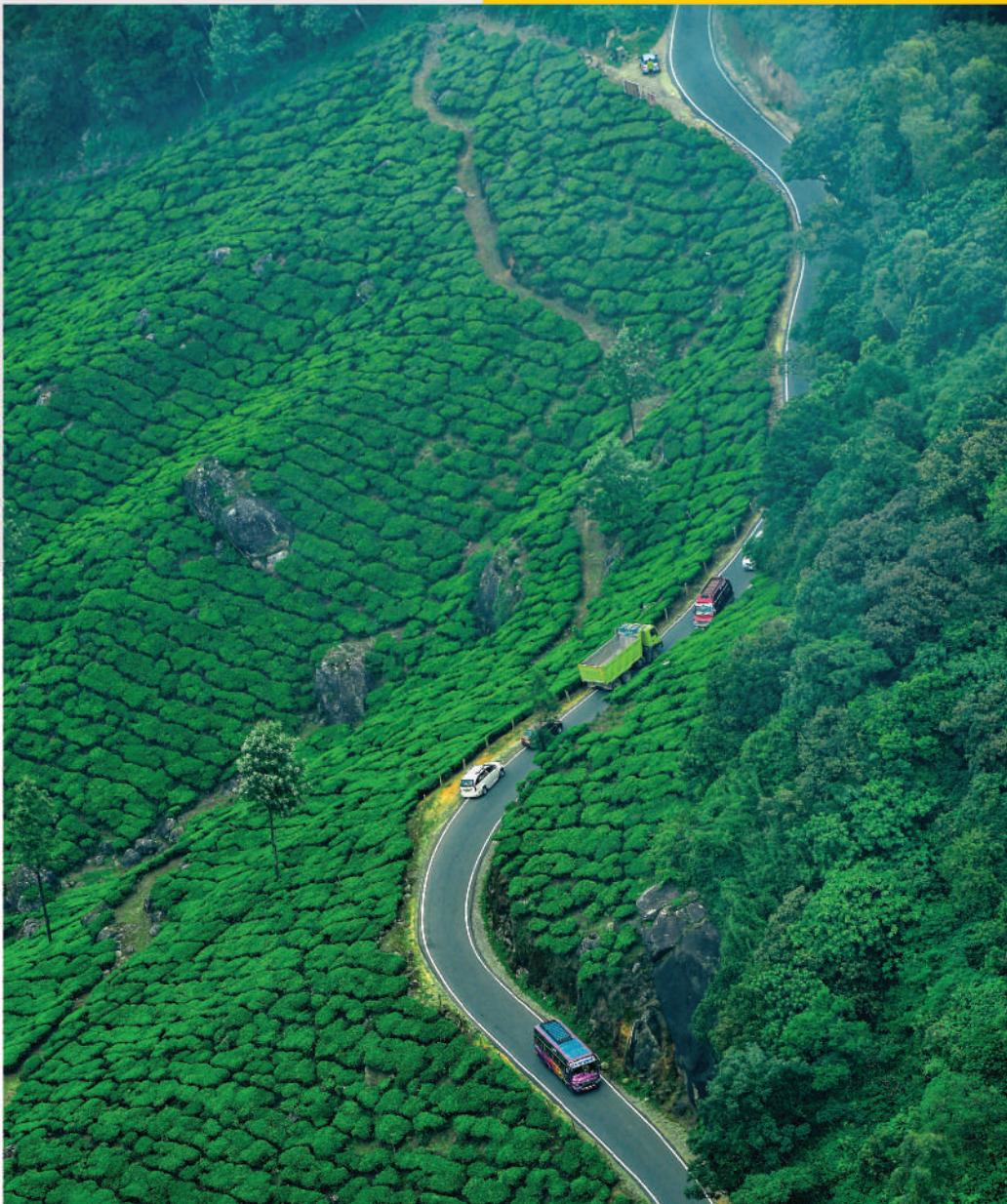




ROAD DEVELOPMENT IN INDIA

Building the National
Highway Network



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BUILDING THE NATIONAL
HIGHWAY NETWORK

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FOREWORD

Roads and Highways have played a silent but indispensable role in the growth of our civilization. From the ancient times to modern days, they have enriched our socio-economic development. As we celebrate 'Azadi ka Amrit Mahotsav' to commemorate 75 years of India's Independence, I am happy to note that this book highlights the growth of Indian Roads & Highways especially in the last 75 years of independence. The National Highway network in the country has grown around seven times since independence. We have been working to take Indian infrastructure to world standards. Time is the most important aspect in construction and considering this, we have created many world records in National Highway construction. The pace of construction of National Highways increased from 12 km per day in 2014-15 to reach a record level of 37 km per day in 2020-21.

In terms of road connectivity, significant work has been done under Golden Quadrilateral Project, NHDP program and now under Bharatmala Pariyojana 34,800 km of national highways are being developed. Under Bharatmala Pariyojna, we are making 27 Greenfield Expressways that will reduce travel time and will help to reduce the logistics cost.

The Delhi-Meerut Expressway which has reduced travel time between the two cities to just 45 minutes from around four hours is a great example of how these expressways will help to reduce travel distance boosting the logistics efficiency of the country. Delhi Mumbai Expressway will be India's longest expressways which will reduce the travel time between the national capital and financial capital city from 24 hours to 12 hours.

To create a holistic infrastructure network and realize the Hon'ble Prime Minister's vision of building an integrated multi-modal national network of transportation and logistics, as part of the 'PM Gati Shakti – National Master Plan', we are building Multi Modal Logistic Parks at 35 locations across the country. Similarly, to boost last-mile connectivity in the hilly areas and to decongest urban centres we are implementing Ropeways under the Parvatmala Pariyojna. Our resolve to build world-class National Highways, integrated and holistic infrastructure will contribute immensely towards ease of living and will boost the growth of our nation.

India has got huge potential in infrastructure and the future of Indian infrastructure sector is very bright. I congratulate all those who have contributed and added value to this book. I am sure that this book will enrich knowledge of the readers and will highlight various aspects of road development in India.

Nitin Gadkari
Union Minister for Road Transport and Highways, Government of India

PROLOGUE

Capturing the Essence of Road Development

In thousands of years of history of human civilization, roads are probably one constant factor that has brought kingdoms and civilizations together. Roads, as we know them today, also took a long journey of evolution to reach the current standards. It has taken meticulous planning and crafting over thousands of years. Making of roads, in a way, also marked the beginning of distant communication and transport. The very idea behind this book is to capture and document the journey of road development in India in its true essence.

Indian civilization, being one of the oldest in the world, witnessed the growth and development of roads along with its own development. Tracing out the history of road development in India cannot be seen in isolation. It is to be studied along with the development in the political, economic and cultural life during various eras in the country.

The initial part of the book covers the journey of early road development from the prehistoric times. The history of road development in India can be traced back to the Indus valley civilization. As established by historians, the civilization had extensive road networks with broad and long main streets running from east to west and north to south, crossing each other at right angles. The Mauryan rulers recognized the importance of infrastructure, particularly roads. The empire had well organized public works department that looked after construction of major roads and other land routes to facilitate trade and communication. The Grand Trunk Road built by Sher Shah Suri remains as one of the most identified landmarks from his reign. The road network further expanded under the Mughal empire and in the pre-independence era where significant changes were introduced by the British that impacted the development of roads in India.

This book covers not only the various historical facets that led to growth of road infrastructure but also meaningful insights on the not so commonly discussed aspects such as work of various committees, impact of road development plans, policy changes, means of financing and effects of these on development of road infrastructure in modern India.

The book will also intrigue the readers with interesting anecdotes, key landmarks and important programs through the journey of NHAI. It captures various challenges and trumps that NHAI has achieved. The later part of the book elaborates about topics such as policy directions and

highlights importance of developing comprehensive policies at the macro level as well as more targeted policies that consider state and local level requirements.

The book also comprehensively covers key focus areas of NHAI such as technological and digital initiatives. These include deployment of world-class Electronic Toll Collection system apart from advanced construction practices that leverages several new and emerging technologies as well as environmentally sustainable materials for highway construction. It also elaborates on innovative financing methods that will help in developing, upgrading and maintaining an efficient and effective road network in the country.

This book underlines and captures key aspects of the road development from early to the modern times and will be of interest to anybody who wants to study or understand the chronological growth of the Indian road sector.

I wish to thank the researchers and the team for their efforts that has resulted in printing of such an insightful and enriching publication.

Santosh Kumar Yadav
Chairman, NHAI

HISTORY OF ROAD AND HIGHWAY DEVELOPMENT IN INDIA





HISTORY OF ROAD AND HIGHWAY DEVELOPMENT IN INDIA

Roads are the lifelines of societies. They connect communities, villages, towns, cities and countries, not only allowing for the movement of people and goods, but also enabling the spread of ideas and cultures. Without roads, there would be no civilisation. These vital arteries ensure we can engage in trade, commerce, development and social interactions. They are the channels that knit together communities and kingdoms, and are essential for the development of both large and organised societies.

The most important function of a road is to connect communities. These connections enable the growth and development of myriad activities – trade, commerce, communication, administration, and leisure.

It would not be an exaggeration to say that roads play a crucial part in the economic and political life of a country. An examination of a country's road

network during a particular period can provide insights into the patterns, aims and character of the ruling power.

The geography of a country also plays an important role in shaping its road network. Plains offer easy movement whereas mountains and rivers are difficult terrains. India has a vast and varied terrain, with towering mountain ranges, rivers that stretch for thousands of kilometres, fertile plains, deserts, dense forests and plateaus. These have strongly influenced social patterns as well as the nature and extent of political and administrative divisions.

Ancient road networks

The history of roads is as ancient as the history of mankind itself. Prehistoric men carved out tracks as they went from place to place hunting and gathering. As civilisation advanced, man gained mastery over new materials and tools. Agriculture grew and human settlements were established. Pathways were formed, connecting one settlement to another.

Mesopotamian Civilisation (3500 BC)

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With the advent of a more settled life, and food supply and security guaranteed, man, for the first time, could devote more attention to industrial experimentation. His curiosity, combined with the need to transport goods and travel longer distances, led to the invention of the wheel in the early Mesopotamian Civilisation, around 3500 BC. This marked a turning point in the development of transportation systems and roads. Although at first the wheel wasn't used for transportation — it was used by potters — it wasn't long before man learnt the art of joining two wheels to get the advantage of an axle, and thereby built two-wheeled and four-wheeled carts and chariots. The advent of wheeled transportation

demanded the development of more durable roads with hard surfaces that could withstand the abrading effects of the wheels. The roads also had to be made wider to accommodate the chariots and carts, and straighter for easier navigation. Thus the meandering, narrow footpaths gave way to straighter, broader streets with more durable surfaces.

Indus Valley Civilisation (3300–1300 BC)

The Mesopotamians weren't the only ones using wheeled transportation and building roads. On the Indian subcontinent, the Indus Valley civilisation was characterised by well-planned towns, complete with extensive road networks and drainage systems. The streets were laid out in a regular order in straight lines (the modern grid pattern). The main streets ran from east to west or north to south, crossing each other at right angles. Minor streets were laid parallel to the main streets. The main streets were significantly broad and long. The longest street in Mohenjo-daro was half a mile and about thirty feet wide.

The Vedic period (1500-500 BC)

The decline of the Indus Valley Civilisation was followed by the emergence of the Vedic period. By 1500 BC, the Aryans, nomadic cattle herders from central Asia, had migrated into the Indian subcontinent. They were simple folk, with agriculture and animal breeding being their main occupation. Over time, their society grew more organised and their villages grew to become towns and cities. Trade

and commerce developed, and routes were established between the major cities and towns of the time, which included Takshashila in the northwest, Kurukshetra in the plains of Punjab, Hastinapur near present-day Delhi, Kashi, Mathura, and Ayodhya, to name a few.

We know much about the life of the Aryans through the Vedas, which were composed during this period and describe Aryan beliefs, rituals and daily life. References to bridges, roads, crossroads, wooden carriages, etc. in the Vedas clearly indicate a well-developed transport system. The Rig Veda mentions “mahapaths” as a means of communication.

The Atharva Veda has the following passage on the importance of roads for a prosperous society:

“There are many pathways on this earth. These pathways are important means of travelling for people. The tracks for chariots are built on these pathways. They are also useful for carts loaded with goods. Everybody, good or bad, has equal rights to travel on the pathways. But the pathways must be kept safe from the dangers of wild beasts and dacoits. For if the pathways are safe and fortune-giving to travellers, then they are the symbol of richness dwelling on the earth.”

King Bimbisara (543-491 BC), one of the early rulers of the Magadha empire, was known for his cultural achievements and was also a great friend and protector of the Buddha. Bimbisara built the city of Rajagriha to serve as his capi-

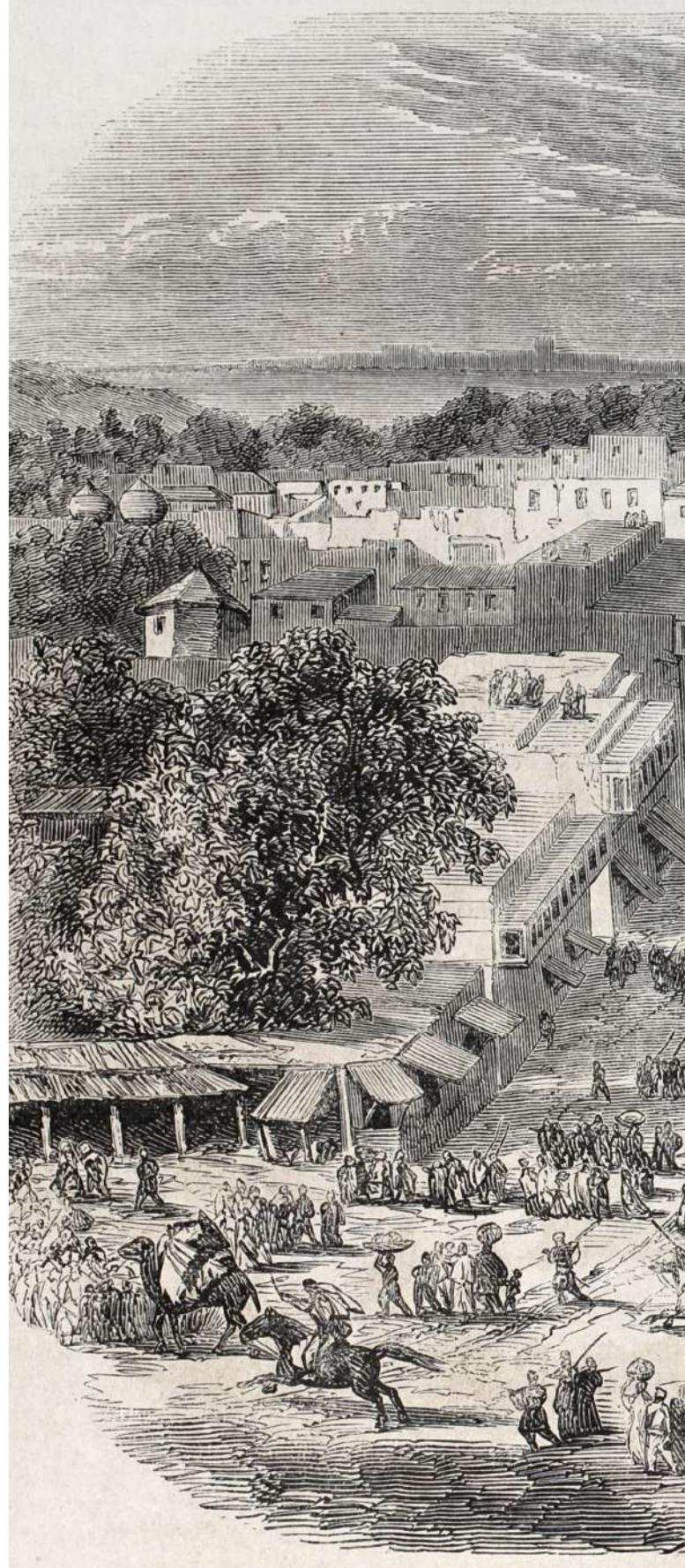
tal, and according to the chronicles of Chinese traveller Hiuen-Tsang, he built a wide, stone-paved road (6.1 m to 7.3 m wide) to nearby Mount Griddhakuta so he could visit the Buddha. This road is still in existence today.

Ancient trade routes of India - Uttarapath and Dakshinapath

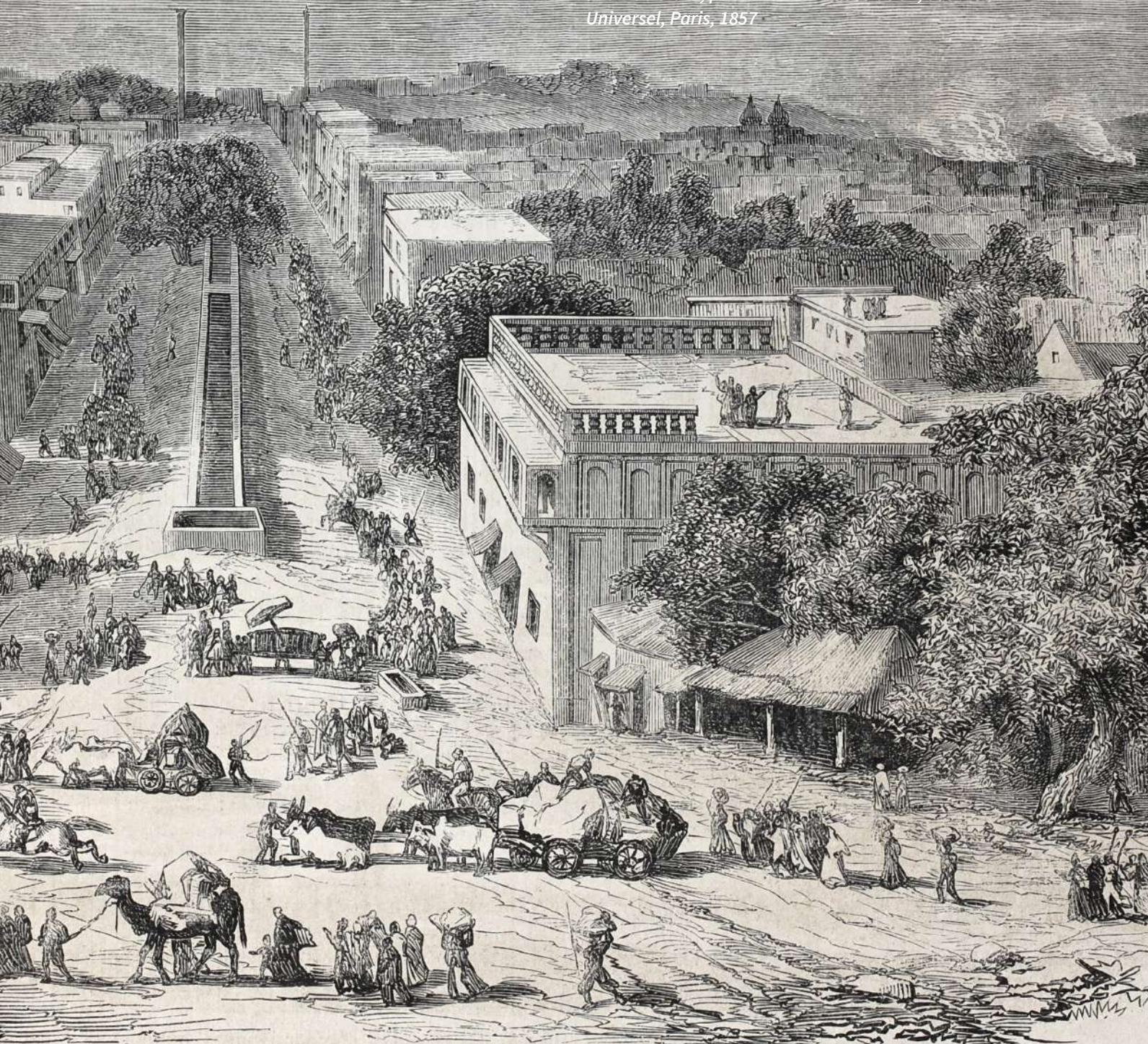
Throughout history, trade routes have facilitated the movement of people, goods and ideas. The two prominent trade routes in the subcontinent were the Uttarapath, in the north and northwest, and the Dakshinapath, in the central and southern parts of the peninsula. Another strategic location was Jambudwipa, along the Indian Ocean coast, which held influence over both the East and the West.

During the pre-Harappan civilization era, trade primarily took place within the catchment areas, with Sind and Baluchistan interconnected and routes connecting them to the Indus plains and the Indo-Gangetic divide. Along these routes, objects such as lapis lazuli, copper, silver, turquoise, ceramics and pendants were discovered. In addition, Mehrgarh served as a trade hub ,connecting Bolan, Quetta, Kandahar, Iran and Turkmenia. Kabul was another route, leading to northern Afghanistan.

During the early Harappan phase, international trade with the Persian Gulf and Mesopotamia was initiated, facilitated by both land and sea. Along the Gujarat, Sind and Makran coastlines, there was a well-developed maritime route leading to the Persian Gulf.



Old view of Chandni Chowk. Created by De Bar and De Berard, published on L'illustration, Journal Universel, Paris, 1857



Northern India's most important trans-regional trade route was the Uttarapath. The Ganga and its tributaries, the Yamuna, Ghaghra and Sarayu were a part of this land-cum-river route. Its northern part, Haimvata path, passed through Lahore, Jullunder and Saharanpur before reaching Bijnor, Gorakhpur, Bihar and Bengal. The southern route started from Lahore and continued to Delhi, Hastinapur, Varanasi, Allahabad, Pataliputra and Rajgir. Manibhadra was the presiding deity of traders along the Uttarapath. Pataliputra and Kaushambi were connected by the Dakshinapath to Vidisha, Ujjaini and Pratishthana. Manimekalai was the presiding deity for traders along this route. These two major trade routes were connected to the seaports located on the east and west coasts of Jambudwipa via auxiliary routes.

These routes were used during military expeditions. The control of these trade routes was a significant point of conflict, such as the dispute over the control of the Haimavata marg between Chandragupta and Seleucus. Apart from this, the spread of Buddhism can be traced along the Uttarapath, Dakshinapath, Silk Route and the maritime routes. Despite certain similarities, the present-day road network does not precisely follow the same trajectories. India is home to artistic and aesthetic marvels in exceptionally distant locations. Indeed, these locations were teeming with commercial transactions, economic exchange, and diverse cultural and spiritual practices during the ancient period. In sum, the Uttarapath and Dakshinapath routes served as intricate networks of vibrant threads interlinking diverse regions of the subcontinent, regardless of the transient reign of any particular ruler.

THE UTTARAPATH AND DAKSHINAPATH ROUTES SERVED AS INTRICATE NETWORKS OF VIBRANT THREADS INTERLINKING DIVERSE REGIONS OF THE SUBCONTINENT.

The Mauryan Empire (4th to 2nd century BC)

In 322 BC, Chandragupta Maurya founded the Mauryan Empire after conquering the kingdom of Magadha. The

Mauryan age marked a new era in the history of the country. For the first time, almost the entire subcontinent was politically united under one ruler. Indeed, the Mauryan Empire grew to become one of the largest empires in the world during its time, stretching from eastern Iran to the western borders of the Burmese hills, and from the Himalayas to the southern plateaus of peninsular India. The strength and prosperity of the Mauryan Empire were due to the strong and able rule of its founder, Chandragupta Maurya. His legacy was ably carried out by his son Bindusara and grandson Ashoka.

As much an administrator as a general, Chandragupta recognised that the strength of an empire lies in more than just its army—it needed a strong administration to hold it together. He established a single currency across the empire, a network of regional governors and administrators and a civil service to provide justice and security for all. It is no surprise that trade, commerce and agriculture flourished under Chandragupta and his successors. The Mauryan rulers recognised the importance of infrastructure, particularly roads. Without them, their armies could not march to distant lands, administrators could not travel from place to place to collect taxes, and tradesmen and merchants could not transport their goods to markets, whether domestic or international. Amongst the numerous departments that were set up to govern almost every aspect of social life, there was one dedicated to the building of roads. This public works department was well organised, with its scope and functions clearly

defined. Its activities included the construction and care of roads and other land routes to facilitate communication.

The Greek diplomat and historian Megasthenes, who visited India during this period, makes special note of the fact that the Mauryan rulers were great road builders. The four quarters of the vast empire were connected via a network of roads radiating from the capital Pataliputra (Patna). Special care was taken to repair the roads, and labourers were exempted from taxes. Trees were planted along the roads to provide shade, wells were dug and rest-houses were provided for the comfort of the travellers.

Pillars, which served as milestones and signposts, were placed at regular intervals of half a “kos” (approximately 2,022 yards) along the roads to mark distances. Tolls were collected for road and river crossings. Damaging of roads or blocking them was a punishable offence, and the punishment depended upon the importance of the road.

Road-building during the Mauryan empire was thus a well-planned enterprise. Indeed, the Arthashastra, a treatise on statecraft, economic policy and military strategy written by the famed Kautilya, Chandragupta’s prime minister, lays down a classification of roads; the technical specifications of various types of roads, including their standard width; the desired curvature and so on.

During his reign, Chandragupta constructed



Howrah Bridge, 1901

Pic courtesy: Wikipedia Commons

an approximately 2,400-km-long road across the subcontinent connecting Pataliputra in the east to Takshashila (now in Pakistan) in the west. Known as Raja Marg, this road played an important role in the economic and political life of India from Mauryan times, connecting, as it did, numerous important cities, including Varanasi, Kausambi, Mathura, Indraprastha (modern Delhi) and Kurukshetra. It also connected the subcontinent to major international trade routes, as from Takshashila it crossed the Hindukush mountains to join the routes leading to China and Central Asia. Branches of the route also connected to ports on the western coast. Over the centuries, Raja Marg has endured and developed innumerable branches. This road is more or

less on the same alignment as the present National Highway 2, or the Grand Trunk Road.

In spite of the might of its armies, the strength of its infrastructure, and the economic prosperity of its lands, the Mauryan Empire could not survive due to its weak rulers following the death of Ashoka in 232 BC. In 185 BC, the last Mauryan ruler was assassinated by his commander-in-chief while inspecting his troops. The once mighty Mauryan empire had more or less disintegrated.

The Gupta period (3rd to 5th century AD)

The fall of the Mauryan Empire was followed by

a period of political instability. The beginning of the 4th century, however, ushered in a new era — the rise of the mighty Gupta empire. Art, industry, science, communications and literature developed under the patronage of the powerful and enlightened Gupta emperors.

A major source of information on the roads and communication system under the Guptas are the travel accounts of Chinese pilgrim Fa-Hien, who visited India in about 405 AD. He travelled extensively throughout the country and was impressed by the security and comforts provided to travellers.

Roads were built of brick and hard-packed dirt, which ensured their durability. They were typically built a few feet higher than ground level to enable proper drainage of rainwater.

After the fall of the Gupta Empire in the middle of the 6th century AD, it was Harshavardhan who unified most of northern India and ruled for four decades from his capital Kanyakubja.

Hiuen-Tsang, visited India in the early 7th century, during the reign of Harshavardhan. His accounts clearly indicate that the road system was maintained in good condition. Harshavardhan took it upon himself to personally supervise the administration of his empire, and in order to do this, he spent a great deal of time travelling from province to province. This necessitated the building and upkeep of roads throughout the empire.

The period following the reign of Harshavard-

han saw the emergence of regional kingdoms, mostly derived from the feudatories of the Guptas.

Road networks during the pre-Mughal period (11th to 15th century)

The travel accounts of Al Beruni in the early 11th century and Ibn Battuta in the 14th century provide insights into the road networks during this period.

Al Beruni mentions several important routes starting from Kanauj, Mathura, Dhar and Bayana, amongst others.

Ibn Battuta visited India during the reign of Sultan Mohammad bin Tughlaq. The sultan's kingdom had a wide network of roads. Important roads were lined with trees, and rest houses, postal stations and deep wells for water supply were built along the routes at regular intervals. Pillars served as milestones.

The next major contribution to the road system was made by Sher Shah Suri, the Pashtun monarch of northern India, in the 16th century. He made serious efforts to restore the road system after long years of neglect. He was quick to realise the importance of roads for defence, commerce, trade and better administration, and set about constructing many roads throughout his kingdom. He also ensured that travellers were provided with proper facilities along the major routes.

Shady trees were planted. As many as 1,700 sarais were built and “kosminars” (milestones) were erected. Sher Shah also standardised the measure of distance. The “Sikandari Gaz” commonly used by him remained popular for many years after the end of his reign.

Sher Shah's greatest achievement in road building was the construction of the “Sarak-i-Azam”, which was about 1,500 kos in length and ran from Sonargaon (near Dacca) in the east to the Indus in the west, connecting the important towns that were in between. It was, essentially, a restoration of Raja Marg built during Mauryan times. It was metalled with “kankar”, thanks to which it remained in good condition long after his time. The modern Grand Trunk Road more or less follows the old route.

After the brief reign of Sher Shah, the Mughal emperors extended this road westward to Kabul and eastward to the port city Chittagong.

Roads during the Mughal period (16th to 18th century)

The enthusiasm for road building continued under the Mughals. At its peak, the Mughal Empire extended over almost the entire Indian subcontinent, with the exception of the far south. To protect and expand their empire, maintain vigilance over the far-flung corners of the land and to ensure that their writ was obeyed, it was essential for the Mughal rulers to have a strong administrative system and a well-developed and well-maintained communication system. To this end, the Mughals

evolved a uniform administrative structure and a well-organised and extensive road system. On the back of this road system was built an efficient postal system and a strong informer network, which helped maintain administrative and military control over the entire empire. The emperors received regular reports about the activities of their subordinates as well as the movements of their enemies, enabling them to respond to threats and issue royal orders quickly. In addition, the road system helped develop trade and commerce, thus contributing to the general prosperity of the land.

Chahar Gulshan, written in the 18th century, provides details of at least 24 important roads built during Mughal times.

Babar, founder of the Mughal empire (reigned 1526-1530), was acutely aware of the political importance of communication to maintain his hold over his new kingdom. He also had to ensure the regular flow of reinforcements from Kabul. Thus, he wasted little time before measuring his territory from Kabul to Agra and developing roads, and an efficient postal system. Square towers were set up every 18 miles, while horse chowkis were established every 36 miles.

Akbar, Babar's grandson, was primarily concerned with establishing a strong central government. To this end, he initiated numerous roadworks, including the construction of a central route through a gap in the Satpura range to connect northern India with the Deccan. The

network of roads, bridges and military posts that he built gave his army greater mobility and also stimulated trade and commerce.

Aurangzeb constructed numerous roads in the Deccan to aid his protracted campaigns in the region.

Under the Mughals, roadbuilding and associated activities were planned and supervised by a public works department. It oversaw activities such as the smoothening and levelling of existing roads, constructing halting places, and clearing jungles and forests in areas where new roads were to be built, and building bridges.

Mughal roads were constructed with “kankar” and were well maintained. In addition, kosminars, or milestones, were erected at regular intervals along roads. Trees were planted along both sides of roads to provide shade, while wells and sarais were also built and attendants were employed to maintain them. These facilities helped ensure the comfort of travellers.

Provincial governors and district officers were responsible for the safety and improvement of roads, but the onus of protecting travellers and merchants from robbery and harassment fell on the zamindars, who appointed guards for the purpose.

Owing to all these measures, travel became easier and safer and communication quicker and more efficient. This, in turn, strengthened the administrative control of the emperor and provided a boost to trade and commerce, both internal and external. The route to Persia and Central Asia via Multan and Kabul was an important one, and the Mughal emperors took measures to improve and protect it. A bridge was built over the Indus at Attock, customs duties were collected, and new chawkis set up.

