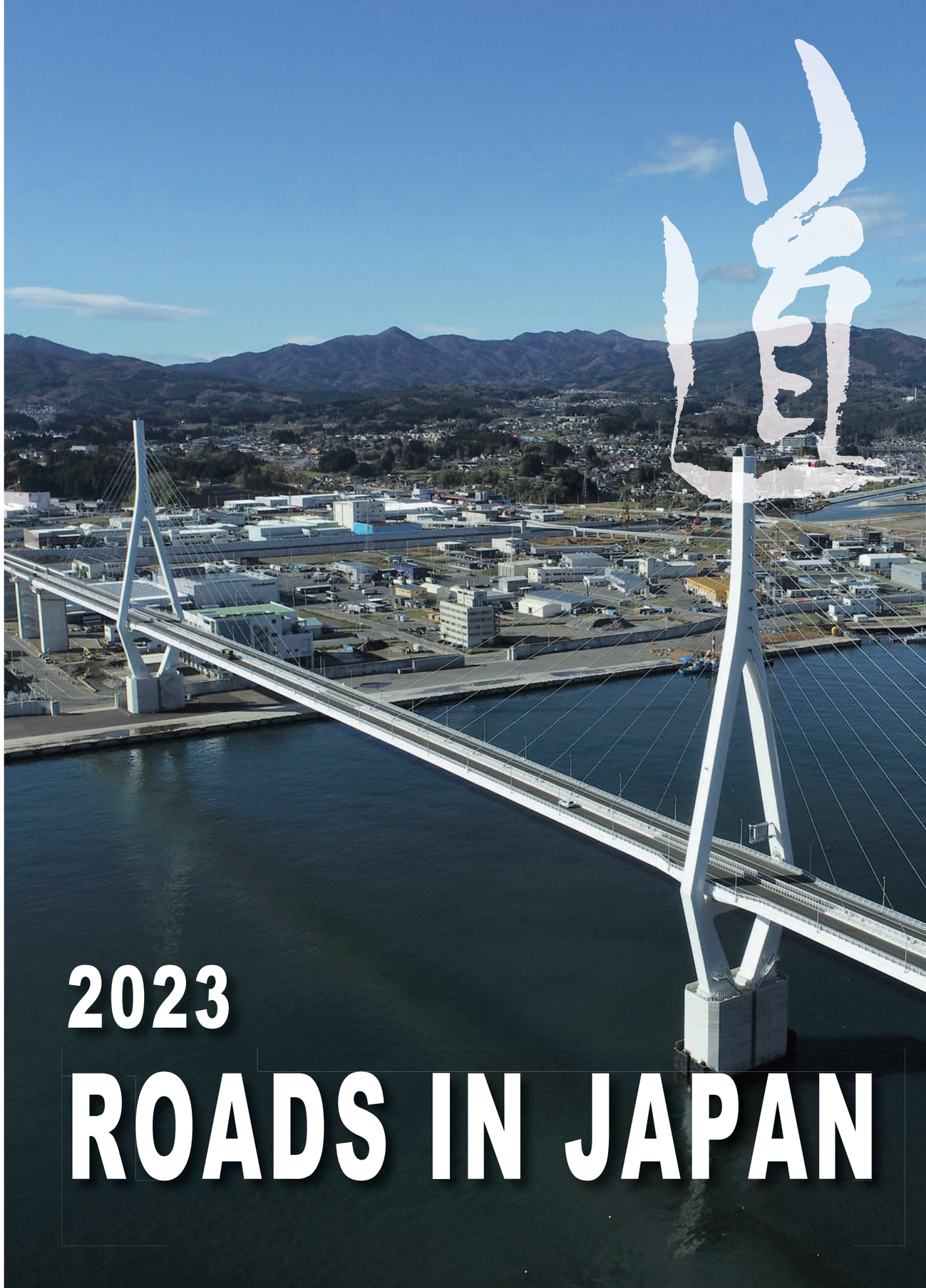


2023
ROADS IN JAPAN

Road Bureau
Ministry of Land, Infrastructure, Transport and Tourism

https://www.mlit.go.jp/road/road_e/index_e.html

2023

CONTENTS




Appendix

Cover photo：Kesennuma Bay Crossing Bridge
This is the only bridge that crosses the sea in the Sanriku Coastal Highway, which was constructed as a leading project for the reconstruction of the areas affected by the Great East Japan Earthquake. Of the 1,344m length of the bridge, the 680m cable-stayed section is the longest in the Tohoku region. In addition to its earthquake-proof, wind-resistant and durable performance using the latest technology, the bridge also has disaster prevention functions such as measures against ship collisions and the installation of evacuation stairs in the event of a tsunami.

Photographs provided by:
East Nippon Expressway Co., Ltd., Metropolitan Expressway Co., Ltd., Hanshin Expressway., Ltd., and Honshu-Shikoku Bridge Expressway Co., Ltd., unless otherwise indicated.

Chapter
1

Road Administration in Japan

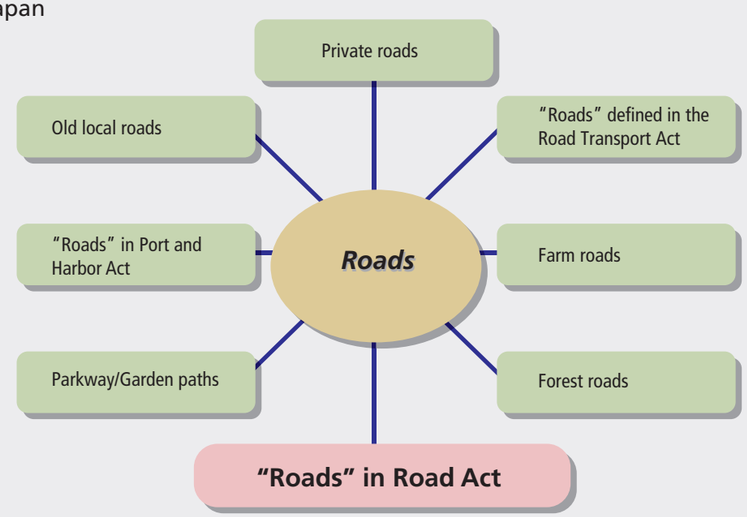
Types of Road

This chapter describes road types which are administrated differently by the national government, prefectural governments, municipal governments and expressway companies. It also explains how their development/improvement and maintenance/repair costs are secured along with the correlated governing acts.

Various types of roads in Japan

The Road Act of Japan classifies "Roads" into several categories; National Highways, National Expressways, Prefectural Roads and Municipal Roads. In addition to the roads defined by the Road Act, there are various roads such as private roads, farm roads and forest roads.

■Roads in Japan



What is a "Road" from a legal perspective?

A "road" is defined in the Road Act.
In this Act, a "road" is defined as a thoroughfare that is open to public use and is classified into the following types, under Article 3 Road Types:
1)National Expressways*1
2)National Highways*2
3)Prefectural Roads*3
4)Municipal Roads*4

■National Highway

National Highway Route 20

■National Expressway

Ichinomiya Interchange
On Meishin Expressway

Definition:
*1: National Expressways form the strategic traffic network for automobiles across the country and connect areas of political/economical/cultural importance or areas that are critical to national interest. (Article 4 of the National Expressway Act)
*2: Together with National Expressways, National Highways form the strategic road network for the nation and meet the legal requirements. (Article 5 of the Road Act)
*3: Prefectural Roads form the regional arterial road network and meet legal requirements (Article 7 of the Road Act)
*4: Municipal Roads serve as a road network within a municipal jurisdiction. (Article 8 of the Road Act)

Cost sharing of roads

Roads in Japan are classified into National Highways, National Expressways, Prefectural Roads and Municipal Roads depending on their road administators. The burden sharing for development/improvement and maintenance/repair activities is different based on this classification.

