Road system DX - The realization of xROAD

In order to use roads safely, wisely, and sustainably, we will accelerate the "xROAD" DX initiative, which aims to make road surveys, construction, maintenance, and administrative procedures more sophisticated and efficient through the introduction of new technologies and the utilization of data.

Policy and examples of initiatives for DX road system

[Policy] Through the use of new technologies such as AI and ICT

① Improve the sophistication and efficiency of road survey, construction, maintenance and management, etc.
② Make procedures and fee payments online, cashless and contactless
③ Improve the sophistication of data collection, utilization of accumulated data, and openness

■Establishment of a new road traffic survey system

Advanced and efficient road traffic surveys using big data such as routes and traffic volumes obtained from ETC2.0 data, etc.

■Increased sophistication and efficiency of road maintenance and management

Promote early detection of road abnormalities and damage detection and labor-saving maintenance work through the introduction of ICT technology

■Data utilization and openness

Constructed road data platform "xROAD" as a foundation for data utilization, opening up data and utilizing it in various fields

■Improvement of convenience of expressways, etc.

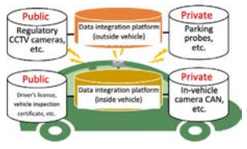
Promote increased convenience through the use of ETCs for various payments on and off expressways.

■Sophisticated administrative procedures

Expedited and online administrative procedures for oversize and overweight vehicle access, occupancy permits, etc.

■Promotion of the next generation of ITS

Establishing a foundation for data linkage between inside and outside of vehicles to promote next-generation ITS.



The future of the road system

■By the end of FY2022

Increase sophistication and efficiency of road maintenance and management
- Commencement of actual deployment of snow removal equipment capable of automatic control

Upgrading procedures for road use
- Promote computerization of road information used for specified vehicle procedures
- Started digitization of occupied property location information

Utilization and openness of data
- Operation and release of road facility inspection database
- Release of MMS 3D point cloud data
- Construction of "xROAD" (trial version)

■By the end of FY2023

Utilization and openness of data
- Publication of road base map information

■FY2024 onwards

Increase sophistication and efficiency of road maintenance and management
- Establish system for automatic detection and early treatment of road anomalies

Improve convenience of expressways, etc.
- ETC dedicated

Utilization and openness of data
- Publication of traffic volume (real-time) data
- Advanced road management and utilization in the private sector

Improve safety and convenience for road users
- Development and operation of next-generation ITS begins

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

Background / data

・The number of skilled construction workers, essential for road maintenance and management, has declined by approximately 1.4 million from its peak, and at the same time, the number of older workers is increasing

[Skilled workers] 1997: 4.55 million → 2020: 3.18 million
[Percentage of construction workers 55 years old or older] 1997: approx. 24% → 2020: approx. 36%

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.

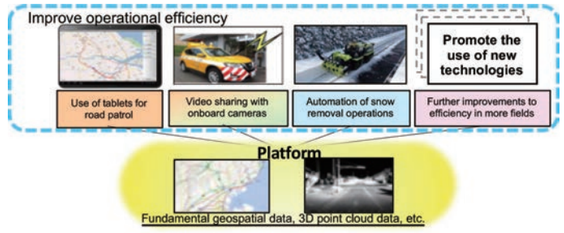
Measures to strengthen the road management system using IT

Accelerate the advancement of road management, including early detection of abnormalities through automatic traffic obstruction detection systems

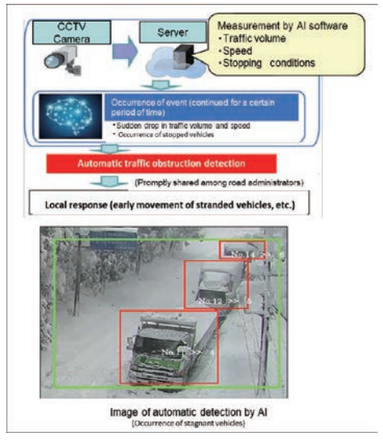
Installation rate of CCTV cameras on emergency transport routes where constant observation is required.（2019→2025）：0% => Approx. 50%

Promote demonstration tests for nationwide deployment of automatically controllable snow removal equipment and actual deployment at national highway offices

Advanced and efficient construction, inspection, and maintenance management using ICT and AI technologies

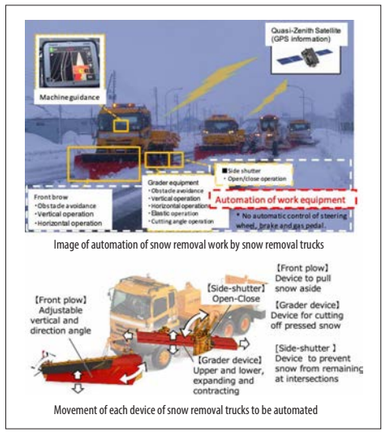


Examples of use at Regional Development Bureaus, etc.