**UNDER THE MUGHALS,
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**THE ROAD SYSTEM
DEVELOPED BY THE
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Thanks to these measures, trade increased along this route and a variety of commodities from Iran and Central Asia were imported into India, including, carpets, silk, precious metal, dry and fresh fruits.

The road system developed by the Mughals stood the test of time and provided the foundation of the present road system, as most of the Mughal roads were mac-



adamised and surfaced afterwards.

Pre-Independence era

Roads during the British period

The period following the decline of the Mughals and the beginning of British rule was

a time of neglect for the road system in India. The East India Company did little during the early period of its rule to improve the deteriorating conditions of the roads. The company was preoccupied with maintaining its political hold and expanding its power, to which end it focused on building and maintaining roads of military importance as well. Thus,



the first few decades of the 19th century were marked by a general lack of interest in road development.

Gradually, however, as the British consolidated and strengthened their rule in India, they realised the importance of a good road network. They understood that well-maintained roads and bridges were necessary for the expansion of trade and commerce as well as for the unhindered movement of the military.

Lord William Bentinck, governor general of

India (1828-1835), was the first to initiate reforms in road construction. Efforts were made to revive old trunk routes. Permanent roads were constructed to better connect Calcutta to the upper provinces. A road from Bombay to Agra was also started.

Matters improved further during the governor general-ship of Lord Dalhousie (1848-1856). Dalhousie transferred the charge of public works from the inefficient military boards to the provincial public works departments. Expenditure on public works was increased.

Qualified civil engineers were recruited from England. Advanced construction techniques and improved materials were employed. A system of road classification was developed. Roads were classified into four categories, namely, first, second, third and fourth class roads. First and second class roads were all-weather and metalled. Third class roads were also all-weather, but had inferior metalling. Fourth class roads were unmetalled, unbridged and fair weather roads.

Numerous trunk routes were constructed, and roadworks undertaken. Of these, the more important ones included the road from Hindustan to Central Asia (commenced in 1850) and the bridging and metalling of the Great Deccan Road.

Perhaps the biggest achievement during the 19th century was the completion of the Grand Trunk Road, which stretched from Calcutta to Peshawar, covering about 1,500 miles. The foundation of this great northern trunk road was laid by the Aryans. It was developed further by the Mauryans in the 4th century BC. After centuries of neglect, Sher Shah revived the route around 1540 AD. The next major expansion and improvement took place under the British in the 19th century.

By the end of the 19th century, a good system of trunk roads, connecting far-flung regions of the country, was established.

The introduction of the railways in India in the mid-19th century had a major impact

on the road system in the country. The first railway line was opened in 1853. Initially, the impact on road development was positive. The two systems complemented each other. The railways provided safe and convenient long-distance transportation of goods, while the roads acted as feeders to the railway network by connecting production centres to the railway lines. This led to the construction of new feeder roads and the improvement of existing roads by metalling, so they could serve the railways in all seasons.

Another factor contributing to road development during this period was the policy of decentralisation adopted by the government and the resulting development of local bodies in India. These local bodies were responsible for road development and upkeep, among other things. They were given the finances and the power to improve the road and communication networks in their respective regions.

However, ultimately, it was these factors that brought about a setback in road development. As the railway network expanded, the needs of administration, trade and the military were adequately served by the railways, which led to neglect of the trunk roads. Money was generally spent only on those roads that served as feeders to the railways.

Due to the excessive decentralisation and the growing powers of the local bodies, the central government became increasingly disinterested in the development of

local roads as it was felt that the local bodies were best placed to know what new roads were needed. Gradually, roads came to be regarded as a subject of local importance only, and the Government of India Act of 1919 further solidified this state of affairs when the subject of roads became a provincial subject, with the central government overseeing only the roads of strategic importance. Further, the local bodies themselves also displayed a lack of interest in the upkeep of roads, preferring to spend money on activities such as education. As a result, the road network across the country started deteriorating.

It is noteworthy, however, that although the condition of roads was steadily declining, the government did recognise the need to improve the road network and made several pronouncements to this effect. The Government of India Administration Report 1917-18 noted that Indian agriculture was being hampered by the lack of a good road system: “Some of the best agricultural districts in India are cut off from the trunk roads and railways and inaccessible for most of the rainy season. A very serious economic loss is thus caused to farmers of India year by year.” The next year’s report described roads as “the most indispensable of all requirements to India’s prosperity.” But in spite of acknowledging the importance of roads, little was actually done to improve and expand the network.

**FOLLOWING THE WAR,
THERE WAS A RAPID
GROWTH IN MOTOR
TRANSPORT IN INDIA,
WHICH LED TO A
REVOLUTION IN INDIA’S
TRANSPORTATION
SYSTEM.**

Road network during the post First World War period and the Jayakar Committee

The situation finally took a turn for the better after World War I (1914-1919). Following the war, there was a rapid growth in motor transport in India, which led to a revolution in India’s transportation system. The increase in traffic, combined with the wear and tear due to the pneu-

omatic-tired vehicles, caused the rapid deterioration of the already neglected roads. With the increase in motor transport, the need for better roads was sharply felt and there grew a great demand for an improved and expanded road network.

The demand for better roads was raised in the Council of States in November 1927, as a result of which the Government of India appointed the Road Development Committee under the chairmanship of Mr M.R. Jayakar.

The formation of the Jayakar Committee and the report that it submitted marked an important turning point in the history of road development in modern India. This was the first time that an effort was made to view and plan road development in a more holistic, pan-India manner. Indeed, it outlined a vision and framework for road development that has continued to guide the sector till today. In the decades prior to the formation of the committee, road development had largely been in response to local needs, with scant regard for wider connectivity among villages, towns and regions.

There was also the issue of finances; most road development was financed via local government revenues, and not every governing authority had the financial capacity to develop and maintain an adequate road system. As a result, road development was ad hoc and uncoordinated.

It was clear that road development was pass-

ing beyond the financial capacity of local governments and bodies and was becoming a matter of national interest. Funding and supporting road development would thus require a closer look at various financing options. The committee studied a range of possibilities to determine which financial avenues would be best suited to raising the revenues required by the sector. As such, the committee determined that road development could, to some extent, be a proper charge on central revenues. Indirect taxation and charges would be an effective means to raise the required revenues, such as a duty on motor spirit, licence fees and vehicle taxation. Further, states could take loans through a sovereign guarantee.

With road development in India at an important crossroads, the committee was required to:

1. Examine the desirability of developing the road system in India and the means by which such development could be financed.
2. Examine the feasibility of setting up a Central Road Board to coordinate the activities of the various governing authorities in the country.

The committee reported on the woeful inadequacy of the Indian road system and stressed that the development of roads was necessary for the welfare of the country, particularly for:

- better marketing of agricultural produce;
- social and political progress of the rural population; and
- complementing railway development.

The committee recognised that developing an efficient, well-maintained national road network that benefited society as a whole would require a coordinated effort that went beyond the hitherto narrow, local outlook.

A village road has only limited value unless it leads to a main road, which in turn leads to a market or an important hub or a railway. Thus, what was required was the orderly development of a network of roads that served a wide range of purposes and adequately connected various parts of the country.

To this end, it would be beneficial to develop a classification of roads and highways according to importance; set up a national supervisory body to coordinate the road development activities of various authorities; provide technical supervision over construction activities, to ensure that the roads built were of high quality and followed proper construction norms and techniques; and promote research on all matters pertaining to roads, including construction and maintenance.

With this in mind, the committee put forth a series of recommendations covering financing, the coordination of road development and other salient factors.

Means of financing road development

1. As road development in India was beyond the financial capacity of the local governments, and as it was a matter of national interest, it was a proper charge on central revenues.

2. Since the growth of motor transport led to the creation of additional requirements and demands on the road network, an additional tax should be imposed on motor transport to respond to these demands and aid in road development. Additional taxes could include:

- a. a duty on motor spirit
- b. vehicle taxation
- c. licence fees for vehicles plying for hire.

3. The additional funds from motor spirit duty were to go to the central revenue as a Road Development Fund. The additional vehicle taxes and the licence fees were to be allocated to provincial or local revenues, and it was left to them to decide how best to use these resources for road development.

4. Annual grants should be made to each province for expenditure on road development projects.

5. Local governments should decide, based on their circumstances and needs, whether to finance road development through loans.

6. Loans should be borrowed in the ordinary way on the security of the revenues of India, and not on the security of a special road development tax.

7. Given the importance of village roads in connecting rural areas, it was recommended that they should receive greater attention and larger grants from local governments and bodies.

Coordination of road development

1. With regard to the coordination of road development, the committee did not consider



er it necessary to create a Central Road Board but recommended the appointment of a road engineer attached to the department dealing with roads.

2. Road Conferences should be held periodically to discuss matters related to road development. These could include the classification of roads and determine which classes would most benefit from grants from central revenues; the coordination of road development programmes in adjoining provinces and states; the coordination of road development with other transportation systems, especially railways and waterways; technical questions relating to construction and maintenance of roads and bridges; taxation of road transport; and motor regula-

tions, registration and licensing.

3. A Standing Committee for Roads should be instituted to, among other things, consider the annual budget of the road development fund; review road projects submitted by local governments for which grants are requested; and promote research on all matters pertaining to roads, including construction and maintenance.

Miscellaneous

1. As a well-developed road network would benefit the railway system by increasing accessibility and providing adequate connectivity, the Indian Railways Act and Devolution Rules should be amended so as to

enable the railway administration to contribute towards the construction and maintenance of feeder roads.

2. A contribution should be made from the army budget towards the cost of repairing the damage done to roads by military transport.

3. Road tolls on all traffic should be abolished as soon as possible, as toll collection hindered the smooth movement of traffic and was seen as an annoyance by the public. The exception could be tolls on bridges where a definite service was provided to replace a ferry or a bad river crossing.

The Indian Roads Congress

As recommended by the Jayakar Committee, it was decided to hold periodic Road Conferences, and the first such conference was held in April 1930. Matters covered by these conferences included devising a uniform, all-India motor vehicle regulation; standardising road warning signs; defining bridge specifications, etc.

These conferences created great interest in roads, and the need was felt to establish a more permanent organisation to oversee the development and maintenance of the road system in the country. This paved the way for the establishment of the Indian Roads Congress (IRC) in 1934.

**THE IRC PROVIDED
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ROADWAYS IN INDIA.**

The inaugural meeting of the IRC was held in New Delhi in December 1934. The meeting was attended by 73 engineers from all over India. The IRC provided a forum for the pooling of experience and ideas on all matters related to roadways in India.

The principal objectives of the IRC were to:

- promote and encourage the science and practice of road building and maintenance;

- publish standard specifications regarding road and bridge works;
- hold periodic meetings to discuss technical questions regarding roads and bridges; and
- suggest improved methods of administration, planning, design, construction, operation, use and maintenance of roads.

Road Development Plan Vision 2021

The Road Development Plan Vision 2021, published by the Indian Roads Congress in 2001, recognized the modernisation of transport infrastructure as the key to achieving a high GDP growth rate.

The vision document also highlighted the need for reviewing the pricing policy for the transport sector and recommended that the prices should be reflective of the cost of providing services.

With regard to the national highways, the major thrust for development should be on capacity augmentation, with a minimum two-lane carriageway with hard shoulders. Half the network should have four/six lanes by the end of 20 years, of which the Golden Quadrilateral should be completed by 2003 and the North-South Corridor and the East-West Corridor by 2009. The report also emphasised the need for the construction of bypasses, railway overbridges, safety engineering and drainage measures. Timely and adequate maintenance of roads should be ensured to provide a high level of service to users.

Formation of CRRI

In 1952, the Central Road Research Institute (CRRI) was established as a constituent laboratory of the Council of Scientific and Industrial Research (CSIR). CRRI is the premier national research organisation for highway traffic, transport planning and other allied aspects. It carries out research and development in the areas of road and road transportation, and provides the highest level of professional consultancy.

Early post-Independence era: 20-year road development plans

The Nagpur Conference of Chief Engineers (1943)

Although the Road Development Fund came into existence in 1929, on the recommendation of the Jayakar Committee, there was no significant increase in road expenditure for more than a decade after its formation. This was largely due to the economic depression that gripped the country between the two World Wars. It was only after the Second World War that matters improved. During the War, it was necessary to develop and maintain roads of military importance. Further, the heavy wartime traffic caused a rapid deterioration of the roads. To address these issues, the government convened a conference of chief engineers from the provinces in Nagpur in 1943.



The objective of the conference was to discuss post-war road development, so as to formulate an all-India road scheme. Measures to provide connectivity and improve the condition of the road network were to be reviewed, and both short- and long-term initiatives to achieve these aims would be discussed. This conference marked the first time when the question of road development was considered comprehensively and in a scientific manner. The outcome of the conference was the Nagpur Plan, which aimed to serve the needs of the country for the next 20 years. It can thus be regarded as the country's first 20-year road development plan (1943-1963). Some of the key outcomes and recommendations of the plan were:

1. Roads were classified into four categories:

- a. National highways, which would traverse several provinces or states, connecting state capitals, major ports and foreign highways. They were of national importance for strategic, administrative and other purposes.
- b. Provincial or state highways, which were the other main roads of a province or state, connecting to its national highways or the high-ways of adjacent provinces or states, district headquarters and important cities.
- c. District roads, which would serve main production areas and markets and connect them to each other and to highways and railways.
- d. Village roads, which would link villages to the broader road system.

2. As all categories were important for national welfare, balanced development of all road types was to be undertaken and one class was not to progress at the expense of others.
3. The responsibility of developing roads was to be divided between the central and provincial governments. The national highways were to be the responsibility of the central government, while the state highways, district and village roads were the responsibility of the state governments.
4. A formula to determine the target lengths of the different categories of roads was provided. This formula would ensure the development of sufficient linkages between villages, towns and cities.
5. A Road Board was to be established to oversee road policy and the day-to-day administration of the road planning and development programme.

National Highways Act, 1956

The National Highways Act, 1956 was the first Act that addressed the national highways sector as a whole. It covers a wide range of operational and procedural issues that govern the functioning of national highways. The Act authorises the central government to designate a highway as a “national highway” as well as remove any highway from the national highway category. It also specifies the powers of the central government in matters connected to national highways, including the power to acquire land and conduct surveys, determine the compen-

sation when land is acquired, develop and maintain national highways, and determine the fee on national highways.

The Bombay Plan (1961-1981)

The Nagpur Plan was admirable in its effort to view road development as a comprehensive, all-India initiative. Under it, the overall mileage target for roads was achieved. However, it fell short of the targets for some of the individual categories, namely, national highways, state highways and major district roads, which formed the major arterial system. On the other hand, the target for village roads was exceeded. Thus, the road network as a whole remained deficient in many respects. Further, the country’s changing economic scenario, owing to the green revolution and the increase in industrial activity, had led to a significant increase in traffic volume. To ensure that India’s road network could support its expanding economy, it was necessary to review the Nagpur Plan targets.

Therefore, a new 20-year plan was prepared and adopted by the chief engineers of the states. This was the Bombay Plan (1961-1981). The objectives of this plan were to cater to future trends in traffic; improve connectivity of semi-developed and underdeveloped areas; and improve and expand the linkages of industrial areas, ports, commercial centres, pilgrimage sites, universities and cultural centres, administrative headquarters, areas of strategic importance, etc.

Some of the key recommendations of the plan were:

- Increasing the road length to achieve a density of 32 km per 100 sq km. Villages were to be brought within 6 to 13 km of metalled roads and within 2.4 to 20 km of any other roads, depending upon the level of development of the village.
- A formula was provided to determine the mileage targets of the four categories of roads — national highways, state highways, district roads and village roads.
- Introduction of a department of training and refresher courses for highway engineers.
- Simplification of land acquisition procedures.
- Formation of a Road Board to coordinate the various activities and initiatives planned for the expansion and maintenance of the road network.
- Development of manufacturing capacity for road machinery in the country.

The Lucknow Plan (1981-2000)

While some of the targets of the Bombay Plan were achieved, the arterial system serving cross-country traffic remained inadequate. The chief engineers and the IRC once again reviewed the plan and formulated a new one for the next 20-year period. This was the Lucknow Plan.

The plan emphasised the need to connect villages with population over 5,000 in underdeveloped areas in order to promote their economic growth and encourage industriali-

sation. It also recommended the construction of expressways in high density corridors and the development of linkages between these and important industrial, agricultural, commercial, tourist and educational centres.

Limitations of the 20-year plans

There is no doubt that the 20-year plans were landmarks in road network planning at the macro level. Roads were classified to ensure balanced development to serve the needs of the urban, rural, developed and underdeveloped regions of the country. Standards and specifications were developed and implemented for the various classes of roads. However, the volume of traffic increased significantly over the next few decades due to several reasons, including increasing population, urbanisation, industrial and agricultural growth. All these factors put increasing pressure on the road system, which unfortunately was not able to keep pace with the growing demands. The 20-year plans did not take into account the extent of the growth in passenger and freight demands, nor did they focus on the need for coordinated development amongst the various modes of transport. The planning of surface modes of transport was so far done in isolation, and as competing entities rather than as complementary parts of a comprehensive whole, resulting in congestion along some routes and the underutilisation of others. To overcome these shortcomings, the National Transport Planning Committee of the Planning Commission attempted to assess and forecast the transport demand

till 2001 and develop different modes according to need and demand, and in concert with one another.

Road development under Five-Year Plans

There is no doubt that the 20-year plans played an important role in establishing a long-term vision and plan for creating an extensive road network and thus guiding road development in India. The targets laid out in these plans focused on developing the road network in response to the needs of the times and resulted in significant growth of the network. Post-Independence era saw the advent of the Five-Year Plans, the overarching aim of which was the balanced development of the nation. Roads were recognised as being essential to achieving this, and the sector received significant focus in the Five-Year Plans, which thus supported and supplemented the activities and initiatives laid out in the 20-year plans. Indeed, the road development programmes in the first two plans were formulated in the mould of the Nagpur Plan.

At the beginning of the First Five-Year Plan (1951-1956), India had 97,000 miles of metalled roads and about 1,47,000 miles of unmetalled roads. During the plan period, about 10,000 miles of new surfaced roads and about 20,000 miles of low type roads were added, and about 10,000 miles of existing roads improved. A special programme of inter-state roads and roads of economic importance was taken up in 1954, and central grants totalling Rs 100 million were approved. The programme included inter-state roads, roads in the border and hilly areas, and roads required for the development of tourist traffic. About 1,000 miles of roads were expected to be constructed under the programme.

This programme was continued during the Second Plan

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(1956-1961). There was also a focus on improving the connectivity of backward areas, which could not be given attention during the First Plan. Efforts to strengthen the road network in states affected by Partition to better connect these areas with the rest of the country continued, with the construction of key missing links and bridges.

A notable development during this period was the passage of the National Highways Act in 1956, which was also the first year of the Second Plan. This was a landmark act as it was the first act to address the national highways sector as a whole. It covered a wide range of operational and procedural issues that governed the functioning of national highways. The impact of the act could be seen in subsequent plans in terms of the focus and direction of highway development throughout the country.

The road development programmes for the Third Plan (1961-1966) were formulated in accordance with the broad objectives laid down in the 20-year road development plan for the period 1961-1981, or the Bombay Plan. The aim of this plan was to ensure that no village in a developed and agricultural area remained more than 4 miles from a metalled road. The plan took into account the special requirements of undeveloped and underdeveloped areas. As such, the programmes for the construction of new roads were to be formulated keeping in view, on the one hand, the need to provide road connections to inaccessible areas, and on the other, the requirements arising from projects in other sectors, such as irrigation, power and industry.

A certain portion of the allotment for road development programmes was also set apart for research, with a focus on field research as distinct from laboratory research. Research on modern techniques of road construction was carried out by the Central and state road research

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laboratories with a view to achieving economies in the cost of construction.

The Fourth Plan (1969-1974) prioritised the removal of deficiencies in the existing road systems such as missing links, unbridged river crossings and the improvement of low-grade sections, besides the completion of works already in progress. A special emphasis was also put on the development of rural roads, which were recognised as being necessary for the growth of the rural economy and for increasing agricultural production. With the increase in the volume of traffic, maintenance of roads assumed significance, and the plan saw a larger budgetary provision for maintenance from the Central and state governments.

The Fifth Plan (1974-1979) emphasised the completion of spill-over works from the Fourth Plan, which included several missing bridges and road links. Besides, provisions were made for certain new schemes related to road safety.

At the time of the Sixth Plan (1980-1985), the length of the national highways stood at about 9,340 km, which worked out to approximately 5 per cent of the entire surfaced road length, yet the national highway network was estimated to carry about 25 to 30 per cent of the total road transportation load. This highlighted the need to prioritise the development of national highways. A major policy thrust of the Sixth Plan was the removal of deficiencies in the national

highway system and the upgrade of selected stretches of roads, taking into account the projected traffic growth. Allocations were also made for strategic roads, centrally-aided state roads of inter-state or economic importance, and road communication in sensitive border areas. Under the state sector of the road plan, the most important was the Minimum Needs Programme, which envisaged the provision of all-weather link roads for all villages with a population of 1500 and above and for 50 per cent of villages with a population of 1,000-1,500, within a time-frame of 10 years. The plan also focused on building road infrastructure in the Northeast.

At the start of the Seventh Plan (1985-1990), about 36 per cent of the villages in the country remained without any road connection, and only 47 per cent of the road length in the country was properly surfaced. The grid as a whole suffered from serious deficiencies and there was a growing mismatch between traffic needs and available infrastructure, resulting in severe capacity constraints, delay, congestion, fuel wastage and higher vehicle operating costs. Thus, the major thrust of the programme in the Seventh Plan was to consolidate the gains so far achieved, properly maintain existing assets, and upgrade and modernise the road system.

The Eighth Plan (1992-1997) focused on completing ongoing works. As the national highway network was still struggling to meet the needs of the ever-expanding volume of traffic, expressway facilities were considered

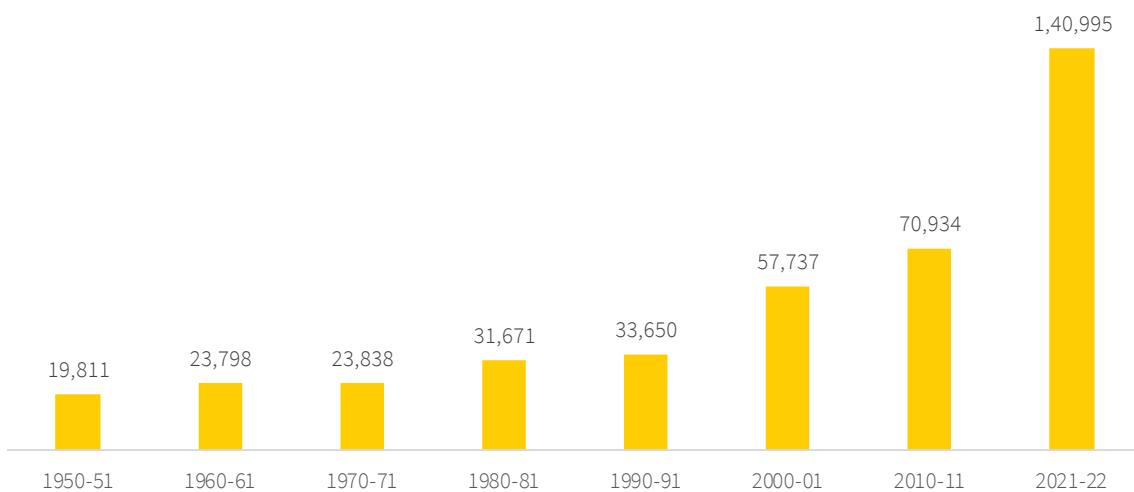
for selected high-density corridors, to enable rapid and safe movement of fast traffic. In view of the resource constraints, the plan programme included seeking non-government sources of funds and promoting private participation in road construction. Toll-based highway projects were also considered as another source of revenue for the road sector. Private participation through build, operate and transfer (BOT) projects was encouraged.

At the time of the Ninth Plan (1997-2002), inadequacies and imbalances in the transport sector threatened to constrain economic growth and the quality of life in both urban and rural India. The transport system was facing capacity saturation, which meant lost economic opportunities and deterioration of assets and services. The modal mix of transport had been continuously shifting against the railways, with

the result that the bulk of the freight (over 60 per cent) and passenger traffic (over 80 per cent) was being carried by road, which was undesirable from the economic as well as the environmental standpoint.

A comprehensive policy package was needed to address the diverse issues facing the transport sector, which is what the Ninth Plan aimed to provide. The road network needed to be expanded and strengthened to improve accessibility of the hinterland and to facilitate the integration of isolated parts of the country. Efforts were made to expand the network and improve the quality of the highways, to provide for speedy, efficient and economical transport of goods and people. To help achieve the goals of the Ninth Plan, a Task Force on Infrastructure was set up with the aim of attracting investment for specific projects of national

Development of the National Highway Network (km)



Source: Press Information Bureau

and regional importance, and ensuring their timely completion.

The galloping resource requirements and the concern for managerial efficiency and consumer responsiveness had already led to the active involvement of the private sector in infrastructure services in the previous plan periods. In the Ninth Plan, efforts to broaden the sources of funding in sectors traditionally funded entirely by the State, such as roads, continued, and an attempt was made to mobilise resources through user charges in various ways. To this end, the National Highways Authority of India (NHAI) proposed to carry out major improvements in the existing highways through the public toll method.

The Ninth Plan period also saw the launch of the National Highways Development Project (NHDP) in 1999. One of the Central government's most ambitious infrastructure development programmes, NHDP guided national highway network development in the country. Implemented by NHAI, its aim included developing four/six-lane highways to the four metros, four-lane highways across the north-south and east-west (NSEW) corridors of the country, high-speed expressways, two-lane roads, ring roads, bypasses, flyovers, etc.

The Tenth Plan (2002-2007) focused on the balanced development of the total road network. To this end, the Golden Quadrilateral and the NSEW corridors, both major components of the NHDP, were to be completed. Emphasis was also laid on four-laning of

high-density corridors, road safety measures, maintenance of the highway network, providing wayside amenities, and achieving 100 per cent rural connectivity with all-weather roads. Inter-modal issues such as road connectivity with airports, railways, ports, etc. were also priority areas. Given the continued resource constraints, particular emphasis was given to the commercialisation of highways and promotion of the concept of user charges for sustainable financing of the road sector.

The main thrust of the Eleventh Plan (2007-2012) was to create world-class road infrastructure, with the objective of improving mobility and accessibility while reducing the cost of transportation. To this end, ensuring the balanced development of the road network across the country continued to be an important aim of the Eleventh Plan. Emphasis was laid on augmenting the capacity of high-density corridors, promoting private sector participation in the road sector, and expediting the implementation of an enhanced NHDP programme, among other initiatives.

The Twelfth Plan (2012-2017) continued the focus on upgrading the road infrastructure, promoting private participation in the sector, completing key NHDP projects, and connecting all villages via all-weather roads. There was also a special focus on developing roads for the Delhi-Mumbai industrial corridor.

A significant milestone under the Twelfth Plan was the introduction of an electronic toll collection (ETC) system. Recognising the fact

that there was an urgent need to modernise the road transportation system, a committee was set up, headed by Shri Nandan Nilekani, chairman, Unique Identification Authority of India, to introduce ETC in the country. An ETC pilot project was inaugurated on April 19, 2012 on a section of National Highway 5 between Delhi and Parwanoo. A second pilot project on the Mumbai and Ahmedabad section of the National Highway was also initiated. Pilot projects were subsequently undertaken on the Bengaluru-Chennai, Kolkata-Dhanbad, and Gurgaon-Jaipur-Beawar stretches of the national highways. Implementation of ETC was entrusted to NHAI.

The Five-Year Plans were structured to realise the vision of a vibrant, progressive India with a healthy economy and opportunities for the socioeconomic advancement of society as a whole. Infrastructure development, especially the roads and highway network, was recognised as critical to achieving this dream, a fact that has been reflected in the programme components of successive Plans. While much remains to be done and gaps in implementation continue to hamper progress towards achieving set goals, there is no doubt that the Plans led to the creation of a vast road network that covered and connected most parts of the country. Efforts to modernise, maintain and expand the network continue with initiatives such as implementing ETC, building expressways, introducing varied modes of financing, and using technology to monitor programme and construction activities and cut costs.

The Central Government made earnest efforts to expand the national highway network successively within the available limited financial resources to meet the expectation in infrastructural growth, the increasing aspirations of people and keep pace with the changing requirements of the contemporary period.

The total national highway network in 1956 was 22,193 km, which grew more than three-fold to 71,772 km - an increase of 49,579 km since the National Highways Act, 1956 came into being. The share of public sector investment in the road sector was 7.5 per cent in the first two Plans and this reduced to 3.7 per cent in the Eighth Plan. Scarcity of resources resulted in a widening of the gap between the funds requirement and the funds available. This led to a search for alternative sources of funding.

In 1991, the government's development strategies changed. It was realised that being a part of the global system, the Indian economy could not be insulated from the development taking place globally.

Several changes were introduced in the sector. MoRTH started outsourcing work to design consultants instead of doing it in-house. The role of consultants evolved from engineers to supervision consultants in government-funded projects to independent engineers in BOT projects. Conventional small-scale contracting industries graduated to large-scale contracting organisations with technology transfers, etc. from abroad. ●

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[\(Pg 946-965 for Roads\)](https://niti.gov.in/planningcommission.gov.in/docs/plans/planrel/fiveyr/10th/volume2/10th_vol2.pdf)

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[\(Pg 214\)](https://niti.gov.in/planningcommission.gov.in/docs/plans/planrel/fiveyr/12th/pdf/12fyp_vol2.pdf)



Construction of tunnel connecting Chenani to Nashri, J&K

NHAI: INCEPTION, VISION AND MISSION



Aerial view of Bengaluru-Chennai section of NH-4



NHAI: INCEPTION, VISION AND MISSION

A road network is critical to ensure the success of society, and through the ages, various measures, big and small, have been taken to ensure the development of these lifelines. After India's independence, the government took up the challenge of building the much-needed infrastructure in the country, including a reliable road network. Thus, road development became an important component of the Five-Year Plans. Another significant milestone in this regard was the constitution of the National Highways Authority of India (NHAI) under an act of Parliament, the NHAI Act, 1988. Established to oversee the development, maintenance and management of the country's national highways, NHAI laid the foundation for the modernisation of India's road network. Prior to the creation of NHAI, the Ministry of Road Transport and Highways (MoRTH) was responsible for developing highways through the public works departments (PWDs) of the state governments. The central government would oversee activities pertaining to planning, approval of design and estimates, monitoring, etc., whereas project execution was the responsibility of the state PWDs. As the central government had no direct administrative control over the executing agency, it was unable to effectively

manage and overcome implementation bottlenecks and roadblocks. Further, there was a multiplicity of government agencies involved in road development, which led to inefficiencies and blurred lines of responsibility. Thus, NHAI was created as a statutory body to enable the centre to take over the development and maintenance of the national highway system.

NHAI was operationalised in 1995 to develop and maintain national highways entrusted to it by the Government of India through MoRTH. NHAI was created with the aim of bringing uniformity in processes and practices and to have a unified authority.

Background

Although national highways constitute only about 2 per cent of the country's road network, they carry 40 per cent of the total road traffic. The rapid expansion of passenger and freight traffic made it imperative to improve the road network in the country. To this end, the government launched the National Highway Development Project (NHDP), India's largest ever highways project, to upgrade and strengthen the country's national highways in a phased manner. NHAI was mandated to implement NHDP.

NHAI is responsible for developing and maintaining a national highway network that conforms to global standards and meets user expectations in the most efficient and cost-effective manner, within the strategic policy framework set by the Government of India. In

doing so, it promotes the economic well-being and quality of life of the people.