■Cost sharing in road development projects

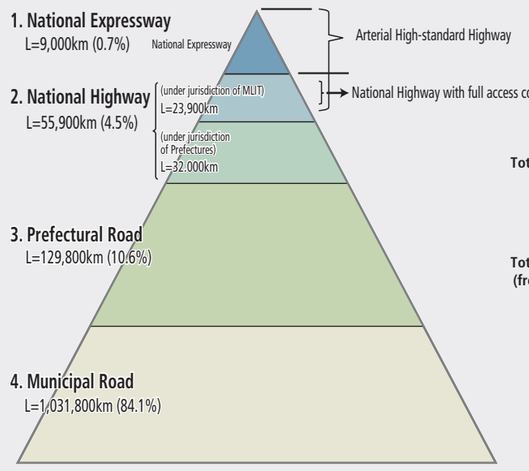
Road Type		Road Administrator	Cost is carried by	Cost Sharing	
				Development/improvement	Maintenance/repair
National Expressway	Toll	Minister*1 〔Article 6 of the National Expressway Act〕	Expressway Companies (NEXCOs)	Development, improvement and repair activities are carried out using a loan. The debt and management expense are repaid with toll revenue 〔Article 3 & 4 of the Act on Special Measures concerning Road Construction and Improvement〕	
	Under jurisdiction of MLIT		National Gov. Prefectures*2	National Gov : 3/4 Prefectural Gov*2 : 1/4 〔Article 20 of the National Expressway Act〕	National Gov : 10/10 〔Article 20 of the National Expressway Act〕
National Highway	Under jurisdiction of MLIT	<Development/improvement> Minister*1 〔Article 12 of the Road Act〕 <Maintenance, Repair and other management> Designated section : Minister*1 Other : Prefecture*2 〔Section 13 of the Road Act〕	National Gov. Prefectures*2	National Gov : 2/3 Prefectural Gov*2 : 1/3 〔Article 50 of the Road Act〕	National Gov : 10/10 〔Article 49 of the Road Act〕
	Under jurisdiction of Pref.*2		National Gov. Prefectures*2	National Gov : 1/2 Prefectural Gov*2 : 1/2 〔Article 50 of the Road Act〕	Maintenance*3 : Prefectural Gov*2 〔Article 49 of the Road Act〕 Repair : Can be subsidized up to 1/2 by National Gov 〔Article 56 of the Road Act〕
Prefectural Road		Prefecture*2 〔Article 12 and 13 of the Road Act〕	Prefectures*2	Can be subsidized up to 1/2 by National Gov 〔Article 56 of the Road Act〕	Maintenance*3 : Prefectural Gov*2 〔Article 49 of the Road Act〕 Repair : Can be subsidized 1/2 by National Gov 〔Article 1 of the Road Repair Act〕
Municipal Road		Municipality 〔Article 16 of the Road Act〕	Municipalities	Can be subsidized up to 1/2 by National Gov 〔Article 56 of the Road Act〕	Maintenance*3 : Municipalities 〔Article 49 of the Road Act〕 Repair : Can be subsidized 1/2 by National Gov 〔Article 1 of the Road Repair Act〕

*1 "Minister" refers to Minister of Land, Infrastructure, Transport and Tourism. *2 "Prefecture" includes ordinance-designated cities. *3 "Maintenance" includes repairs.
Note: Some national highways, prefectural roads, and municipal roads are maintained by Expressway Companies or Road Public Corporations.

Lengths and travels by road type

Expressways account for only 0.7% of the total road length, while they account for 12% of the total vehicle kilometers traveled (VKT) and play a significant role in road traffic.

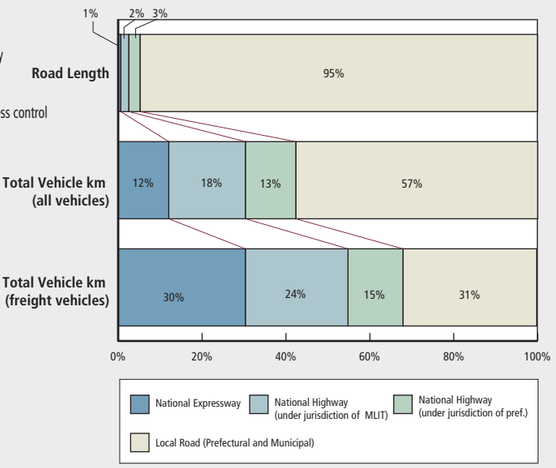
■Road classification and percentage of road length



Total Length = 1,226,500 km (100%)**

**Expressway as of April 1, 2021, Others as of April 1, 2019
Note: Each extension is rounded off to the nearest 100 km, so the total does not match the sum.

■Share of length and VKT by road type



The number of vehicle kilometers traveled is based on the National Survey of Road and Street Traffic Conditions for Fiscal Year 2015 and the Annual Report on Vehicle Fuel Consumption for Fiscal Year 2015.

Classification of arterial high-standard highway system

Arterial high-standard highways were created as a part of the rapid surface transport network across the country.
The total planned length is 14,000km

Classification of arterial high-standard highway system

[System]

Arterial High-standard Highway* (Total length : 14,000km)

National Expressway (Total length : 11,520km)	**National Highway with full access control** (Total length : 2,480km)

[Procedure]

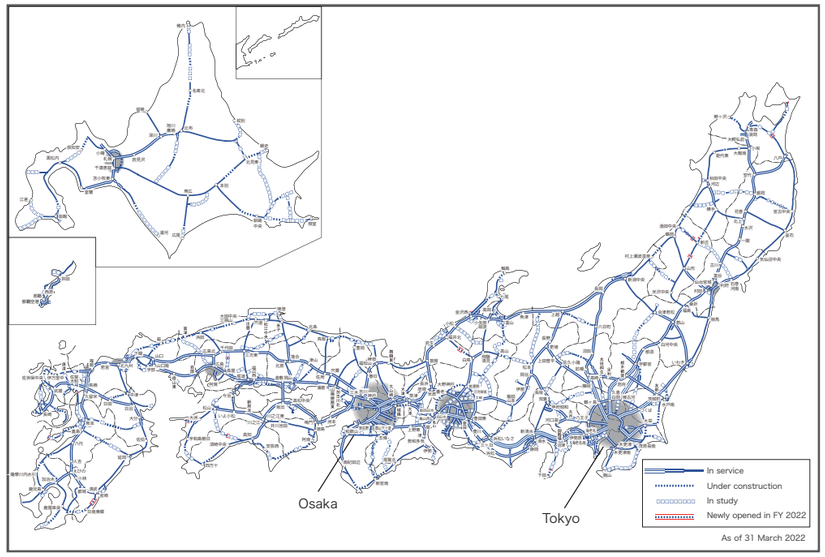
Proposed route	**Decision by Minister of Land, Infrastructure, Transport and Tourism**
Legally determined in the National Development Arterial Express Construction Act [11,520 km]	Master Plan [2,480 km]
Basic Plan	**Basic Plan**
Decided by the Minister of Land, Infrastructure, Transport and Tourism after a discussion in the National Development of Arterial Automobile Roads Panel	Decided by the Minister of Land, Infrastructure, Transport and Tourism after a discussion in the Panel on Infrastructure Development (March 2009)
Development Plan	**Development Plan**
Decided by the Minister of Land, Infrastructure, Transport and Tourism after a discussion in the National Development of Arterial Automobile Roads Panel	Decided by the Minister of Land, Infrastructure, Transport and Tourism after a discussion in the Panel on Infrastructure Development (March 2009)
Section that is under direct jurisdiction of national government	**Toll section**	**Toll rate based on the individual highway profitability Developed as both a public works project and a toll road project**
Difficult to make profitable Financed by national and local governments Toll-free	Distant-base toll system Throughout the nation Use a pool system, which integrates more than one road in the redemption calculation.	Projects mainly developed under the jurisdiction of the national government

* Planned as a strategic high-speed surface traffic network in "the Fifth Comprehensive National Development Plan" (decided by the Cabinet on June 30 1987 and "Grand Design of Japan for the 21st century" (decided by the Cabinet on Mar 31 1998).

