



Leveraging Technology Enhancing Growth



भारतीय राष्ट्रीय राजमार्ग प्राधिकरण

सड़क परिवहन एवं राजमार्ग मंत्रालय, भारत सरकार

National Highways Authority of India

Ministry of Road Transport and Highways, Government of India

INTRODUCTION

India has the second-largest road network in the world, spanning over 6.4 million km. The sector contributes around 3-4% to India's GDP, making it a critical growth engine. The arterial National Highway network constitutes around two percent of the total road network and caters to over 60 percent of freight and passenger traffic across the country.

The National Highways Authority of India (NHAI) was constituted under an Act of Parliament, 1995. NHAI is responsible for the development, maintenance and management of the National Highways.

The length of National Highways increased by 1.6 times from 91,287 km in March 2014 to 1,46,204 km at present. The length of 4 lane and above National Highways has increased by more than 2.5 times from 18,371 km in 2014 to 46,720 km. Capital expenditure on National Highways increased from about Rs. 51,000 Crore in FY2013-14 to around Rs. 2,50,000 Crore in FY2024-25. In line with vision of 'Viksit Bharat 2047', the length of High-speed corridors will be increased by more than 12 times from 4,200 km at present to over 50,000 km by 2047.

In line with its commitment to provide world class National Highways network and enhance transparency to facilitate ease of doing business for its stakeholders, NHAI has effectively leveraged best & latest information technologies in various aspects of highway development and management.

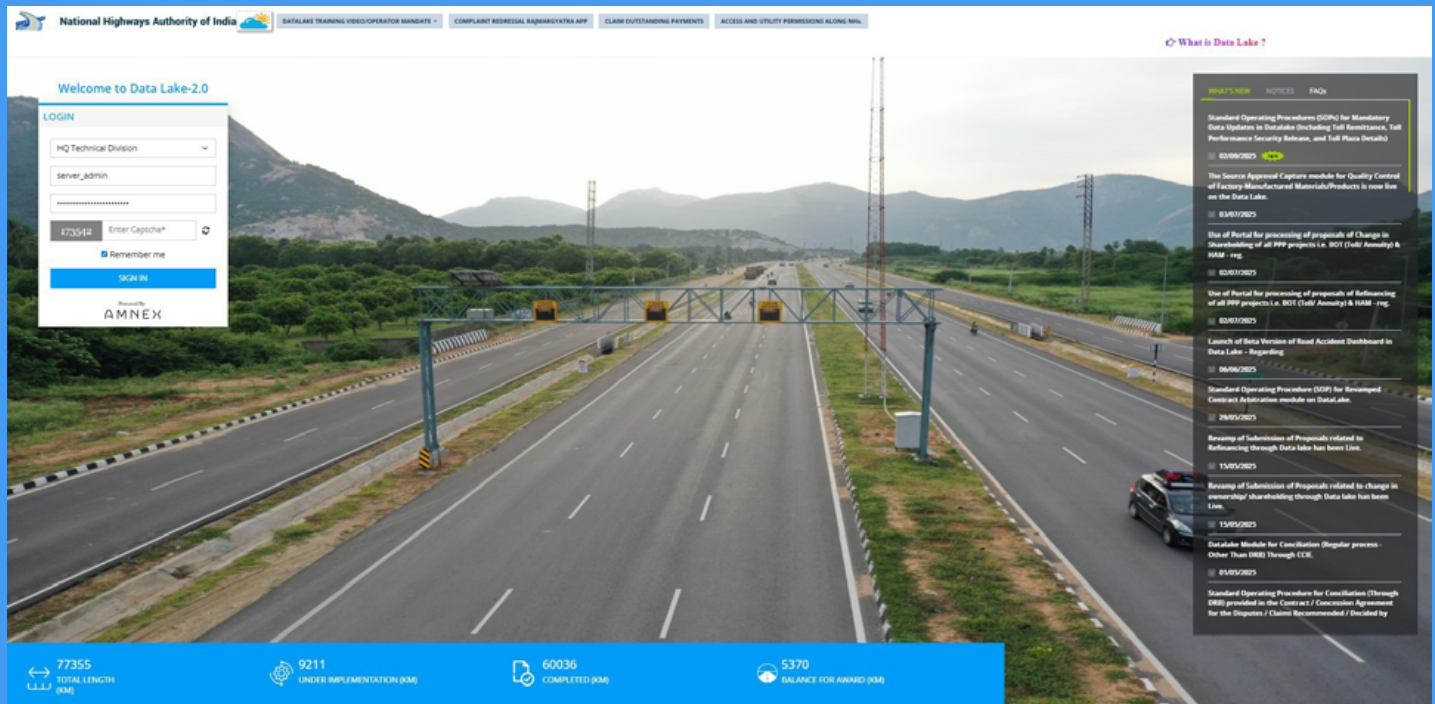
NHAI has introduced most advance IT tools and applications such as AI (Artificial intelligence), Drones, Satellite monitoring, GPS-GIS mapping and Electronic Toll Collection effectively with a significant thrust on technology envisaged to be one of the important strategies for NHAI to successfully manages its systems. NHAI also created an AI based Data Lake to monitor its project on real time basis.



DATA LAKE: POWERING DIGITAL GOVERNANCE AT NHAI

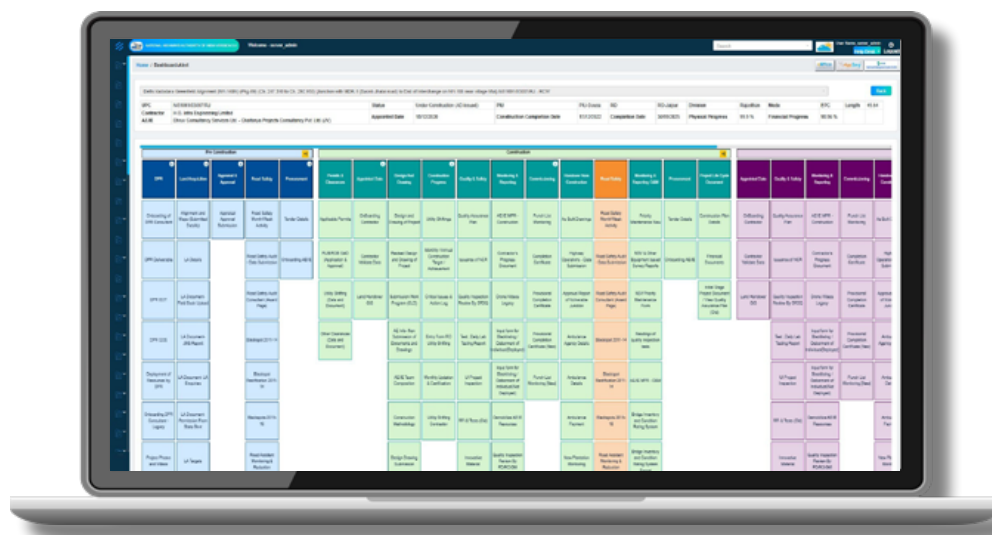
A Centralized Platform for Lifecycle-Based Project Monitoring

Over the years with the development of state-of-the-art high-speed corridors and expressway across the country, NHAI's project volume and complexity grew exponentially. In response, NHAI developed Data Lake, a smart and robust digital platform that integrates planning, execution, and monitoring across every stage of highway infrastructure projects. The platform streamlines workflows, increases transparency and ensures every kilometre built is a step toward transparent, efficient infrastructure development.