The mission of NHAI may be summed up as follows:

- To develop, maintain and manage national highways.
- To collect fees on national highways and regulate the plying of vehicles on these highways to help ensure their proper management.
- To develop and provide consultancy and construction services in India and abroad and conduct research activities in relation to the development, maintenance and management of highways or any other related facilities.
- To advise the central government on matters relating to highways.
- To assist state governments in the formulation and implementation of schemes for highway development.

Financing strategies

Implementing a programme as ambitious as the NHDP required a massive amount of funding. The central government tapped various avenues and adopted several measures to make the necessary funds available. The NHDP was thus financed through cess funds, external assistance, market borrowings and private investment.

The programme was financed in the following ways:

- The government's gross budgetary sup-



Earth work on Ahmedabad-Vadodara Expressway Phase-II

port and additional budgetary support including:

- i. Dedicated accruals under the Central Road Fund, share in the levy of cess on fuel allocated under the Union Budget.
- ii. External assistance from international institutions, such as World Bank, Asian Development Bank and Japan International Cooperation Agency.
- iii. Plough back of revenue including toll collection, negative grants, premium and revenue share deposited by NHAI into the Consolidated Fund of India.
- iv. Funding of BOT (annuity) projects under

SARDP-NE and in Jammu and Kashmir with ABS over and above cess allocation.

- Private financing under public private partnership (PPP) frameworks:
 - i. BOT (toll) and design-build-finance-operate and transfer (DBFOT) investments by private agencies and return through levy and retention of user fee.
 - ii. BOT (annuity) investments by private agencies and return through half-yearly annuities.
- Special purpose vehicles (SPVs) with equity participation by other stakeholders.
- Market borrowings (including funds raised



Chikkaluripet-Nellore section of NH-16

through capital gains tax exemption bonds and tax-free bonds) as authorised by the government.

Over the years, the funding pattern changed considerably. While during 1999-2005, cess funds, external aid and market borrowings formed the bulk of investments under the NHDP, this changed drastically post 2005. Private investment became the preferred mode for funding with projects being awarded in the PPP format. However, private investments reduced substantially after the PPP mode of award became significantly less popular post-2012. It was then that NHAI started issuing tax-free bonds to meet its funding requirements.

The Central Road Fund (CRF), created under the Central Road Fund Act, 2000, has been the mainstay of public funding of highway projects in the country. While cess used to be one of NHAI's biggest sources of funding, the model underwent a change, with NHAI supporting project execution through higher external borrowings. The cess, originally introduced through an Act of Parliament in 2000, went into the kitty of the CRF and was used only for laying roads. The CRF was renamed the Central Road and Infrastructure Fund in 2018, and after a policy tweak, the NHAI had to share the collection with other competing infrastructure projects.

NHAI also regularly raises funds from the

market, which are utilised for partially funding the NHDP. NHAI leverages a part of the cess funds to borrow additional funds from the domestic capital market. These bonds are exempted from capital gains tax and are issued at a nominal interest rate of 7-9 per cent per annum.

Over the years, NHAI's expenditure on national highway projects has increased significantly on account of higher land acquisition and construction costs as well as the shift towards the hybrid annuity model (HAM) and the engineering, procurement and construction (EPC) modes of project award. While the increase in land acquisition costs is also due to more projects being undertaken, there has been a rise in the compensation amount for landowners after the new Land Acquisition, Rehabilitation and Resettlement Act, 2013.

This, along with the moderate allocation of cess towards NHAI, resulted in increased dependence on internal and extra budgetary resources, which led to an increase in NHAI's borrowings. Some of the agencies from which NHAI has borrowed include the Life Insurance Corporation (LIC), Employees' Provident Fund, National Small Saving Fund, bank loans and market borrowings through bonds.

Emerging funding sources

In the absence of a sustained flow of private investment in national highway projects, the government decided to explore innovative funding means such as monetisation of existing assets and tapping of long-term finance from pension and sovereign funds. Infrastructure investment trusts (InvITs) are a popular funding source among road developers for monetising operational assets. The NHAI has already raised Rs 73.5 bil-

**NHAI LEVERAGES
A PART OF THE CESS
FUNDS TO BORROW
ADDITIONAL FUNDS
FROM THE DOMESTIC
CAPITAL MARKET.**

lion through this route.

Long-term financing from banks by securitising user fee receipts from toll plazas is another innovative funding avenue. In 2016, the toll-operate-transfer (TOT) model for partnerships with private developers was introduced to monetise national highways.

Under this model, toll collection rights, and operations and maintenance obligations are passed on to the private developer for a 15-30 year concession period against the payment of an upfront, one-time, lump sum concession fee. The model evolved over time and NHAI successfully introduced several amendments to the concession agreement based on industry recommendations.

Impact of NHAI on road development

The NHAI was set up to ensure that the highway system, which forms the lifeline of the country, keeps pace with the needs of the times and conforms to international standards of quality and safety. Industrialisation has led to a traffic growth of 8-10 per cent per year on many sections of national highways and this growth is expected to continue in the years to come. Consequently, many stretches of national highways are in need of capacity augmentation by way of widening, grade separation, construction of bypasses, bridges and expressways, etc. Traffic movement on national highways also slows down due to a large number of rail/road level crossings and frequent gate closures. The NHAI has played a significant role in helping overcome these issues. Projects to improve national highways have helped provide better connectivity to previously remote and isolated parts of the country besides enabling faster movement of cargo and reducing vehicle operating costs.

INDUSTRIALISATION HAS LED TO A TRAFFIC GROWTH OF 8-10 PER CENT PER YEAR ON MANY SECTIONS OF NATIONAL HIGHWAYS.

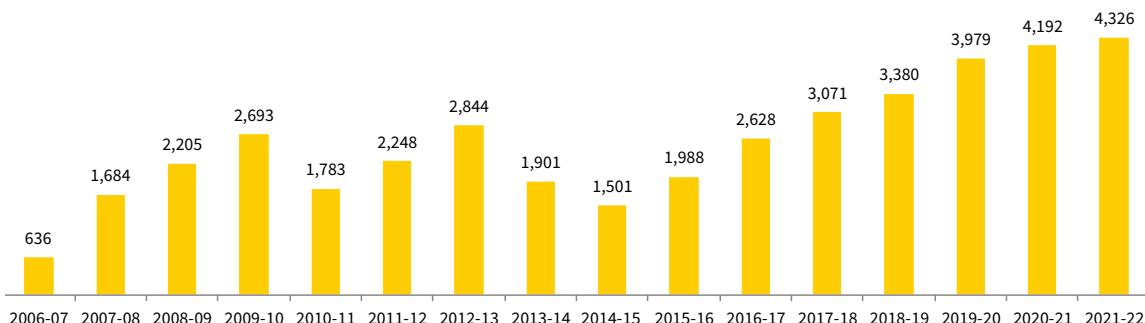
A large number of these projects were undertaken under the NHDP. Subsequently, the government's flagship Bharatmala Pariyojana also contributed to the development of the highway network.

The programme aims to connect cities, remote areas and ports. Critical infrastructure gaps will be bridged through the development of economic corridors, intercorridors and feeder routes; improving the efficiency of national corridors; developing road networks

to enhance border and international connectivity; building roads to improve coastal and port connectivity; and developing greenfield expressways.

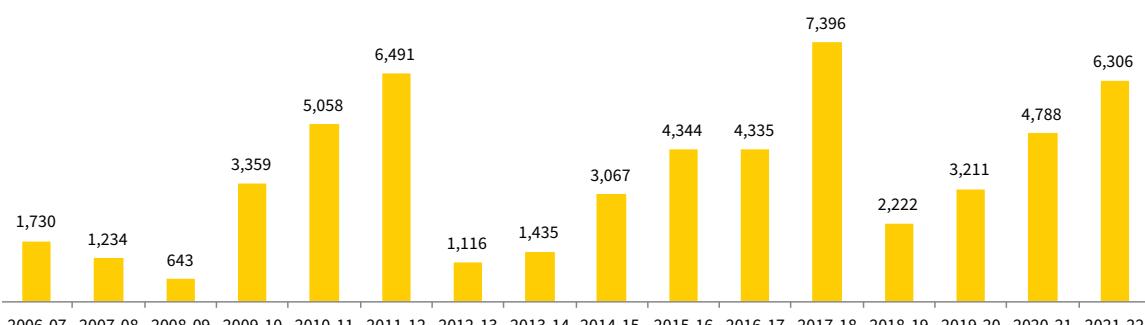
NHAI has thus spurred the development of national highways in the country. The length awarded by the authority increased significantly from about 1,730 km in 2006-07 to 6,306 km in 2021-22. NHAI's contribution has been rising, from around 1,684 km constructed in 2007-08 to 4,326 km in 2021-22.

Year-wise length completed during 2006-22 (km)



Source: NHAI

Year-wise length awarded during 2006-22 (km)



Source: NHAI

Contribution towards direct employment

National highways form the economic backbone of the country and have often facilitated development along their routes with many new towns developing alongside the major highways. They also contribute to generating long-term employment through a large number of small restaurants, hotels and other amenities along their length.

The construction of the highways offers massive employment opportunities. About 4,600 man days of employment is generated while constructing one lane of 1 km of a highway stretch and roughly 22 million permanent jobs driven by increased level of economic activities.* Seasonal employment opportunities will open up as the execution of highway projects will require qualified professionals as well as skilled and semi-skilled labour. National highway projects thus make



Laying of Bituminous Material on Chennai-Bangalore Section

a significant contribution to the generation of employment opportunities.

Given the large requirement for professionals, skilled and semi-skilled workforce, NHAI has embarked upon an elaborate skill development exercise.

Evolving philosophy

Since its inception, NHAI's role has evolved from a dedicated highway project implementation authority to a comprehensive highway solution provider, overseeing every aspect of road development. Through its long journey from NHDPL to Bharatmala, the authority has taken a leap towards building highways on a corridor-based approach. The entire focus has shifted from capital cost of projects to life-cycle cost. The authority has time and again catered to the needs of the industry and introduced amendments to the concession agreements and several contractual frameworks.

It has also transformed design structures and construction practices. For instance, earlier, tunnels were not part of the road plan. Over time, the authority shifted from developing conventional bridges to building long-span bridges. The increase in land acquisition costs paved the way for developing elevated structures rather than bypasses. A significant philosophical change has been an increase in environmental and social consciousness. Road operation is no longer confined to road development and includes road safety Video surveillance and advanced traffic management sys-

tems (ATMS) are steps towards ensuring road safety. Among the many firsts, the 3D Automated Machine Guidance (AMG) technology will be used for the construction of the Lucknow-Kanpur expressway by NHAI to double the speed of construction, and an intelligent transport system facility has been deployed at the Eastern Peripheral Expressway.

In spite of the ups and downs it has faced, the NHAI has made every effort to realise its mission of developing a world-class highway network in the country. From policy measures to innovative financing models, it has taken steps to help drive the nation's march towards economic and social prosperity. In the process, it has connected the far-flung corners of the country and made a meaningful impact on the livelihoods of millions. ●

*MoRTH press release dated December 22, 2017

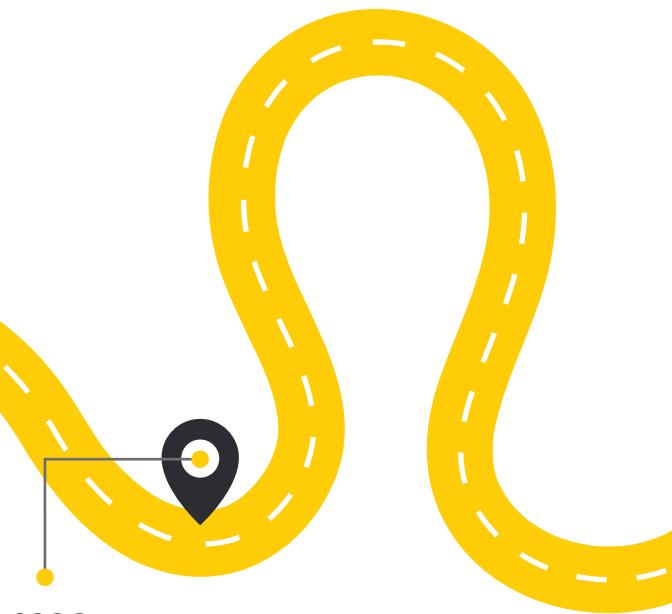
<https://pib.gov.in/PressReleasePage.aspx?PRID=1513847>

KEY MILESTONES

In the 25 years since its inception, NHAI has played a critical role in spearheading the expansion and modernisation of the country's national highway network. Through the years, it has adopted a range of policy and other measures to help ensure the implementation of the NHDP. Here is a look at some of the milestones.

1994

- The road sector declared as an industry to facilitate borrowings from financial institutions
- Customs duties on construction equipment relaxed



1996

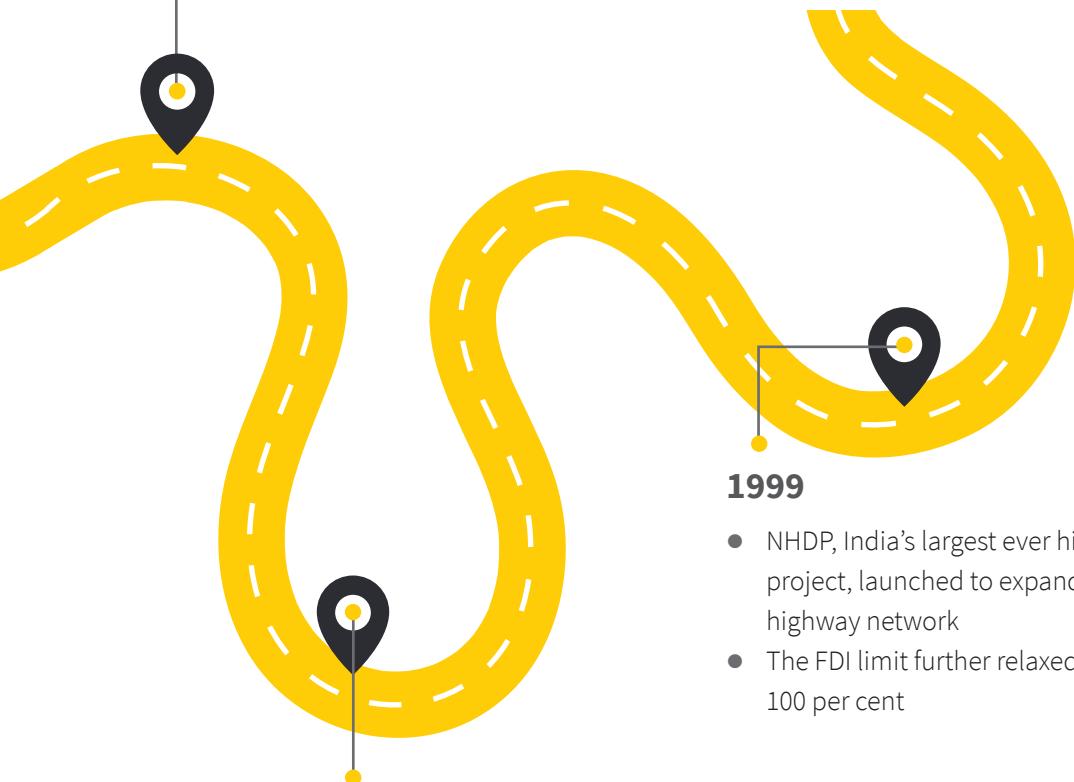
- FDI limit for the construction of roads, highways, vehicular bridges and toll roads relaxed from 51 per cent to 74 per cent
- Automatic approval for foreign equity participation of 51 per cent for support services such as operation of highway bridges and toll roads permitted

1995

- The National Highways Act, 1956 amended to enable private sector participation in the road sector
- NHAI established to oversee the development, maintenance and management of the country's national highways

● 1997

- Principles of four-laning, BOT, bidding, government grants, tolling, etc. approved by the cabinet to award projects
- A high-powered committee constituted to formulate BOT terms and conditions for approval by the cabinet, which included evolving the model concession agreement (MCA)
- National Highways Law (Amendment) Act, 1997 introduced to expedite the process of land acquisition for highways
- Toll levied on highways developed through budgetary resources
- The BOT (annuity) model introduced
- NHAI allowed to partner in special purpose vehicles (SPVs) set up by private players
- Fee rules notified by the government for different vehicles based on the Wholesale Price Index to facilitate progress in the BOT (toll) mode of national highway development
- Projects taken up for execution using NHAI funds directly – Chennai bypass (phase I) Jaipur bypass (phase I) four-laning of the Samakhali-Gandhidham section of NH-8A, and construction of a toll plaza near Manoharpur on tolled Kotputli-Amer section of NH-8
- BOT projects taken up – Durg bypass on NH-6; Moradabad bypass on NH-24; and four-laning of the Hosur-Krishnagiri section of NH-7, Chingelpet-Tindivanam section of NH-45 and Jaipur-Kishangarh section of NH-8



1998

- The Land Acquisition Act, 1894 amended

1999

- NHDP, India's largest ever highway development project, launched to expand and upgrade the country's highway network
- The FDI limit further relaxed from 74 per cent to 100 per cent

2004

- The Committee on Infrastructure (CoI) formed to fast-track the implementation of key infrastructure projects

2000

- Two MCAs developed for projects less than and more than Rs 1 billion, respectively
- CRF Act, 2000 introduced, specifying the use of petrol and diesel cess for the development of national highways, state roads and rural roads

2001

- Biggest intervention in the road sector - Golden Quadrilateral – launched as part of the NHDP connecting Delhi, Mumbai, Chennai and Kolkata. Item rate was the dominant mode of project award

2005

- PPP adopted as the main format for project development for Phases III to VII of the NHDP
- Inter Ministerial Group (IMG) constituted to examine and evolve the MCA for BOT (toll), BOT (annuity) and operation-maintenance-tolling (OMT) projects
- Control of National Highways (Land and Traffic) Act, 2002 came into effect

2007

- The MCA for BOT (toll) projects released by Col, and the use of MCA mandated by the government to bid out all projects under the NHDP post January 2007
- Standard bidding documents, request for qualification and request for proposal launched to standardise the bidding process

2008

- A new tolling policy, National Highways Fee (Determination of Rates and Collection) Rules, 2008 introduced for the revision of toll fees every year

2006

- The design-build-finance-operate (DBFO) model introduced by NHAI
- IIFCL established to bridge the gap between economic and financial feasibility to enable the private sector to develop mega infrastructure projects including roads
- Public Private Partnership Appraisal Committee (PPPAC) set up

2009

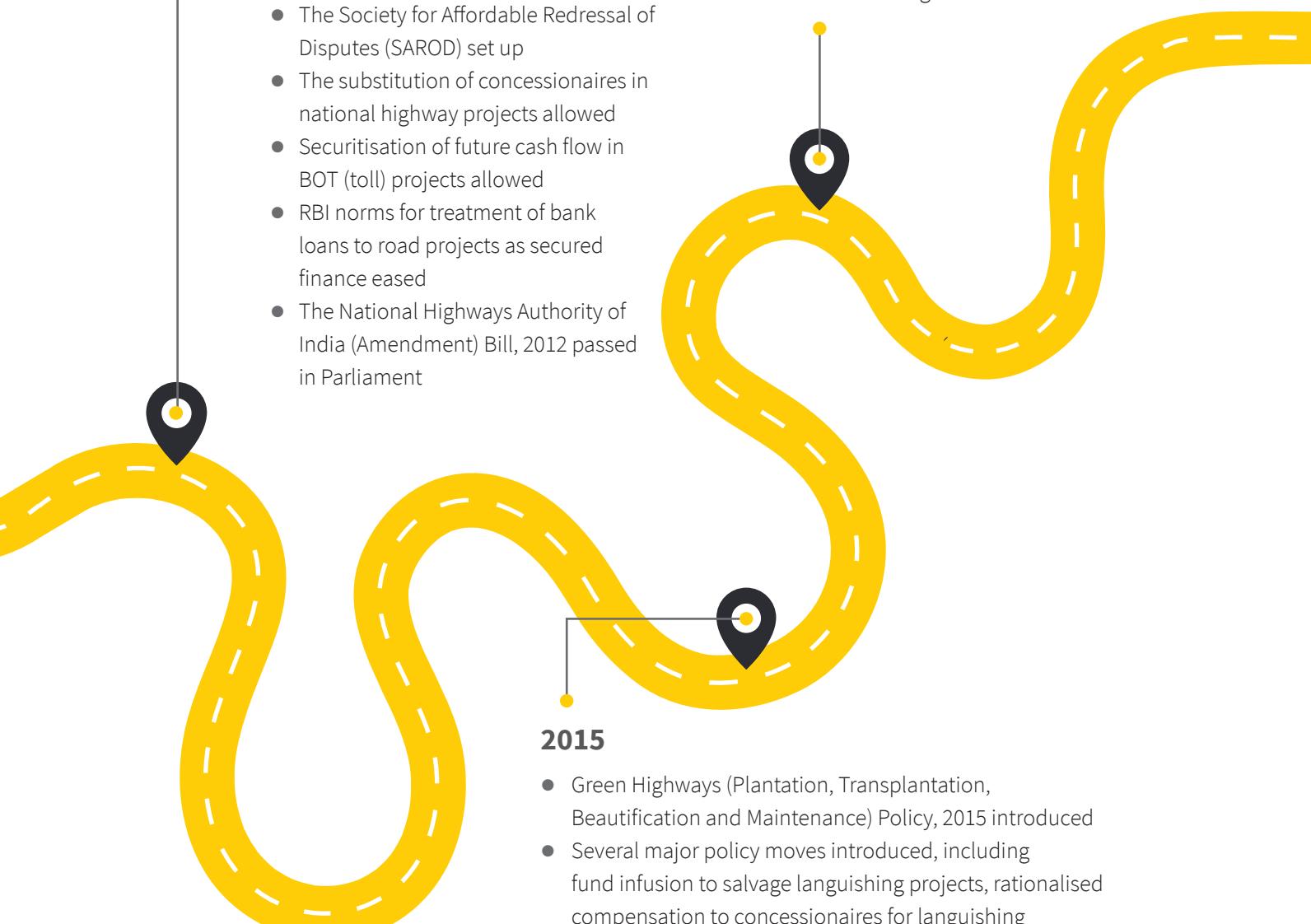
- Improved versions of the MCA published by the Planning Commission: PPPs in national highways, state highways and operations and maintenance of highways
- Ambitious plans laid out by the government to develop 20 km of highway every day; three work plans drafted to award 12,000 km during 2009-12; and mega highway road projects identified
- A 12-member Cabinet Committee on Infrastructure (CCI), headed by the prime minister, established to fast-track the implementation of infrastructure projects and monitor their performance
- The B.K. Chaturvedi Committee formed to recommend changes in the standard bidding documents
- Lease agreements signed with two petroleum companies for establishing, operating and maintaining wayside amenities

2011

- An annual pre-qualification process launched to speed up the award of national highway projects under the NHDP
- PPP-based development of mega highways introduced to realise economies of scale

2012

- A modified EPC model approved by the CCI
- The Independent Settlement Advisory Committee for constituted by NHAI for resolution of pending disputes and claims



2016

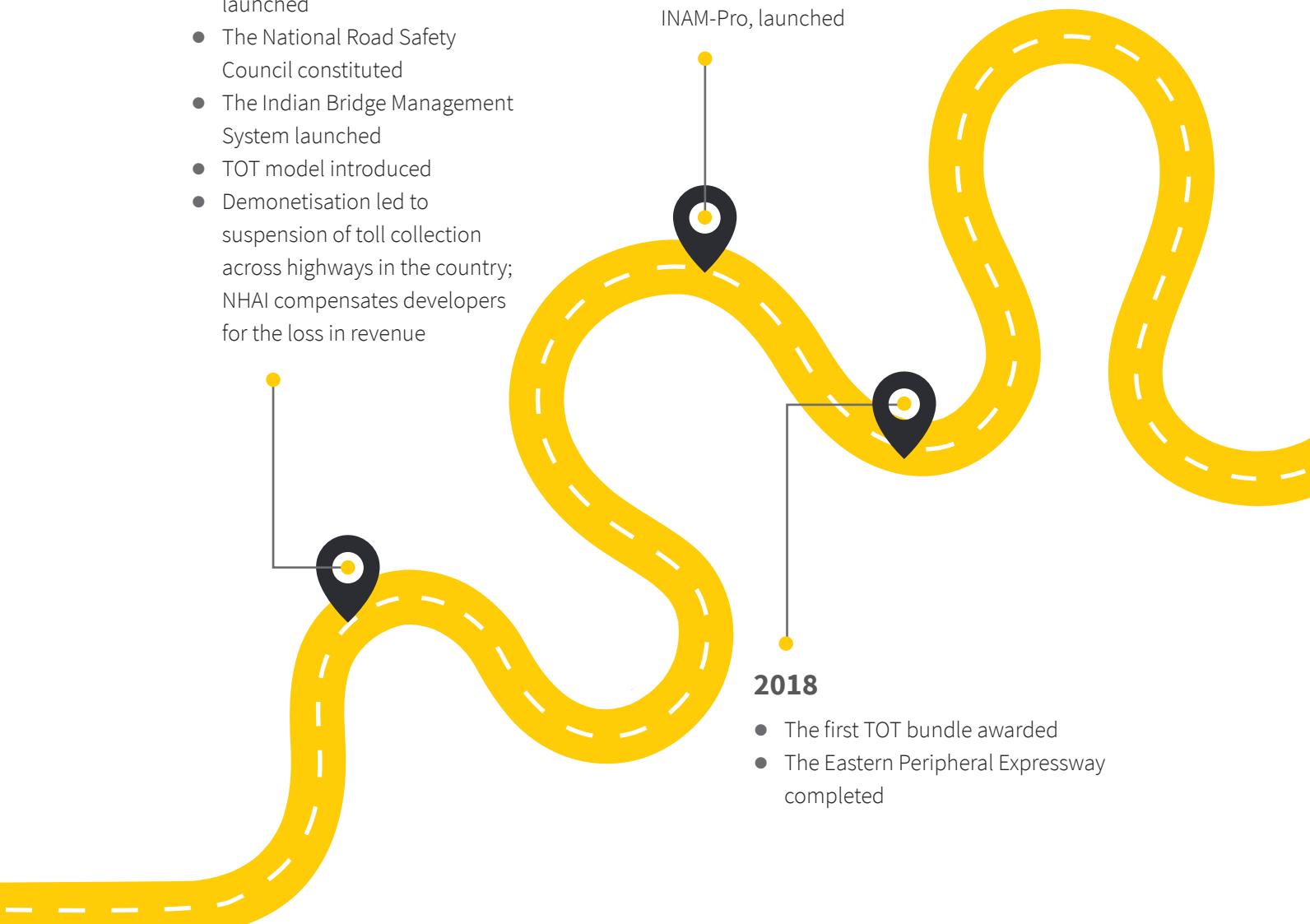
- The hybrid annuity model launched
- The National Road Safety Council constituted
- The Indian Bridge Management System launched
- TOT model introduced
- Demonetisation led to suspension of toll collection across highways in the country; NHAI compensates developers for the loss in revenue

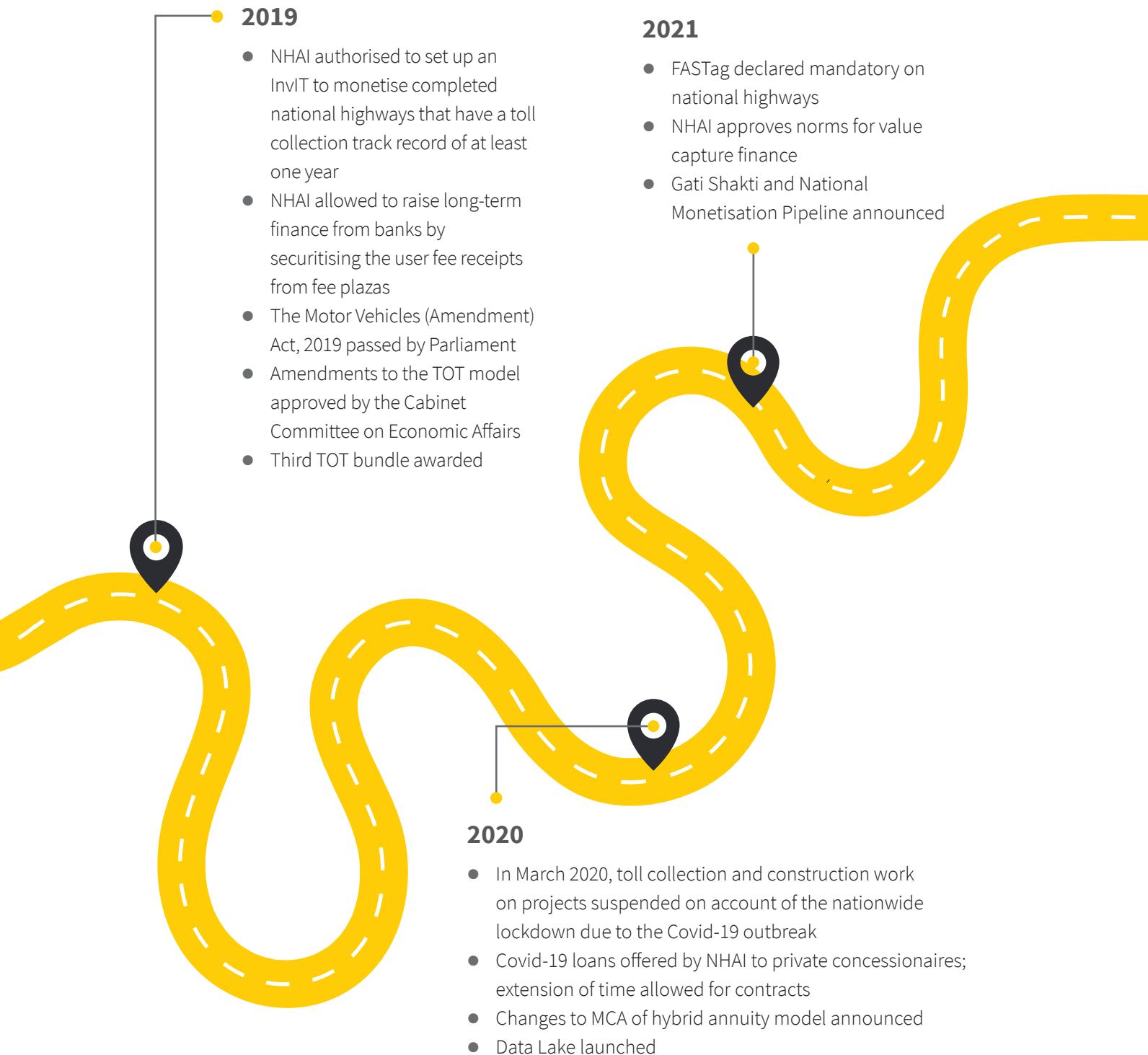
2017

- The Bharatmala Pariyojana launched
- One dedicated FASTag lane operationalised at all toll plazas
- Alternative financing source tapped – an issue of masala bonds launched by NHAI at the London Stock Exchange
- INAM-Pro+, an upgraded version of INAM-Pro, launched

2018

- The first TOT bundle awarded
- The Eastern Peripheral Expressway completed







Takoli to Kullu NH, Himachal Pradesh

NATIONAL HIGHWAY DEVELOPMENT: PHILOSOPHY, PARADIGM AND PROCESS



Bridge at Yamuna river near Naini



NATIONAL HIGHWAY DEVELOPMENT: PHILOSOPHY, PARADIGM AND PROCESS

The story of India's road sector has seen several twists and turns over the past 20 years. From being a government-dominated arena till 2005, the sector was able to attract significant private participation thereafter. Key changes to the policy landscape have played an important role in this evolution. The government took the first step to enable private participation in the sector in 1995 when it amended the National Highways Act, 1956, to allow the government to enter into an agreement with any private player to develop and maintain national highways. Later, the National Highways Authority of India (NHAI) was established to develop the national highway network.