Arterial high-standard highway network

Arterial high-standard highways, which consist mainly of expressways, have been developed throughout the country.

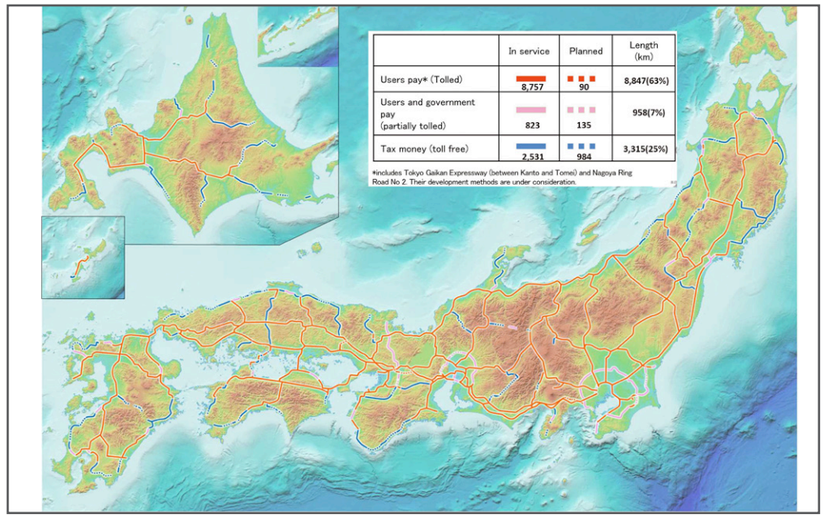
Arterial high-standard highway network



Cost sharing of arterial high-standard highways

As of May 2021,12,000 km of arterial high-standard highways are in service. There are two types of highways in Japan: one is tolled highways and the other free highways.
Red lines indicate tolled highways, while blue and pink ones indicate partly or fully financed by tax money because of insufficient profitability.

Arterial high-standard highway network cost-sharing



Toll road system in Japan

Rapid motorization accompanied by economic growth demanded networks of expressways and the government didn't have sufficient tax revenue to finance expressway development. That's why "Toll road system" was introduced. This system enables to repay the maintenance costs and construction debts of particular roads with the toll revenues that are collected from the road users.

Introduction to the toll road system in Japan

In response to the rapidly increasing traffic demand after World War II, immediate road development was necessary. However, additional financial resources were required , so a toll road system was developed.

A Toll Road System

In 1952, **the Act on Special Measures concerning Road Construction and Improvement was enacted.**
→ The toll road system was introduced on public roads across the country.
(Project proponent: National, prefectural or municipal governments act as a road administrator.)

In order to expand the current toll road system, as part of the measure to immediately develop roads across the country, an organization needs to be established so that private funds will be widely introduced and comprehensive, efficient operations will be carried out. As such, in 1955 the Road Council recommended the creation of the Japan Highway Public Corporation (JHPC, provisional name).

In 1956, **a full-fledged revision of the Act on Special Measures concerning Road Construction and Improvement Act on Japan Highway Public Corporation was enacted.**
In 1959, the Act on the Metropolitan Expressway Public Corporation was enacted.
In 1962, the Act on the Hanshin Expressway Public Corporation was enacted.
In 1970, the Act on the Honsyu-Shikoku Bridge Authority was enacted.

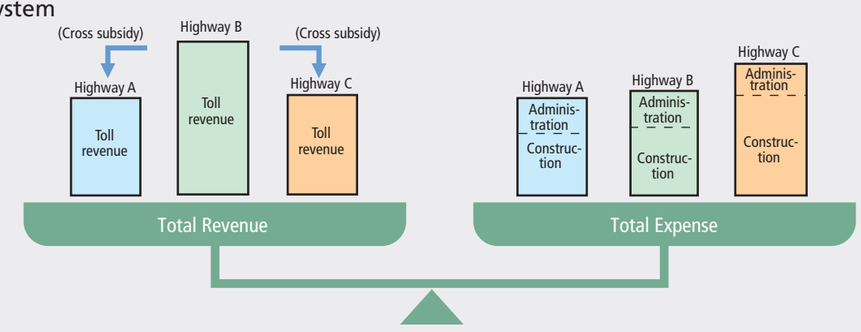
Pool system

After the partial opening of the Meishin Expressway in 1963, a 3,400km plan, based on individual profitability, was developed and formulated by March 1972. By that time, 8 expressways, about 710km had been developed, including the Tomei Expressway and Chuou Expressway.

1972 Road Council Recommendation

1) Expressways should create an arterial network, wherein they connect to each other throughout the country. Each link is not necessarily considered independent and, therefore, the toll rates should remain consistent and integrated.
2) Under circumstances where development costs are affected largely by changing land costs and construction costs that depend on the length of time needed for construction, cost differentiation due to the start time of projects should be avoided. In addition, debt repayment should be smoothly carried out. Shifting from the individual profitability system to a pool system seems to be the most effective method to combat the aforementioned problems and ensure reliability.

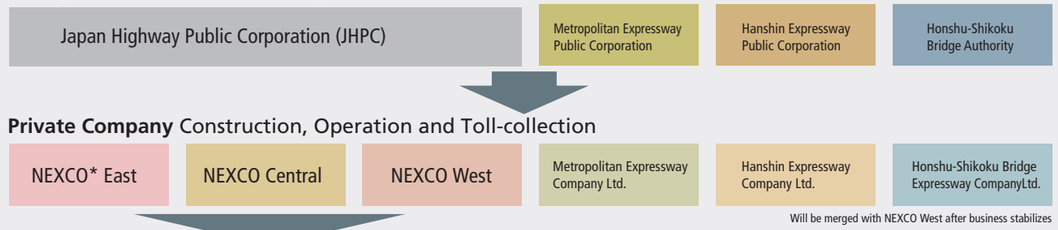
Pool system



Privatization of highway public corporation

-Secure the repayment of interest-bearing debts amounting to about 40 trillion JPY.
-Construct, without delay, genuinely needed expressways with minimum fiscal burden on the general public, while paying due respect to the autonomy of the Companies.
-Offer diverse and flexible prices and services for expressway users by utilizing the private sector's knowledge.

