Road system DX
- The realization of xROAD

Even with with limited resources, it is necessary to ensure safe and secure traffic and to provide advanced road use services to road users. In order to transition to a sustainable and smart road system, we will accelerate labor-saving and efficiency improvement of road management and administrative procedures by introducing digital and new technologies.

Policy and examples of initiatives for DX road system

[Policy] Making full use of IT

① Early detection and treatment of various events that hinder road use
② Thorough automation and unmanned construction and maintenance operation
③ Procedures and payments will be online, cashless and touchless.
④ Collecting, storing, and fully utilizing big data on roads to contribute to society

■ Provision of high-level road infrastructure services

Real-time images from cameras mounted on patrol vehicles are processed by AI to automatically detect pavement damage.

■ establishment of xRoad and its utilization in various fields

Utilization in various fields in addition to maintenance management by establishing a nationally unified and open data platform and Implementing applications using new technologies.

AI search for similar damage from database
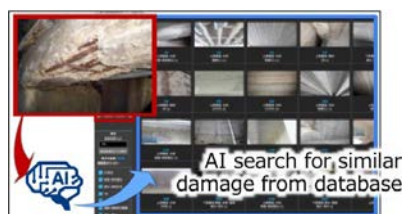
■ Digitizing and 'smartifying' administrative procedures

Prompt and immediate processing of administrative procedures, such as oversize and overweight vehicle permits, using ETC2.0.

Main Route
Alternative Route

■ Improvement of convenience of expressways

Promote increased convenience through the use of ETCs for various payments on and off expressways.

ETC multipurpose use system installed in drive-thru

The future of the road system

■ End of FY2021

Resolve issues that need immediate attention

· Immediate processing of oversize and overweight vehicle permits.
· Abolishment of manual traffic monitoring in principle.
· Initiate nationwide deployment of an automatic traffic obstacle detection system.

■ End of FY2022

Automation of road management tasks

· The National Highway Offices to begin deploying automatically-controllable snow removal machines.

Upgrading procedures for road use

· Occupancy permit procedures, specific vehicle parking permit procedures, etc.

Building a data platform

· Outline of xROAD, opening of partial data, start of road management application development, etc.

■ End of FY2025

Dedicated ETC, etc.

· Urban areas to be completed in 5 years from FY 2020 (target)

Providing high-level road infrastructure services by mobilizing IT and new technologies

In addition to the promotion of ICT construction, we will achieve the advancement and efficiency of structural inspections and daily maintenance management.
Through digitalization, we will fundamentally review business processes related to daily maintenance and management, and optimize operations based on data such as lead time for processing abnormalities and regulation time, to achieve early detection and early treatment of damaged areas and falling objects.

Background / data

· Cooperation with building contractors is essential for road maintenance and administration. However, the number of skilled workers has declined by approximately 1.3 million since its peak, and at the same time, the population is aging.

[Technicians] (1997) 4.55 million people -> (2019) 3.24 million people
[Percentage of construction workers aged 55 and over] (1997): approx. 24% -> (2019): approx. 35%

Promote i-Construction, including ICT construction using 3D data, with the goal of using BIM/CIM in principle for all public works by FY2023.

To ensure appropriate maintenance and management of road facilities, ICT and AI technologies will be used for inspection, diagnosis, construction, and recording to promote sophistication and efficiency.
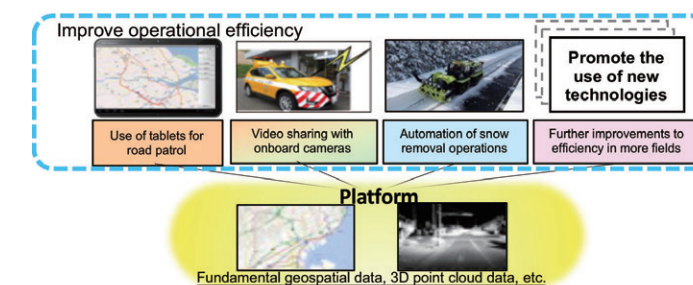
Measures to strengthen the road management system using IT