Although private participation was a welcome development, the lack of standardised procedures threatened to derail the public-private partnership

(PPP) model. To overcome this hurdle and ensure uniformity, transparency and quality of the road sector projects, the government introduced the model concession agreement (MCA) in the mid-90s.

Then, in 1999, the National Highways Development Project (NHDP) was launched to develop the national highway system comprising about 54,000 km of roads.

Private participation and the NHDP helped put the sector on the road to recovery, and the years from 2005 to 2011 saw strong growth. However, by 2012, the sector was once again struggling. Financing constraints, a weak dispute resolution mechanism, land acquisition hurdles and delays in regulatory clearances hampered project execution. Aggressive bids placed prior to 2011-12 had resulted in the award of a large number of unviable PPP projects. While several contractors-turned-developers had secured projects, they were now finding it difficult to financially close them. The lender fraternity that had once advanced up to 80-90 per cent of the project cost became hesitant in financing projects. As a result, project award and completion activity slowed down during 2012-13 and 2013-14.

**IN 1999, THE
NATIONAL HIGHWAYS
DEVELOPMENT PROJECT
(NHDP) WAS LAUNCHED
TO DEVELOP THE
NATIONAL HIGHWAY
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ABOUT 54,000 KM
OF ROADS.**

The sector saw many projects turning into non-performing assets and several established developers faced the pressure of over-leveraged balance sheets. The government then decided to switch to the engineering, procurement and construction (EPC) mode of project award.

In a bid to reverse the slowdown, the ministry initiated several measures. These included rescheduling and deferment of premium payments, a one-time fund infusion, revisions in the MCAs, easing of the exit policy for developers, and streamlining of land acquisition procedures.



Tuni-Ankapalli Section of NH-5

In 2015, attempts were made to modify the PPP model with the Kelkar Committee showing the way in its report on Revisiting and Revitalising the PPP model of Infrastructure Development.

While these initiatives were able to bail out the sector partially, what was needed was a fresh wave of reforms to reignite investor confidence in the sector. This led to the emergence of the hybrid annuity model (HAM) as a new means of project delivery.

Further, several out-of-the-box initiatives were launched, which helped resuscitate the sector. The government changed the way it

channelled funds, with the emergence of new and diversified funding avenues such as masala bonds and infrastructure investment trusts (InvITs) to facilitate fund flow in the sector.

NHDP

Launched in December 1999, the NHDP was touted as the central government's most ambitious endeavour for the infrastructure sector. The programme, planned across seven phases, covering 54,000 km at a massive investment of about Rs 3 trillion, served as a blueprint for national highway network development in the country. It involved the development of four/six-lane highways to the four met-

Project scope of NHDP

| Phase | Length (km) | Description/components | Date of approval |
|----------|---|--|------------------|
| I | 7,522 | GQ: Connecting the four metropolitan cities through a 5,846-km road network. NSEW corridors: 981 km Port connectivity: 380 km Other national highways: 315 km | December 2000 |
| II | 6,815 | NSEW corridors: 6,319 km Other national highways: 496 km | December 2003 |
| III A | 12,109 | Four-laning of select high-density corridors of national highways | March 2005 |
| III B | | | April 2007 |
| IV | 14,799 | Strengthening/widening to two-lane with paved shoulders | October 2006 |
| V | 6,500 | Six-laning of high-traffic corridors | March 2005 |
| VI | 1,000 | Developing access-controlled expressways connecting important commercial and industrial townships | November 2006 |
| VII | 700 | Constructing ring roads, flyovers, grade separators, bypasses, and service roads in important cities | December 2007 |
| SARDP-NE | MoRTH is undertaking improvement of roads in the north-eastern states under two phases of this programme. Several sections of national highways are planned to be taken up under the NHDP | | |

MoRTH: Ministry of Road Transport and Highways; NSEW: North-South-East-West; SARDP-NE: Special Accelerated Road Development Programme for North-East

Source: NHAI

ros, four-lane highways across the north-south and east-west (NSEW) corridors of the country, high-speed expressways, two-lane roads, ring roads, bypasses, flyovers, etc.

Phase I of the programme comprised the Golden Quadrilateral (GQ) project covering 5,846 km of national highways. The GQ

successfully provided and improved connectivity across the four metro cities and is divided into four corridors – Delhi-Mumbai, Delhi-Kolkata, Kolkata-Chennai and Mumbai-Chennai. Also included in this phase were about 981 km of NSEW corridors and 695 km of port connectivity and other national highways.

Phase II entailed the provision of connectivity across the north-south (Srinagar to Kanyakumari) and east-west (Silchar to Porbandar) corridors. These two corridors (apart from the 981 km covered in Phase I) together covered 6,319 km. This phase also included 496 km of some other important national highways.

Phase III involved the four-laning of 12,109 km of selected high-density corridors of national highways.

Under Phase IV, the strengthening/widening to two lanes with paved shoulders of almost 15,000 km of national highways not covered under the first three phases was taken up.

Phase V envisaged the six-laning of 6,500 km of high-density corridors. Phase VI entails the development of over 1,000 km of access-controlled expressways. These expressways aim to connect important commercial and industrial townships.

Phase VII involved the construction of ring roads, flyovers, grade separators, bypasses, service roads, etc. in important cities.

Golden Quadrilateral

Phase I of the NHDP comprised the 5,846 km Golden Quadrilateral (GQ), which connects the four metros of Delhi, Mumbai, Chennai and Kolkata. The GQ passes through 13 states in India and is the fifth longest highway project in the world.

Given that India relies heavily on road transportation to move both goods and people, the GQ was conceived to improve connectivity amongst major hubs in the country and thus spur both economic and social development. The vast highway network connects important agricultural, industrial and cultural centres of India, as well as key ports and cities, enabling faster and smoother transportation of goods and people. The benefits of this connectivity are manifold – farmers are able to transport their produce to major cities and towns for sale and export, and there is less wastage and spoilage; access to varied markets leads to industrial development and job creation; industries are more efficiently distributed across regions as land and building-intensive industries move from the core to the peripheries of cities, and medium-sized cities become more attractive locations for manufacturing activity; economic growth is further spurred by the follow-on effects of construction, which result in higher demand for steel, cement and other construction materials.

As this was the first project to be launched under the NHDP, the majority of the funding was provided by NHAI. Three multilateral agencies – the World Bank, Asian Development Bank (ADB) and Japan Bank for International Cooperation (JBIC) – also contributed to funding projects under this phase. Private participation, however, was limited as awards under the GQ took place before the PPP format became popular. Financing was also secured through a cess on petrol and diesel, normal budgetary allocations and market borrowing.

The GQ was initially scheduled to be completed by December 2005, but land acquisition issues, termination and re-award of contracts led to significant delays. The phase was finally completed in 2012.

Targets and achievements

Given the massive scale of the programme, the implementation of the NHDP witnessed several ups and downs over the years.

The financial year 2005-06 was a game changer for the NHDP as the central government decided to award projects on a PPP basis, which led to the inflow of substantial private investment in the sector.

However, during 2006-2009, the pace of project award dropped considerably as a result of the introduction of standard processes and the teething issues that accompanied them. Once these processes were stream-



RQB on Udaipur Chittorgarh Section of NH-76

Phase-wise progress under NHDP (as of September 2018) (km)

| Scheme | Total length | Length completed | Under implementation | Balance for award |
|-------------------|------------------|------------------|----------------------|-------------------|
| NHDP I | 6,602.26 | 6,501.76 | 70.50 | 30.00 |
| NHDP II | 8,421.75 | 7,962.48 | 312.49 | 146.78 |
| NHDP III | 11,865.67 | 8,054.53 | 2,560.00 | 1,251.14 |
| NHDP IV | 13,676.59 | 7,052.96 | 4,584.60 | 2,039.03 |
| NHDP V | 5,392.27 | 3,191.15 | 1,431.90 | 769.22 |
| NHDP VI | 893.72 | 269.72 | 73.00 | 551.00 |
| NHDP VII | 646.14 | 24.65 | 384.74 | 236.75 |
| SARDP - NE | 110.56 | 110.22 | 0.34 | 0.00 |
| Port Connectivity | 623.73 | 428.91 | 34.82 | 160.00 |
| NH (O) | 2,572.33 | 136.99 | 337.95 | 2,098.00 |
| Others | 2,956.48 | 1,146.79 | 313.82 | 1,495.87 |
| Total | 53,761.50 | 34,880.16 | 10,104.16 | 8,777.18 |

Note: The data is as of September 2018. The scope of the NHDP was merged with the Bharatmala Pariyojana soon after the latter was launched

Source: NHAI

lined, awards picked up pace, and 2010-2012 saw significant activity in the sector. There was a marked increase in PPP-based projects while the EPC mode was relegated to the backseat. The phase also saw the evolution of small contractors into road developers and over-optimistic bids. As a result, by the end of the financial year 2012, the sector saw an increasing number of projects languishing for want of equity and reduction in lender interest. Project award slowed down substantially. In a bid to revive the moribund sector, MoRTH switched over to the EPC mode of implementation.

In 2014, several measures were initiated to reinvigorate investor confidence in the sector and deal with pre-construction issues. EPC continued to be the preferred mode, with 81 per cent of the projects awarded under it in 2015-16, but HAM, introduced to reignite investor confidence, also found takers, accounting for 12 per cent of the total project awards. HAM proved to be an attractive model, and by 2016-17, it accounted for a significant 44 per cent of the projects awarded. At the same time, the EPC and BOT modes saw a decline to 51 per cent and 5 per cent respectively.

Apart from award, project execution slowed down by bottlenecks related to land acquisition, clearances and absence of long-term financing. This impacted the pace of construction under the programme. Between 2005 and 2018, the construction rate averaged around 4.9 km per day. Starting at a low rate of 2.1 km per day in 2005-06, the daily construction rate peaked during 2012-13, then slid again, before picking up from 2014-15 to reach 8.4 km per day in 2017-18.

Logistics Efficiency Enhancement Programme

The Ministry of Road Transport and Highways, in 2015, initiated a Logistics Efficiency Enhancement Program (LEEP) to improve India's logistics efficiency. Development of multimodal logistics parks is proposed to improve the logistics efficiency of the country, enabling reduction in logistics costs. It is proposed to develop logistics parks in 15 cities with the highest freight movement (covering more than 40 per cent of the total road freight movement in India) in Phase I of the program. Logistics parks in the next 20 nodes (accounting for ~20 per cent of the total road freight movement in India) can potentially be developed in the next phase. The development of logistics parks in the top 15 nodes will require capital investment of Rs 330 billion for land acquisition, construction of storage space and development of allied infrastructure.

**DEVELOPMENT OF
MULTIMODAL LOGISTICS
PARKS IS PROPOSED TO
IMPROVE THE LOGISTICS
EFFICIENCY
OF THE COUNTRY,
ENABLING REDUCTION
IN LOGISTICS COSTS.**

Bharatmala Pariyojana

In the two decades since its launch, the NHDP achieved several significant milestones in its journey to expand and upgrade India's road network. The GQ connecting the four major metros of India and the NSEW corridors linking Srinagar to Kanyakumari and Silchar to



Rewa- Katni Section of NH-30

Porbandar were perhaps amongst the biggest achievements. However, after the programme reached a certain level of maturity, it required a new direction to address the current realities and needs. To this end, in October 2017, the central government launched the Bharatmala Pariyojana covering 24,800 km and requiring an estimated expenditure of Rs 3.85 trillion.

The Bharatmala Pariyojana is an umbrella programme that focuses on optimising the efficiency of freight and passenger movement across the country by bridging critical infrastructure gaps through effective interventions such as developing economic corridors, inter-corridors and feeder routes; improving the efficiency of national corridors; and developing border and international connectivity roads, coastal and port connectivity roads and greenfield expressways.

To help achieve the overarching aims of the programme, namely, enhanced effectiveness of already built infrastructure, multi-modal integration, bridging of infrastructure gaps for seamless movement and integration of national and economic corridors, several new approaches have been adopted. The Bharatmala Pariyojana thus envisages a corridor approach rather than the package-based approach.

Further, the identification of the project stretches has been done based on detailed origin-destination (OD) studies, freight flow projections and verification of the identified infrastructure gaps through geo-map-

ping. The OD studies also take into account the integration of economic corridors with the ongoing projects under NHDP and infrastructure asymmetry in major corridors. To ensure optimal route selection and alignment, a greenfield approach is being adopted. This has the advantages of faster land acquisition; crow-flight alignment, which reduces distances and therefore results in travel time and fuel cost savings; ease of upgrading the highway to up to eight lanes; and opening up the potential for the development of new areas and wealth creation for less developed areas.

Under Phase I of the project, around 24,800 km are being developed along with an additional 10,000 km of residual road works under NHDP. The initial estimated outlay for Phase I is Rs 5,350 billion spread over five years, that is, 2017-18 to 2021-22.

Owing to disruptions on account of the pandemic along with the ministry's mandate to acquire 90 per cent land for EPC projects and 80 per cent land for BOT/HAM projects before project award, the programme is expected to be completed by 2027-28. Along with the targeted development of 48,900 km under various other existing schemes, the government's overall highway development programme covers approximately 83,700 km at an outlay of Rs 6.9 trillion. The projects under the Bharatmala Pariyojana are being implemented on a PPP (BOT, HAM) and EPC basis, depending on the financial viability of the projects.

Component-wise projects under Bharatmala Pariyojana (Phase I)

| Component | Target | |
|---|----------------|------------------------|
| | Length (km) | Outlay (Rs billion) |
| Economic corridors | 9,000 | 1,200 |
| Intercorridor and feeder routes | 6,000 | 800 |
| National corridors efficiency enhancement | 5,000 | 1,000 |
| Border and international connectivity roads | 2,000 | 250 |
| Coastal and port connectivity roads | 2,000 | 200 |
| Expressways | 800 | 400 |
| Total Bharatmala | 24,800 | 3,850 |
| Residual NHDP | 10,000 | 1,500 |
| Total Bharatmala and Residual NHDP | 34,800 | 5,350 |

Source: MoRTH

Components

The major components of the Bharatmala programme are:

Economic corridors

The OD study identified 44 new economic corridors. These include Mumbai-Agra, Mumbai-Kolkata, Chennai-Madurai, Bilaspur-Delhi, Pune-Vijayawada, Indore-Jaipur and Amritsar-Jamnagar. These corridors are expected to carry 25 per cent of freight in the coming years. Along with national corridors (GQ and NSEW), the economic corridors will comprise India's new highway grid. As per estimates, the national and econom-

ic corridors along with their inter-corridor and feeder routes will carry 80 per cent of the nation's freight traffic. Around 25,000 km of economic corridors have been identified for development.

Intercorridor and feeder roads

The effectiveness of the national and economic corridors can be improved by building feeder routes. A network of shorter inter-corridor routes connecting two existing corridors and feeder routes to the corridor network is therefore also being developed. These roads are expected to carry around 20 per cent of freight. Approximately 12,000 km of inter-corridor and feeder routes have been identified.

Efficiency improvement of national corridors

Currently, the GQ and NSEW corridors carry nearly 35 per cent of India's freight. These highways have witnessed significant growth in traffic volumes by virtue of being the lifeline of India's highway network. They have also developed choke points, impacting the logistics efficiency. To decongest them and do away with the bottlenecks, new ring roads, bypasses and elevated corridors will be built. In addition, multimodal logistics parks will be developed at critical economic nodes along the GQ and NSEW corridors to enable efficient modal transfers, freight aggregation and disaggregation. Around 5,000 km are being taken up under this category in Phase I. Around 35 multi-modal logistics parks (MMLPs) will come up in the country under the Bharatmala project.

Border and international connectivity roads

Around 3,300 km of border roads will be built along the international border for their strategic importance. Around 2,000 km of roads are required to connect India's major highway corridor to international trade points to facilitate trade with the country's neighbours – Nepal, Bhutan, Bangladesh and Myanmar. Around 2,000 km are being developed under this category in Phase I.

**TO DECONGEST
HIGHWAYS AND DO
AWAY WITH THE
BOTTLENECKS, NEW
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AND ELEVATED
CORRIDORS WILL
BE BUILT.**

Coastal and port connectivity roads

Around 2,100 km of coastal roads are planned to be built along the coast of India. These roads will boost both tourism and industrial development of the coastal region. Around 2,000 km of port connectivity roads have been identified to facilitate trade with a focus on improving connectivity to non-major ports. The roads have been identified in concert with the Sagarmala programme. Around 2,000 km will be developed in Phase I.



Goa/Karnataka Border to Kundapur, NH-66

Greenfield expressways

To ease congestion, expressways will be built close to the national and economic corridors where traffic has breached 50,000 passenger car units (PCUs) and there are multiple choke points. About 1,900 km of these stretches have been identified for the development of greenfield expressways. A few large projects, such as the Eastern Peripheral Expressway (135 km) and the Western Peripheral Expressway (135 km), have already been completed.

The two expressways were conceptualised with the twin objectives of decongesting and de-polluting the national capital by diverting traffic not destined for Delhi.

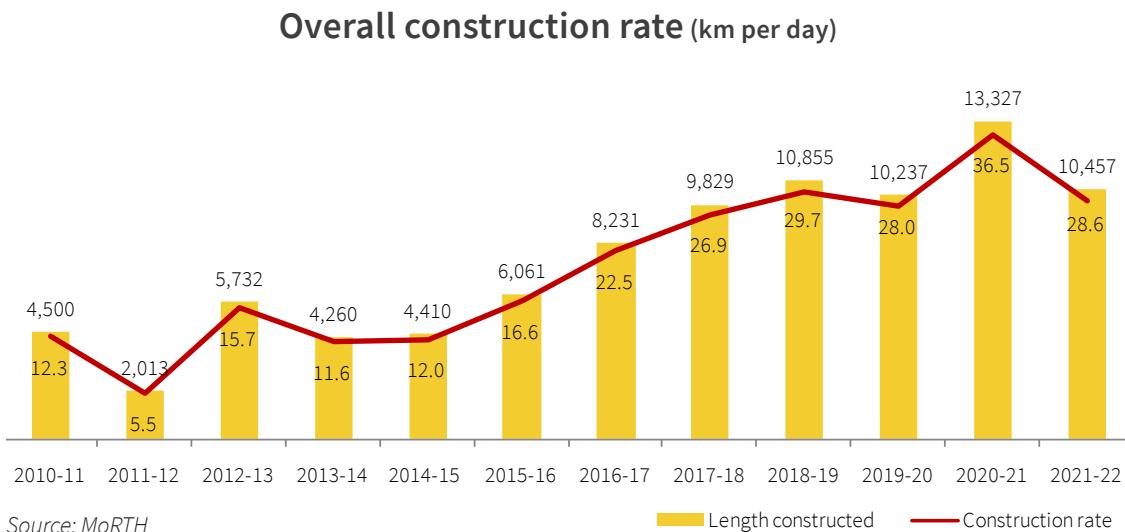
Other expressways that are either planned or under construction include the Vadodara-Mumbai, Bengaluru-Chennai and Nagpur-Hyderabad-Bengaluru expressways.

Targets and achievements

As of March 2022, projects spanning 22,247 km with a total cost of Rs 6.75 trillion have been awarded and a length of 8,985 km has been constructed. Award of all works under Phase I is targeted by 2024-25 and completion by 2027-28.

Bharatmala Phase I also encompasses the development of five greenfield expressways and 17 access-controlled highways spanning a total length of 8,142 km. Of this, 1,615 km have been completed and construction of 3,355 km is underway, as of March 2022. Around 2,226 km have been awarded with the remaining length being in different stages such as bidding/DPR stages. All expressway projects are targeted for completion by 2024-25.

Overall, construction picked up pace, with MoRTH increasing the average construction rate from about 12 km per day in 2014-15 to



37 km per day in 2020-21. A record length of 13,327 km was constructed during 2020-21 owing to the government's focus on project execution.

Financing

An undertaking as large as the Bharatmala Pariyojana cannot be financed through government funding alone. Recognising this, NHAI started tapping various avenues to meet the huge investment requirement.

One such source is asset monetisation through the TOT model. Under this, toll collection rights and operation and maintenance obligations are passed on to a private developer for a 15-20 year concession period against the payment of an upfront, one-time, lump-sum concession fee. InvIT is another means of monetising operational assets.

NHAI started raising long-term financing from

banks through toll securitisation. Similar to the TOT mode of asset monetisation, NHAI monetises its projects to banks in exchange for a lump-sum amount while keeping the tolling and maintenance rights with itself.

Banks give loans to the NHAI, which will be paid back through an SPV or through specific project requirements.

NHAI has developed an equity funding model in a bid to seek funding partners for national highway construction. The new model, more on the lines of consortium funding, seeks to garner interest from domestic and foreign institutional investors for greenfield projects.

Project-based funding to build highways under the EPC route is another avenue being explored by NHAI. Till now, financing for NHAI was at the corporate level. Project-based funding will offer long-term financing of infrastructure projects based on their projected

cash flows rather than the balance sheet of the sponsors. The financing is typically secured by all the project assets, including the revenue streams. The debt and equity used to finance the project are paid back from the cash flow generated by the project. Under this model, a highway stretch will be packaged as an NHAI-sponsored SPV, which will borrow funds from the market to construct the facility and repay the loan. The EPC contractor will merely construct the highway and hand it over to NHAI, which will operate, maintain and collect tolls from the users to recover the cost. Under the SPV structure, one company will own a particular road stretch (compared to NHAI owning all the assets) and the funding is based on the traffic density on that road.

Value capture financing is a mechanism to share gains in land value resulting from the upgrade of highways. The move will help NHAI raise extra budgetary resources for urban highway projects and ring roads.

With a variety of financing mechanisms in place and a series of measures taken over the years to ease roadblocks caused by other factors, the government has taken efforts to ensure that the execution of the Bharatmala Pariyojana remains on track.

Once implemented, the programme will optimise the efficiency of traffic movement on roads across the country. It will also ensure the timely completion of high priority projects in a focused manner. It will connect 550 districts in the country through national highway

linkages. The programme will also have a positive impact on the logistic performance index of the country. There is no doubt that the two landmark programmes — NHDP and Bharatmala Pariyojana — have changed the face of the country's road sector.

Under them, the country's road network has greatly improved and expanded, connecting not only important hubs and cities, but also remote locations and underdeveloped regions.

This improved connectivity has had a positive impact on the economic and social fabric of the country, facilitating the smoother transport of goods and people, and thus spurring development on all fronts. Although both programmes have faced their fair share of issues, various corrective measures as well as proactive initiatives launched by the government over the years have helped advance the vision and ambitions encapsulated in these programmes.

Other noteworthy programmes

Setu Bharatam

Another programme designed to improve the national highway network with a particular focus on safety is the Setu Bharatam programme, launched in March 2016 with the aim to make all national highways free of railway level crossings.

These crossings limit the line capacity of

tracks and increase the operations and maintenance cost.

To eliminate these obstacles to efficiency, 208 road over-bridges (RoBs) and road under-bridges (RuBs) will be constructed across 19 states at a cost of over Rs 200 billion. In addition, about 1,500 old bridges will be replaced or improved by widening at a cost of about Rs 300 billion.¹

An earlier scheme for the removal of level crossings was implemented on a cost-sharing basis, wherein 50 per cent of the cost was borne by MoRTH and the remaining 50 per cent by the concerned state governments. However, this

resulted in inordinate delays on account of coordination issues between the ministry and the state governments. To overcome this problem, the responsibility of implementing the Setu Bharatam programme was vested with MoRTH, which will fund the scheme without any interference from the Ministry of Railways and the state governments.

As with most infrastructure programmes, land acquisition is a major implementation challenge. In some cases, the existing level crossings do not have the correct alignment, resulting in the need for a new alignment, which requires the acquisition of land. Obtaining clearances for the land from various



Bhubaneswar-Puri Section of NH-203

agencies is a time-consuming process, which slows down project execution. Further, the construction of RoBs/RuBs often requires the shifting of utilities such as electric/telephone lines, water pipelines, permanent structures, etc., for which clearances need to be obtained from the concerned departments.

Prior to the commencement of construction, the executing agency must obtain approvals from the Commissioner of Railway Safety to ensure adherence to guidelines aimed at protecting railway tracks and ensuring the safety of running trains. Fast-tracking such approvals is essential to speed up the pace of project execution.

Thus, the successful implementation of Setu Bharatam requires a streamlined decision-making process and an efficient project management system.

Special Accelerated Road Development Programme in Northeast

The Ministry of Road Transport and Highways has taken up an ambitious Special Accelerated Road Development Programme (SARDP-NE) for the development of the road network in the north-eastern states of the country. This programme envisages the provision of road connectivity to all the district headquarters in the north-eastern region by minimum two-lane highway standards, apart from providing road connectivity to backward and remote areas, areas of strategic importance and neighbouring countries. The programme

is planned in two phases (A and B) including the Arunachal Package. The government has approved the 2x4 laning of 6,418 km of various categories of roads under Phase A and the Arunachal Package at an estimated investment of about Rs 304.50 billion. The government has also approved the preparation of the detailed project report for 3,723 km of roads under Phase B.

A sum of Rs 36.40 billion has been allocated for SARDP-NE works (including the Arunachal Package), of which an expenditure of Rs 33.14 billion was incurred during 2020-21. SARDP-NE works for 285 km for Rs 50.20 billion were sanctioned during 2020-21. Phase A, including the Arunachal Package, is targeted for completion by 2023-24. Phase B will be taken up after completion of Phase A.²

Road connectivity in LWE-affected areas

Projects for the construction of roads in left wing extremism (LWE)-affected areas in nine states with a total length of 5,422 km at a cost of Rs 86.73 billion have been taken up by the Ministry of Road Transport and Highways under the Road Requirement Plan-I (RRP-I). Of this, 4,932 km have been completed and the balance works are in progress, as of July 2021.³ ●

¹<https://morth.nic.in/setu-bharatam>

²<http://164.100.24.220/loksabhaquestions/annex/175/AU516.pdf>

³<http://164.100.24.220/loksabhaquestions/annex/176/AU2900.pdf>



Bridge on Chambal River, Kota

IMPLEMENTATION MODELS OF NATIONAL HIGHWAY DEVELOPMENT



New Town, Kolkata

IMPLEMENTATION MODELS OF NATIONAL HIGHWAY DEVELOPMENT

The NHDP was an ambitious programme with a massive funding requirement. The need was felt for private participation to augment government resources and expertise in rapidly expanding the country's road network. Increased private participation would enable the construction of better quality roads, improve road services, and reduce time and cost overruns.

The union government took the first step to enable private participation in the road sector in 1995 when it amended the National Highways Act, 1956, to empower the government of India to enter into an agreement with any private player to develop and maintain national highways and entitle the private player to collect and retain fees to recover costs. Later, the NHAI was established to develop the national highway network.

A host of fiscal incentives were extended to attract private sector participation in the 1990s. These included declaring the road sector an industry to facilitate borrowing on easy terms and allowing the floating of bonds, relaxation of FDI norms, reduction in custom duties, duty-free import of high capacity and modern road construction equipment, tax exemptions, extension in concession periods for up to 30 years, and the treatment of property development activities as part of national highway development for tax benefits.

To further spur private participation, the government took several initiatives to streamline the process for awarding PPP projects in 1997. As a result of these and subsequent measures, the process of private sector participation in the national highway segment has evolved from often opaque public works contracts to a standardised, transparent and efficient process. The government approved the principles of four-laning, BOT, bidding, government grant, tolling, etc.; notified fee rules for toll collection; amended the outmoded Land Acquisition Act, 1894, to simplify and accelerate land acquisition for highway projects; levied tolls on highways developed through budgetary sources; introduced the BOT (annuity) model; allowed NHAI to partner in SPVs set up by private players; and introduced compensation for private players for unforeseen circumstances, etc.

**ONE OF THE BIGGEST
UPSHOTS OF THE PPP
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CONTRACTORS TO
DEVELOPERS.**

Initially, the government experimented with the BOT (annuity) model, in which the developer earns a return on his investment through an annuity payable by the government entity (in this case NHAI) over the concession period.

One of the biggest upshots of the PPP drive in the road sector was the transformation of several EPC contractors to developers. Based on the strength of orders received

under the NHDP, many contractors made the transition from mere construction companies to developers of road projects, and grew in scale. While the PPP model was slowly gaining momentum through the 1990s, it was 2005 that marked a turning point, as the government decided to implement the upcoming phases of the NHDP solely on a PPP basis. This decision prompted the move to standardise the award process through the formulation of standard bidding documents and MCAs to make the process transparent and invite the confidence of the private sector.

The union government introduced the design-build-finance-operate-transfer (DBFOT) model in 2006. This model allowed the private sector to design projects, and alleviated private sector concerns regarding project delays due to changes in scope or design by the NHAI.

In 2005-06, the government also tried to aid the financial closure of PPP projects. The viability gap funding (VGF) scheme was launched to support the financial viability of infrastructure projects, including road projects, which happened to be economically justifiable but not commercially viable, in the immediate future.

The India Infrastructure Finance Company Limited (IIFCL) was set up to fund mega infrastructure projects taken up by the public and private sectors, including those in the PPP format.

To speed up the bidding process for PPP

projects and to make the award process transparent, the union government standardised the bidding documents for PPP road projects in December 2007. The process was divided into two stages – the request for quotation (RfQ) and request for proposal (RfP) stages. The RfQ document evaluates the technical and financial capability of the bidders for pre-qualification, and the RfP document gives the standard format for submission of financial bids by pre-qualified players (shortlisted after the RfQ stage).

However, private players raised several concerns pertaining to the lengthy process, issues related to the cross-holding limit and technical capability limit, etc. In response, the government set up the B.K. Chaturvedi Committee in August 2009. All of the committee's recommendations on how to boost the confidence of developers and financiers were accepted. As a result, the government qualified bidders annually for all expected projects to be bid, which was later discontinued.

The sector received another major boost on account of the policies announced by the government in a slowing economy in 2009. The government set an ambitious target of developing 7,000 km of national highways every year at an average of 20 km per day. As a result, awards picked up pace.

Thus, PPP in the road sector increased significantly during 2005-12 on the back of a well-defined policy and operational framework. Bidding was aggressive during this period. The

year 2011-12 witnessed the highest number of PPP projects awarded by NHAI and garnered the highest revenue for the government.

The scenario changed in 2012-13, which proved to be a challenging year for the road sector.

NHAI awarded about 1,116 km during 2012-13 via the PPP format. This was in sharp contrast to the record length of 6,491 km awarded in 2011-12.

The slowdown in awards was a result of flagging bidder interest. The reasons can be traced back to the aggressive bidding in 2011-12 based on overestimated traffic projections, which delayed financial closures for projects awarded in the previous year. Consequently, developers became reluctant in picking up new highway projects in 2012-13. Financing of projects awarded in 2011-12 was challenging, as these had been awarded on the basis of aggressive bidding by developers. This made

bankers circumspect in lending to national highway projects due to aggressive bids.

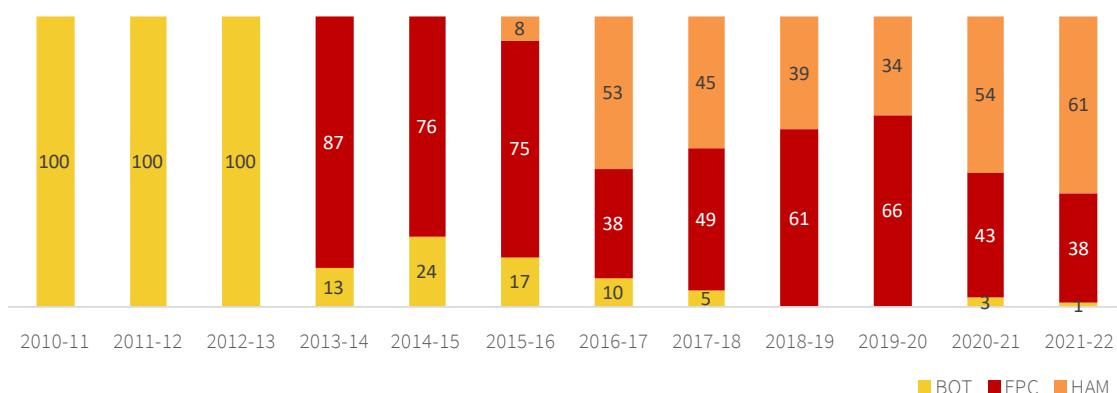
Implementation remained stagnant due to delays in pre-construction activities such as land acquisition, environmental clearance and financial closures. A large percentage of these stalled projects became non-performing assets for banks.