End-to-End Project Lifecycle Tracking

- Covers Pre-Construction, Construction, and O&M phases with precision.
- Unique Project Codes (UPCs) assigned at each phase ensure traceable, digital accountability.



Built for Scale and Security

- Developed in-house using the .Net framework, hosted securely on NIC servers.
- Daily reporting, milestone tracking, and automated alerts keep all stakeholders aligned.

Governance Through Digitisation

- Contractor onboarding, Letter of Award generation and contract signing fully digitized.
- Reduces manual errors, external interference and enhances transparency.

Integrated Financial Monitoring

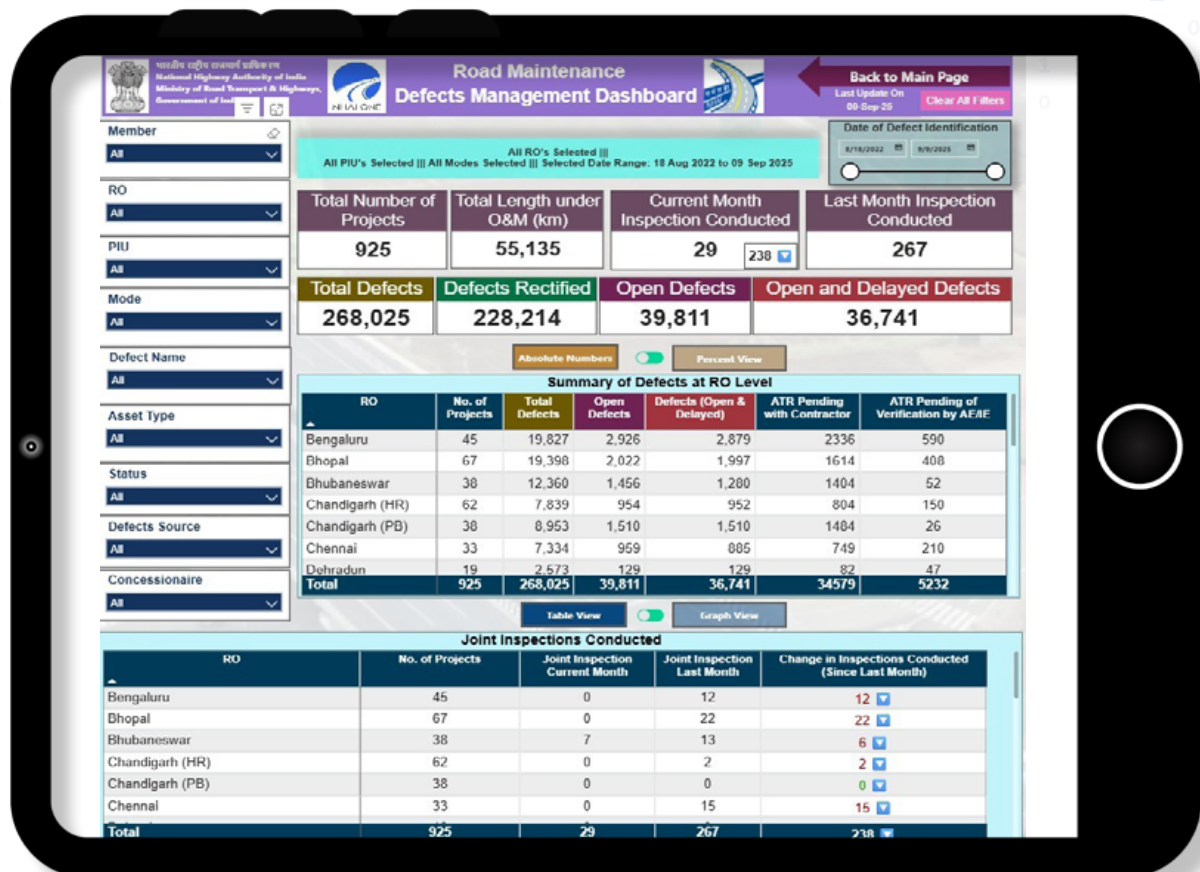
- Linked with AFMS for real-time invoice scrutiny and multi-tiered payment verification.
- Payment pendency reports visible to top management for timely interventions.

Field Force Empowerment via NHAI One App

- Mobile extension supports geo-tagged reporting, face authentication and AI-powered cleanliness checks.
- Available on Android and iOS for last-mile digital documentation.

Insightful Dashboards, Informed Decisions

- Power BI-enabled dashboards track land acquisition, utility shifting and other critical activities.
- Allows early identification of delays, improving project timelines and cost control.

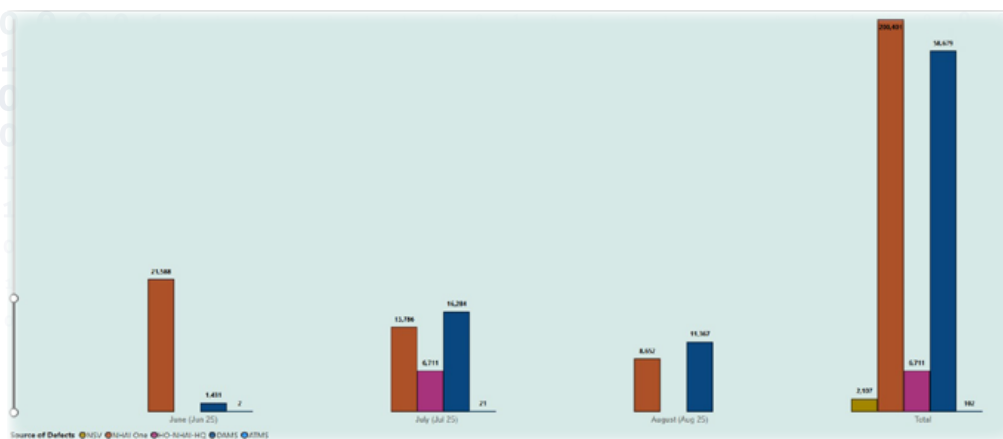
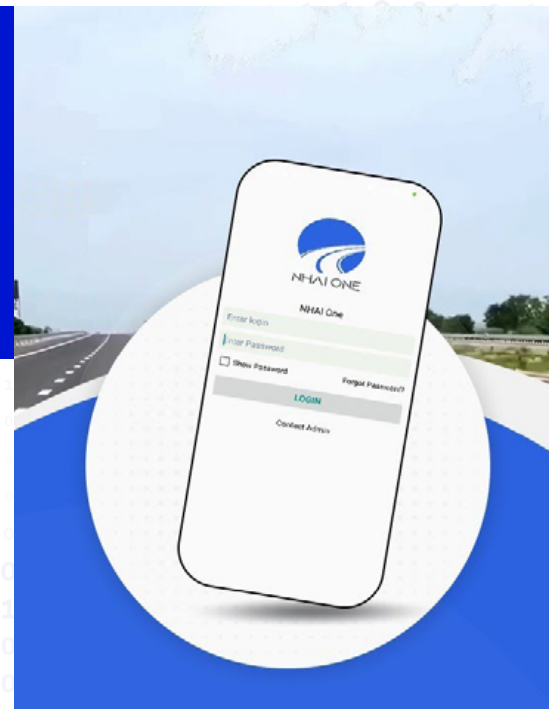