Accelerating the sophistication of road management, including the realization of early detection and early treatment of road defects through automatic traffic hazard detection systems
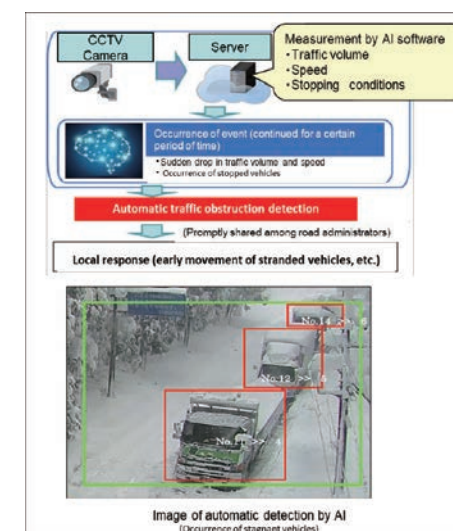
Installation rate of CCTV cameras on emergency transport routes where constant observation is required（2019→2025）： 0% => Approx. 50%

Promote the automation of snow removal work that requires advanced skills, and start deploying automatically controlled snow removal machines at National Highway Offices by FY2022.
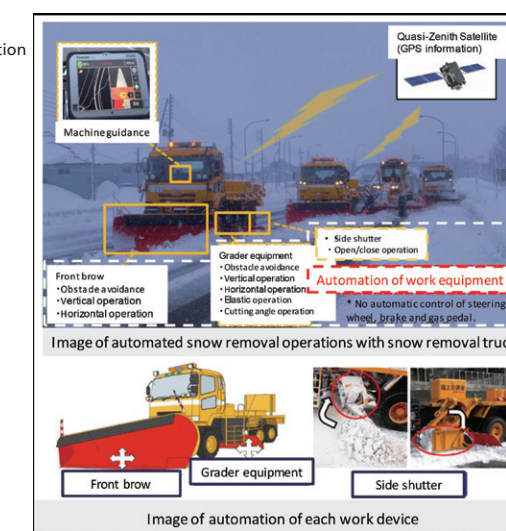
Improving the sophistication and efficiency of construction, inspection, and maintenance management using ICT and AI technologies

Improve operational efficiency
Use of tablets for road patrol | Video sharing with onboard cameras | Automation of snow removal operations | Further improvements to efficiency in more fields
Promote the use of new technologies
Platform
Fundamental geospatial data, 3D point cloud data, etc.

Examples of use at Regional Development Bureaus

Automatic traffic obstruction detection system
Image of automatic detection by AI [Occurrence of stagnant vehicles]

Automation of snow removal operations
Image of automated snow removal operations with snow removal trucks
Image of automation of each work device

Dramatic increase in productivity through digitalization and 'smartification' of administrative procedures

To improve the productivity of road users administrative procedures related to road space can be streamlined and processed immediately.

A new traffic system for oversize or overweight vehicles (immediate processing) will be put into practical use in April, 2022. We will also promote digitalization and smart procedures for road occupancy permits and for permitting stoppage at oversize or overweight vehicle stopping facilities.

## Expediting procedures for the passage of oversize or overweight vehicles

Background / data
・Oversize or overweight vehicle access permit (results of the Regional Development Bureau)
<Number of oversize or overweight vehicle permits>
Approx. 320,000 pieces (FY2016) → Approx. 500,000 pieces (FY2020) [approx. 1.6 times]
<Average review time>
Approx. 43 days (FY2016) → Approx. 24 days (FY2020) [Approx. 0.6 times] * Approx. 23 days in the first half of FY 2021

Promote the expansion of the use of the new system for special-purpose vehicles, which provides instant online answers to passable routes, by promoting the digitalization of information on target roads.

Strengthen control of violating vehicles by using automatic weight measuring devices and ETC 2.0, as well as by strengthening cooperation with related organizations.

New system through promotion of digitalization
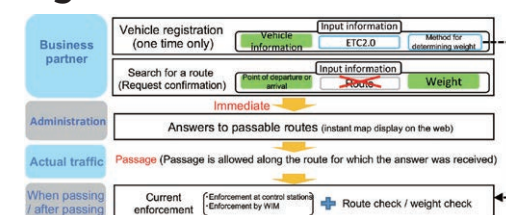
Improving the sophistication and efficiency of road occupancy permit procedures

Background / data
・Road occupancy permits (aggregate results for regional development bureaus)
Number of road occupation permits: approximately 40,000 (Directly managed national roads: average from FY2016 to FY2020)
・Factors leading to accidents involving underground buried objects in construction work (FY2018)
Percentage of buried pipelines that were in a different location and not listed in the road register: 19%.
・The installation status (plan, elevation, and section) of the occupied property is currently saved as 2D data.