Thus, sluggish global and domestic economic growth, delays in land acquisition and environmental clearances, the stretched financial position of road developers, and the high cost of capital all combined to adversely impact PPP in the road sector.

Moreover, the unwillingness of banking institutions to finance without 100 per cent land availability further impacted investor interest in the sector.

The years 2013 to 2015 did not see much

Share of implementation modes (% share of awarded length)



Source: NHAI



Guwahati to Nalbari, NH-27 (old NH-31)

improvement in the bidding scenario. With many projects languishing, the government needed to take action to revitalise the sector. Consequently, it switched to the EPC mode.

The bidding scenario showed a slight improvement during 2015-16. New and regional players secured a large number of orders and outbid the traditional and large players in the market. The dominance of the EPC mode was reflective of the government's strategy to tap the potential of asset-light small contractors.

Journey from BOT to EPC

Prior to 2005, item rate was the default mode of award. Then, in 2005-06, PPP emerged as the preferred model. However, plagued by the weak financial position of players, delays in project clearances and low estimated traffic density for many stretches on offer, BOT

projects in the roads sector hit a roadblock by 2011-12, severely impairing the pace of development of road infrastructure in the country. Further, the investment environment in the road sector was not very optimistic.

Most of the BOT players were originally EPC contractors, who evolved into BOT concessionaires by virtue of their experience in constructing large road projects.

However, these companies had limited or no knowledge of the tolling business, which affected toll revenues. Aggressive bidding and tolling revenue risks negatively impacted the developers' bottom lines, which made them wary of bidding for additional BOT projects. The slow pace of project awards pushed MoRTH to focus on implementing projects on EPC basis. In 2012, the Cabinet Committee on Infrastructure (CCI) approved the MCA for a modified EPC model.

A shift was made from item-rate construction contracts to turnkey-based EPC contracts to minimise time and cost overruns in road projects. The modified EPC model clearly defines the responsibilities of the contractor and the risks involved. The new model also allows contractors greater liberty in designing and constructing projects. At the same time, responsibility for quality and completion lies with the contractors. The government envisaged that the EPC model would evince significant interest from small and mid-sized construction companies.

Thus, since 2013-14, EPC has dominated the mix of project awards in the national highways segment. PPP awards declined sharply from a high of 6,491 km in 2011-12 to 222 km in 2013-14.

The length awarded under EPC more than doubled in a span of two years from around 1,213 km in 2013-14 to over 3,000 km in 2015-16.

Launch of HAM

With the roads sector in a slump, there was a need for a better financial mechanism for road development and to revive the PPP momentum. In January 2016, the Cabinet Committee on Economic Affairs (CCEA) approved the hybrid annuity model (HAM) as one of the modes of implementation for highway projects.

**SINCE 2013-14, EPC
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HAM is based on a mix of private and public funding, which reduces the risk of developers and enhances funding in the highways. Under this model, 40 per cent of the project cost is borne by the government, while 60 per cent is arranged by the concessionaire.

Initially, HAM expedited project execution. As per estimates, HAM constituted about 40 per cent of the project



Sister Nivedita Setu, Kolkata

awards (in terms of length) by NHAI in 2018-19.

The share drastically increased from 8 per cent in 2015-16 to 53 per cent in 2016-17 due to the euphoric sentiment regarding the new model. But by 2017-18, various issues in the model started coming up.

One of the major bottlenecks was caused by land acquisition issues. Despite several HAM projects being able to tie up funds, many faced long delays in receiving appointed dates on account of delays in land acquisition or regulatory clearances. These projects

were stuck as the government did not release the mobilisation advance until the appointed date was fixed. The date was announced only after the government secured 80 per cent of the required right-of-way for a project. Although 80 per cent land availability offered an edge in terms of swifter completion of projects, delays in providing encumbrance-free land continued to weigh on the road sector.

Another issue was the cash flow mismatch due to delays in rate cut transmission. Falling bank rates impacted the cash flow streams of HAM projects as the corresponding reduction

in cost of borrowing was slow. The annuity paid by NHAI was linked to the bank rate (plus 3 per cent).

In a falling interest rate scenario, the lag in rate transmission on loans created a mismatch in the annuity income earned by the road developer and the interest paid by it to the bank.

This caused cash flow disruptions for operational assets in the short term, till bank rates stabilised.

Developers also faced difficulties in obtaining financial closure due to a slowdown in lending by many public and private banks. Further, the developer's low equity share in the total project cost made the banks more cautious.

This meant higher equity requirement for HAM developers. In addition, the average or below average credit rating of small and medium developers did not help them in raising funds from the capital market.

OMT

In 2009, the government decided to outsource the operations and maintenance of highways to private entities. This was to be done on an operate, maintain and transfer (OMT) basis. This is similar to the BOT model, except that OMT does not require the concessionaire to construct the highway, which is the case in the BOT model.

The MCA for this was approved in August

2012. However, the model faced issues such as revenue exemptions and leakages, strikes, etc. Later, the TOT model was introduced.

Launch of TOT

As we have seen, the government has over the years introduced various policies to respond to the needs of the times, be they expanding and improving the road system, speeding up the implementation of road projects or attracting critical private sector participation. The toll-operate-transfer (TOT) model was one such policy initiative. Introduced in 2016 with the aim to monetise national highways, TOT is a model for partnership with private developers in the road sector. Toll collection rights, and operation and maintenance (O&M) obligations, are passed on to the private developer for a 15-30 year concession period against the payment of an upfront, one-time, lump sum concession fee. As projects are awarded as a bundle of operational national highways, the investor is able to offset the risks of one project against another. Since existing and operational roads are auctioned, there are no construction-related risks, and the model also opens the doors to developers without construction expertise to participate.

Broadly, the TOT model enables NHAI to: (i) ensure the efficient management of operational national highways through proper O&M; and (ii) arrange for additional funds required to achieve the targets under the Bharatmala programme and other national highway development works. Some of the

key features of the model are:

- The assets will be handed over to the authority post the concession period.
- NHAI may, at its cost, increase the capacity of the highway if the traffic increases.
- Up to 49 per cent divestment is allowed till two years of the concession period.
- Up to 100 per cent change in ownership is allowed after two years of the concession period.

- An independent engineer shall be appointed to monitor the engineering/safety improvements and O&M of each project highway.
- The concessionaire shall appoint a statutory auditor to audit the financials
- Any dispute between the concessionaire and NHAI shall be settled via a three-tier dispute resolution mechanism based on mediation, conciliation and arbitration.



Vijayawada-Eluru section of NH-5

The highways eligible for TOT are: publicly funded projects that have been operational for more than one year; and projects that are largely contiguous with a proven tolling history.

Since the CCEA authorised the monetisation of national highway projects through the TOT model in August 2016, bids have been conducted for eight bundles of TOT projects. The response has been mixed.

The overwhelming response to the first bundle, which received bid 1.5 times the NHAI's estimate, was followed by a weak response to the second bundle. Higher initial capital expenditure and change in interest rate was a major reason for the lukewarm investor interest in TOT-II.

The bidding window for the third bundle was extended thrice, indicating a tepid response to this bundle as well. However, the third bundle was also awarded, while the fourth bundle was cancelled. The fifth bundle was further divided into two parts, both of which have been leased out.

In November 2019, CCEA approved the amendments proposed in the TOT model by NHAI. The amendments will ensure a wider set of assets for monetisation and a more attractive model for investors. The key amendments include the duration of the concession period, which could vary between 15 and 30 years, depending upon the features of the stretches being offered. Smaller TOT concessions will allow more Indian and medium-sized international firms to bid for such projects.

This also brings some element of certainty, as private players will be able to better assess the investment climate for the next 10-15 years vis-à-vis 30 years. Also, NHAI

**THE TOT AMENDMENTS
ENSURED A WIDER
SET OF ASSETS FOR
MONETISATION AND
A MORE ATTRACTIVE
MODEL FOR INVESTORS.**

will now monetise roads one year from the date of operation instead of two years. This brings the benefit of faster asset recycling.

The NHAI decided to discontinue the practice of announcing the initial estimated concession value (IECV) for TOT bundles at the beginning of the tendering process. The IECV will be disclosed after receipt of technical bids and after declaring the selected bidder. The two stretches under TOT-V were leased out under this model.

In spite of the mixed response, the TOT model provides some attractive opportunities to long-term investors. It offers operational road assets with a historic data of traffic growth and toll collection, and is free of construction risks. A significant portion of the annuity road assets available for sale are projects with NHAI/MoRTH as the counterparty, thus leading to significantly lower credit risk. The model has created opportunities for platform investments, as cash flow-generating road assets are put up on the block.

Other benefits of the model include access to a long-term cash flow to fund future development for non-toll projects under HAM, annuity and EPC contracts; opportunities for developers/O&M contractors observing financial stress but possessing operating capabilities; FDI opportunities for potential interests from sovereign wealth funds/ pension funds/ FIIs, etc.; and availing of best international practices for highway operation and the international lending community.

On the downside, the risks and challenges associated with the model include issues with capacity augmentation, wherein there is a risk with respect to expansion of roads from 4 to 6 lanes, as the toll is frozen at 75 per cent of the existing toll during the upgrade.

Further, if the upgrade is not completed on time, the toll becomes zero. Another challenge is that it is difficult to clearly assess how much major maintenance will be required each year. However, these risks have been mitigated.

Key issues

The government has taken several measures over the years to spur development in the road sector and ensure the success of the ambitious NHDP. As a result, a fairly comprehensive policy and regulatory framework is in place and the government has firm targets and plans for the future. Nonetheless, there remain some issues that may pose risks for the sector and need the urgent attention of key stakeholders.

Land acquisition continues to be the biggest issue facing the implementation of the NHDP. Land acquisition, which is the responsibility of state administrations, takes about 18 months to be completed on an average, but can take longer depending on the location and the state. The problems have mostly been on account of procedural formalities, court cases and lesser than expected cooperation from state governments.

Delays in land acquisition have a domino



Tree Transplantation on Dwarka Expressway

effect on project execution, as financial institutions are wary of giving loans to projects before the land has been acquired.

Land acquisition cost, which used to be 5-10 per cent of the total project cost (TPC) about a decade ago, has now increased to 50-100 per cent of TPC.

Environmental and forest clearances impact project schedules, as these clearances are difficult to acquire and the processes for obtaining them are long-drawn. Apart from the conditions specified by the Ministry of Environment, Forest and Climate Change (MoEFCC), the state forest departments stipulate additional conditions. Also, the demand for compensatory afforestation ranges between two to twelve times depending on the state, making each project a unique case. In addition, the MoEFCC had directed that all infrastructure projects passing through forest land must secure both forest and environmental clearances before the commencement of development work. Since it takes 12 to 15 months to receive environmental clearances, and up to two years to obtain forest clearance, ongoing and new projects both get delayed.

Obtaining railway clearance for rail over-bridges entails a time-consuming and complicated process, resulting in significant delays. Approvals have to be obtained for the general agreement drawing and detailed design of substructures after proof-checking by consultants; permission is required for

operating blocks of traffic on trunk routes; and permission from the commissioner of railway safety is required for shifting level crossings and constructing other super structures.

Shifting of utility infrastructure is another major issue. For proper project implementation, utility infrastructure such as electric lines, water pipelines, sewer lines, telecommunication lines, etc., need to be relocated. Most of these require specialised work, often carried out by specific departments. This leads to lack of coordination and delays. Nodal officers have been appointed to ensure faster shifting of utilities to expedite the progress of works.

Issues related to the L1 bidding criteria for awarding national highway projects. The bidding process also poses problems for large contractors. The current open system of bidding encourages smaller players to bid for projects where they may lack the requisite capability. Consequently, the L1 bidding criterion has resulted in several unviable or aggressive bids. It becomes the responsibility of the owners and financiers to ensure the viability of the projects at the price quoted by the contractor.

Local law and order problems have also delayed projects in many cases. Stoppage of work due to demands by the local population for additional facilities such as underpasses, flyovers and bypasses also leads to delays.

Miscalculation in traffic estimation. As per

the CAG report released in December 2014, the performance assessment of a few PPP projects revealed miscalculation in the estimation of traffic volumes. The report points towards the fact that the NHAI considered only tollable traffic instead of total assessed volume of traffic (that is, carrying capacity of the road). This resulted in longer concession periods, which, in turn, resulted in a higher burden on road users by way of tolls for the extended period.

Financing constraints hamper project award and execution. Aggressive bidding for projects in the past, coupled with the prevailing macroeconomic conditions and regulatory issues, have had serious ramifications on the financing environment of the roads sector. Raising funds for such projects has been extremely difficult, which is reflected in the termination of a few projects, and several others not achieving financial closure. As a result, several of the delayed projects have been declared as NPAs.

Dispute resolution: Dispute resolution mechanisms were slow and not very well developed, often delaying project timelines. The arbitration process was proving to be expensive and time consuming.

Initiatives taken to address these constraints

Recognising these issues, several initiatives have been taken to expedite implementation

of the NHDP and improve internal processes. In July 2014, the government issued standardised formats to streamline the land acquisition procedures for infrastructure projects. Guidelines have been issued for continuation of the process in the case of foreclosed projects, thereby removing any ambiguity and ensuring the timely execution of pre-construction activities. Further, the Land Acquisition Act, which came into effect from January 1, 2014, is aimed at addressing this issue to a great extent.

To streamline the land acquisition process, MoRTH decided to develop a single point platform for online processing of land acquisition notifications. Thus, Bhoomi Rashi was launched in August 2018.

In October 2014, the central government introduced a new bidding strategy for national highway projects in a move to revive investor interest in the sector. As per the new strategy, the NHAI will invite bids for projects simultaneously on BOT and EPC basis.

NHAI has taken several measures to ensure that the process of obtaining environmental and forest clearances has been relaxed significantly. An online system has been introduced to speed up the process of obtaining environmental clearances. This will help cut down time and cost overruns. Further, national highway projects less than 100 km in length are exempt from environmental clearance.

Contracts are regularly monitored at various

levels by supervision consultants/project directors and senior officials of the NHAI. Progress reviews are also held at the level of the chairman of the NHAI and the secretary of the Ministry of Road Transport and Highways.

State governments have appointed senior nodal officers for resolving implementation problems relating to land acquisition, relocation of utilities, forest/pollution/environment clearances, etc. These officers hold periodic meetings to review projects and resolve problems. Further, a CoS has been set up to deal with inter-ministerial and centre-state issues regarding land acquisition, shifting of utilities, environmental clearances, etc.

For speedy construction of rail over-bridges, a memorandum of understanding has been signed with Ircon, a public sector undertaking under the Ministry of Railways. Ircon is now responsible for obtaining the necessary approvals at different stages from the railways.

To ensure the quality of detailed project reports (DPRs), they are being peer reviewed. Also, in the case of complicated structures, DPRs are now being checked by consultants. Stiffer performance guarantees have been imposed to ensure that the DPRs are of a high standard. DPR consultants are now required to coordinate with project implementation units at the field level, the NHAI, local officers and local residents at every stage of the DPR preparation. Proof consultants also review DPRs to ensure full compatibility with project requirements, timelines and detailed guidelines.

NHAI had set up a high level Independent Settlement Advisory Committee (ISAC) for one time settlement of old cases pending with the various Courts of Law. In 2013, the authority formed SAROD for time bound completion of arbitration proceedings. NHAI later formed three Conciliation Committees of Independent Experts (CCIE) of three members each. It has adopted a fast-track mechanism to resolve all the disputes through conciliation.

NHAI has instituted a three-stage dispute resolution mechanism to expedite the settlement of disputes. Mechanisms for speedy resolution of long-pending disputes related to EPC and BOT projects have been established. Several contractors and concessionaires have opted for the same and have successfully settled claims with the NHAI.

Steps have been taken to ease the cash flow problems of contractors through the grant of interest-bearing discretionary advances at the request of the contractor, release of retention money against bank guarantees of equal amount, deferment of recovery of advances (on an interest basis) and relaxation in minimum Interim Payment Certificate amounts. Further, NHAI has allowed equity investors to exit from projects post completion. ●



NH-74, Kashipur-Sitarganj Section

EFFECTIVE POLICY FORMULATION FOR NATIONAL HIGHWAY DEVELOPMENT



Guna-Biaora Section of NH-3



EFFECTIVE POLICY FORMULATION FOR NATIONAL HIGHWAY DEVELOPMENT

Given the critical role played by the road system in the economic and social development of the country, roads and highways are a subject of national importance. To ensure the balanced development of a network that serves both the overall national interests as well as local needs, it is important to develop comprehensive policies at the macro level as well as more targeted policies that take into account state and local level requirements.

The road sector is on the concurrent list in the Indian Constitution. It therefore comes under the aegis of both the central and the state governments. At the central government level, MoRTH is responsible for formulating policies and overseeing the sector. MoRTH and NHAI together oversee the national highways. MoRTH's prime responsibilities include construction and mainte-

nance of national highways, and formulation and implementation of various policies for road transport, national highways and transport research. It also provides technical and financial support to state governments for developing state roads.

Rural roads are under the purview of the Ministry of Rural Development (MoRD). The Border Roads Organisation (BRO) is responsible for the construction and maintenance of roads in border areas. The Central Road Research Institute (CRRI) is responsible for conducting high quality research on roads.

At the state level, the responsibility of roads is divided amongst state governments, PWDs, road development corporations, infrastructure boards and rural development authorities.

There are various acts and policies that govern the roads and highways sector. The key policies and laws include the National Highways Act, 1956; NHAI Act, 1988; National Highway Rules (1957, 1964 and 1997), Indian Toll Act, 1851; CRF Act, 2000; Land Acquisition Act, 1894; Dispute Settlement Act, 1940; and the Control of National Highway (Land & Traffic) Act, 2005.

Most of these laws are old and have been amended from time to time. Some of these amendments relate to the introduction of the latest norms on efficiency and standards and a simpler framework to increase private participation.

In addition, the Prime Minister's Committee on Infrastructure (CoI) had prepared a model concession agreement (MCA) for PPP projects. The government made it mandatory for NHAI to use the new draft MCA to bid out projects post January 1, 2007.

**AT THE STATE LEVEL,
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BOARDS AND RURAL
DEVELOPMENT
AUTHORITIES.**

Over the past several years, the government has changed or introduced several rules and regulations as well as announced initiatives to spur the overall development of the sector. These include amendment to the CRF Act, revision of the MCA, and provision for 100 per cent FDI in the sector.

Existing legal framework: Key Acts

In order to gain a better understanding of the framework that shapes and guides the road sector in the country, it is necessary to first look at the existing laws and acts that govern the sector:

National Highways Act, 1956

This was a landmark Act as it was the first Act that addressed the national highways sector as a whole. It covers a wide range of operational and procedural issues that govern the functioning of national highways.

The Act authorises the central government to designate a highway as a “national highway” as well as remove any highway from the national highway category. It also specifies the powers of the central government in matters connected to national highways, including the power to acquire land and conduct surveys, determine compensation when land is acquired, develop and maintain national highways, and determine the fee on national highways.

The National Highways Act was amended in

1995 to enable private sector participation in the road sector. This amendment permitted private entrepreneurs to undertake national highway projects on a BOT basis and recover their investments through toll. The amendment also prescribed a simplified procedure for the acquisition of land for the building, maintenance, management and operation of a national highway.

The Act also contains some rules relating to national highways, which are grouped under the National Highways Rules. Three sets of rules are applicable currently – National Highways Rules, 1957; National Highways Rules, 1964; and National Highways Rules, 1997. While the 1997 rules relate to the collection of fees from any person using national highways or bridges, the other two are general rules.

NHAI Act, 1988

Through this Act, an independent and autonomous authority was constituted for the development, maintenance and management of national highways. Until the enactment of this Act, national highways were directly under the control of the central and state governments and were managed through the MoRTH.

The National Highway Authority of India (NHAI) became operational in February 1995.

NHAI Amendment Bill, 2012

In December 2011, MoRTH introduced an NHAI amendment Bill in the Lok Sabha. Some

of the matters proposed in the Bill included:

- procedures for the selection of the chairman of NHAI by a search committee headed by the Cabinet Secretary;
- increasing the full-time members of NHAI from five to six and part-time members from four to six (including experts who would be from the non-government sector);
- creating additional Chief General Manager (CGM) posts (15 technical and 11 non-technical);
- creating various cells to improve processes in technical areas; and amendments to the NHAI Act, 1988.

In order to strengthen the institutional framework for developing national highways, the Lok Sabha passed the National Highways Authority of India (Amendment) Bill, 2012, in September 2012. The amendment provided for the appointment of six full-time and six part-time members in NHAI. The Bill mandated the appointment of at least two non-government professionals as part-time members with experience in financial management, transportation planning or any other relevant discipline. Consequently, the NHAI (Amendment) Act, 2013 was introduced.





Concrete Paving on Kanpur-Akbarpur Section of NH-2

The restructuring enabled the authority to take decisions related to the financing structure approved by the CCEA so as to effectively implement PPP projects and put in place systems, structures and processes for effective operations, tolling and allied facilities, maintenance and safety.

Central Road Fund Act, 2000

This Act is one of the most significant policy developments in the roads and highways sector of India. It was promulgated to give statutory status to the existing CRF, formed in 1929, and to entrust the central government with the responsibility of managing the fund.

The Act specifies the cess to be charged on petrol and diesel utilised for the develop-

ment and maintenance of various categories of roads including national highways, rural roads and other state roads. It also specifies the powers of the central government for the management of this fund.

The CRF Act was amended in October 2006. Earlier, the Act did not enable leveraging of cess funds for rural roads. The amendment enables borrowing of funds from a separate window under the National Bank for Agriculture and Rural Development and repayment of the principal and interest amounts from the cess fund. Further, in December 2017, the Lok Sabha passed the Central Road Fund (Amendment) Bill, 2017, to allocate 2.5 per cent of the CRF generated towards national waterways with the reduction of an equal percentage from the share of national high-

ways. Eventually, the Union Budget 2018 amended the CFR Act, 2000, and renamed the Central Road Fund as the Central Road and Infrastructure Fund.

Land Acquisition Act, 1894

The Act mandates the government to acquire land required for public purposes. It also determines the compensation to be paid on account of such acquisition. In 1998, the Act was amended to simplify procedures and accelerate the process of land acquisition for highway projects. In 2013, the Land Acquisition Act, 1894 was replaced with the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013.

New Land Acquisition Act, 2013

The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013, came into effect on January 1, 2014. It replaced the Land Acquisition Act, 1894. The Act introduces new rules with regard to compensation for land acquired for infrastructure projects, under which a minimum compensation of up to four times the market value of land in rural areas and two times the value of land in urban areas has been made mandatory. Further, land acquisition for PPP projects will require the approval of 70 per cent of the landowners as against the earlier 80 per cent. Land acquisition by private companies will also require approval from 70 per cent of the landowners.

The Act was further amended through a bill, which was passed by the Lok Sabha in March 2015. Certain amendments were made to the Act to strengthen the provisions to protect the interests of the project-affected families.

**THE UNION BUDGET
2018 AMENDED THE
CFR ACT, 2000, AND
RENAMED THE CENTRAL
ROAD FUND AS THE
CENTRAL ROAD AND
INFRASTRUCTURE FUND.**



Tolling Policy

Indian Tolls Act, 1851

The Act enables the state governments to levy and collect tolls on roads or bridges that have been funded by the central or the state governments. However, the Act needs to be amended by the respective state governments to allow the private sector to levy and collect tolls on state roads and bridges. Some state governments, including Uttar Pradesh and Madhya Pradesh, have amended the Act, for instance. Tolling is subject to the National Highways Fee (Determination of Rates and Collection) Rules, 2008.

The 2008 tolling policy addresses a variety of issues including uniformity of tolling rates, classification of vehicles, fee rates for different categories of vehicles, discounts to local traffic/frequent travellers, categories of persons/vehicles to be exempted from fees, penalties/fines for evaders/overloaded vehicles, toll gates on access roads to check avoidance of toll, distances between two plazas, reasonable period for commencing fees after completion, applicability of revisions in toll policy to existing BOT/ongoing projects, and unauthorised collection of user charges.

Toll rates are uniform for public and privately funded projects. The salient features of the

current tolling rules include increase in base toll rates by 3 per cent every year; increase in toll charges to the extent of 40 per cent of the increase in WPI; toll charges for new structures (bridges and tunnels) determined based on the construction cost; and rounding off fees to the nearest five rupees.

Electronic toll collection (ETC): In a follow-up to the Nandan Nilekani Committee recommendations (the committee was set up for strengthening the digital payments ecosystem), Indian Highways Management Company Limited (IHMCCL) was constituted in December 2012 to standardise tolling technology across Indian highways. The company undertakes toll collection through the ETC system and manage such projects. The implementation of the ETC method of tolling across national highways has facilitated faster transit at toll plazas and seamless travel across tolled roads.

In September 2014, MoRTH decided to launch the ETC programme for national highways under the brand name FASTag, which is a passive radio-frequency identification (RFID) tag. In November 2014, MoRTH inaugurated the ETC system on the Delhi-Mumbai section of NH-8, with the FASTag service. National Payments Corporation of India operates the ETC platform.

Recommendations of NTDPC's report

In 2015, Rakesh Mohan's National Transport Development Policy Committee (NTDPC)

came out with the India Transport Report – Moving India to 2032. The report emphasised the need for the modernisation and expansion of all segments of the transport system and for capacity building in all aspects. The report also highlighted the need for a significant improvement in productivity and efficiency, and noted that it was imperative that future planning of the transport network should focus on the development of multi-modal transport.

Model Concession Agreements

Public-private partnership (PPP)

While the legal framework was aimed at guiding and propelling development in the road sector, the changing times and needs rendered several existing laws as well as development models either obsolete or lacking. Thus, at the turn of the millennium, the Indian road sector was languishing, faced as it was with execution bottlenecks, a paucity of financing and poor quality of construction. In a bid to re-energise the sector, the government, in 2005, decided to award road projects on a PPP basis. This model would not only help secure much-needed private sector financing, but would also divide responsibility between the government and the private developer to help ensure speedy award, timely completion and better quality.

The Planning Commission developed the model concession agreement to standardise documents and processes for the PPP frame-

work to ensure uniformity, transparency and quality in the development of large-scale infrastructure projects. The MCA is thus the legal contract that forms the basis of PPP projects in India. It clearly defines the policy and regulatory framework for the implementation of a PPP project. It addresses a range of critical issues including mitigation and unbundling of risks; allocation of risks and returns; symmetry of obligations between the principal parties; precision and predictability of costs and obligations; reduction of transaction costs; and termination. The

MCA allocates risk to the parties best suited to manage them. Subsequently, the Planning Commission developed various other versions of the MCA to cater to the different PPP modes such as BOT (toll); BOT (annuity); design, build, operate and transfer (DBOT); and operate maintain and transfer (OMT).

The initial MCA developed by the Planning Commission was also later revised and the government has made it mandatory for the NHAI to use the new draft MCA to bid out projects post-January 1, 2007.



NH-44 near Krishnagiri

Key features of the new MCA

Technical parameters: The initial MCA focused on construction specifications or input-based procurement specifications. However, the technical parameters proposed in the new MCA are based on output specifications, as these have a direct bearing on the level of service for users. This shift provides the private sector with greater opportunities to innovate and optimise designs.

Concession period: The concession period will be determined on the basis of the volume of both the present and projected traffic. The idea is that toll-paying users should not be subjected to congested highways and the concession should cease when the full capacity of the road is utilised. The time required for construction (which is usually about two years) has been included in the concession period so as to incentivise early completion, implying greater toll revenues.

Selection of the concessionaire: The selection of the concessionaire will be based on open competitive bidding. In exceptional cases, instead of seeking a grant, the bidder may offer to share revenues with the NHAI.

Risk allocation: Risks are allocated to the parties best suited to manage them as against the existing policy. Under the new framework, the technical and commercial risks are assigned to the concessionaire to help increase innovation and thus lead to efficiencies in costs and services.

Lender concerns: Typically, road infrastructure projects take a long time to achieve financial closure. In addition, there is no definite timeframe for achieving financial closure, nor is there any penalty for a failure to do so. The new MCA specifies a time limit of 180 days (extendable up

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to another 120 days on payment of a penalty), after which the bid security shall be forfeited if financial closure is not achieved. Also, since project revenue is the only source of security for lenders, the new MCA grants them assignment and substitution rights. These rights enable the transfer of the concession agreement to another company in case the concessionaire fails to operate the project successfully.

Construction issues: In the past, most NHDP projects were delayed due to problems in acquiring land and obtaining environmental clearance. To ensure speedy implementation of projects, NHAI has been directed to hand over at least 80 per cent of the required land to the concessionaire prior to the financial closure of the project.

An option to upgrade a highway from four to six lanes during the concession period has been introduced in the new draft. However, in this case the concession period will be reduced from 20 years to 12 years. Such a provision provides flexibility to construct the highway as per the actual traffic and therefore makes the project less capital intensive.

Road users and fee collection: The MCA exempts local residents from paying tolls. This is expected to garner local support for the project. Also, frequent users will be entitled to discounted rates. A differential fee has been proposed for peak and off-peak hours. The concessionaire is entitled to levy and collect user fees and liquidate damages from vehicle owners making unauthorised use of the high-

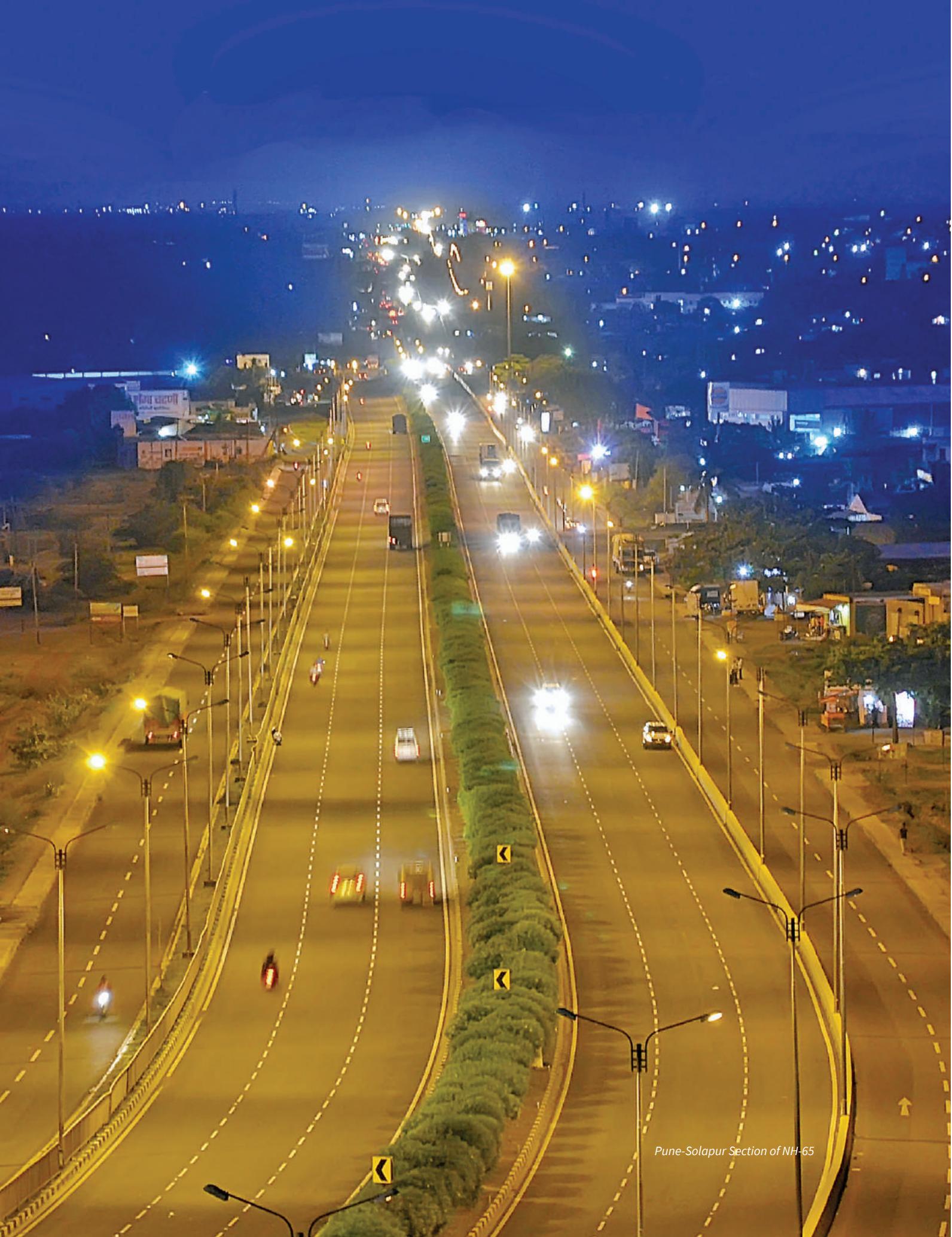
way. This clause was essential as overloading of vehicles by transporters has resulted in the deterioration of roads.