DRIVING DIGITAL TRANSFORMATION ACROSS NATIONAL HIGHWAYS

NHAI One App, a unified mobile platform designed to streamline National Highway construction, operations and maintenance. This all-in-one digital tool empowers NHAI officials, contractors, and field personnel with real-time data access, task tracking, and reporting capabilities. By integrating inspection, safety, and monitoring into a single ecosystem, this app enhances operational efficiency and transparency.

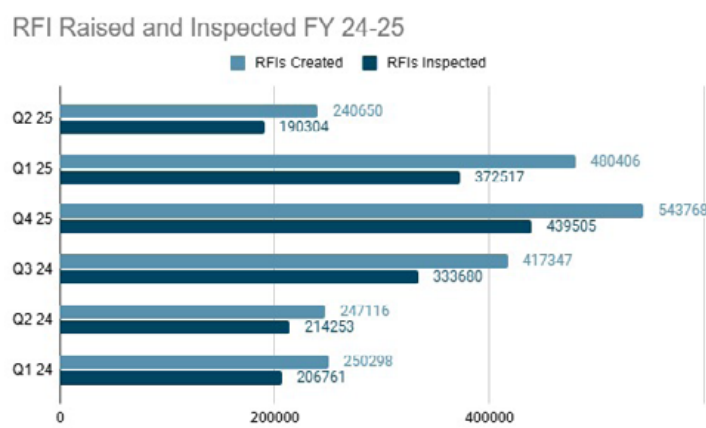
Highway Maintenance at Fingertips

- Real-time damage reporting with image evidence for swift rectification.
- Integrated inputs from NSV, DAMS, ATMS, and field inspections streamline maintenance decisions.



Smart Inspections with RFIs

- Digital checklists to monitor construction quality and timelines for roads and tunnels.
- Over **26 million+ RFIs raised, 21 million+ inspected** across **500+ projects**.
- Offline mode support for tunnels and low-network zones.



Sanitation Oversight at Scale

- Monitoring of **1364 toilet blocks** across **938 toll plazas**.
- 57%** inspected daily; **86%** meet cleanliness standards.

Bridge Inspection and Condition Rating

- Biannual digital inspections across **35,000+ structures**.
- Over **31,000 inspections** completed in last five months across **438 projects**.

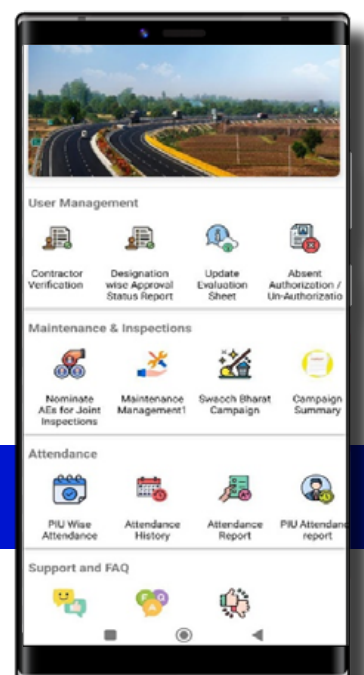
RO/PIU Wise Rating Summary						
RO	1 Rating	2 Rating	3 Rating	4 Rating	5 Rating	Total
⊞ Bengaluru	15	87	51	1624	901	2673
⊞ Bhopal	3	18	18	1240	874	2153
Bhopal		1	3	166	71	241
Chhattarpur				104	9	113
Chhindwara		1	1	63	26	91
Gwalior	1	5	8	216	59	289
Harda	1	2		141	267	411
Indore				13		13
Jabalpur		1	2	59	59	121
Total	138	434	1266	17683	15372	34800

Integrated Employee Directory & Attendance Management System

- Easily searchable contact database with department-wise listings and ERP-linked profiles.
- Face verification ensures fraud-free, geo-tagged attendance for **5500+ daily users**.
- Image verification drive enhances face match accuracy.

Proactive Audits

- Regular checks on rest area amenities (toilets, electricity, water) by Route Patrol Vehicles (RPVs). 700+ Inspections conducted till date.
- Over **2168 audits** conducted, with **1,26,742 observations** logged to ensure highway safety.



HARNESSING DRONE INTELLIGENCE FOR NATIONAL HIGHWAY INFRASTRUCTURE

Over the years with the development of state-of-the-art high-speed corridors and expressway across the country, NHAI's project volume and complexity grew exponentially. In response, NHAI developed Data Lake, a smart and robust digital platform that integrates planning, execution, and monitoring across every stage of highway infrastructure projects. The platform streamlines workflows, increases transparency and ensures every kilometre built is a step toward transparent, efficient infrastructure development.

WHY DAMS?

Challenges of Traditional Inspections

Manual methods were slow, expensive, and prone to inconsistency and subjectivity in reporting.

A leap toward automation

DAMS transforms raw drone imagery into structured, geo-tagged, AI-analysed insights for faster and more reliable decision-making.

Digitally integrated operations

Data flows seamlessly from drone flights to Datalake to dashboards, enabling real-time project oversight.

End-to-end ecosystem

Covers everything from automated flight plans, image quality checks, 2D/3D reconstruction to AI-driven analytics and reporting.

Actionable insights vs. passive data

Unlike earlier drone videos used only for documentation or dispute resolution, DAMS actively powers project governance.