Online application for road occupancy permits and associated road use permits in Hokomichi system.

Promote the acceleration of road occupancy procedures and

the prevention of roadside construction accidents by digitalizing the data on the installation status of occupied properties and linking it to the data platform (xROAD).

Digitalization of procedures for permitting stoppage at oversize and overweight vehicle stopping facilities

Background / data
・Following the 2020 revised Road Act, terminals dedicated to buses, taxis, and trucks (stop facilities for oversize or overweight vehicles) are categorized as road accessories.
・Permission from the road administrators is required to stop a vehicle at such "stop facilities for oversize or overweight vehicles".

Improve convenience for bus and other operators by creating an environment that allows them to apply for stoppage permits online.

Ref. 1: (一社) Survey by the Japan Federation of Construction Companies.

Improving the convenience of expressways

We will systematically promote cashless and touchless toll gates by converting expressways to ETC-only.
We will promote the use of ETC for various payments on and off expressways to improve convenience.

Background / data
・Change in ETC usage rate （September, 2006 → September, 2021)
・Metropolitan Expressway 70.4% ⇒ 96.7%
・Hanshin Expressway 64.0% ⇒ 96.1%
・NEXCO 60.5% ⇒ 93.5%

Promotion of ETC exclusive use

In order to reduce traffic congestion at toll gates, reduce future management costs, and reduce the risk of infectious diseases, Based on the roadmap [Ref. 1], Cashless toll gates, being promoted systematically with the aim of completing the project in approximately 5 years for urban areas and 10 years for rural areas.

・In consideration of the ETC usage rate, traffic volume, and substitutability with neighboring IC's, the project will start on a

trial basis at metropolitan some toll gates at the end of FY2021[Ref. 2], and gradually expand based on the operational status.

・Improvement of the ETC usage environment and countermeasures for non-ETC vehicles through subsidies for in-vehicle equipment (scheduled to start on January, 2022) and lowering of the minimum deposit for ETC personal cards [Ref. 3] (from 20,000 yen to 3,000 yen).

Improving the convenience of expressway users by using "My Number Cards"

Consider a discount system based on the user's situation and attributes using the My Number Card.

The spread of touchless payment by ETC

Improve an environment necessary for the expansion of ETC technology into various fields, including the establishment of a general-purpose settlement system using ETC cards.

Expanding the ETC multipurpose use system [Ref.4] to other public corporation toll roads, which was introduced in full-scale for the first time in Japan on the Izu Chuo Road.

■Examples of the expansion of ETC technology into various fields

Regional public road corporations
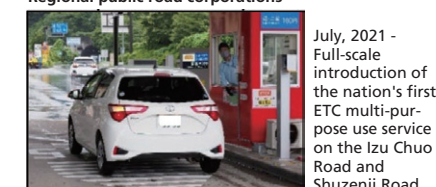
July, 2021 - Full-scale introduction of the nation's first ETC multi-purpose use service on the Izu Chuo Road and Shuzenji Road.

Drive-Thru

In April, 2021, the "Pit Stop SUZUKA" drive-thru store at the Suzuka PA (inbound) began offering an ETC multipurpose use service.

Parking lot

Conducted demonstration tests at private parking lots from July, 2017 (6 locations in Tokyo, Osaka, Nagoya and Shizuoka)

Expansion of rest services using ETC2.0

■Smart fees that allow for temporary exits

[Current Status]
An experiment is currently underway at 23 "Roadside Rest Areas" across Japan to allow users to keep the same fare as that without exiting, even if they temporarily leave the expressway. (Temporary exit is possible for: 3 hours)