Miscellaneous: Some of the other key features of the new MCA include compulsory buyout by NHAI in case of termination of the contract; compensatory payments to concessionaire in case of force majeure situations, default by NHAI or in the event of an additional tollway/competing road; minimal day-to-day interaction between NHAI and the concessionaire; monitoring and supervision of construction, operation and maintenance being undertaken by an independent engineer appointed by NHAI; and discretion of the NHAI to construct service roads after eight years from the date of appointment of the concessionaire.

Modified EPC Model

Although the PPP model helped spur development in the road sector, private developers faced several pitfalls, which resulted in slow implementation of road projects and a significant drop in the road construction rate.

The problems included delays in land acquisition and institutional clearances such as forest clearances; inability of private players to repay bank loans in time due to implementation delays, which resulted in many banks becoming reluctant to lend to road projects; and difficulties in fundraising from private equity sources due to concerns over implementation delays. With their finances stretched thin,



Pune-Solapur Section of NH-65

many private players started exiting construction projects.

To overcome these deficiencies and revive the ailing sector, the government pushed the EPC model for undertaking projects. A new EPC agreement was approved in August 2012. Under this, road contracts were to be awarded on a turnkey basis, replacing the erstwhile rate contracts, which were blamed for the tardy pace and poor quality of public highways. Broadly speaking, under the new model, the government took responsibility for raising capital, procuring clearances and such, while the private builder constructed roads. Contractors thus had greater liberty in the design and construction of projects. The government specified only broad requirements and design and performance standards, while the contractors were responsible for quality and completion.

Some of the salient features of the new EPC concession agreement are:

- Transparent open competitive bidding, to be conducted through e-tendering.
- An incentive measure to encourage contractors to complete projects ahead of schedule. The bonus for early completion can go up to 3 per cent of the contract cost.
- Projects to be awarded only after 90 per cent of the required land is in possession and environmental clearances have been procured.
- Division of EPC works into four categories – road works, major bridges, structures and other works. Each item of work has been further sub-divided into different

stages and the payment will be linked to the completion of each of these stages.

- A clearly defined dispute resolution mechanism. Conciliation has been recommended in the first instance; failing this, the arbitration route has been suggested.
- Day-to-day interaction between the NHAI and the contractor to be kept to the bare minimum. An independent engineer appointed by the NHAI will monitor and supervise the project. If required, a public sector consulting firm may be appointed as engineer.
- The contractor is responsible for addressing commercial and technical risks related to design, construction and maintenance.

Hybrid annuity model

In 2016, a new financial model was introduced to overcome the shortcomings of the EPC mode. This was the hybrid annuity model (HAM). A mix of private and public funding, it reduces the risk of developers and enhances funding in highways.

The government contributes 40 per cent of the costs, which are provided in five equal instalments linked to project milestone achievements. The remaining 60 per cent of the project cost is arranged by the private concessionaire, who designs, builds and operates the highway for 15 years after construction. The government reimburses the concessionaire for its investment in the project via biannual annuity payments over 15 years, as per a predetermined distribution.

The concessionaire is responsible for O&M of the project, and in return is entitled to biannual O&M payments along with annuity payments. The government collects the toll revenues and uses these to make the annuity and O&M payments to the concessionaire.

Enhancing private participation

In a bid to attract the private sector, NHAI made amendments to the HAM and BOT concessions. The reassessment of revenue potential every five years, award of project after acquisition of 90 per cent of land, change in the concession period depending on the actual traffic, etc. are the key amendments to the BOT (toll) MCA. In order to accelerate the identification and settlement of disputes, the Dispute Resolution Board has been introduced. To resolve the issue of capacity augmentation, NHAI will review the requirement of six-laning at the project conceptualisation stage itself, based on traffic projections and right-of-way availability. The concessionaire would not be required to undertake subsequent capacity augmentation.

As per the earlier MCA, the entire traffic risk is borne by the concessionaire throughout the concession period, except for one clause, which provides relief to the concessionaire based on a seven-day traffic census in the tenth year of the concession period. There have been multiple requests from the market to share this risk in line with the TOT model. As per the amendment, traffic counting is to be conducted every five years based on the latest technologies prescribed by the authority, and the concessionaire may be provided relief in case of an abnormal (± 5 per cent) variation in traffic through the concession period. Besides, the bid parameter has been changed from a fixed amount of premium to a percentage of actual revenue to be shared by the concession-

**IN A BID TO ATTRACT THE
PRIVATE SECTOR, NHAI
MADE AMENDMENTS
TO THE HAM AND BOT
CONCESSIONS.**

aire. This will allow the government to bear a part of the revenue risk.

Some of the amendments to the HAM MCA are 100 per cent ownership change six months from commercial operation date (COD), shift to Marginal Cost of Funds-based Lending Rate (MCLR) from bank rate for computing interest on annuities, increase in payment milestones, formation of the Dispute Resolution Board, etc.

PM Gati Shakti

PM Gati Shakti, launched in October 2021, aims to accelerate the development of infrastructure through synchronised, holistic, integrated and comprehensive planning based on knowledge, technology and innovation. The PM Gati Shakti National Master Plan provides a comprehensive database of the ongoing and planned initiatives of various ministries and states, integrated with 200+ GIS layers, thereby facilitating planning, designing and execution of infrastructure projects.

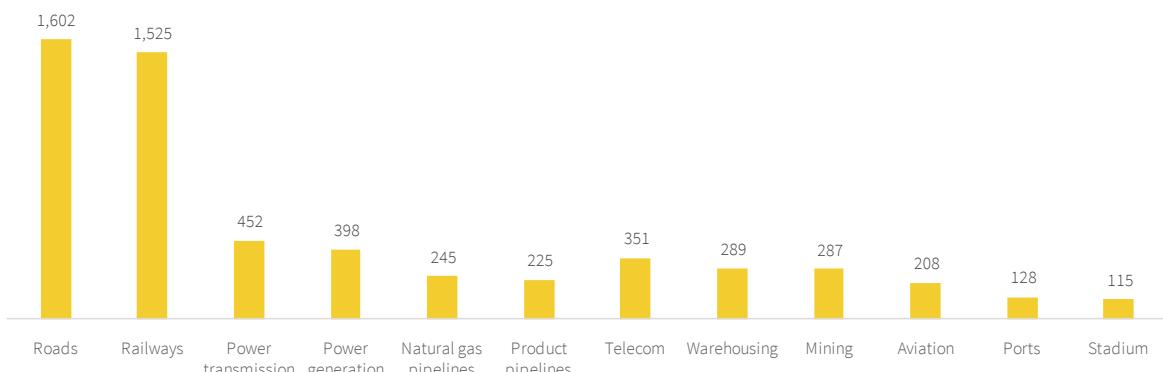
In the National Master Plan, all the existing and proposed economic zones have been mapped along with the multimodal connectivity infrastructure in a single platform, ranging across three time periods – status as on 2014-15, achievements made by 2020-21 and planned interventions up to 2024-25.

National Monetisation Pipeline

The government's focus on infrastructure investments gave way to a re-imagined approach – to look beyond traditional financing sources to fund the Rs 111 trillion National Infrastructure Pipeline (NIP) over the five-year period (FY 2020-25). Asset monetisation assumes importance in this context as the government can sell its infrastructure assets to the private sector and investors and use the proceeds for further infrastructure creation.

The government has therefore unveiled the National Monetisation Pipeline (NMP), which includes various asset classes such as toll

Sector-wise monetisation pipeline over FY 2022-25 (Rs billion)



Source: National Monetisation Pipeline



Bridge construction on river Ganga on Allahabad Bypass

roads, gas pipelines, power transmission, warehouses and airports. The road sector is a huge enabler in this as it has the highest share in terms of asset value. The NHAI has a sizeable inventory of de-risked brownfield highway assets, which could be of interest to investors.

Under the NMP, there is a monetisation potential of Rs 6 trillion through core assets of the centre, over a four-year period, from 2021-22 to 2024-25. The estimated value corresponds to around 14 per cent of the proposed outlay under the National Infrastructure Pipeline (NIP) (Rs 43 trillion). The top five sectors (by estimated value) capture 83 per cent of the total pipeline value. These include roads (27 per cent),

followed by railways (25 per cent), power (15 per cent), oil and gas pipelines (8 per cent) and telecom (6 per cent).

The monetisation of highway assets holds the maximum potential for carrying out the NMP exercise over the next four financial years as the sector constitutes 27 per cent of the total asset pipeline value. This would be achievable through the TOT model and InvIT transactions.

The aggregate length of assets considered for monetisation over 2021-22 to 2024-25 is around 26,700 km. This is based on the length of operational/to be operational, four-lane highways and above in the coun-

try, entailing potential for revenue generation and thereby monetisation. Highway assets considered for monetisation (26,700 km) constitute around 22 per cent of the total national highways (estimated to be about 1,21,155 km) excluding the network operated by the private sector under BOT (toll) based concessions. Highways, which will become operational over the NMP period, have also been considered as part of the monetisable asset base once these assets complete one to two years of operations post establishment of base traffic. Based on past trends in the pace of award and construction, it is estimated that NHAI is adding at least 2,000-3,000 km of monetisable toll roads every year. The total indicative value of road assets considered for monetisation is estimated at Rs 1.6 trillion.

Initiatives for the revival of stalled projects

Given that the highway sector provides jobs for millions and thus has a multiplier effect on the economy, it was critical for the government to take several measures and initiatives to remove bottlenecks from the sector and revive stalled projects as well as investor confidence. The various models discussed above were part of these efforts but were not the only measures taken. Other initiatives ranged from easing the environmental clearance process to significantly increasing budget allocations and fast-tracking stalled projects.

MoRTH conducted a series of consultations

with all stakeholders to identify problem areas. Some of the resulting policy decisions are discussed below.

Fast-tracking land acquisition and environmental clearances

Acquiring land and obtaining forestry and environmental clearances are among the most time-consuming aspects of a road construction project. Delays in these processes have often derailed projects, hampering development and causing financial woes to both private developers and the government. Therefore, the government has come up with several policy changes and initiatives over the years to overcome these bottlenecks.

Land transfer policy: In July 2012, the Prime Minister approved the land transfer policy, thereby lifting the ban imposed on the transfer of government lands in 2011. This was done to relax the norms for the transfer of government-owned land for infrastructure projects, including roads. The new norm did away with the need for cabinet approvals for PPP project development.

Environmental clearances: The Ministry of Environment, Forest and Climate Change (MoEFCC) agreed to facilitate phase-wise preparation and processing of clearances for projects involving the utilisation of forest land. Further, in the event that part of a project falls on forest land, the authority can

begin construction on the non-forest part of the project while awaiting forest clearance.

Also, the new guidelines exempt linear projects from conducting public hearings before obtaining clearance from any village council. In addition, linear projects can now directly be granted environmental clearance for new and expansion projects of border highways.

Committee on easing environmental clearance norms: In August 2014, the government formed a committee headed by former cabinet secretary T.S.R. Subramanian to review and suggest changes to major environmental laws with the aim of speeding up the process of obtaining environmental clearances – the Environment (Protection) Act, 1986, Forest (Conservation) Act, 1980, Wildlife (Protection) Act, 1972, the Water (Prevention and Control of Pollution) Act, 1974, and the Air (Prevention and Control of Pollution) Act, 1981.

Online portal for environment and forest clearance: To fast-track the approval process and bring in transparency and accountability, the MoEFCC initiated an online portal for according environment and forest clearances to projects.

Other initiatives include allowing government-approved valuers to carry out the valuation of structures, rather than leaving it solely in the hands of PWDs, which was causing delays; introducing the Bhoomi Rashi portal to digitise and automate the process of land acquisition; prioritising projects based on

their financial viability to help streamline NHAI's land-acquisition process; introducing a centralised CALA account to facilitate disbursement of compensation to the beneficiaries; and utilising the RTGS/NEFT payment system to fast-track the payment of compensation to the beneficiaries.

Financial incentives

To improve investor confidence, ease the flow of funds to the roads sector, and revive highway projects facing resource crunch, both the Reserve Bank of India and the government have come out with an array of financial initiatives over the years.

Limit on annuity payments: In 2013, the Cabinet Committee on Economic Affairs approved the central government's recommendation to put a cap on the budgetary allocation for annuity payments for PPP projects.

Modifications in take-out financing: At the end of 2011, India Infrastructure Finance Company Limited (IIFCL) announced its modified takeout financing. One of the major modifications included allowing project developers to approach IIFCL to take over their loans. Earlier, this was limited only to lenders. Further, for BOT (annuity) projects, the disbursement of takeout loans can start immediately after commercial operations.

Increase in insurance firms' exposure: In 2012, the Insurance Regulatory and Development Authority allowed insurance firms to



Six-lane access-controlled Greenfield project (NH-152D) connecting Ambala to Kotputli

increase their exposure to 20 per cent of their total funds in the infrastructure sector, including roads. The limit can further be increased by 5 per cent in the case of debt with the prior approval of the Board. The earlier limit was 10 per cent. Further, mortgaged-based securities with “AAA” rating were qualified as approved investments.

Rescheduling premium payments: As a major relief to developers, the government allowed premium deferment in stressed projects. In 2014, the government allowed rescheduling of premium committed by concessionaires during bid stage.

Exit for equity investors: In 2015, the cabinet allowed developers 100 per cent equity divestment from all BOT projects two years after the completion of construction works. This helped developers unlock their capital for future projects and attract fresh funding in the highways sector.

Greater financial autonomy for MoRTH: The ministry is now empowered to appraise and approve projects worth Rs 10 billion and above. Removing the earlier constraint of limiting the ministry to projects worth less than Rs 5 billion will help approve a greater number of projects.

Other financial initiatives: These include allowing non-banking financial companies (NBFCs) to restructure project loans; permitting banks to refinance project loans through full or partial takeout financing; release of the 5/25 Scheme (which has now been discontinued); and allowing the issue of long-term bonds by commercial banks.

Mode of execution for projects

The Cabinet Committee on Infrastructure (CCI) approved

**IN 2015, THE CABINET
ALLOWED DEVELOPERS
100 PER CENT EQUITY
DIVESTMENT FROM
ALL BOT PROJECTS
TWO YEARS AFTER
THE COMPLETION OF
CONSTRUCTION WORKS.**

the proposal to allow MoRTH to decide the mode of execution for projects with traffic between 5,000 passenger car units (PCUs) and 10,000 PCUs. These projects can be undertaken on an EPC basis, as developing them on a BOT basis is not viable. The initiative provided the much-needed incentive for the execution of new projects.

Faster dispute resolution

The NHAI has instituted mechanisms for speedy resolution of long-pending disputes involving BOT and EPC contracts. As part of the one-time settlement, several contractors and concessionaires have opted for the same and successfully settled claims with NHAI. Further, the Society for Affordable Redressal of Disputes (SAROD) was set up for speedy and affordable redressal of disputes. NHAI has formed three Conciliation Committees of Independent Experts (CCIE) of three members each. The CCIE is headed by retired officials from the judiciary, as well as experts from public administration, finance and the private sector. The CCIE is responsible for settling disputes with all contractors. NHAI has adopted a fast-track mechanism to resolve all the disputes through conciliation. This will not only reduce the legal hassles of a long-drawn arbitration process, but the money stuck in arbitral cases can be unlocked for revival of the private sector.

Simplification of procedures to expedite road projects

Projects worth up to Rs 5 billion can now be

appraised by a committee headed by the Secretary, MoRTH, and approved by the minister. Earlier, projects worth Rs 3 billion-Rs 5 billion were appraised by a committee headed by Secretary (Expenditure), MoRTH.

Fast-tracking road projects in border areas

The central government has taken several measures to expedite the pace of road projects in border areas. These include approvals for diversion of forest land required for construction/widening of roads entrusted to BRO in an area falling within 100 km aerial distance from the line of actual control, subject to certain conditions; allowing outsourcing to augment the capacity of BRO; approval for long-term roll-on works plan and long-term equipment plan; and enhanced financial and administrative powers of the BRO executives.

On January 15, 2015, the Ministry of Defence (MoD) stated that BRO would be brought under it. The MoD has approved the delegation of more administrative and financial powers to BRO in order to avoid delays in project implementation.

MoRTH and the Ministry of Railways (MoR)

In November 2014, MoRTH and MoR signed an MoU to remove bottlenecks in the infrastructure sector. Both the ministries have agreed to work in coordination and not levy any charges for supervision and maintenance, or depart-

mental charges and land lease charges, from each other.

Other key initiatives

A healthy road sector is one that has the vision to plan a road system that fosters the overall development of the nation, taking care of its economic and social aspirations. It must also have the wherewithal to execute this vision, which entails adequate finances, technical know-how and a strong policy framework, among other things. To help ensure a vibrant road sector, the government has launched a variety of policy and other initiatives over the years.

FDI norms and other incentives: FDI of up to 100 per cent is allowed in the road sector. The FDI limit was relaxed from 51 per cent to 74 per cent in 1998 and further to 100 per cent in December 1999. India has signed the Multilateral Investment Guarantee Agency (MIGA) to safeguard foreign investor interest. The provisions relating to FDI in the road sector include foreign equity participation in the construction and maintenance of roads and bridges (automatic approval of up to 100 per cent); and foreign equity participation in the case of land transport support services such as the operation of highway bridges, toll roads and vehicles (automatic approval of up to 100 per cent).

Some of the other key incentives include VGF up to 40 per cent of project cost based on competitive bidding for each project and

duty-free import of high capacity and modern road construction equipment.

Col: In a major policy development, the central government formed the Committee on Infrastructure (Col), under the Planning Commission, in 2004. The committee is chaired by the Prime Minister. Its key objectives include initiating policies to ensure timely creation of world-class infrastructure services, developing structures that maximise the role of PPPs and monitoring the progress of key infrastructure projects to ensure that targets are met.

Road safety: Road safety has emerged as a central theme of MoRTH's activities.

The National Road Safety Policy was formulated, focusing on three key areas – strengthening the legal framework for road safety, strengthening the institutional framework for managing road safety and strengthening the financial framework for road safety. The ministry evolved a multi-pronged strategy to tackle the issue of road safety based on the four Es – education, engineering (both of roads and vehicles) enforcement and emergency care. The National Road Safety Council was also constituted as the apex body to take policy decisions in the matter of road safety.

Amendments to the Motor Vehicles Act, 1988: A key law governing the road freight segment – the Motor Vehicle Act, 1988 – was amended in May 2012. The revised law emphasises issues pertaining to overloading



Chennai Bypass

of vehicles and increases penalties on offenders. As per the amendments, apart from the driver and vehicle owner, the consignor will be held responsible for overloading of goods and charged for violations of the rules.

The Act was amended again in 2019. As per the amendment, the central government will develop a scheme for cashless treatment of road accident victims during the golden hour, that is, one hour following a traumatic injury, during which the likelihood of preventing death through prompt medical care is the highest. The minimum compensation for hit-and-run cases has also been increased.

The central government may now order the recall of motor vehicles if a defect in the vehicle may cause damage to the environment,

driver, or other road users. The central government must also constitute a Motor Vehicle Accident Fund to provide compulsory insurance cover to all road users in India. A Good Samaritan has been defined as a person who renders emergency assistance to a victim at the scene of an accident. Such a person will not be liable for any civil or criminal action for any injury to or death of an accident victim, caused due to their negligence in providing assistance to the victim. Aggregators have been defined as digital intermediaries or marketplaces that can be used by passengers to connect with a driver for transportation purposes (taxi services). These aggregators will be issued licences by the states.

Setting up NHIDCL to undertake road works in the Northeast: NHIDCL was incor-

porated on July 18, 2014 as a fully owned company of MoRTH. It envisages the promotion, survey, establishment, design, construction, operations, maintenance and upgrade of national highways and other infrastructure, including interconnecting roads, particularly in the north-eastern region and other strategic areas of the country.

Use of alternative construction materials:

MoRTH decided to use cement as raw material for construction in all upcoming road projects. However, with rising cement costs, focus has shifted to the use of alternative materials for road construction.

Introduction of toll coupons: After the government announced demonetisation in November 2016, the NHAI introduced duly approved coupons for all toll-fee related payment transactions at the toll plazas situated on national highways throughout the country. These coupons, valid from December 7, 2016, were discontinued after December 30, 2016.

Initiatives by NHAI to boost highway construction during Covid-19 pandemic

The NHAI is committed to providing a safe and smooth drive to commuters on national highways.

During 2020, when the world was grappling with the Covid-19 pandemic, India

announced a nationwide lockdown. The country saw mass labour migration and slowdown in construction activities. The Covid-19 crisis had a strong impact on the Indian road sector. While the nationwide lockdown and consequent shortage of labour and raw materials delayed numerous ongoing road projects across the country, the growing market uncertainties and financial constraints faced by highway developers impacted private participation in highway projects to some extent. As part of the Covid-19 relief package, the central government announced the extension of completion timelines by up to six months for road contractors. Besides, a standstill period of six months was announced for road sector contractors and PPP concessionaires, with no associated penalties for not meeting the project milestones. The government also agreed to ease companies' cash flow position by partially releasing bank guarantees. Meanwhile, the NHAI took several initiatives to revive the road sector and enhance its award and construction activity.

Covid-19 relief to highway developers: In order to reduce the plight of highway developers, the NHAI has laid down the principles of force majeure in national highway contracts with private developers after extensive meetings with industry representatives and the government. The authority has given a three to six month extension to all private highway developers whose contracts had ended on or after February 20, 2020. Any concession fee or premium payable to the government has been deferred for all private national highway

projects for the same period they incurred losses in toll collection because of the nationwide lockdown. Besides, the toll collection period for existing contracts has been extended by 21 days. Moreover, the days can be extended in proportion to the loss incurred in toll fee during the lockdown phase, if it is less than 90 per cent of daily average collections. The contract period will be extended by a day if the loss is 25 per cent of the daily collections. The authority has also offered Covid-19 loans to highway developers to help them tide over the crisis. However, the loan will be granted to only those parties that are not in default of contractual obligations as of February 19, 2020. An interest rate of 2 per cent above the bank rate will be charged on the loans extended to private operators. The interest will be compounded quarterly and calculated on the daily outstanding balance of the loan. The loan will be disbursed within 60 days of receiving a valid request from the concessionaire.

Steps to expedite project execution: Seeking to reduce delays in highway construction on account of non-availability of land, statutory approvals and inadequate DPRs, the NHAI unveiled plans to adopt a new project execution mechanism, wherein project management consultants (PMCs) will be responsible for a range of activities, from conceptualisation of projects to making DPRs, and from obtaining clearances to supervising construction and maintenance.

Over the past several years, the high cost of

land acquisition and arbitration issues have been some of the key hurdles in project implementation. Seeking to reduce the cost of land acquisition, NHAI has been working on alternative greenfield alignments. This will not only reduce the land acquisition cost, but the cost of utility shifting will also be reduced substantially. Land pooling and the value capture mechanism have also been explored by the authority. To reduce the build-up of arbitration cases, NHAI has decided to cancel portions of the proposed contracts in case of hurdles in the land acquisition process.

Steps to fast-track arbitration claims: The government has been focusing on expeditious settlement of arbitration claims to deleverage its balance sheet. NHAI is looking to settle the majority of its arbitration cases through conciliation. ●



Allahabad Bypass NH-2

OTHER KEY FOCUS AREAS



OTHER KEY FOCUS AREAS



Developing a robust highway system is not just about building and improving roads. There are a host of related activities and systems that support the smooth functioning of a highway network. Technology plays a key role in helping ensure the efficient movement of goods and people by providing solutions such as electronic toll collection. It also enables transparency and streamlines services through instruments such as online portals, which can be used to speed up hitherto long-drawn processes like land acquisition and environmental clearances. Utilising advanced construction techniques can step up the construction of highways and enable the development of mega projects, which have manifold benefits. Further, a variety of alternative construction materials are now available to improve the quality and prolong the life of highways. Other initiatives such as greening highways and supporting the development of wayside amenities not only promote traveller comfort but also generate employment opportunities. Recognising this, the NHAI has taken a variety of initiatives to strengthen the nation's road system and bring it on par with the best in the world, because an extensive and well

developed highway system leads to a strong economy and nation.

Technology and digital initiatives

Implementation of electronic toll collection

While an extensive highway system is essential to facilitate the movement of goods and people across the length and breadth of the nation, building and maintaining such a network is an expensive undertaking. Ensuring adequate financing is thus a key concern. There are various ways to finance highway construction, ranging from government funding to private initiatives to levying user fees. Toll collection is a prime example of the latter and has done much to help ease the financial burden of highway construction.

Toll collection, however, requires setting up a proper infrastructure, especially if the aim is to achieve efficiency and maximise revenues. Initially, NHAI set up a manual toll collection system. However, as the volume of traffic increased, it quickly became obvious that the manual system was inefficient, prone to leakages and difficult to sustain. Increasing congestion at toll plazas and operational inefficiencies prompted the government to plan an overhaul of the system and adopt nationwide electronic toll collection (ETC). As ETC enables the collection of tolls electronically, the system can reduce congestion, increase operating efficiency, improve travel time, reduce pollution and improve road safety.

**THE ETC SYSTEM,
WHICH WAS A FLAGSHIP
INITIATIVE OF MORTH,
WAS ROLLED OUT IN
APRIL 2016.**

The ETC system, which was a flagship initiative of MoRTH, was rolled out in April 2016. Indian Highways Management Company Limited (IHMC) is the implementing agency for ETC with the National Payment Corporation

of India (NPCI) functioning as the central clearing house (CCH).

IHMCL's nationwide ETC programme aims to implement a unified and interoperable ETC solution for national highways in India based on radio frequency identification (RFID) technology. The programme will facilitate the seamless movement of traffic by offering ETC services across all tolled roads in the country. The ETC programme further aims to serve as an open platform for the development of services such as congestion or cordon pricing, collection of parking fees, automated collection of fines/challans by police authorities, payment of road tax and other duties, and a range of other services.

A nationwide interoperable ETC programme is a massive undertaking as it entails setting up a central clearing house (CCH) for clearing and settlement of toll transactions, and the installation of ETC systems at all toll plazas. ETC systems enable the smooth flow of traffic by enabling registered users to electronically pay toll fees at dedicated ETC lanes without stopping at toll plazas. RFID tags, branded as FASTag, affixed to the windshield of a vehicle enable the automatic deduction of the toll fee from the user's linked account. FASTag offers the convenience of cashless payment along with benefits such as fuel and time savings as the customer does not have to stop at the toll plaza.

In August 2017, MoRTH issued a Gazette Notification according to which all four-wheel

motor vehicles sold on or after December 1, 2017 will have FASTags fitted on them by the manufacturer or the authorised dealer, as the case may be.

On September 1, 2017, the NHAI achieved its first milestone in ETC by operationalising one dedicated FASTag lane at each toll plaza.

To facilitate the availability of FASTags, NHAI has made them available both online and offline at common services centres near toll plazas. NHAI also launched two mobile applications (apps) — MyFASTag and FASTag Partner — to expand the availability of FASTags. The FASTag partner app will enable more than 6,000 dealers in the country to access a single platform and activate the FASTag at the time of delivery of the vehicle.

Besides, several private banks have been offering FASTags to ensure their availability to users. NPCI has authorised several private players to manufacture/supply FASTags in India. These efforts to ensure that FASTags are easily and widely available are paying dividends – as of February 2022, more than 47 million RFID tags had been issued. This marked a significant jump from the 0.46 million issued as of April 2017.

Online portals

Online portals can be a boon for highway development projects as they offer the benefits of fast-tracking and streamlining lengthy and complicated processes, facilitating coor-

dination among multiple agencies and introducing transparency. To take advantage of these benefits, the government introduced several online portals.

Data Lake: NHAI has gone “fully digital” with the launch of a unique cloud-based and artificial intelligence-powered big data analytics platform – Data Lake and Project Management Software. NHAI’s entire project management work flow has been transformed from manual to online portal-based, wherein the complete project execution operations, including “workflow with timelines” and “alert

mechanism”, have been configured. All project documentation, contractual decisions and approvals are now being done through the portal only.

With advanced analytics, the Data Lake software forecasts delays and likely disputes, and sends out alerts. Thus, apart from expediting decision-making, it also facilitates correct and timely decisions, as the system predicts the financial impacts of different alternatives based on historical data.

In the Covid-19 pandemic scenario, when most

Khed-Sinnar Section of NH-60 (old NH-50), Maharashtra

organisations were facing serious challenges in working, NHAI employees continued their work undeterred. Data Lake has brought about revolutionary changes to NHAI with benefits such as no delays, quick decision-making, comprehensive records and remote working.

Bhoomi Rashi: Land acquisition for highway projects has always been a cumbersome process as it involves multiple authorities and stakeholders. To streamline the process, MoRTH decided to develop an online system that would provide linkages across authorities, eliminate the need for physical copies, and enable easy tracking of the draft notification. Thus, Bhoomi Rashi was born. Launched in August 2018, the portal is a single point platform for online processing of land acquisition notifications to accelerate highway projects. By fast-tracking the process of land acquisition, Bhoomi Rashi will result in greater benefits for all stakeholders. Moreover, the transparency of the online system is a welcome change for farmers, landowners, contractors and investors, who have suffered because of the complex system of land acquisition.

INAM Pro: Launched in March 2015, INAM-Pro is a web portal that brings together material providers and prospective buyers. Initially, INAM-Pro included only cement sellers and buyers as the government was moving towards constructing cement concrete highways instead of bitumen-based ones. INAM-Pro has increased the efficiency of the procurement of construction materials as one can place orders, obtained price quotes and

tracked them in a swift manner. The publicly visible prices have promoted transparency and enhanced ease of doing business.

INAM Pro+: Following the success with cement, in July 2017, the portal was upgraded to INAM-Pro+ to include all construction materials, equipment/machinery and services. With its enhanced features, INAM-Pro+ has helped reduce the time and effort required in the preparation of proposals and bid submissions, and increased efficiency and transparency in the procurement of construction materials.