Organizational chart after privatization

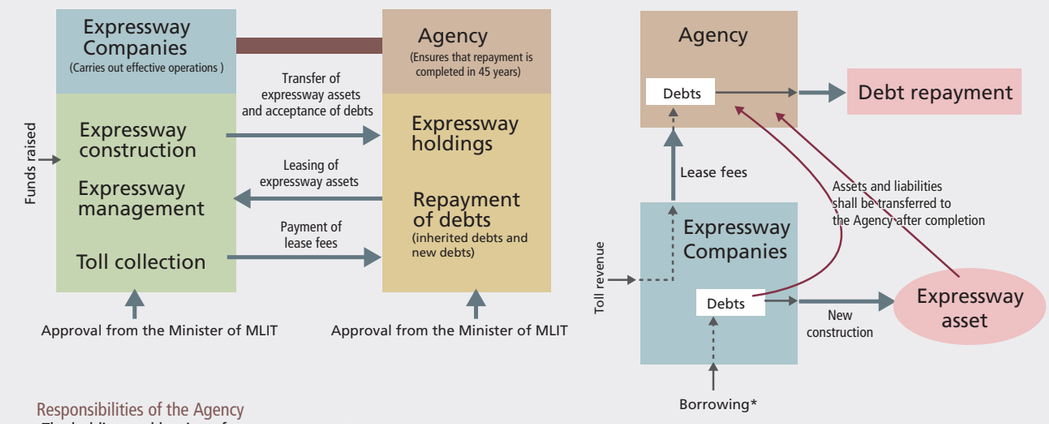


Privatization was based on the following acts
-Expressway Company Law
-Japan Expressway Holding and Debt Repayment Agency Law
-Law Regarding the Development of Highway-Related Laws in Connection with the Privatization of the Japan Highway Public Corporation
-Act for Enforcement of Acts Related to Privatization of the Japan Highway Public Corporation, etc.
*NEXCO: Nippon Expressway Company

Business scheme

-Expressway Companies are responsible for the construction of new roads which are funded through loans, before transferring the expressway assets and the corresponding debts to the responsible Agency.
-The Agency is then responsible for completing the repayment of debts within 45 years, using the revenue earned from the roads.
-In 2014, the law was amended to extend the toll period for motorways by 15 years, from 2050 to 2065, and the toll revenue from the extended 15 years will be used for major renewal and repair projects.

Business scheme



Responsibilities of the Agency
-The holding and leasing of expressway assets
(property tax is exempted based on the premise of free service in the future)
-To ensure early repayment of the debts and thus reduce the public's burden
-To support expressway companies in carrying out their business successfully

*borrowed from both national and local governments for construction (and this money is loaned to the companies at no interest)

Administrative Organization

The Ministry of Land, Infrastructure, Transport and Tourism (MLIT) is in charge of the comprehensive and systematical use of national land, development and conservation, consistent infrastructure development, implementation of transport policies, development of meteorological service, and maritime safety and security. Below is the chart showing the organization of the MLIT.

Organization Chart of MLIT

(As of April 1, 2021)

Ministry of Land, Infrastructure, Transport and Tourism

- Minister of Land, Infrastructure, Transport and Tourism
- State Minister of Land, Infrastructure, Transport and Tourism (2)
- Parliamentary Vice-Minister of Land, Infrastructure , Transport and Tourism (3)
- Special Advisor to the Minister of Land, Infrastructure, Transport and Tourism
- Administrative Vice Minister of Land, Infrastructure , Transport and Tourism
- Vice-Minister for Engineering Affairs, Ministry of Land, Infrastructure, Transport and Tourism
- Vice-Minister for Transport and Tourism, Ministry of Land, Infrastructure, Transport and Tourism
  Vice-Minister for Land, Infrastructure and Hokkaido Development, Ministry of Land, Infrastructure, Transport and Tourism
  Vice-Minister for International Affairs, Ministry of Land, Infrastructure, Transport and Tourism
- Private Secretary to the Minister of Land, Infrastructure, Transport and Tourism

(Organs such as Facilities)
- Policy Research Institute for Land, Infrastructure, Transport and Tourism
- National Institute for Land and Infrastructure Management
- College of Land, Infrastructure, Transport and Tourism
- Aeronautical Safety College

(Extraordinary Organs)
- Geospatial Information Authority of Japan
- Ogasawara General Office
- Bicycle Utilization Promotion Headquarters
- Japan Marine Accident Tribunal

(Local Branch Bureaus and Departments)
- Regional Development Bureau
- Hokkaido Regional Development Bureau
- District Transport Bureau
- Regional Civil Aviation Bureau
- Air Traffic Control Center

(External Organs)
- Japan Tourism Agency
- Japan Meteorological Agency
- Japan Transport Safety Board
- Japan Coast Guard

(Councils)
- National Land Council
- Council for Infrastructure
- Council for Transport Policy
- Transport Council
- Geospatial Information Authority of Japan
- Central Construction Disputes Committee
- Central Council for Construction Business
- Japan Marine Accident Tribunal
- Council for Construction of Arterial Motorways for National Development
- The Central Review Council for Kenchikushi
- Amami Islands Promotion and Development Council
- Ogasawara Islands Promotion and Development Council

Minister's Secretariat
- Deputy Vice-Minister
- Deputy Vice-Minister for Policy Coordination (2)
- Deputy Minister for Technical Affairs
- Deputy Minister for Evidence based Policymaking
- Deputy Minister for Public Transportand Logistics Policy
- Deputy Minister for Land Policy
- Deputy Director General for Policy Evaluation
- Deputy Director General for Policy Evaluation
- Deputy Vice-Minister for Security and Transport Safety Policy
- Deputy Minister for International Projects
- Chief Record Officer
- Deputy Director-General for Policy Evaluation
- Deputy Vice Minister for Cyber Security and Information
- Assistant Vice-Minister (25)
- Assistant Vice-Minister for Engineering Affairs (5)
- Counsellor (16)
- Deputy Director-General for Engineering Affairs (2)
- Personnel Division
- General Affairs Division
- Public Relations Division
- Budget and Accounts Division
- Local Affairs Division
- Welfare Division
- Engineering Affairs Division
- Inspector-General
- Director for Security Policy
- Director for Transport Safety
- Government Buildings Department
  - Director-General
  - Administration Division
  - Planning Division
  - Architecture and Building Engineering Division
  - Building Equipment and Environment Division

Policy Bureau
- Director-General
- Vice-Director-General
- General Affairs Division
- Policy Division
- Infrastructure Policy Division
- Policy Division for Universal Design
- Environmental Policy Division
- Ocean Policy Division
- Transport Policy Division
- Regional Transport Division
- New Mobility Service Division
- Logistics Policy Division
- Policy Planning and Coordination Division for Public Works Project
- Technology Policy Division
- International Policy Division
- Overseas Project Division
- Information Policy Division
- Ministerial Informatization Division
- Public Transport Policy Department
  - Director-General
  - Transport Planning Division
  - Public Transport Support Division
  - Director for Comprehensive Transport Policy

National Spatial Planning and Regional Policy Bureau
- Director-General
- General Affairs Division
- National Planning Division
- Regional Policy Division
- National Land Information Division
- Regional Development Division
- Remote Islands Development Division
- Director for Planning (2)
- Director for Special Areas Development

Real Estate and Construction Economy Bureau
- Director-General
- Vice-Director-General
- General Affairs Division
- International Markets Division
- Information Utilization Division
- Land Policy Division
- Land Price Research Division
- Cadastral Promotion Division
- Real Estate Industry Division
- Real Estate Market Division
- Construction Industry Division
- Construction Market Division
- Counsellor

City Bureau
- Director-General
- General Affairs Division
- Urban Policy Division
- Urban-Safety Affairs Division
- Urban Renewal Promotion Division
- City Planning Division
- Urban Development and Improvement Division
- Urban Transport Facilities Division
- Parks, Green Spaces and Landscape Division