18000 km
Under-construction

50000 km
O&M

3205
Active Civil Contracts

1.2 Cr
Daily FASTag transaction

24
States

NHAI-HQ
Strategic planning, appraisals, approvals, budgeting, procurement

Private contractors and third-party agencies

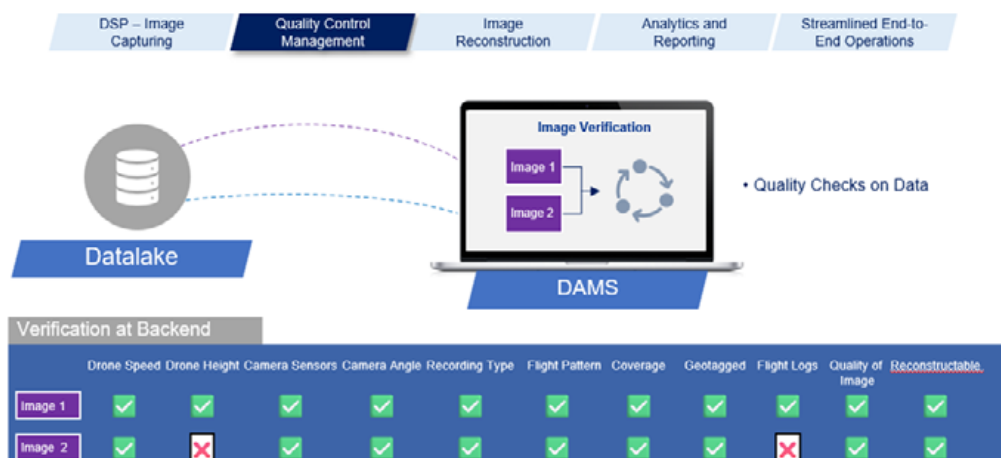


Regional Offices and Project Implementation Units

Set across the country for execution of the NH projects.

Agencies/Individuals awarded the tasks of Highway construction, tolling, road safety audits, safety inspection: etc.

Stakeholder Map



PERFORMANCE & IMPACT

TURNING DATA INTO DECISIONS: MEASURABLE GAINS FROM DAMS

DAMS has delivered transformational results in a very short span of time—saving time, cost, and resources while improving safety and compliance. Its impact is not theoretical but backed by strong metrics across thousands of kilometres of National Highways.

Efficiency & Cost Optimization

- **Survey time halved**
100 km inspections now completed in ~7 days (vs 10–15 days manually), accelerating decision timelines.
- **Manpower effort reduced by 63%**
Requires just 1–2 drone operators per stretch vs 3–4 experts over several days.
- **Cost savings of ~48% per inspection**
Automated workflows and image reusability drive long-term savings and reduce repetitive field visits.

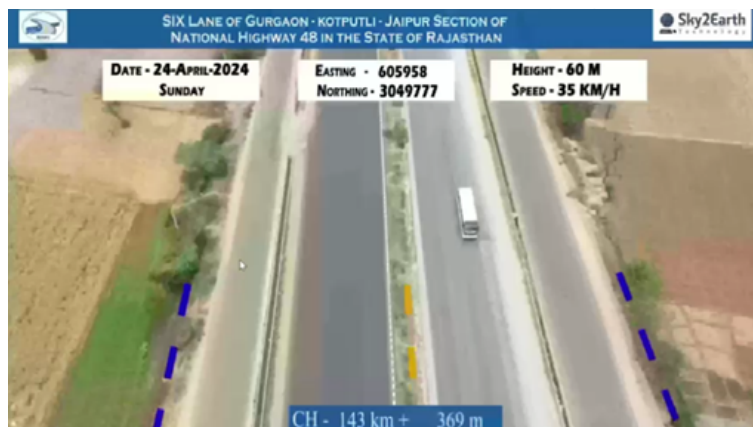
Scale of Operation

- **53,000+ km surveyed in 6 months**
Massive highway coverage without compromising data accuracy.
- **Over 90% of defects detected were previously unreported**
Indicates the system's ability to catch what traditional methods missed.
- **55% of defects already closed via system-driven contractor responses**
Demonstrates effective issue resolution and contractor accountability.

Erstwhile System of Drone Videography

- Non-Standard Quality of Data
- Voluminous and Cumbersome to stream
- Required Manual Video Annotation
- Limited Insights

ADVANCED DEFECT DETECTION DETECTS MULTIPLE ASSET AND SAFETY ISSUES INCLUDING:





DAMS

DSP – Image
Capturing

Quality Control
Management

Image
Reconstruction

Analytics and
Reporting

Streamlined End-to-
End Operations



Autonomous KML
based drone flights as
per criteria in RFP
Section 2.4 (Flight
SOP)

DRONE IMAGES

- Onboarding new highways with KML, centerline, ROW, chainage, integrated with drone maps



Datalake

- Upload DSP drone image data to Datalake portal
- Assessment of any exceptions

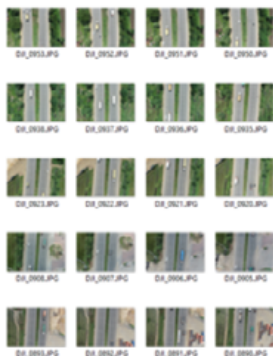
DSP – Image
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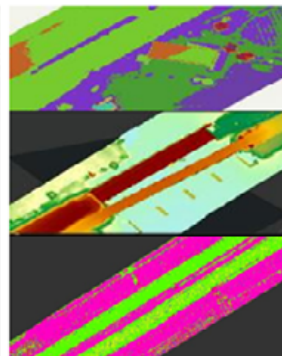
Streamlined End-to-
End Operations