IBMS: Launched in October 2016, the Indian Bridge Management System (IBMS) aims to create an inventory of all bridges in the country and rate their structural condition so that timely repair and rehabilitation work can be carried out.

INFRACON: Launched in May 2016, INFRACON is a national portal that hosts the credentials of consultancy firms and key personnel. It has linkages to Aadhaar and Digi-locker for data validation and purity.

e-Pace: Launched in May 2016, Projects Appraisal and Continuing Enhancements (ePACE) is an online integrated management information system that brings projects from all wings of MoRTH under a common platform, ensuring their effective and real-time tracking.

BIMS: Launched in August 2018, the Bidder Information Management System (BIMS)

aims to streamline the process of pre-qualification of bidders for the EPC mode of contracts and thus bring about enhanced transparency and objectivity.

The portal serves as a database of information about bidders, covering basic details, civil works experience, cash accruals and network, annual turnover, etc. The pre-qualification of bidders can be assessed from data already stored in the portal, so that the technical evaluation can be carried out much faster.

PMIS: A Project Monitoring Information System (PMIS) has been introduced to track the status of all projects, preparation of reports and online uploading of important project documents like DPRs and contract documents, etc. It has a comprehensive database with over 180 data fields being tracked for each project, and a further 500 fields specifically for complex PPP projects. In October 2017, NHAI launched a PMIS mobile app.

GATI: Continuing with its efforts to increase efficiency and reduce unnecessary delays, in February 2020, NHAI launched the web portal GATI to enable faster decisions. Contractors, concessionaries, consultants and toll operators can register on the portal by providing basic, project-related details. They can then use GATI to raise project-specific issues such as delays in decisions or payments, or lodge any other grievances that they wish to get addressed on a priority basis. Every issue will be monitored daily by a team of NHAI officials.

BIMS AIMS TO STREAMLINE THE PROCESS OF PRE- QUALIFICATION OF BIDDERS FOR THE EPC MODE OF CONTRACTS.

Others

Weigh-in-motion (WIM) technology: This helps prevent damage to roads and enhances safety by ensuring that vehicles are not overloaded. Vehicles are weighed while they are in motion as they pass over a scale installed on



Baran-Shivpuri-Jhansi, NH-27

the road. These systems are usually installed at border check posts, ports, toll plazas, entry points for bridges/tunnels/underpasses, etc.

Sukhad Yatra app and toll-free emergency number: Launched in March 2018, the app allows users to enter road quality-related information or report accidents or potholes on the highway. It also provides users with real-time data related to waiting time at plazas and various facilities such as highway nests. The app can also be used to purchase FASTag.

A toll-free number, 1033, enables users to report an emergency condition or high-

way-related feedback.

Road safety measures: Speed is a benefit of highway travel, but it can come at a price — the accident and fatality rate on national highways is quite high due to the high speeds at which vehicles travel. To ensure road safety, NHAI is focusing on both prevention and post-accident measures. Technological solutions play an important role in this. Prevention entails taking measures to reduce accidents by installing better communication and surveillance systems. To this end, the automatic traffic management system has been implemented in several locations. It is

equipped with surveillance, incident detector and number plate recognition cameras as well as weight enforcement mechanisms and command control centres. To help ensure a speedy response to accidents, NHAI has equipped ambulances and recovery vans with GPS so they can arrive at the site of an accident within 20 minutes of its occurrence.

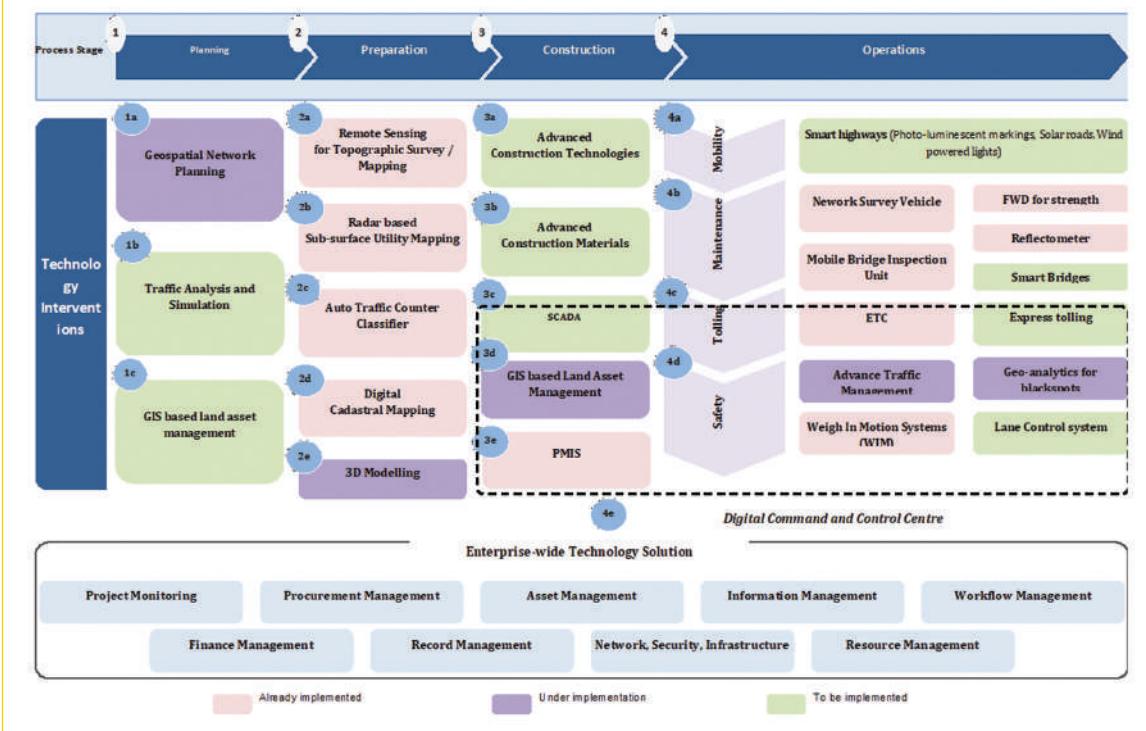
For improvement of road safety on national highways, NHAI has taken various steps, including rectification of blackspots, conducting road safety audits and Road Assessment Programme (iRAP) safety ratings, observing National Road Safety Month, and capacity building through training of officers,

concessionaires and other stakeholders. Of the total 5,803 black spots identified by MoRTH, 4,002 black spots have been entrusted to NHAI. As of April 2022, 2,569 black spots have been rectified by the authority.

eDISHA: It is an IT platform that enables integration of applications currently running in silos and facilitates real-time information access across departments. The main objective of eDISHA is to identify, harmonise and develop a single solution for the civil projects of NHAI, NHIDCL and MORTH.

eOffice: Implemented by NHAI in May 2019, eOffice aims to support governance by ush-

NHAI's technology deployment plans



ering in more effective and transparent inter and intra-government processes. It brings together independent functions and systems under a single framework.

Application Tracking System (ATS) and Bill Tracking System (BTS): BTS is used by parties such as contractors, concessionaries, consultants and various other firms that must submit bills/invoices for payment to NHAI. ATS takes care of applications that NHAI receives from institutions and other commercial establishments for permitting access to national highways. The system has been replaced with Data Lake.

Road Asset Management System (RAMS): This system was developed to bring both publicly and privately funded roads under one umbrella. It aims to assist in accurate and scientific maintenance planning, enhancing road safety measures and planning the national highway network. NHAI collaborated with the Indian Space Research Organisation for optimal use of geospatial technologies.

Drones: Drones are fast proving to be effective means of quickly gathering valuable data that can then help speed up project planning and execution and save on costs. Drones can be used to assist in all aspects of a highway construction project, including land acquisition, shifting public utilities and monitoring construction activities. Aerial videography and surveys of the terrain provide detailed information on topography, distribution and location of utilities, existing structures and real-time

progress on construction activities. By providing this information within days rather than months — as is the case with physical surveys — drones enable the concerned authorities to take decisions in a timely manner and thus avoid unnecessary delays and bottlenecks. In June 2021, NHAI mandated the use of drones for monthly video recording of national highway projects during all stages of development, construction, operation and maintenance.

Harit Path: The NHAI, in August 2020, developed a mobile app called ‘Harit Path’ to monitor location, growth, species details, maintenance activities, and targets and achievements of each of its field units for each and every plant under all plantation projects. Monitoring of plantation is done through geo-tagging and web-based GIS-enabled monitoring tools.

Advanced construction practices

India has an extensive road network, and the number of vehicles plying on these roads is increasing by almost 10 per cent every year. Ensuring that the roads are well maintained and cater to the ever-growing traffic in an efficient, cost-effective manner is a constant concern.

In India, several agencies are involved in researching and developing new construction techniques as well as materials to improve the quality and durability of roads, reduce the time and cost of road construction, find solutions to issues caused by phenomena such as land-



Krishnagiri-Salem Section of NH-44 (old NH-7)

slides and earthquakes, and encourage the adoption of environmentally friendly practices. There are several new and emerging technologies that help in achieving these goals.

Concrete roads: India was among the first countries in the world to start building concrete roads. The first concrete road in India was built in Madras (Chennai) in 1914, which remained pothole-free for many years despite the heavy rains in the region.

The results encouraged engineers to adopt the technique and soon the trend gained popularity and more and more concrete roads were laid in India. The original Delhi-Agra (NH2), Bombay-Poona (NH4) and Bangalore-Mysore roads were all built of concrete. In 1939, Mumbai's Marine Drive was constructed out of cement concrete. Eighty years later, it is still in excellent condition. It is

a perfect example of the value offered by concrete roads over bitumen.

Indeed, the use of concrete has several advantages. Apart from durability, concrete roads have a rated service life of twenty-five to thirty years, whereas asphalt roads theoretically last for 10 years at the most. They require little repair and maintenance. Concrete roads are not damaged by the leaking oils from vehicles or by extreme weather conditions like excess rain or extreme heat. The construction process is greener as compared to asphalt roads as bitumen produces highly polluting gases at the time of its melting.

Concrete also reflects light better than the black bitumen roads. As a result, the requirement for road lighting is reduced by half, saving electrical energy and giving better visibility at night.

Self-healing asphalt: Road repair and maintenance is a costly and often time-consuming job. To reduce potholing and cracking of roads, scientists are developing ingenious and unconventional methods to improve durability. Rather than improving the strength of the road, scientists are focusing on asphalt with the ability to heal itself once damaged. Self-healing asphalt has several benefits. The lifespan of roads is increased and the need for road maintenance is practically eliminated. By addressing the premature ageing of asphalt pavements, self-healing asphalt can reduce the amount of natural resources used to maintain road networks, decrease the traffic disruption caused by road maintenance processes, decrease CO₂ emissions during the road maintenance process and increase road safety.

Asphalt is a mixture of gravel and sand held together by bitumen, a thick, viscous mixture. As roads age, the bitumen wears down and pieces of asphalt erode, causing small cracks that soon balloon into big potholes. To combat this erosion, a technique was developed to “heal” the asphalt. Small pieces of steel wool are mixed into the bitumen. This makes the bitumen conductive.

Once the asphalt is poured and set, the bitumen can be heated with an induction machine so it rebinds to the stones and gravel in the asphalt.

Cold-mix bitumen: In India, hot-mix asphalt with bitumen aggregate has long been used

for road construction. However, technological advancements and a focus on sustainable development have spurred the use of cold-mix bituminous emulsion. Some of the major advantages of cold-mix bitumen are energy savings, pollution-free environment and safer working conditions for labour at construction sites as the process does not require high temperatures to mix and lay the bitumen.

Perpetual pavement: Perpetual pavements are designed and built to last 50 years or more without requiring major structural rehabilitation or reconstruction. They are also able to withstand high traffic loads. With perpetual pavements, the potential for traditional fatigue cracking is reduced, and pavement distress is typically confined to the upper layer of the structure. Thus, when surface distress reaches a critical level, an economical solution is to remove and replace the top layer.

White-topping: This entails covering an existing asphalt pavement with a layer of Portland cement concrete to either restore the road, or increase the load carrying capacity, or both. White-topping is particularly useful for roads that experience a high volume of traffic or that are prone to damage due to other reasons such as climate.

White-topping has several benefits. It is more durable and hence the life-cycle cost is far lower than that of both asphalt and concrete roads. It has a turnaround time of just 14 days, much faster than the turnaround time for concrete roads. Visibility and commuter safety are

improved thanks to the enhanced reflectivity of white-topped surfaces. The vehicular braking distance is also lower, making it safer in both dry and wet surface conditions. The material used for white topping has excellent surface drainage. As it is 100 per cent recyclable, it can be crushed and reused at the end of life.

New construction materials

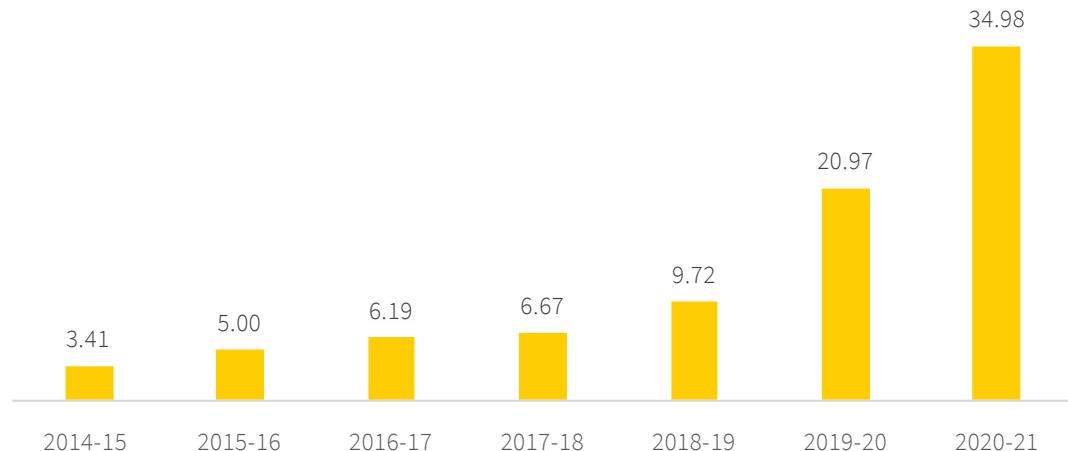
As the reality of climate change hits home harder with the increasing occurrence of extreme weather events the world over, the cost to the environment is now a major consideration in highway construction. Opting for the use of alternative materials such as plastic waste, fly ash and rubber/polymer in road construction is one way to mitigate this cost as it reduces the consumption of scarce natural materials and recycles materials that would otherwise be disposed of as waste. In India, the use of such alternative materials is being increasingly encouraged and promoted. MoRTH has developed specifications and standards to allow the use of alternative materials for road construction.

Plastic waste

Of the municipal waste generated, plastic waste accounts for a significant portion. Indeed, safely disposing of and recycling plastic waste are among the most pressing challenges facing the world today as countries and oceans across the globe are literally drowning under the burden of plastic. Among the various ingenious solutions being developed to cope with this environmental disaster is the use of unrecycled plastic waste (which accounts for 40 per cent of total plastic waste) for road construction. Waste items such as carry bags, cups, packaging for food items, PET bottles, spoons and plates can be cut to a size between 2.36 mm and 4.75 mm using a shredding

**MoRTH HAS DEVELOPED
SPECIFICATIONS
AND STANDARDS
TO ALLOW THE USE
OF ALTERNATIVE
MATERIALS FOR ROAD
CONSTRUCTION.**

Fly ash utilisation in roads and flyovers (mt)



Source: Central Electricity Authority

machine and used for road construction. Further, using plastic waste to replace a certain amount of bitumen can result in significant cost savings.

MoRTH is promoting the use of plastic waste in a big way. In 2015, the government made it mandatory for road developers to use plastic waste along with bituminous mixes for road construction within a 50 km radius of any city with a population of over 0.5 million.

There is huge potential for utilisation of plastic waste in road construction as resurfacing of one lane km alone consumes 1.6 tonnes of plastic waste in construction of roads.

On August 27, 2019, MoRTH issued a circular on the collection and re-use of plastic waste under the Swachhata Hi Sewa campaign. All regional officers of the ministry, NHAI and NHIDCL may coordinate with all the states

and union territories to receive plastic waste collected at various centres to be used for road construction.

Fly ash

Fly ash is a fine powder that is a by-product of burning pulverised coal in electric generation power plants. When mixed with lime and water, fly ash forms a compound similar to Portland cement. This makes fly ash suitable as a prime material in blended cement, mosaic tiles and hollow blocks, among other building materials. Fly ash can thus be a cost-effective substitute for Portland cement. It is also recognised as an environmentally friendly material because it is a by-product and has low embodied energy, the measure of how much energy is consumed in producing and shipping a building material.

Other benefits of fly ash are that it requires



Vijayawada-Chilakaluripet Section of NH-16 (Old NH-5)

less water than Portland cement; has high cold weather resistance; has high strength gains, depending on use; produces dense concrete with a smooth surface; has great workability; reduces crack problems, permeability and bleeding; and reduces CO₂ emissions, among others.

In the road sector, fly ash is mostly used for the construction of roads, embankments and flyovers. Although the use of fly ash has increased over the years, it is still not as popular as other materials such as cement and bitumen. The main reason behind low utilisation is the reluctance of thermal power plants to bear the transportation costs of ash to the

road construction site and lack of knowledge on fly ash usage.

The Ministry of Environment, Forest and Climate Change (MoEFCC) issued a notification in September 1999 for the use of fly ash in the construction of embankments for roads and flyovers. The notification was amended by the ministry in 2003, 2009 and 2016. As per the guidelines, it is mandatory to use fly ash in the construction of road or flyover embankments within a radius of 300 km of a thermal power plant. Further, the cost of transportation of ash for road construction projects within a radius of 100 km will be borne by the thermal power plant while that between 100 km to 300 km

will be shared equally between the user and the plant. Additionally, for a radius of 300 km or more, the thermal power plant will bear the entire transportation cost under the Pradhan Mantri Gramin Sadak Yojana and asset creation programmes of the government involving construction of roads, dams and embankments.

To demonstrate various fly ash uses, in August 2019, NTPC in association with NETRA (NTPC Energy Technology Research Alliance) used a fly ash-based geopolymmer concrete to lay a road. The cement-free material provides for sustainable construction material with negligible CO₂ emission and low water consumption, besides paving the way for bulk fly ash utilisation.

The National Green Tribunal has imposed penalties of up to Rs 50 million on thermal power plants (TPPs) that have not fully disposed of the fly ash generated by them. This should also spur the use of fly ash in road construction.

Other materials

Other construction materials include bitumen and geosynthetics. MoRTH mandated the use of bitumen and modified bitumen in the construction of flexible pavements in August 2018. More than 90 per cent of the bitumen produced in the country is utilised in the construction of roads and the remaining in the aviation sector and the waterproofing segment. Bitumen is used in road construction because it is easy to produce, reusable,

non-toxic and is a strong binder.

Geosynthetics, which include a range of materials used to stabilise terrain and reinforce soil, are also extensively used in the construction of roads and highways. Geotextiles, geogrids and geocomposites provide a sustainable option for pavement stabilisation. NHAI has carried out a study with the Indian Institute of Technology, Hyderabad, for the use of geotextiles in pavement construction.

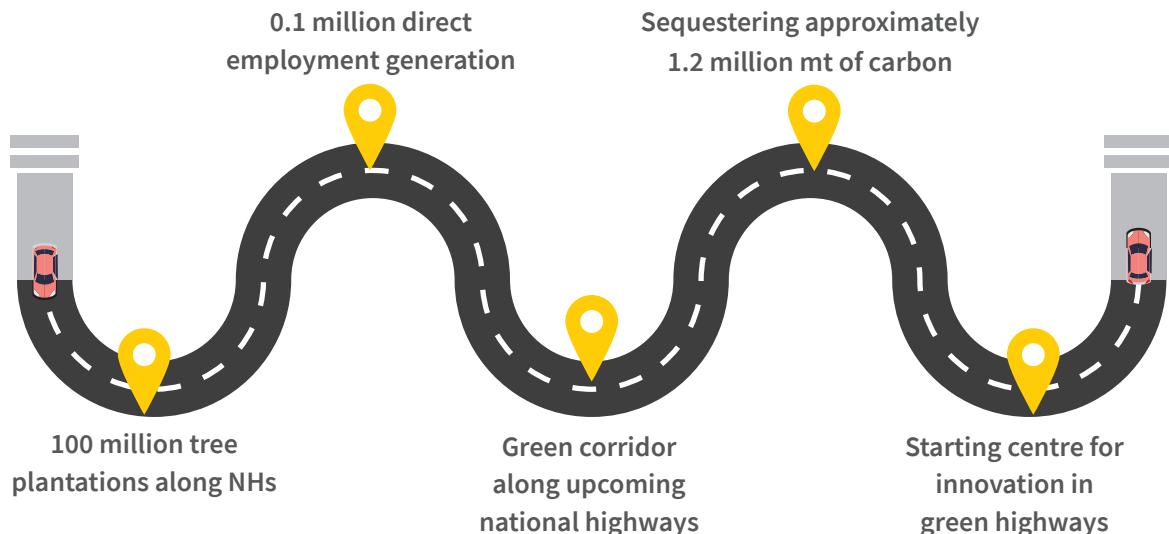
A variety of waste materials are also being studied and experimented with in road construction. These materials include cinder, coal ash, copper slag, kimberlite, and municipal solid waste.

Other initiatives

Large-scale environmental degradation and climate change, combined with a loss of natural resources and growing construction activities, are making it increasingly imperative to adopt green construction methodologies and green highways in the country.

Recognising this need, MoRTH has undertaken several initiatives to encourage the use of green technologies in road construction. The concept of green highways originates from the integration of transportation functionality with ecological sustainability. The key features of green highways are reduction in greenhouse gas emissions and the carbon footprint, curtailment in the use of non-renewable energy sources, conservation of natural resources,

Mission for the next 10 years



and improvement in human health and safety, along with the welfare of future generations.

In the transportation sector, roads contribute the majority of the carbon footprint. Interventions such as increasing the use of energy-efficient modes of transport, adopting stringent regulations to reduce carbon emissions from vehicles, shifting from ad hoc to proactive highway maintenance, incentivising the shift to larger trucks, and promoting the use of public transport and low-carbon fuels such as electricity and biofuels could be of immense help in reducing the carbon footprint during project operationalisation. Besides, the government has taken notable initiatives to ensure conservation of the natural ecosystem. To name a few, the MoRTH issued draft guidelines in September 2013 for adopting rainwater harvesting and artificial groundwater recharge systems along national highways. Further, in May 2019, the

ministry issued directions to all implementing agencies to avoid sanctuaries/national parks at the planning stage and to take a detour, wherever possible. Apart from this, the MoRTH has recently issued guidelines for the use of recyclable materials such as plastic waste and fly ash for road construction and renewal.

Multimodal Logistics Parks

There is significant focus on the development of multimodal logistics parks (MMLPs) across the country. The creation of MMLPs is expected to be a game changer for the sector. In 2021, NHAI incorporated National Highways Logistics Management Limited to oversee multimodal logistics parks and port connectivity projects. This will facilitate the creation of robust infrastructure for efficient container movement across different modes and improve India's logistics efficiency.

In total, 35 MMLPs are being developed on a hub and spoke model to reduce the associated costs and to strategically integrate highway projects and other connectivity initiatives such as inland waterways and railways in tandem with the freight distribution ecosystem.

As per the Management Model approved by MoRTH for the implementation of MMLPs, a special purpose vehicle (SPV) will be created between the Central and/or the state government and other stakeholder, if any, and the SPV will take up the development of the MMLP through the concessionaire in PPP mode.

Green highways

Following the promulgation of the Green Highways Policy in 2015, the National Green Highways Mission (NGHM) was launched. NGHM made it mandatory to set aside 1 per cent of the total project cost of any national highway contract to a green fund corpus that will be used for plantation purposes. The afforestation is expected to help sequester 1.2 million mt of carbon annually.

To track compliance and actual progress on the ground, the projects under the mission will be monitored through satellite technology, and payments will be made only after successful implementation. Besides, an application to monitor the real-time progress of the plantation drive and plants has been launched.

The NGHM initiated the Adopt a Green Highway programme to engage corporates, public

sector units, government organisations and other institutions to develop green corridors along national highways through plantation on avenues, medians and other available nearby land patches. The Bharatmala Pariyojana Phase I envisages the development of 800 km of green highways/expressways.

NHAI's pursuit of environmental sustainability is in line with the Green Highways (Plantation, Transplantation, Beautification, & Maintenance) Policy, 2015, which aims to promote conservation of the environment through the greening of highway corridors. Since the launch of the Green Highway Policy, NHAI has planted an additional 27.4 million plants, apart from the statutory obligations.

With an emphasis on monitoring the plantation of trees, in August 2020, NHAI introduced 'Harit Path', a unique mobile app that provides a digital address to every tree planted along the national highways. The GPS-based app monitors the location, growth, species and maintenance of every plant. NHAI has already completed geo tagging of 21.1 million trees along the national highways across the country.

Over the years, NHAI has been undertaking plantation drives to develop eco-friendly national highways. NHAI has collaborated with different stakeholders such as the State Rural Livelihood Missions (special purpose vehicles), self-help groups, corporate social responsibility partners and non-governmental organizations to organise plantation drives. In July 2022, NHAI organised a nation-

wide plantation drive and planted around 0.11 million plants in a single day through simultaneous plantations at 114 identified locations across the country.

It is estimated that avenue plantations and compensatory afforestation carried out after highway construction have the potential to sequester around 0.6 million tonnes of CO₂ over a period of 20 years. In 2021-22, NHAI witnessed a 27 percent reduction in energy intensity and a 17 percent decline in greenhouse gas emission intensity.

As per an observation of the study report on the assessment of avoided emissions of 20 selected highway stretches by MoEFCC, a reduction of about 19 per cent in fuel consumption has been observed compared to a business-as-usual case.

Over the past few years, NHAI has increased the utilisation of recycled materials, including reclaimed asphalt pavement (RAP) aggregates. NHAI has successfully diverted 431 metric tonnes of plastics, 12,782,460 metric tonnes of fly ash and 42,429 metric tonnes of steel slag from landfills for use in road construction. The use of such material in road construction will make construction more economical and promote a circular economy as well as resource efficiency.

Wayside amenities

Apart from measures to green the nation's highways, efforts are being made to ease the jour-

neys of all those who travel along the highway network. To this end, the NHAI launched an initiative in August 2017 to develop wayside amenities along national highways. These sites will provide a range of facilities such as parking for cars, buses and trucks, toilets, restaurants and food courts, dhabas, fuel stations, dormitories for drivers, repair shops, markets and retail outlets, among others. The scheme aims to provide comfort and convenience to travellers, generate employment, and provide an opportunity for local farmers and craftspeople to sell their goods. The amenities will help enhance road safety through the provision of adequate resting facilities for drivers and thereby reducing fatigue-related road accidents. Though the concept of wayside amenities is not new for the country, a distinguishing feature of this initiative is its vast scope and increased private sector participation. The ministry is planning to develop 1,000 wayside amenities, with one at every 50 km along national highways. Of these, 800 will be developed under the PPP mode, wherein NHAI will provide the land while the concessionaire will make the investment. There has been a shift in approach of the NHAI. Wayside amenities is now part of the project.

Facilities with an area of more than 5 acres will be developed under the brand name "Highway Village". Facilities with an area of less than 5 acres will be developed under the brand name "Highway Nest".

Tunnels

With their ability to facilitate transportation

Tunnels on National Highways

| Sl. No. | Description | No. | Length (km) |
|--------------|------------------------------|------------|-------------|
| A | Tunnels under operation | 21 | 43 |
| B | Tunnels under implementation | 39 | 120 |
| C | Tunnels under DPR | 50 | 192 |
| Total | | 110 | 355 |

Source: NHAI

Operational tunnels

| Sl. No. | Name of Work | Length of tunnels (km) | Date of completion |
|---------|---|------------------------|------------------------------|
| 1 | Four-laning from km 126/450 to km 140/700 and from km 164/080 to km 165/400 (Maibong to Nrimbanglo section) of NH-54 in Assam | 1.068 0.240 | August 2014 November 2016 |
| 2 | Four-laning of Parwanoo-Solan section of NH-22 (new NH-05) from km 67 to km 106.139 in Himachal Pradesh | 0.936 | January 2021 |
| 3 | Chenani-Nashri tunnel project from km 89 to km 130 on NH-44 in Jammu & Kashmir | 10.89 | March 2017 |
| 4 | Jammu Udhampur project with four twin tube tunnels on NH-44 in Jammu & Kashmir | 1.386 | August 2019 |
| 5 | Four-laning of Quazigund-Banihal section of NH-44 (old NH-1A) from km 189.350 to km 220.700 including 8.45 km length twin tube tunnels in Jammu & Kashmir | 8.45 | August 2021 |
| 6 | Four/Six-laning of Hungund-Hospet section of NH-13 from km 202 to km 299 on NH-13 in Karnataka | 0.145 | March 2013 |
| 7 | Katraj Ghat bypass on NH-4 (new NH-48) in Maharashtra | 1.39 | October 2006 |
| 8 | Four-laning of Beawar-Pali-Pindwara section of NH-14 (new NH-25, 162, 62) in Rajasthan | 0.29 | June 2015 |
| 9 | Deoli Kota section of NH-52 in Rajasthan | 1.12 | April 2016 |

| | | | |
|--------------|--|--------------|---------------|
| 10 | Four-laning of Gomati Chouraha-Udaipur section of NH-8 (new NH-58) in Rajasthan | 0.486 | October 2015 |
| 11 | Bekariya-Gogunda section from km 29 to km 73 of NH-76 in Rajasthan | 0.6 | February 2009 |
| 12 | Atal tunnel on NH-03 in Himachal Pradesh | 9.02 | October 2020 |
| 13 | Jawahar tunnel on NH-44 in Jammu & Kashmir | 2.54 | December 1959 |
| 14 | Two-lane road tunnel near Dat-Ki Devi at km 33 to km 34 on NH-72A (new NH-307) in Uttarakhand | 0.34 | November 2018 |
| 15 | Chamba tunnel in Uttarakhand | 0.44 | June 2021 |
| 16 | Theng tunnel in Sikkim (NH-310A) | 0.4 | May 2018 |
| 17 | Six-laning of Vadakanchery-Thrissur section of NH-47 from km 240 to km 270 in Kerala | 0.960 | January 2022 |
| 18 | Balance work and value addition works of four-laning of part of Ramban-Banihal section of NH-1A (now NH-44) in Jammu & Kashmir under NHDP Phase II (three tunnels) | 1.142 | June 2022 |
| 19 | Two-lane Chisopani Traffic Tunnel of 250 m length, including approaches from km 67+080 to km 67+500 on NH-10 in Sikkim | 0.25 | May 2022 |
| 20 | Road and slope protection works at Patalganga landslide from km 458.900 to km 459.475 of NH-07 under the Chardham Pariyojna in Uttarakhand | 0.15 | January 2021 |
| 21 | Additional work for construction of landslide protection gallery from km 100.300 to km 101.060 of NH-34 in Uttarakhand | 0.31 | April 2022 |
| Total | | 42.55 | |

Source: NHAI

in difficult terrain, tunnels have become increasingly important. Tunnel construction is growing in India due to increasing pressure on land for economic and social uses. With the construction of tunnels, transportation is accelerated, and optimum protection is provided for the environment and the landscape. Tunnels are considered technological masterpieces; however, constructing a tun-

nel is one of the most complex challenges in highway construction.

NHAI has constructed many such engineering marvels, including the Quazigund-Banihal Tunnel in the Union Territory of Jammu & Kashmir and the Kuthiran Tunnel, which is South India's first twin tube tunnel in the state of Kerala.

There are 21 road tunnels with a total length of around 43 km that are currently in operation on national highways, and around 89 tunnels with a total length of approximately 312 km are expected to come up in the next five to six years.