Water and Disaster Management Bureau
- Director-General
- Deputy Director-General
- General Affairs Division
- Water Administration Division
- River Planning Division
- River Environment Division
- River Improvement and Management Division
- Disaster Prevention and Relief Division
- Water Resources Department
  - Director-General
  - Water Resources Policy Division
  - Water Resources Planning Division
- Sewerage and Wastewater Management Department
  - Director-General
  - Sewerage Planning Division
  - Sewerage Works Division
  - Director for Watershed Management
- Sabo (Erosion and Sediment Control) Department
  - Director-General
  - Sabo (Erosion and Sediment Control) Planning Division
  - Land Conservation Division

Road Bureau
- Director-General
- Vice-Director-General
- General Affairs Division
- Road Administration Division
- Road Traffic Control Division
- Planning Division
- National Highway and Engineering Division
- Environment, Safety and Risk Management Division
- Expressway Division
- Counsellor

Housing Bureau
- Director-General
- General Affairs Division
- Housing Policy Division
- Housing Development Division
- Residence Support Division
- Housing Production Division
- Building Guidance Division
- Urban Building Division

Railway Bureau
- Director-General
- Senior Deputy Director-General
- General Affairs Division
- Trunk Railway Division
- Urban Railway Division
- Railwy Industries Division
- International Policy and Projec Division
- Engineering Planning Division
- Facilities Division
- Safety Administrator

Road Transport Bureau
- Director-General
- Senior Deputy Director-General
- General Affairs Division
- Safety Policy Division
- Environmental Policy Division
- Engineering Policy Division
- Registration and Information Division
- Passenger Transport Division
- Cargo Transport Division
- Type Approval and Recall Division
- Maintenance Service Division

Maritime Bureau
- Director-General
- Senior Deputy Director-General
- General Affairs Division
- Safety Policy Division
- Ocean Development and Environment Policy Division
- Seafarers Policy Division
- International Shipping Division
- Coastal Shipping Division
- Shipbuilding and Ship Machinery Division
- Inspection and Measurement Division
- Seafarers License and Education Division

Ports and Harbours Bureau
- Director-General
- General Affairs Division
- Port Management and Operation Division
- Planning Division
- Industrial Port Policy Division
- Engineering Planning Division
- Ocean and Environmental Policy Division
- Coastal Administration and Disaster Management Division

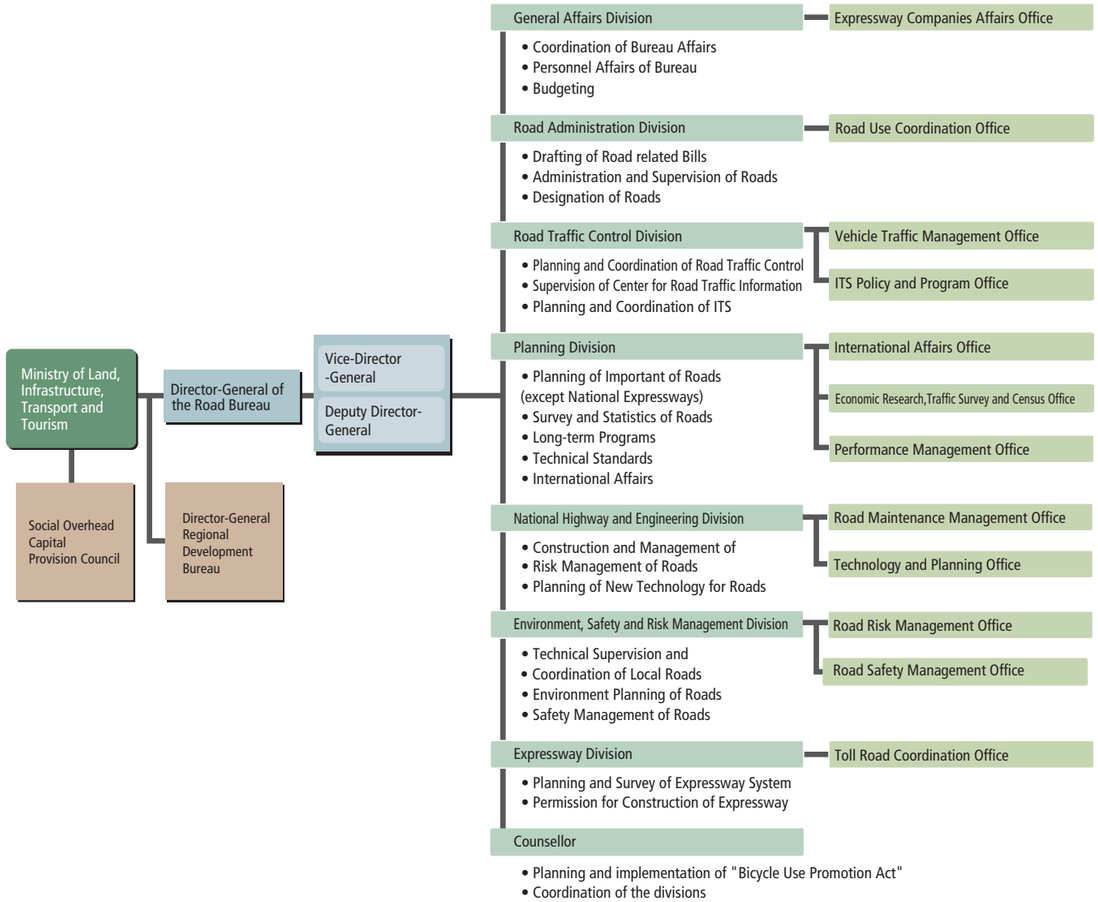
Civil Aviation Bureau
- Director-General
- Senior Deputy Director-General
- General Affairs Division
- Aviation Network Department
  - Director-General
  - Planning Division
  - International Air Transport Division
  - Aviation Industries Division
  - Airport Planning Division
  - Airport Engineering Division
  - Capital Area Airports Division
- Aviation Safety and Security Department
  - Director-General
  - Aviation Safety and Security Planning Division
  - Flight Standards Division
  - Airworthiness Division
- Air Navigation Services Department
  - Director-General
  - Air Navigation Services Planning Division
  - Air Traffic Control Division
  - Operations and Flight Inspection Division
  - Air Navigation Services Engineering Division

Hokkaido Bureau
- Director-General
- General Affairs Division
- Budget Division
- Road, City and Housing Administration Division
- Water Administration Division
- Port and Harbor Administration Division
- Agriculture, Forestry and Fishery Division
- Counsellor