Automatic traffic obstruction detection system

Image of automatic detection by AI
(Occurrence of stagnant vehicles)



Automation of snow removal operations

Image of automation of snow removal work by snow removal trucks

Movement of each device of snow removal trucks to be automated

Dramatic increase in productivity through digitalization and 'smartification' of administration

To improve the productivity of road users, etc., administrative procedures related to road space can be streamlined and processed immediately.
We will expand the use of the Oversize or overweight Vehicle Passage Confirmation System, which began operating in April 2022, and promote the digitization and smartening of procedures for road occupancy permits and permits for stopping at specified vehicle stopping facilities.

Expediting procedures for special vehicles

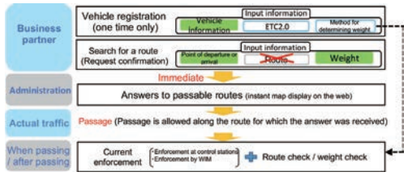
Background / data

<Number of oversize and overweight vehicle permits>
Approx. 390,000 (FY2017) → approx. 540,000 (FY2021) [approx. 1.4 times]
<Average number of screening days>
Approx. 51 days (FY2017) → Approx. 22 days (FY2021) [Approx. 0.4 times]

Promote electronic data conversion of road structure information, etc., and expand the use of the Special Vehicle Traffic Verification System

Promote proper passage of oversize and overweight vehicles by utilizing weigh in motion(WIM) devices and ETC2.0

Oversize and Overweight Vehicle Passage Confirmation System



Improving the sophistication and efficiency of road occupancy permit procedures

Background / data

• Road occupancy permits (results of the Regional Development Bureau, etc.)
Number of permits: about 40,000 (National highways under jurisdiction of MLIT, 2017 to 2021 annual average)
• Factors causing accidents involving underground buried properties in construction (*1) (FY2021)
Percentage of buried conduit locations differing from the information on the drawings: 14%
• Currently, the installation status of occupied properties is managed by 2D data

Digitize location information of occupied properties to promote proper road management and prevent road construction accidents

Centralized online procedures for road occupancy permits, including those from local governments

Digitalization of procedures for permitting stoppage at specified vehicle stopping facilities

Background / data

• Permission from the road administrators is required to stop a vehicle at such “specified vehicle stopping facilities".

Establish an environment where bus and other operators can apply online for stop permit procedures

Digitization of road ledgers

Digitize road ledgers and make them available on the website

Ref. 1:Survey by the Japan Federation of Construction Companies.
Ref. 2: Under the revised Road Law of 2020, dedicated terminals for buses, cabs, trucks, and other vehicles (specified vehicle stopping facilities) were positioned as road accessories

Improving the convenience of expressways

We will systematically promote cashless and touchless toll gates by converting expressways to ETC-only, etc.
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 2022)
• Metropolitan Expressway 70.4% ⇒ 97.9%
• Hanshin Expressway 64.0% ⇒ 96.4%
• NEXCO 60.5% ⇒ 93.5%

Promotion of ETC exclusive use

Systematic promotion of cashless tollgates based on the roadmap (*1) in order to improve operational efficiency at tollgates, reduce congestion, and reduce the risk of infection, etc.

• Considering the ETC usage rate, traffic volumes, substitutability of nearby interchanges, etc., the program was launched on a trial basis at some tollgates in the Tokyo metropolitan area and the Kinki region in 2022 (*2) and will be expanded gradually based on operational status and other factors
• In addition to providing subsidies for ETC 2.0 on board unit in a timely manner, we will continue to improve the ETC usage environment by lowering the minimum deposit for ETC personal cards (*3) (from 20,000 yen to 3,000 yen) and other measures

■Examples of ETC toll stops

Kasumigaseki (outer loop) entrance on the Metropolitan Expressway Inner Circular Route, which was converted to ETC-only service in April 2022

Promotion of touchless payment by ETC

Promote introduction of ETC multi-purpose use system (*4) at local road public corporations and parking lots, etc.

■Introduction case study

Local road public corporation

Introduced on the Torikai-Ninnaji Ohashi toll road in February 2022

Introduced on the Izu-Chuo and Shuzenji roads in July 2021

Parking lot

Conducted demonstration tests at private parking lots from July, 2017

Gas station

Introduced at Oil Bank Shinshiro Store in August 2021

*1: The document clearly specifies the procedures for the introduction of ETC exclusively and the approximate target dates (by FY2025 for urban areas and by FY2030 for rural areas), etc. (published on December 17, 2020)
*2: Metropolitan Expressways: 34 locations (5 from March 2022, 29 from April 2022)
NEXCO: 5 locations (4 from March 2022, 1 from June 2022)
Hanshin Expressway: 5 locations (5 from March 2022)
*3: ETC card available for those without a credit card by depositing a certain deposit 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.