Data Acquisition



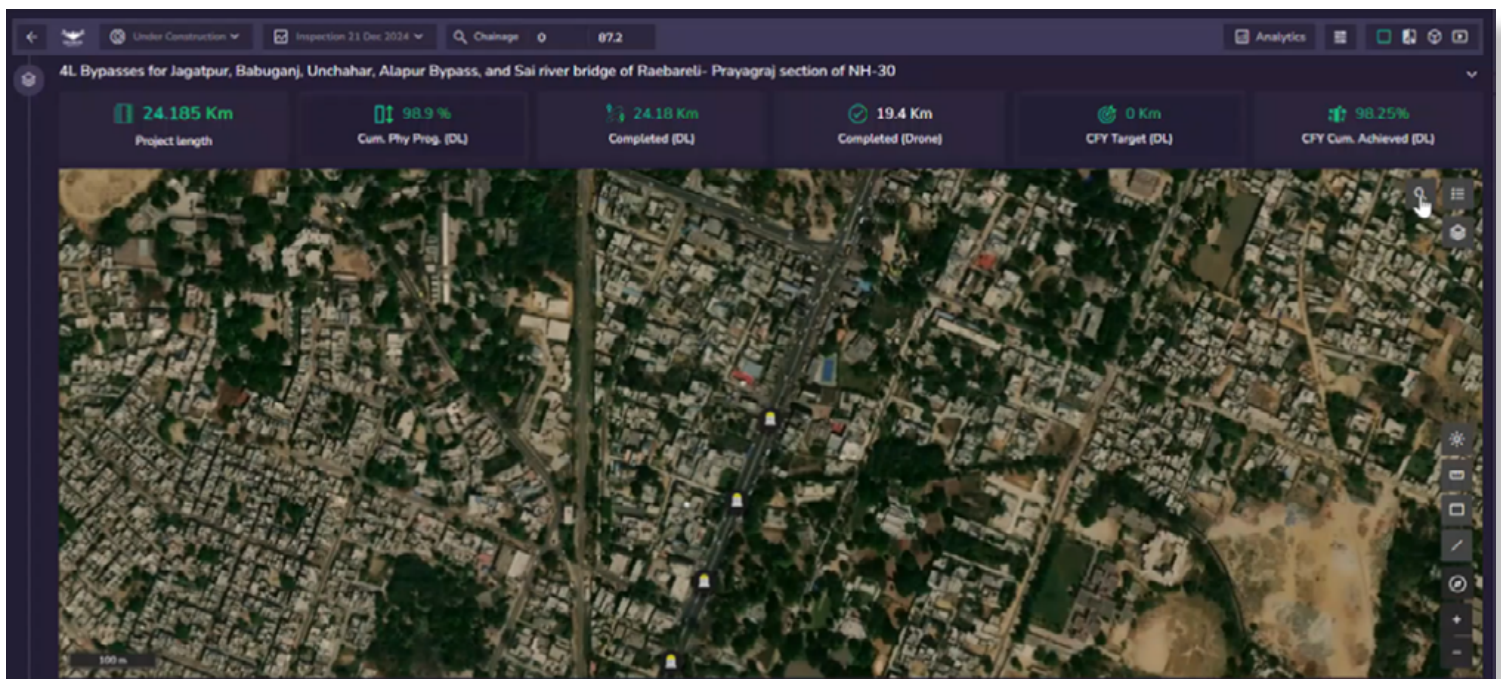
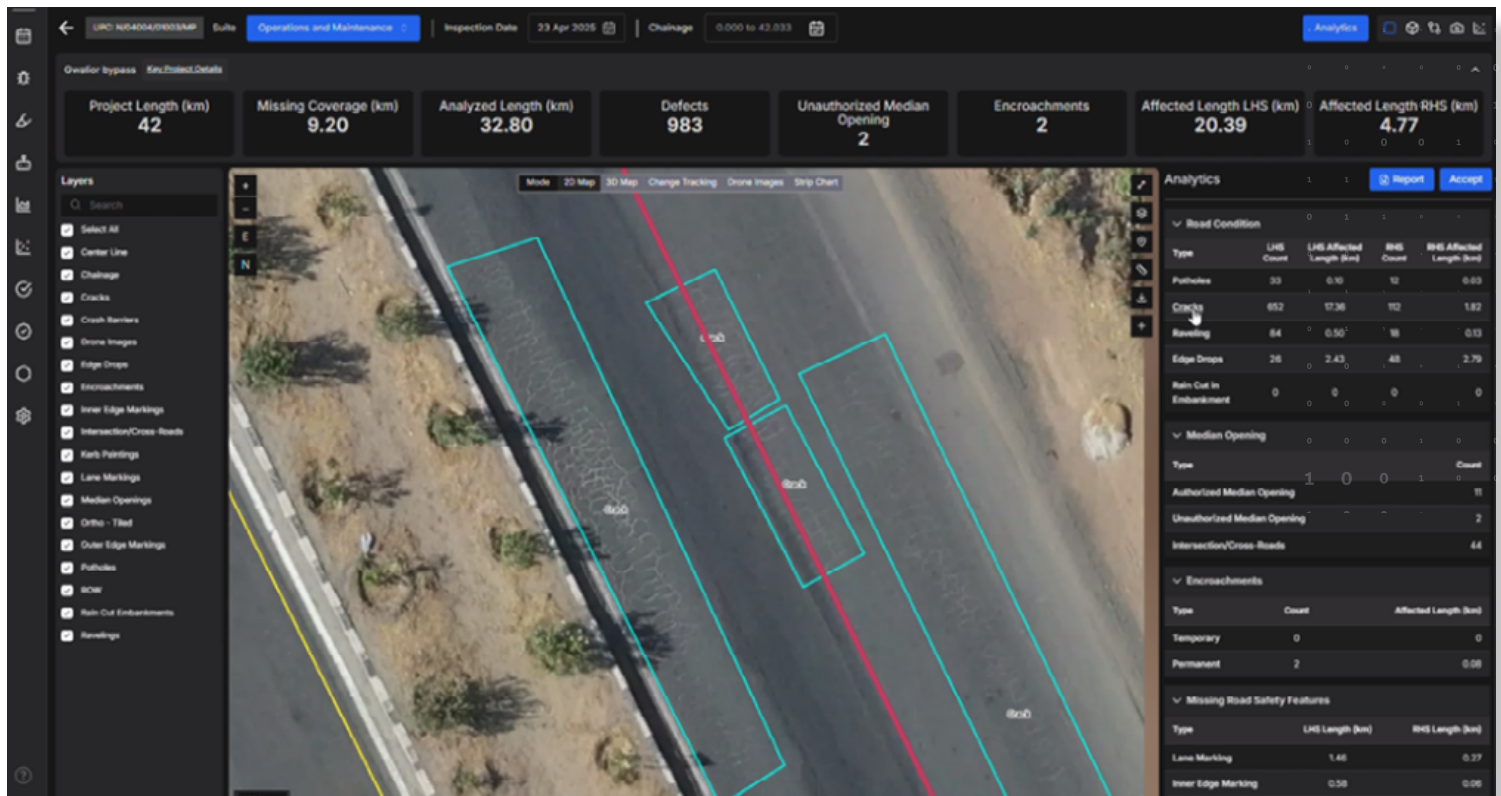
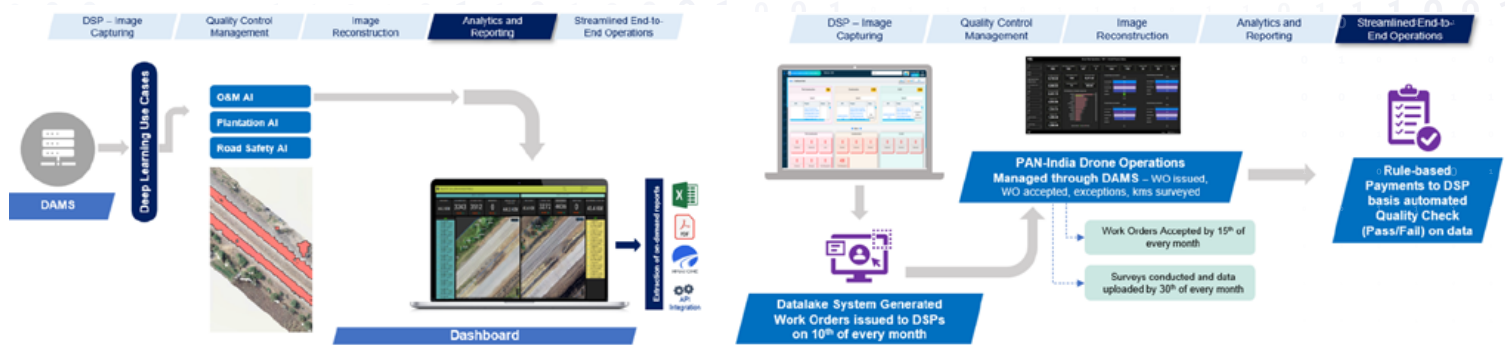
Image Processing