Director-General for Policy Planning
- Director for Policy Evaluation

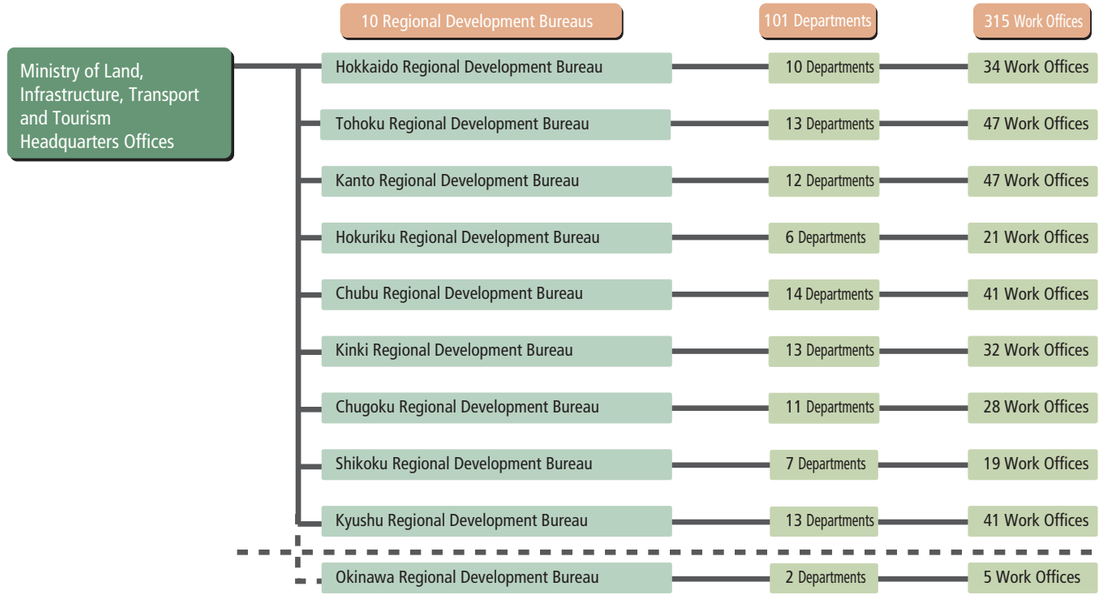
Director-General for International Affairs

Organization Chart of Road Bureau



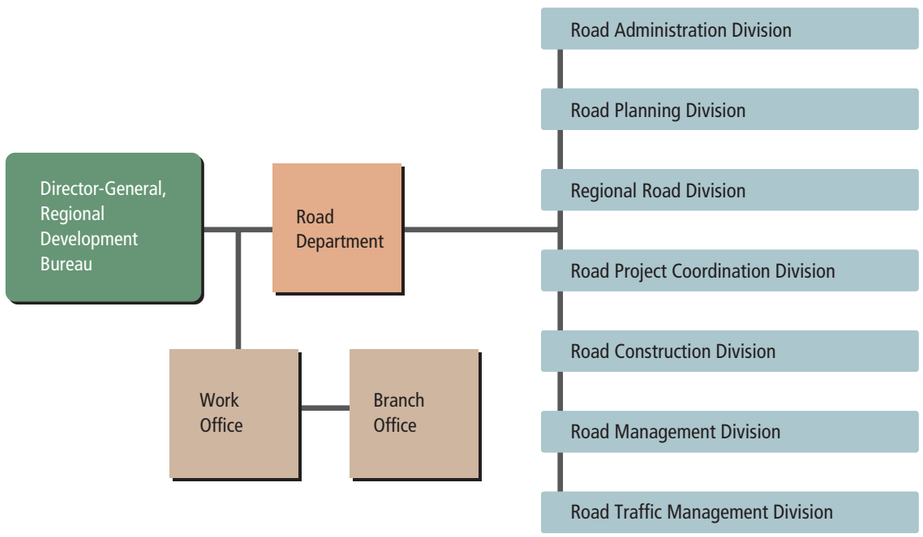
As of April 1, 2018

Regional Development Bureaus



As of April 1,2021

Organization Chart of a Regional Development Bureau



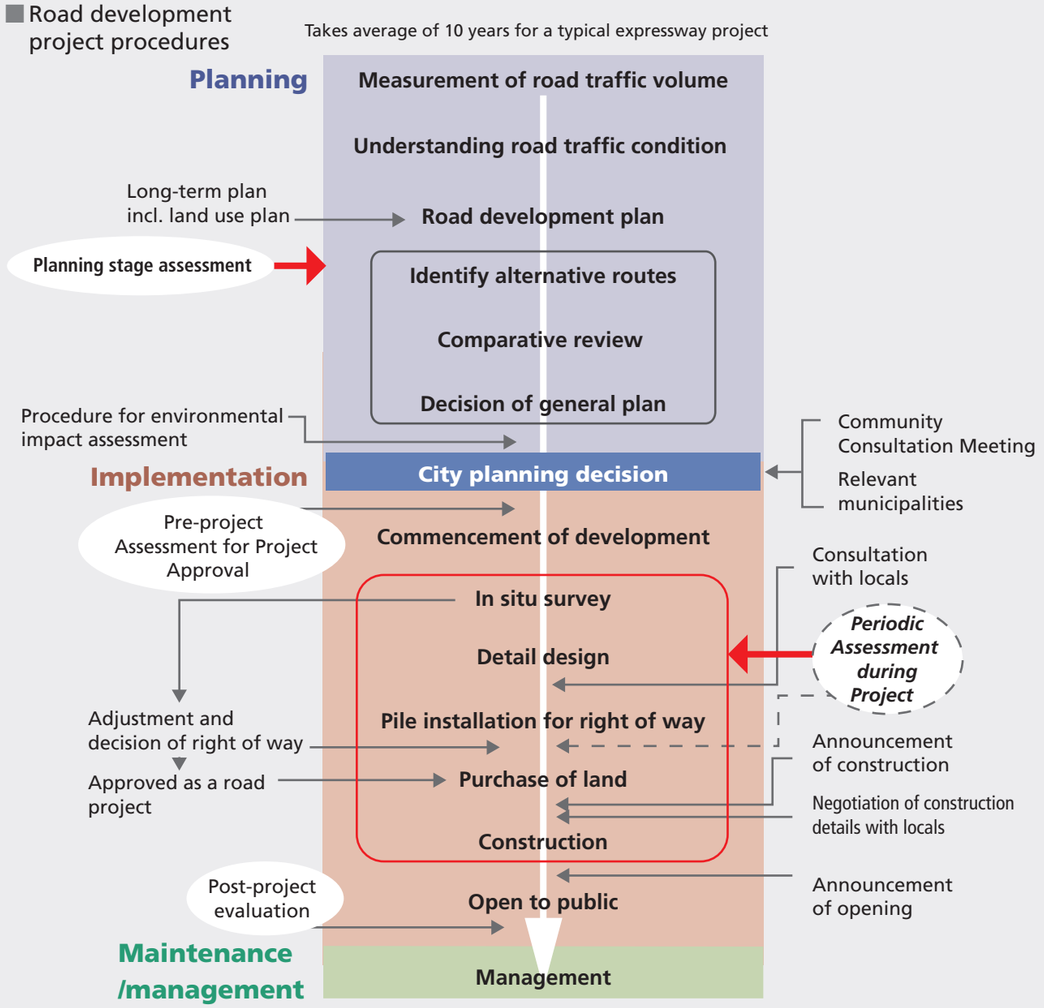
Planning and Implementation of Projects

This section describes how road projects are evaluated in order to achieve accountability

Implementation of an evaluation system

To improve efficiency and transparency, project evaluation is conducted throughout the entire process, from preparation to execution and servicing. The first evaluation is conducted while planning a new project and involves cost-benefit analysis. Projects that are not complete within five years of their start date are reassessed, and those that are found to be no longer necessary or no longer effective are discontinued or cancelled. Projects are also assessed when they are completed.
In order to evaluate the sustainability of a project, the economic, environmental and social effects of the projects should be assessed. Economic and environmental impacts are assessed through cost-benefit analyses and environmental assessments respectively.