Emergency Landing Facilities on highways

Emergency Landing Facilities (ELFs) is an ambitious scheme of the Government of India in line with most advanced countries in the world. Looking at the strategic, logistic and geographic requirements of various parts of the country, the Government decided to develop a road map to provide stretch-

Details of the identified ELFs

| S.No. | State | No. of Emergency Landing Facilities |
|--------------|-----------------|-------------------------------------|
| 1 | Assam | 5 |
| 2 | West Bengal | 4 |
| 3 | Andhra Pradesh | 3 |
| 4 | Gujarat | 3 |
| 5 | Rajasthan | 3 |
| 6 | Bihar | 2 |
| 7 | Haryana | 2 |
| 8 | Jammu & Kashmir | 2 |
| 9 | Tamil Nadu | 2 |
| 10 | Punjab | 1 |
| 11 | Uttar Pradesh | 1 |
| Total | | 28 |

Source: NHAI

es on national highways suitable for aircraft operations.

Described as the “force multiplier”, Emergency Landing Facilities on Highways and Expressways act as an auxiliary base to the regular airbases. Such ELFs provide a strategic advantage to the defence forces as they can serve as additional airbases during emergencies, allowing fighter aircraft to land and take off at short notice. During normal times, the ELF is used for the smooth flow of highway traffic.

A list of 28 locations was drawn up for the development of ELFs, of which 10 were initially entrusted to NHAI for implementation and one ELF was already existing on the Agra-Lucknow Expressway. However, it was later decided that all the ELFs should be developed by NHAI for better coordination and uniformity in specifications. NHAI framed the specifications and design parameters based on International Civil Aviation Organization (ICAO) guidelines after detailed discussions and vetting by the Indian Air Force and the Ministry of Defence.

Close coordination is being maintained with the Indian Air Force, the Ministry of Defence and the Ministry of Road Transport and Highways to resolve issues related to location, design and funding to develop ELFs at the earliest, so that they can be dedicated to the nation for catering to the country's emergent and logistics needs. ●



Hungud-Hospet section of NH-50 (old NH-13), Karnataka

FUTURE OF NATIONAL HIGHWAY DEVELOPMENT



Panagarh Palsit Section of NH-2



FUTURE OF NATIONAL HIGHWAY DEVELOPMENT

NHAI's vision is to build and maintain a national highways network on par with global standards and to meet users' expectations in the most timebound and cost-effective manner, within the strategic policy framework set by the Government of India. In doing so, it will play an important role in promoting the economic well-being of the people and ensure a better quality of life.

Mission

- To develop, maintain and manage the country's national highway network.
- To collect fees on the national highways, and regulate and control the plying of vehicles on the national highways for their proper management.
- To provide consultancy and construction services in India and abroad, and conduct research for the development, maintenance and management of highways and other facilities.

- To advise the central government on matters relating to highways.
- To assist state governments in the formulation and implementation of schemes for highway development.

India is one of the fastest growing economies in the world. To support and fuel this growth, the country requires robust infrastructure, including a well-developed and maintained road and highway system. With about 6.3 million km of roadways, India has the second largest road network in the world, second only to the United States.

The transport sector contributes about 5.5 per cent to the country's GDP. Road transport occupies a dominant position in the transport sector because of easy accessibility, flexibility in operation and door-to-door operation. Although the spread and reach of India's road network is impressive, there is no doubt that there is a need to improve the system.

Recognising this need, as well the critical role that the roadways play in the development and prosperity of a nation, NHAI has been engaged in a series of initiatives, most notably the NHDP, to augment and improve the country's road infrastructure. Indeed, its vision is to develop and maintain a national highway network that matches up to global standards, meets users' expectations, and promotes the economic well-being of the nation and a better quality of life for the people.

WITH ABOUT 6.3 MILLION KM OF ROADWAYS, INDIA HAS THE SECOND LARGEST ROAD NETWORK IN THE WORLD, SECOND ONLY TO THE UNITED STATES.

The Bharatmala Pariyojana will help achieve this laudable goal. The project, once completed, will see the construction and upgrade of 34,800 km of roadways throughout the country under Phase I. This includes residual NHDP works spanning 10,000 km. The deadline for completion of Bharatmala Phase I has been extended to 2027-28.

To help ensure maximum impact, the initiative is following a corridor approach to developing roadways. The various corridors will be interconnected and integrated to create an efficient, smoothly running system that connects important economic, social and cultural hubs throughout the country.

The corridors were identified in a scientific manner, that is, based on a commodity-wise survey, freight movement across 600 districts, and mapping of the shortest routes for 12,000 routes carrying 90 per cent of the country's freight traffic.

A technology-based traffic survey of over 1,500 points across the country and satellite mapping of corridors to identify upgrade requirements were also undertaken.

Sustainable and resilient infrastructure

There is a growing focus on lifecycle cost management and sustainable, environment-friendly construction. This comprises green expressways and national highways with solar-powered installations, mandatory tree cover and rainwater harvesting, as well as noise barriers in urban/wildlife/protected zones. In addition to promoting shared mobility solutions, it is important to create infrastructure for micro-mobility alternatives such as electric bicycles and scooters.

The priorities for recycling and waste management are the "Waste to Premium" road-build-

ing approach using fly ash, pond ash and plastic waste, and 100 per cent use of reclaimed road-building materials via circular use, recycling, and re-recycling. Recycling electric vehicle battery and hydrogen waste is another approach towards sustainable mobility.

Some of the steps planned for the future to achieve disaster and deterioration resilience are AI/ML-based highway condition modelling for region-specific calamities such as floods, cyclones, earthquakes and landslides; 100 per cent disaster-ready expressways and national highways; and predictive asset management using scientific methods such as deterioration modelling.

PM Gati Shakti National Master Plan

High logistics costs and poor multimodal connectivity have long been a cause of concern for the central government. To address these issues, the government launched the PM Gati Shakti National Master Plan for Multimodal Connectivity in October 2021. The initiative aims to ensure integrated planning and coordinated implementation of infrastructure connectivity projects. PM Gati Shakti will incorporate the existing and planned initiatives of 16 ministries on one centralised digital platform. As part of Gati Shakti, MoRTH plans to develop 27 greenfield expressways and 35 multimodal logistics parks (MMLPs) under the Bharatmala Pariyojana and other schemes of the ministry. The integrated planning and execution of expressways and



Zirakpur-Parwanoo Section of NH-5 (old NH 22)

corridors will help reduce logistics costs and ensure the seamless movement of people and goods. The construction of MMLPs will facilitate smoother and faster freight transportation across the country.

The PM Gati Shakti National Master Plan is a vital enabler for the future. GIS-based mapping of transportation supply across modes such as roads, rail and waterways; big data analytics of government and private databases (GSTN e-way bills, FASTag and Google Maps) to iden-

tify transportation demand; open data sharing with stakeholders (researchers, academics, contractors, consultants, etc.) across all transportation infrastructure; and the identification of gaps in transportation infrastructure will make planning and coordination under the programme extremely effective.

The advantages of the master plan include optimal utilisation of resources through the evaluation of complementarity, modal shift and synergy as well as resolution of cross-sec-

toral concerns, accelerated clearances and efficient implementation.

Inclusive socio-economic development

As an alternative mobility solution, MoRTH envisions the development of ropeway projects in difficult and sensitive terrain. Ropeway connectivity to hilly/isolated areas as part of inclusive socio-economic development will increase accessibility and enhance tourism. NHAI has actively collaborated with state governments and other stakeholders to implement Parvatmala, the National Ropeways Development Programme, which aims to facilitate last-mile connectivity and develop tourism and transportation in hilly regions.

NHAI has also been entrusted with the responsibility of setting up intermodal stations (IMS). This terminal infrastructure will help integrate various transportation modes such as rail, roads, mass rapid transit, bus rapid transit, inland waterways, auto-rickshaws, taxis and private vehicles so people can seamlessly move from one mode to another.

Downstream infrastructure should be in sync with greenfield corridors to support the needs of urban development through intermodal stations, bus ports, etc. In addition, local connects can be established through “Expressway Haats”, with features such as world-class amenities for road users across the national highway network; retail markets for artisanal handicrafts and micro, small and medium enterprise

products; mandis for local agricultural produce including horticulture, dairy, and grains; space for promoting local culture; and wayside amenities on every major NH stretch.

Innovative financing for sustainable infrastructure

Developing, upgrading and maintaining an efficient and effective road network in a country as large and geographically diverse as India requires not only vision and planning, but also a huge capital outlay. Traditional methods of financing have not been able to meet the needs of the sector. To ensure that lack of funds does not compromise its ambitious and much-needed programmes and initiatives, NHAI has explored various financing avenues to secure the required funding. To this end, the authority has adopted an asset monetisation strategy through the infrastructure investment trust (InvIT) and the TOT models. In December 2019, the Union Cabinet authorised NHAI to launch InvITs to enable it to monetise national highways with a toll collection track record of at least one year. NHAI has raised around Rs 73.5 billion via its InvIT.

The roads sector in India has adopted the asset recycling concept through the TOT model, with the aim of generating more resources for the construction of future highways. Asset recycling is an attractive option as it carries the advantage of low construction risk for the concessionaire. It also helps the asset-controlling infrastructure authority/department meet its capital requirement for

priority developments. Further, it enhances operational efficiency by bringing in international exposure in the O&M of existing assets.

Toll securitisation is another funding avenue for NHAI. Besides, the authority has decided to form SPVs for greenfield expressways to secure financing at the project level. DME Development is an example of this. The SPV was formed for the financing, construction and operation of the Delhi-Mumbai Expressway. By floating SPVs specific to corridors, NHAI aims to diversify its resource base and develop a sustainable and self-liquidating approach to raising finances.

New-age funding instruments such as green bonds, carbon credit trading and value capture financing, as well as innovative financing mechanisms across equity and debt for public investments (such as bonds) through domestic and foreign sources are additional engines of growth.

New technologies and global manufacturing excellence

Apart from looking at innovative financing models, NHAI has explored new technologies in construction to help it realise its vision of a far-reaching and efficient road network that is cost-effective and environmentally friendly. Utilising advanced construction techniques can speed up the construction of highways and enable the development of mega projects. Further, a variety of alternative construction materials have been used to improve

the quality and prolong the life of highways. Major cities such as Delhi, Mumbai, Chennai and Pune have actively started using shredded plastic waste in road construction. Indeed, the government has mandated the use of plastic waste for road construction. This carries the dual advantage of better quality, longer lasting roads and promotion of the environmentally-friendly practice of recycling plastic waste.

The Covid-19 pandemic has had a wide-ranging and deep impact on all aspects of lives. While much of the impact has been negative, it has also been a time for innovative solutions and adopting new ways of doing business. The digital sphere has been a big winner during these times. Recognising its power and benefits, NHAI has gone fully digital with the cloud-based data lake software, becoming the first such construction-sector organisation. With advanced analytics, the data lake software forecasts delays and likely disputes and sends advance alerts, thus expediting decision-making. At the same time, the software facilitates correct and timely decision-making, as the system can predict the financial impacts of different alternatives based on historical data.

There is a strong emphasis on domestic development (including research) and production of sustainable construction materials at scale, such as ultra high-performance fibre reinforced concrete, non-metallic glass/carbon fibre reinforced polymer rebars and geosynthetics. Green construction materials include bio-bitumen, fly ash, pond ash and plastic waste. Innovative manufacturing technologies such as 3D

printing of machinery spares and pre-cast structures on site are gaining relevance in current times.

The Make in India initiative promotes domestic manufacturing of currently imported construction and transportation equipment such as tunnel boring machines, milling machines, pavers, recyclers and spreaders, and ropeway systems. Joint ventures with international organisations for the transfer of technology and knowledge will play a crucial role in this. Going forward, automation and robotics should be the focus of research and development in order to produce next-generation equipment to accelerate construction and reduce construction costs.

Capacity building

Capacity building of stakeholders through “Global Centres of Excellence” is the next logical step. This can be achieved through big data/AI/ML-based highway planning and design with advanced safety protocols such as crash modelling, and predictive road and structure performance measurement and management through automated data capture and processing. Global benchmarking and gap assessment can help establish world-class highway standards. Additionally, the promotion of high-risk research through indemnity against vigilance enquiries upon failure along with a periodic review of design and construction standards, including road safety standards, will help improve road safety.

Road safety, quality and highway aesthetics

According to the World Health Organization’s Global Status Report on Road Safety-2018, India recorded the highest number of deaths due to road accidents in the world in 2016. Apart from the high cost in terms of lives,

**CAPACITY BUILDING
OF STAKEHOLDERS
THROUGH “GLOBAL
CENTRES OF
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THE NEXT
LOGICAL STEP.**

poor road safety standards lead to economic losses as well. It is thus imperative to ensure that adequate road safety measures are instituted across the network. NHAI has come up with new initiatives to ensure the safety and high standards of highway stretches.

In its effort to improve the quality of roads, NHAI has undertaken a performance assessment and ranking of the highways in the country. This assessment audit and ranking will help them take corrective recourse, wherever needed, to improve the quality of the highways and provide a higher level of service to commuters. The assessment parameters are based on different international practices and studies for benchmarking highway performances in the Indian context. The criteria for the assessment have been broadly categorised into three main heads: highway efficiency (45 per cent), highway safety (35 per cent) and user services (20 per cent). Based on the outcome of the assessment, the authority will undertake a comprehensive analysis and decide on the level of intervention required to enhance the overall service quality.

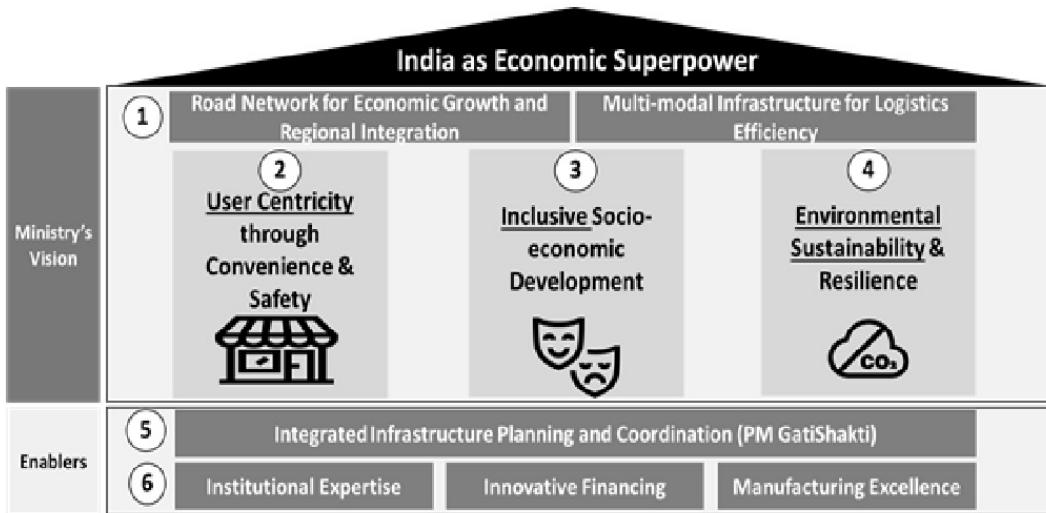
Additionally, important parameters such as operating speed, access control, time taken at toll plazas, road signage, road markings, accident rate, incident response time, crash barriers, illumination, availability of Advanced Traffic Management Systems, functionality of structures, provision of grade-separated intersections, cleanliness, plantation, wayside amenities and customer satisfaction have been considered while conducting the assessment.

The score obtained by each corridor in each of the parameters provides feedback and shapes the corrective recourse for higher standards of operation, as well as better safety and user experience to improve existing highways. This also helps identify and fill gaps in the design, standards, practices, guidelines and contract agreements for other NHAI projects.

In its endeavour to provide a world-class national highway network, NHAI has approached all IITs, NITs and reputed engineering colleges to collaborate in adopting stretches of national highways in the vicinity of the campuses as part of Institutional Social Responsibility.

The objective is to leverage the intellectual wherewithal of students and faculty to help improve the road infrastructure ecosystem of the country. The faculty and students of the institutes have a better appreciation of local requirements, topography, resource potential, etc., and these vital inputs can be utilised by NHAI during the various stages of pre-construction, construction and operation of national highway stretches.

This decentralised approach, besides building a sense of participation in decision-making, also provides an opportunity to the students for hands-on learning, the option of an internship, and future areas of research. The adoption of a stretch of highway by an institute provides access to important data, which can be used to improve the quality and safety aspects of national highways and enhance



the local capacity of the institute in terms of advanced lab and simulation systems.

Thus, the adoption of a national highway stretch by an institute would facilitate stakeholder engagement and help mitigate routine local problems such as poor traffic movement and congestion, while helping in the immediate identification of accident-prone sites. Highway users become more empowered to resolve local problems through the institute and NHAI. Such instances would help the authority understand local needs both for present and future projects, improve maintenance and riding comfort, and develop wayside amenities for enhanced user experience. The overall outcome will be a commuter-friendly and enjoyable ride on the national highways.

With road safety being one of the key priorities, the government has promoted the application of artificial intelligence to enforce lane

discipline on national highways, identify the pattern of accidents in black spots, forensic post-crash investigations, etc. MoRTH has also mandated implementation of incident management services, comprising rescue ambulances, route patrol vehicles and tow away vehicles/cranes, during operation and maintenance of national highways.

Key focus areas for the future

Dispute resolution

The government has been focusing on the expeditious settlement of arbitration claims to deleverage its balance sheet. NHAI is looking to settle a majority of its arbitration cases through conciliation. NHAI expedited the dispute resolution and claim settlement process during the lockdown. The formation of the Conciliation Committees of Independent Experts has also enabled the faster settlement of disputes.

Completion of pre-construction activities

Seeking to reduce delays in highway construction on account of the non-availability of land, the long-drawn process for obtaining statutory approvals, and inadequate DPRs, NHAI unveiled plans to adopt a new project execution mechanism wherein project management consultants will be responsible for pre-project works from conceptualisation to making DPRs, and from obtaining clearances to supervising construction and maintenance.

Over the past several years, the high cost of land acquisition and arbitration issues have been some of the key hurdles in project implementation. Seeking to reduce the cost of land acquisition, NHAI is working on alternative greenfield alignments. This will reduce both land acquisition and utility-shifting costs. Land pooling and the value capture mechanism have also been explored by the highways authority. To reduce the build-up of arbitration cases, NHAI has decided to cancel portions of proposed contracts in case of hurdles in the land acquisition process.

Covid-19 impact and next steps for NHAI

The Covid-19 crisis had a strong impact on the Indian roads sector. The nationwide lockdown and consequent shortages of labour and raw materials delayed numerous ongoing road projects across the country. As part of the Covid-19 relief package, the central

government announced the extension of completion timelines by up to six months for road contractors. Besides, a standstill period of six months was announced for road sector contractors and PPP concessionaires, with no associated penalties for not meeting project milestones. The government also agreed to ease companies' cash flow positions through the partial release of bank guarantees.

NHAI has also undertaken several initiatives to revive the road sector and enhance its award and construction activity. To reduce the plight of highway developers, NHAI laid down the principles of force majeure in national highway contracts with private developers after extensive meetings with industry representatives and the government. The authority gave a three- to six-month extension to all private highway developers whose contracts had ended on or after February 20, 2020. Any concession fee or premium payable to the government was deferred for all private national highway projects for the period in which they incurred losses in toll collection because of the nationwide lockdown. Besides, the toll collection period for existing contracts was extended by 21 days. Moreover, the timeline could be further extended in proportion to the loss incurred in toll fees during the lockdown phase, if it was less than 90 per cent of daily average collections. The contract period was extended by a day if the loss was 25 per cent of the daily collections. The authority also offered Covid-19 loans to highway developers to help them tide over the crisis.

Road network for economic growth and regional integration

The expressway and national highway network will be expanded to ensure connectivity and serve over 1,00,000 towns and cater to 85 per cent of all road freight traffic, including access-controlled corridor;s to all major economic centres and nodes. The vision for multimodal infrastructure includes the development of over 70 MMLPs for efficient intermodal freight transportation and passenger intermodal stations in all cities with a population of 1,00,000 or more for the convenience of passengers.

User-centricity

User-centricity is one of NHAI's key priorities. The average distance travelled by freight vehicles is anticipated to increase from 250-400 km per day to 700-750 km per day as a result of initiatives such as GPS-based tolling to enable distance-linked toll collection and zero waiting time; dynamic toll rates based on congestion and time of day; and digital clearances at inter-state borders and customs check points through smart transport solutions. These initiatives will ensure seamless movement.

Integrated mobility will be enhanced by the eradication of siloed land ownership by individual transportation ministries (such as the Ministry of Road Transport and Highways, Ministry of Railways, Ministry of Civil Aviation, and Ministry of Ports, Shipping and Water-

ways), and the establishment of land banks for the development of multimodal infrastructure for seamless freight and passenger movement. Multimodal transportation planning and booking platforms and mobility cards linked to bank accounts for seamless transportation are other areas of focus.

Advanced Traffic Management Systems for surveillance, speed, congestion and weather detection are the need of the hour. Furthermore, AI-based real-time traffic diversion through lane control systems (incident isolation) and tunnel management systems (disaster containment) will ensure smart transportation.

It is clear that the road network is, in many ways, the lifeline of the country and plays a critical role in the economic, social and cultural well-being of the nation. It serves to connect people and places and helps spread the gains of prosperity. Recognising this, NHAI has worked steadily to improve and expand the road network in India since its establishment. The ambitious plans it has laid out for the future will ensure that it continues to meet the challenges and responsibilities of maintaining the road network and further developing it into a world-class system that drives India towards prosperity and a bright future. ●



Gomti ka Chauraha-Udaipur, NH-8

ICONIC PROJECTS



Ahmedabad-Vadodara section of NH-8



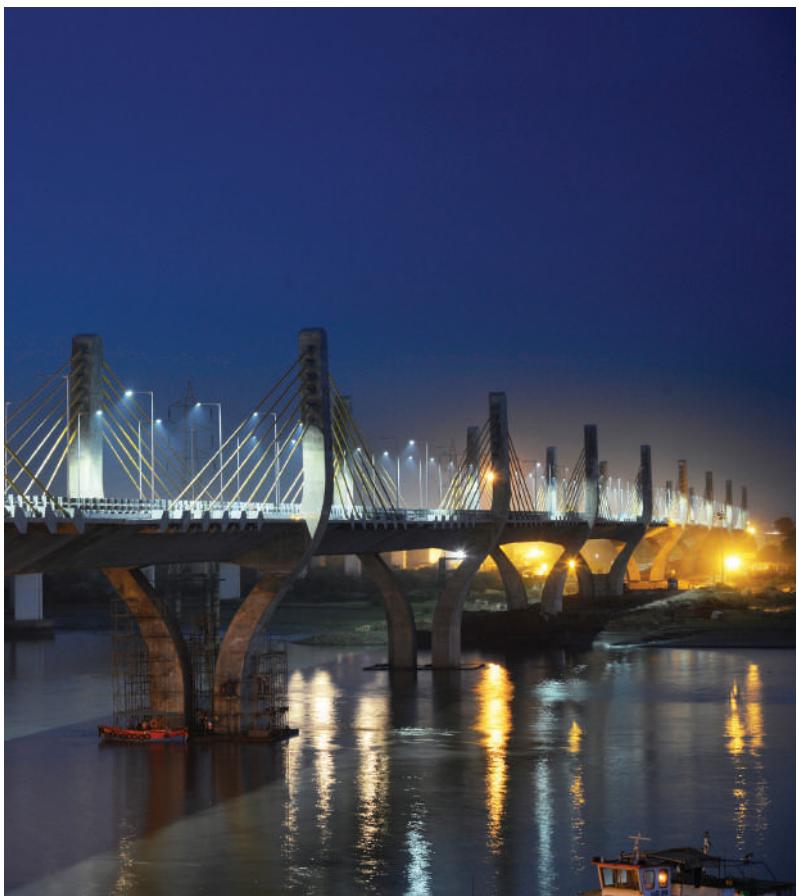
Delhi-Mumbai Expressway (under construction)



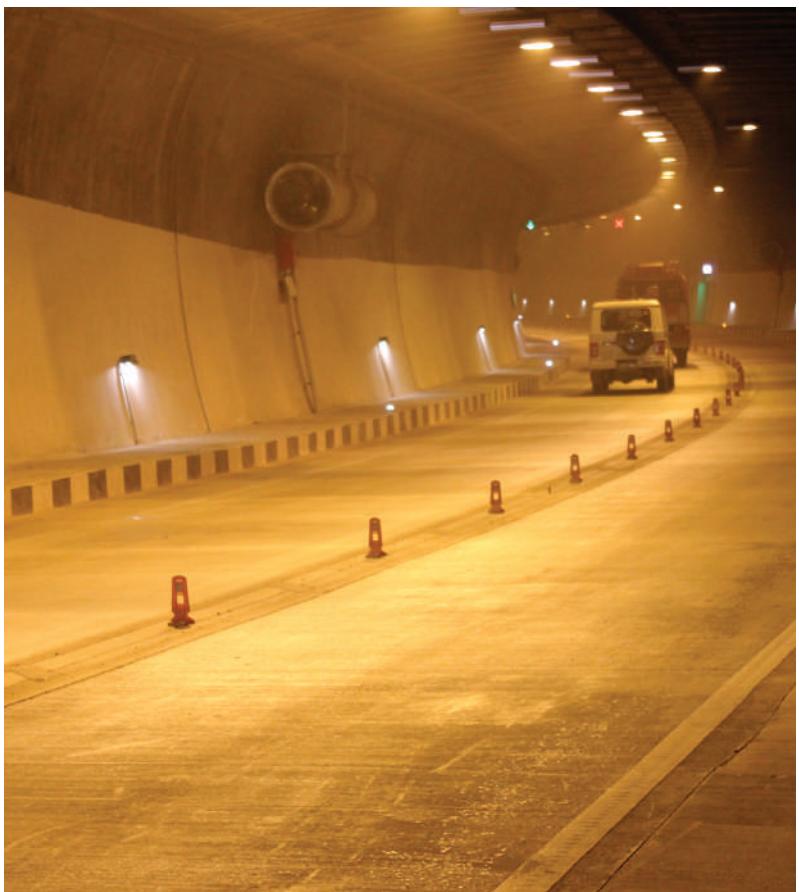
Gomti ka Chauraha-Udaipur, NH-8



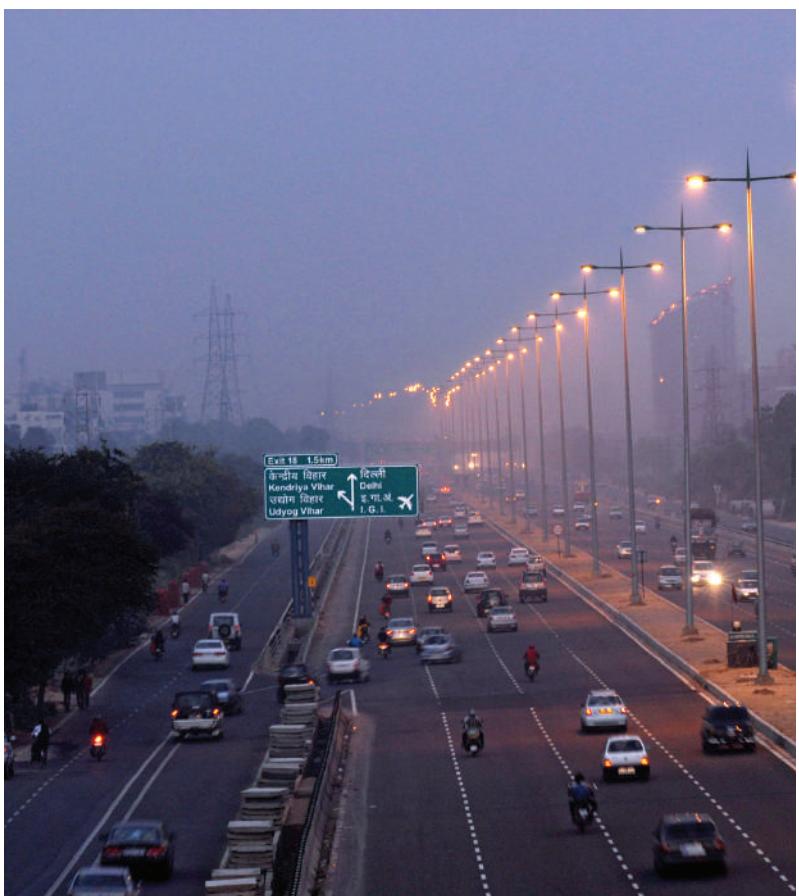
Six-lane access-controlled Greenfield project (NH-152D)
connecting Ambala to Kotpluli



Bridge over river Narmada on NH-8 at Bharuch (Gujarat)



Chenani Nashri Tunnel on Jammu-Srinagar Highway, NH-44
(old NH-1A)



Delhi-Gurgaon Expressway on NH-8



Ranchi Jamshedpur section of NH-33



Sadar Flyover, Nagpur



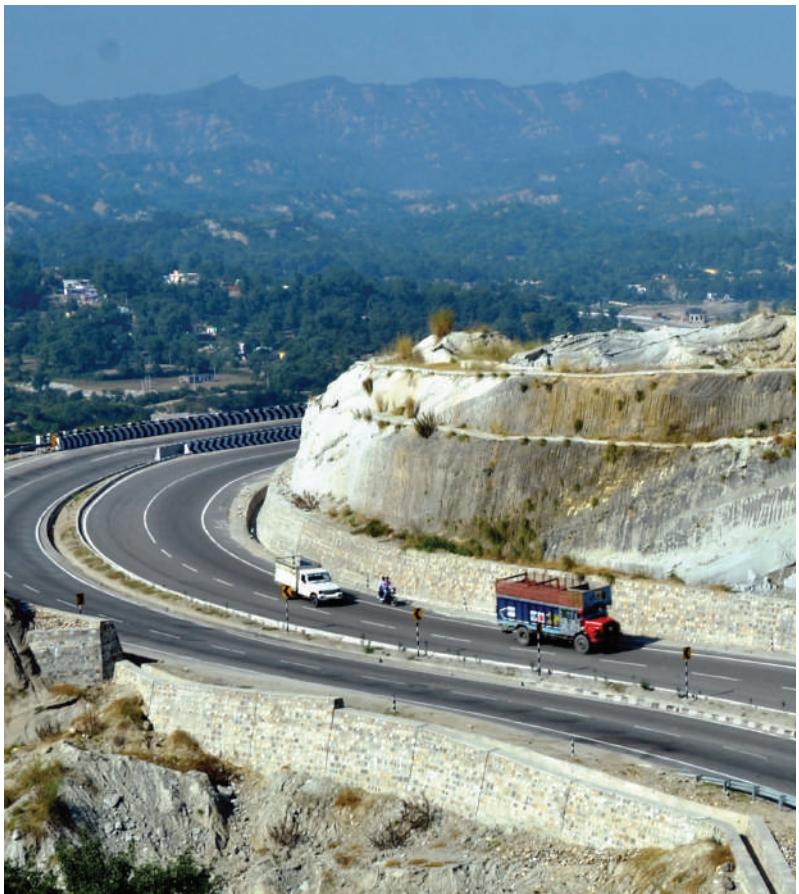
Elevated highway at Badarpur on Delhi-Agra section of NH-44
(old NH-2)



Hyderabad to Vijayawada, NH-65



Solapur to Bijapur section of NH-13



Jammu-Udhampur section of NH-44 (old NH-1A)



Eastern Peripheral Expressway



Goa Karnataka Border to Kundapur, NH-66



New Brahmaputra Bridge at Guwahati, Assam NH-27 (old NH-31)



Takoli to Kullu NH, Himachal Pradesh

BUILDING A NATION, NOT JUST ROADS



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