Geo-spatial data



Orthomosaic Generation



BUILT FOR THE FUTURE: INTEGRATED, TRANSPARENT & SCALABLE

DAMS is deeply embedded into NHAI's digital ecosystem and designed to grow with evolving infrastructure needs. It enhances transparency, speeds up project execution, and ensures all stakeholders are digitally connected and accountable.

System Integration

- **Tightly linked with NHAI's Datalake**

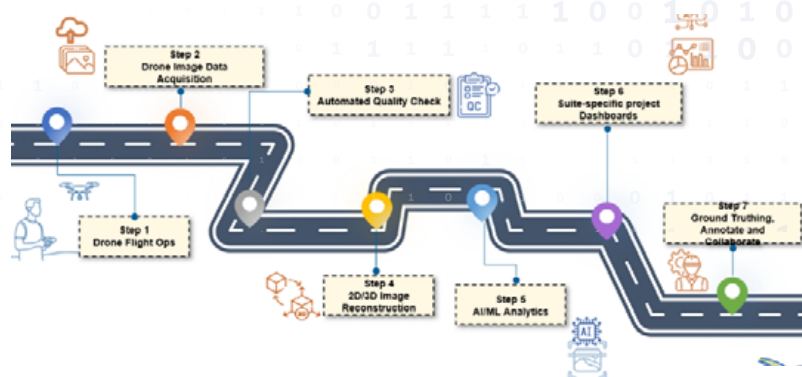
Work orders, data uploads, and analytics flow in a structured monthly cycle.

- **Real-time alerts via NHAI One App**

Contractors receive location-specific notifications and upload Action Taken Reports (ATRs); engineers verify digitally.

- **Rule-based payments to drone service providers (DSPs)**

Tied directly to automated data quality checks, ensuring service accountability.



Analytical Capability & Dashboards

- **Multiple data visualization formats**

Access to 2D/3D views, strip charts, change detection overlays, and defect hotspots.

- **Machine learning models powering insights**

AI models trained to detect over a dozen types of defects and plantation attributes with high accuracy.

- **Modular and scalable design**

New analytical suites can be plugged in without infrastructure overhaul.

Policy Alignment & Expansion

- **Currently being adopted by NHIDCL and MoRTH**

Proven scalability across allied infrastructure agencies.

- **Procured via SaaS model (pay-per-km)**

Billing tied to measurable AI performance (precision/recall), ensuring value-based procurement.

COMMITMENT TO SMART GOVERNANCE

DAMS reinforces NHAI's long-term vision of:
Digital-first infrastructure oversight
Safer and well-maintained roadways
Data-backed decision-making at scale



BUILT FOR THE FUTURE: INTEGRATED, TRANSPARENT & SCALABLE

NHAI launched the Rajmargyatra app to enhance the travel experience of commuters on India's vast network of National Highways. This innovative Unified Citizen-centric Mobile Application aims to provide assistance to travellers by providing comprehensive information about the National Highways, making journeys safer, seamless, and enjoyable. The Rajmargyatra app is available on both Google Play Store and iOS App Store.

The user-friendly application is equipped with multiple features that assist National Highway commuters. Here are some notable features:

1. FASTag Annual Pass:

To provide commuters with a convenient and efficient tolling experience, the FASTag Annual Pass was launched on 15th August 2025 at around 1,150 Toll Plazas on National Highways and Expressways across the country. It received an overwhelming response from highway users, enabling it to achieve the milestone of becoming a top-ranking Government app.

Offering a seamless and economical travel option, the FASTag Annual Pass eliminates the need for frequent recharges for all non-commercial vehicles. With a one-time fee payment of ₹3,000, users can enjoy one year of validity or up to 200 toll plaza crossings—whichever is earlier.

2. Comprehensive Highway Information:

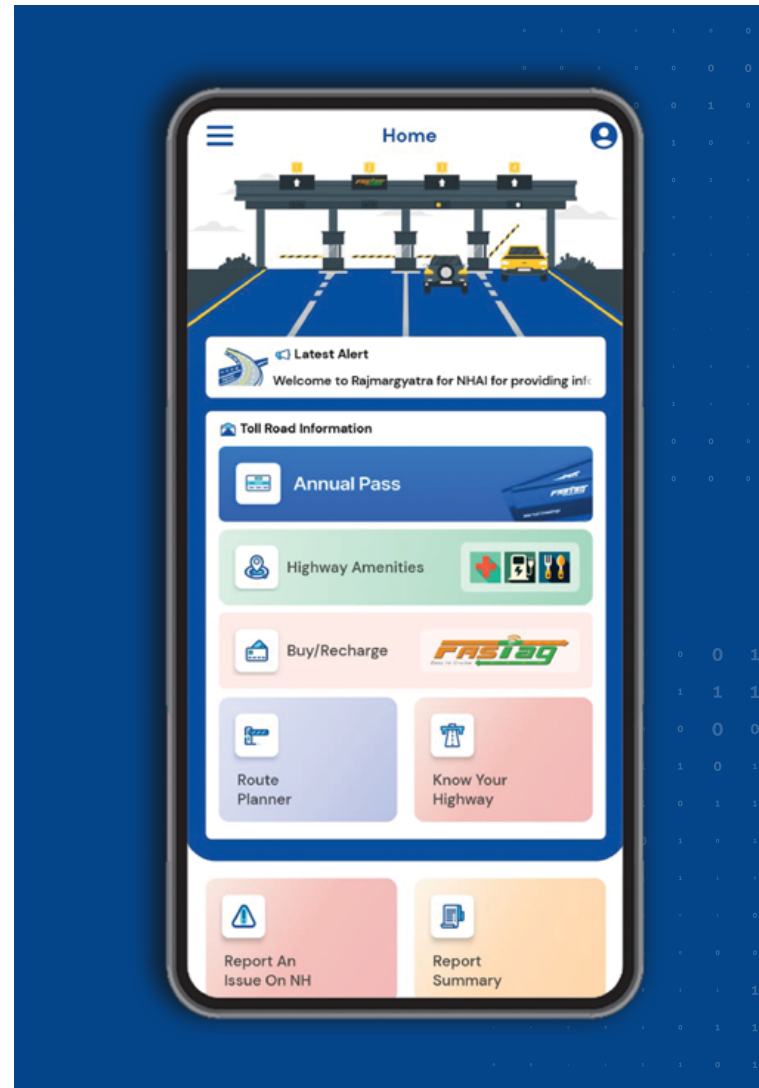
'Rajmargyatra' serves as a one-stop repository of essential information for National Highway users. Get real-time weather conditions, broadcast notifications, and access to details about nearby toll plazas, petrol pumps, hospitals, hotels, and other essential services that ensure a seamless and safe journey on National Highways.