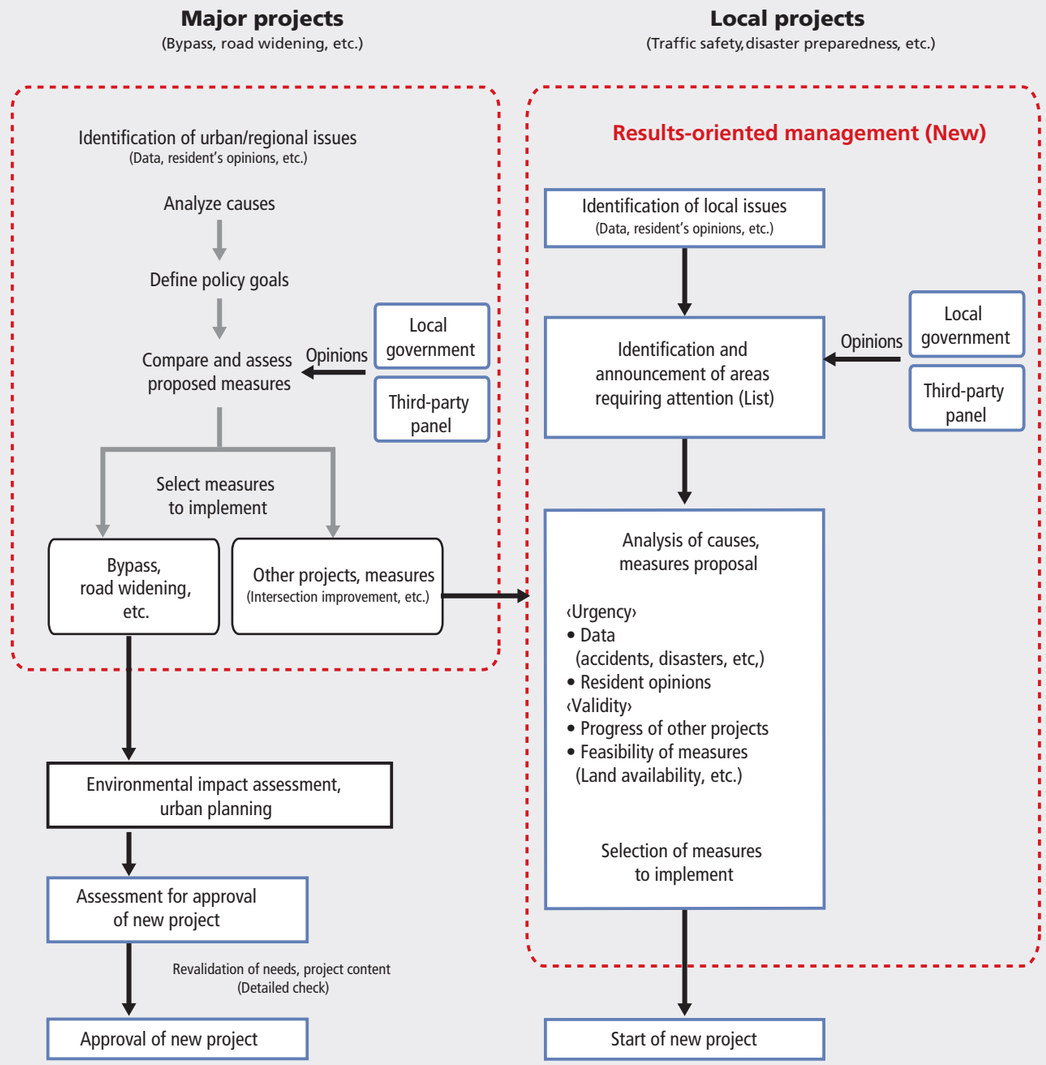
■ Road development project procedures



Assessment of policy goals for road projects

To enhance the transparency and efficiency of road projects, reviews have been introduced into the planning stage of bypass, road widening and other projects, and "outcome-based management" practices, which are based on data, have been introduced in local projects.

■ Planning review and outcome-based management flowchart



Road development planning

Roads in Japan are generally developed through the following procedure to make sure to choose the optimal route.

■Road development planning

Measurement of road traffic volume
Covers vehicles, bicycles and pedestrians for the purposes of;
(1) Traffic volume (2) Origin and destination
(3) Condition of road development

↓

Assessment of road and traffic condition
Assess the current condition such as traffic volume and traffic safety of the existing roads.

↓

Road development plan
Determine the road type and plan the fundamental design (number of lanes and cross-section)

↓

(1)
Identify alternative routes
Identify multiple routes for comparison in the light of the plan.

↓

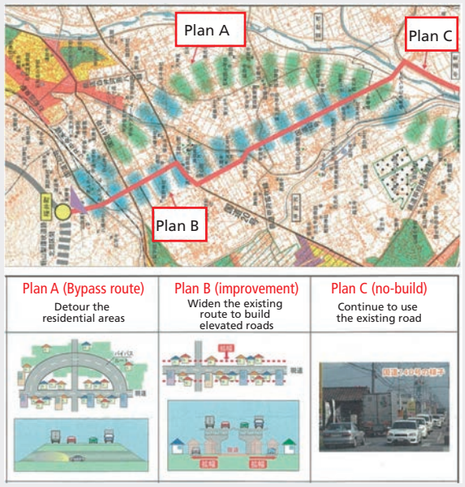
Comparative review
Make a comparison with other routes with respect to nature, structure, care for control-points* and economy before deciding the optimal route.

↓

(2) **Decision of general plan**

*Control-point: a spot where a route should avoid because of its societal condition such as shrines and temples or landslide-prone areas.

(1)



Comparison

(2)

Road development process

After a city planning decision was made, roads are developed taking the following steps while making sure to build the consensus of the local residents.

■ Implementation of road projects

City planning decision

↓

Commencement of development

↓

Community Consultation Meeting — Explain measurement to the parties involved

(1)
In situ survey — Install piles for center mark during the land survey
Detail design — Designed based on the survey data (S=1/1,000)

↓

Consultation with locals — Explanation of details to the parties involved using the design together with indemnity for land loss.

(2)
Pile installation for right of way — Install piles to mark right of way
Measurement of lands — Measurement of properties, both lands and buildings (owners are asked to be present to confirm measurements)
Land acquisition negotiation — Negotiation with the parties involved on the indemnity for land loss
— Payment of indemnity for land loss following conclusion of agreement
Explanation of construction plan — Explanation of the construction methods and construction safety to the parties involved

* Further survey of buried cultural properties is to be conducted as necessary

↓

Construction

↓

Completion/open to public

↓

Maintenance/ management

(1)

Measurements of centerline, horizontal/vertical profiles and geological are carried out.

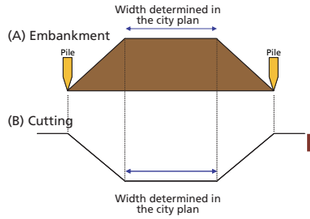
(2)

Land measurement/survey is carried out after explanation to the owners.

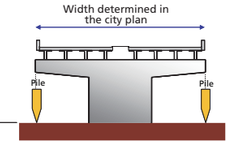
Negotiation of compensation is conducted.

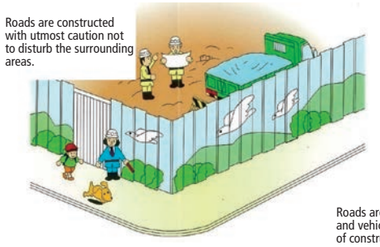
【Pile installation】

(1) Structures at grade

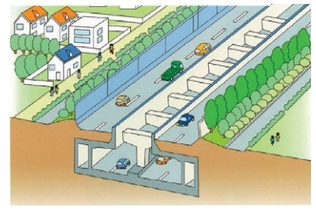


(2) Elevated structures





Roads are open to pedestrians and vehicles after completion of construction.