Promotion of next-generation ITS

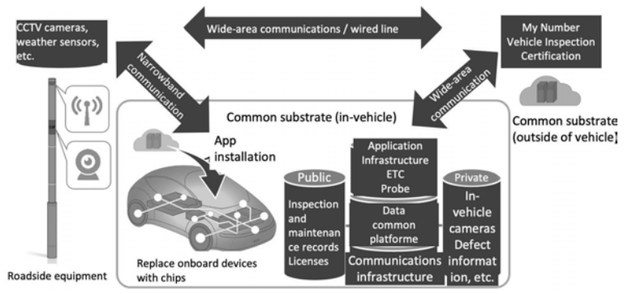
In anticipation of the era of autonomous driving, promote next-generation ITS by building an infrastructure that securely links data from inside and outside the vehicle in order to dramatically improve the safety and convenience of road users

Background / data

- Around 90% of new car sales are expected to be connected cars around 2035 (Ref. 1)
- Accelerating efforts to upgrade ITS overseas
  - Road-vehicle Cooperative ITS (C-ROADS) project is progressing across Europe, and vehicle data formats are being standardized (FMS standard) to improve logistics efficiency
  - China begins construction of roadside-to-vehicle cooperation system with 5G
  - Singapore is diversifying means of payment, including the use of debit cards for expressway tolls

Through discussions among industry, government, and academia, the services to be realized by next-generation ITS and the data and functional requirements for those services will be fleshed out, and the development of an infrastructure for linking data inside and outside of vehicles will be promoted

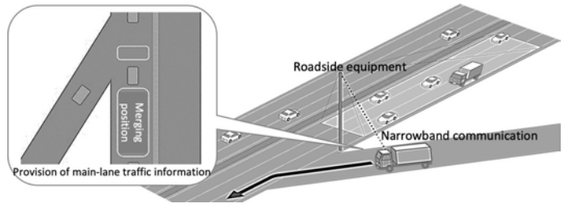
■Image of the data linkage infrastructure inside and outside the vehicle



Service image we aim to realize

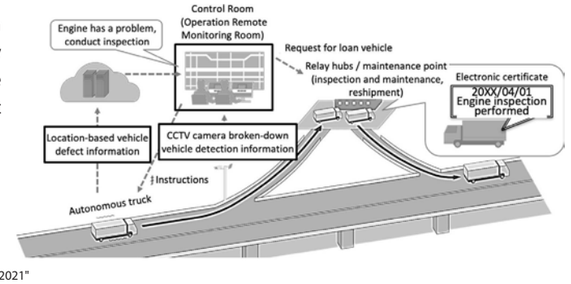
■Merging support at expressway interchanges using narrowband communications

By utilizing narrowband communication in the common infrastructure inside the vehicle, traffic information is collected from roadside equipment and provided to merging vehicles, providing information on entry speed and location to enable safe merging



■Autonomous truck operation management through public-private data collaboration using wide-area communications

Linking vehicle data owned by the private sector and data on logistics facilities along the road with facility data owned by road administrators through a common infrastructure outside the company using wide-area communications to realize fault monitoring and transshipment at relay points, etc.



Ref. 1: Fuji Keizai, "Future Outlook for Connected Car, V2X and Automated Driving Related Markets 2021"

Construction of xROAD (data platform) and its utilization in various fields

"xROAD," a road data platform, will be established to promote advanced road management, and some data will be made open to promote technological development and the utilization of data in various fields.

Background / data

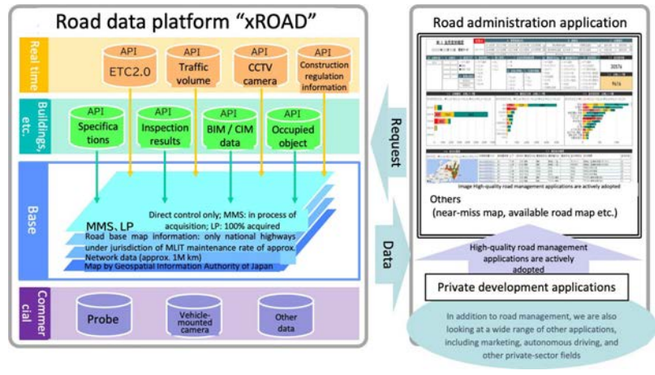
- Accumulated data on inspection and diagnosis of road facilities (about 730,000 bridges, 10,000 tunnels, and 40,000 road accessories)
- ETC2.0 on-board unit number approximately 8.62 million units (as of the end of November, 2022)
- Obtained 3D point cloud data of 19,000 km of national highways under jurisdiction of MLIT using mobile mapping system technology (MMS) (as of the end of March, 2022)

"xROAD," a road data platform that supports the management and utilization of information by promoting the creation of databases of various types of information collected and held by road administrators and linking these databases through APIs using map information and other data as a common platform

Develop applications that utilize data from traffic volume, ETC2.0, road facilities inspection results, and other sources to make road management and ICT traffic management more sophisticated and efficient

Partial release of data will promote open innovation and data utilization in a wide range of fields, including the private sector

■"xROAD" configuration (future image)



■Image of the development of applications using the database