[Future]
Consideration of expanding the number of target locations from the perspective of securing rest opportunities for logistics companies (large vehicles) and revitalizing the region
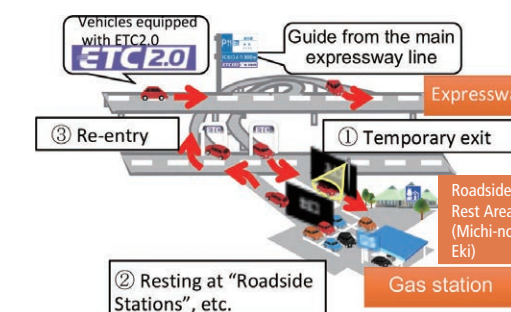
Ref. 1：Clarification of the procedures for introducing ETC exclusive use and the approximate target date (announced on December 17, 2020)
Ref. 2：Metropolitan Expressway：34 points（Match, 2022〜 5 points、 April, 2022〜 29points) NEXCO：5points （2022 spring〜)
Ref. 3：An ETC card issued jointly by six expressway companies to users who do not have a credit card contract and who deposit a certain amount of money (minimum 20,000 yen) in advance.
Ref. 4：A system that enables the use of ETC technology outside of expressways while realizing cost reductions through the centralized processing of payment information.

Establishment of xRoad (data platform) and its utilization in various fields

By collaborating with related organizations to efficiently collect data and establishment of xROAD (nationally unified and open data platform), we will promote the development of data-based technologies and utilize them in various fields in addition to maintenance and management.

Background / data

・Each road administrator accumulates a huge amount of inspection and diagnosis data with various specifications.
  Bridges: approx. 730,000 bridges, tunnels: approx. 10,000 tunnels, road facilities: approx. 40,000 facilities
・Efficient road maintenance and management can be achieved through new technologies that utilize data.
・The number of ETC2.0 on-board units has increased to approx. 7.14 million (as of the end of November, 2021).

・Using Mobile Mapping System (MMS) technologies, collect 3D mapping data from national highways under jurisdiction of MLIT for over 9000 km (as at November 2021)

Establish a data platform (xROAD) , based on the digital road map database (DRM-DB), that links structural data, ETC2.0 and other databases, in addition to promoting the development of databases for each road facility

Promote the use of MMS to acquire 3D point cloud data of roads (intersection shapes, location information of geographic features such as demarcation lines, etc).

The data contained in the platform will be partially open to the private in order to promote open innovation, such as the development of AI and applications for road policy study and maintenance management.

■xROAD structure (future image)
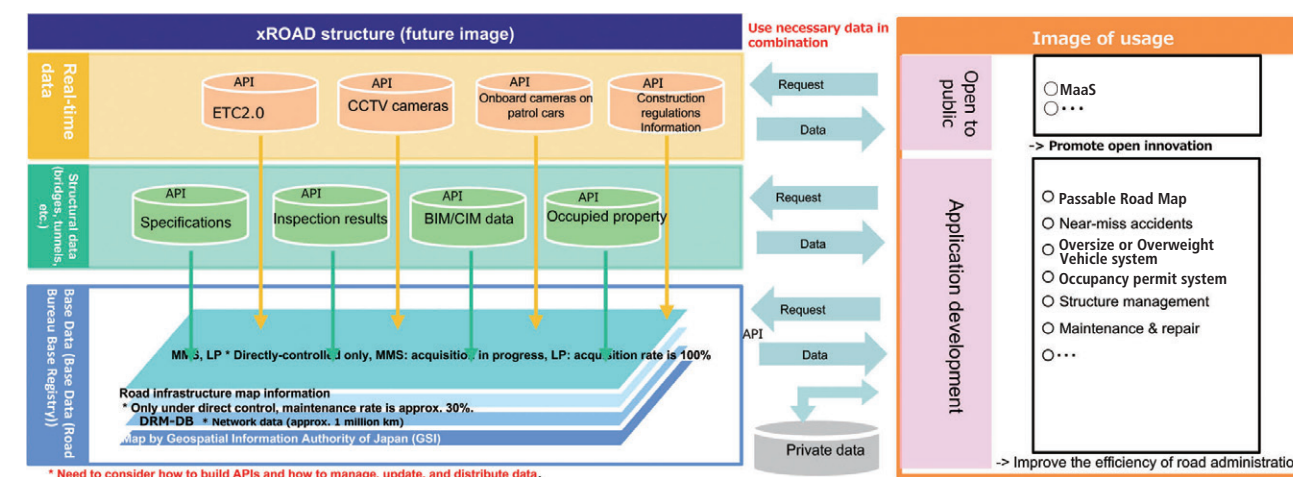
■Image of the development of applications using the database