3. FASTag Related Services:

'Rajmargyatra' integrates its services with various bank portals, making it convenient for users to recharge their FASTags, avail monthly passes, and access other FASTag-related banking services — all within a single platform.

4. Emergency Services and Assistance:

Rajmargyatra has a feature that allows users to seek emergency highway assistance. In case of accidents, breakdowns or any other emergency, users can seek help through the app.

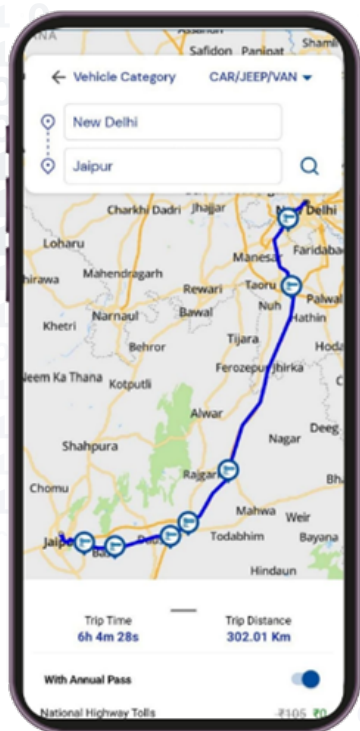


5. Nearby Amenities and Services:

To enhance the overall travel experience, the app provides information about nearby amenities and services such as fuel stations, rest areas, restaurants, and medical facilities. Travellers can plan their breaks by accessing this information, ensuring a more comfortable and stress-free journey.

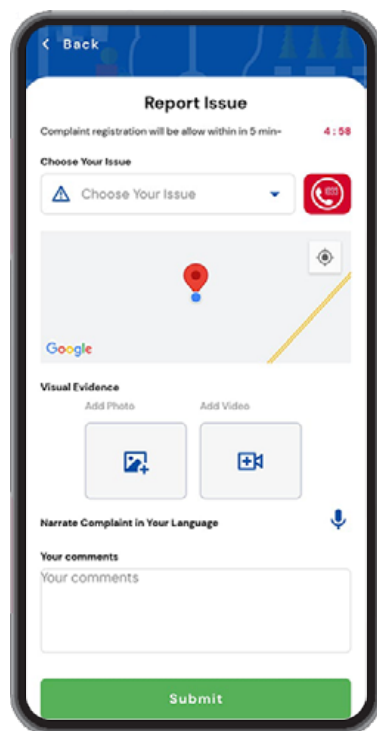
5. Interactive Map Navigation:

The Rajmargyatra app includes a revamped route planner that allows users to plan journeys and view all tolls on their route through National Highway network, providing precise cost estimates and savings with the Annual Pass. The app provides turn-by-turn directions, making it easier for travellers to reach their destinations.



6. Hassle Free Complaint Redressal:

The Rajmargyatra app also incorporates a built-in mechanism for addressing and escalating complaints in a timely manner. Users can utilize the app to report issues related to National Highways like potholes or encroachments and have the option to attach geo-tagged pictures and videos. The registered complaints are handled within the stipulated timeframe.



Benefits of Rajmargyatra App

1. Safety Enhancement:

The emergency assistance features contribute significantly to enhancing the safety of the travellers. The app also features Over-speeding notifications and voice-assistance to encourage responsible and safe driving behaviour.

2. Efficient Travel Planning

Rajmargyatra enables users to plan their journeys more efficiently. The app assists travellers with information on the enroute toll plazas and user fee details to help them plan their travel more efficiently.

3. Improved Convenience

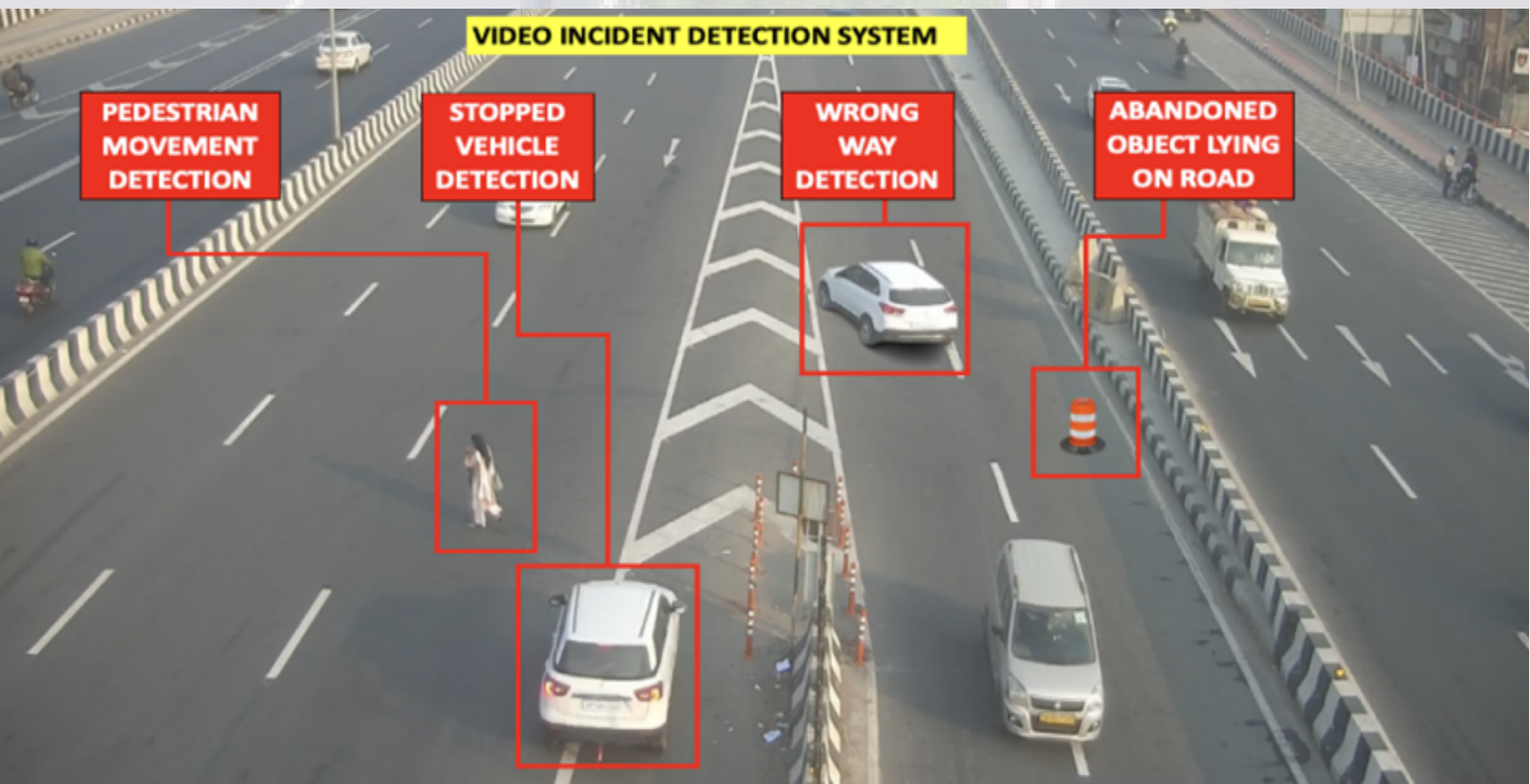
Features such as information on nearby amenities and interactive map navigation, enhance the overall travelling convenience. Users can make informed decisions, find essential services easily, and navigate through unfamiliar areas with confidence.

I ADVANCED TRAFFIC MANAGEMENT SYSTEM

As traffic volumes grow and expectations evolve, India is reimagining its National Highway commuting experience. Managing traffic efficiently and ensuring a smoother commute has become important. Recognizing this, NHAI has embraced Advanced Traffic Management Systems (ATMS) to modernize operations and maintenance of the expansive National Highway network. ATMS marks a move from reactive traffic handling to proactive, data-driven decision-making, paving the way for safer roads and smarter travel.

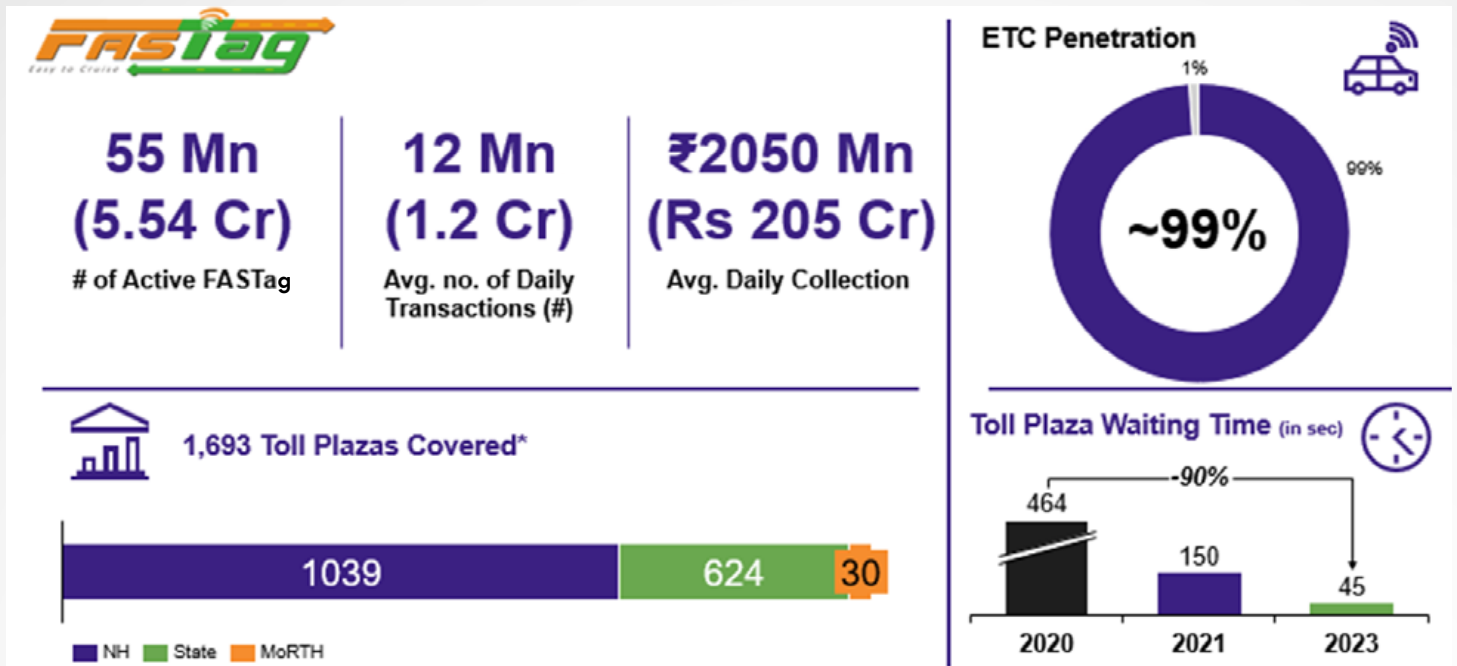
ATMS: Smarter Highways, Safer Roads

- Real-time vehicle detection and incident alerts
- Automated lane enforcement using ANPR cameras
- Centralized monitoring of traffic flow and congestion
- Smart signages for dynamic speed and safety messaging
- Faster emergency response through integrated control rooms
- Improved road safety through proactive surveillance and alerts
- Data-driven planning for smoother operations and maintenance



REVOLUTIONIZING TOLL PAYMENTS WITH FASTAG

With penetration rate of around 99 percent, FASTag has revolutionized the Electronic Toll Collection system in the country. FASTag has helped in transforming toll operations to make them more efficient as well as ensuring seamless & comfortable journeys for the National Highway users.



Multi-Lane Free Flow (MLFF) Electronic Toll Collection System for a Faster, Seamless Future

Built for Scale and Security

- Gantry-based system: no stopping, no booths, no barriers
- Combines FASTag and ANPR cameras for automatic toll deduction
- Point-based tolling: charged only for the distance you travel
- E-notices sent directly to violators via SMS/email
- No human intervention fully automated toll transactions
- Integrated with vehicle registration databases for enforcement

Impact of MLFF

- Zero congestion at toll plazas, improving journey speed and experience
- Fuel savings through uninterrupted vehicle flow
- Environmental gains from reduced idling and CO₂ emissions
- Enhanced compliance and reduced toll evasion
- Better data insights for planning, enforcement and infrastructure upgrades
- Paves the way for nationwide barrier-free travel



**National Highways Authority of India,
G 5&6, Sector-10, Dwarka, New Delhi - 110 075**

Phone: 91-011-25074100 & 25074200

Fax: 91-011-25093507, 25093514

Website: www.nhai.gov.in