Environmental impact assessment (EIA)

An assessment system in which a project proponent identifies/predicts/evaluates the potential impacts of the project on the environment prior to the decision being made on the details. In order to create an improved project, this collected information is available to the public and municipalities so that they can add their input.

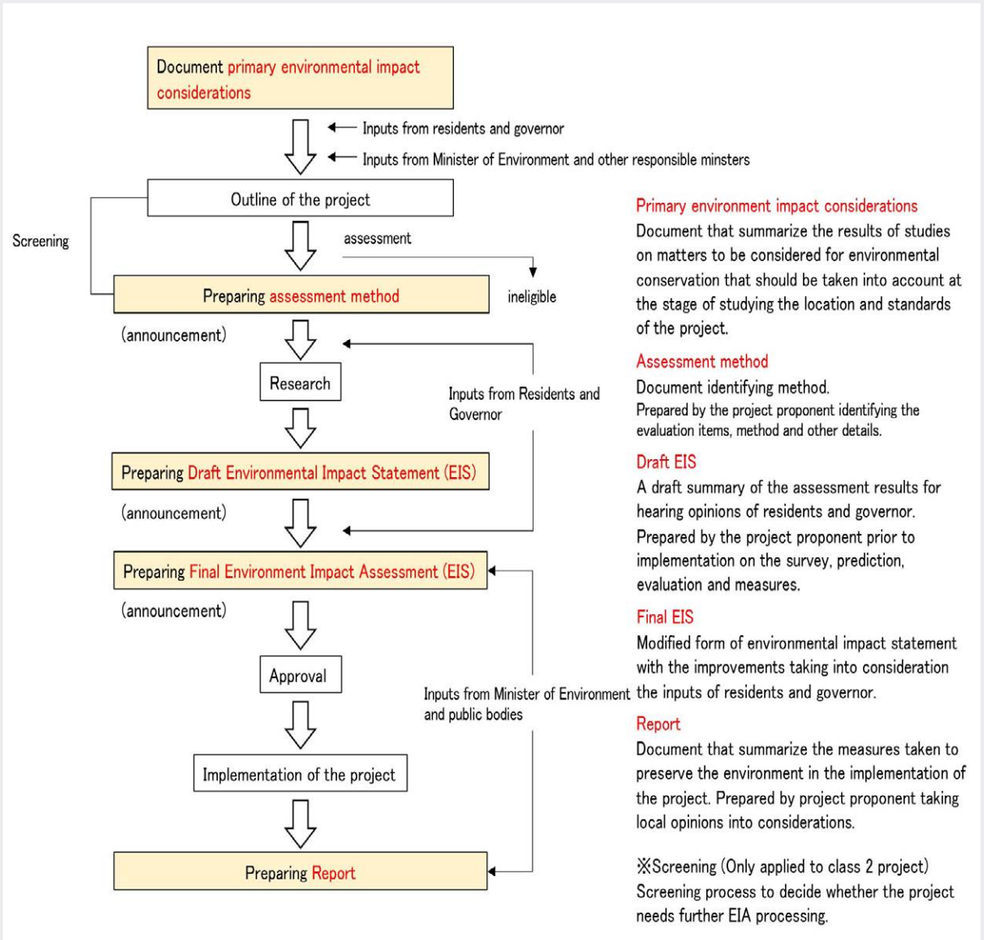
■Road projects that have to be assessed

	Class 1	Class 2
National Expressway	All	————
Tokyo Metropolitan Expressway	4 lanes or more	————
National Highway	4 lanes or more,10km or longer	7.5km-10km

Class 1
A large-sized project with potentially significant environmental impacts.

Class 2
A large-sized project that requires an assessment to determine whether it has significant environmental impacts. A large-sized project that requires an assessment to determine whether it could have significant environmental impacts.

■Road projects that need to be assessed



Primary environment impact considerations
Document that summarize the results of studies on matters to be considered for environmental conservation that should be taken into account at the stage of studying the location and standards of the project.

Assessment method
Document identifying method.
Prepared by the project proponent identifying the evaluation items, method and other details.

Draft EIS
A draft summary of the assessment results for hearing opinions of residents and governor.
Prepared by the project proponent prior to implementation on the survey, prediction, evaluation and measures.

Final EIS
Modified form of environmental impact statement with the improvements taking into consideration the inputs of residents and governor.

Report
Document that summarize the measures taken to preserve the environment in the implementation of the project. Prepared by project proponent taking local opinions into considerations.

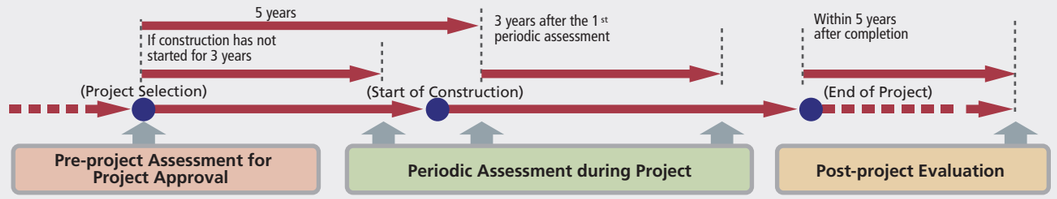
※Screening (Only applied to class 2 project)
Screening process to decide whether the project needs further EIA processing.

Road project assessment

Road project assessment is carried out at various phases of the project; assessment at planning phase, pre-project assessment phase, during project and post-project phase.

■Road project assessment

•Target of the project assessment : New development or improvement
•Evaluation proponent : Project proponent (MLIT, municipalities or the kind)



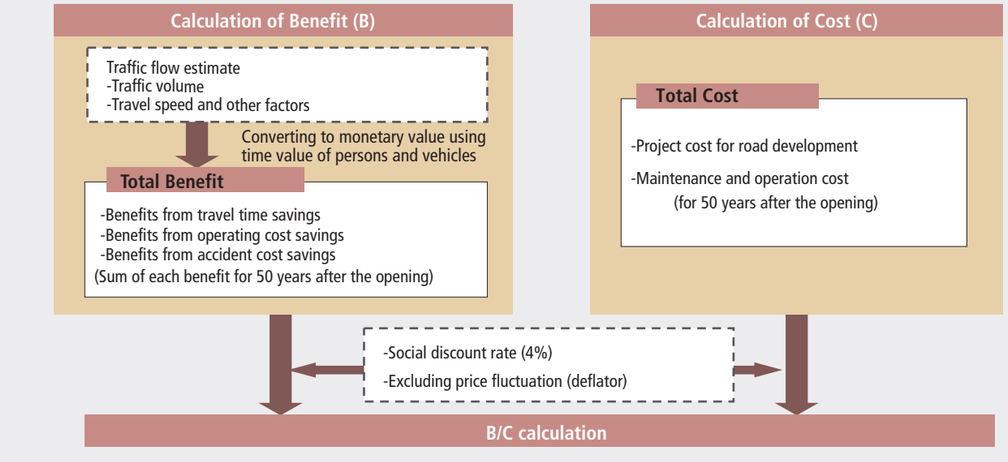
1) Pre-project assessment for project approval Project assessment including a cost-benefit analysis is conducted when approving a new project. **This procedure was introduced in FY 1998.**	Total : 1,067projects (FY2020 : 45projects)
2) Periodic assessment during project When a project has not started for 3 years after approval or when a project is still in progress for 5 years, another assessment will be conducted and any necessary improvements will be made. If the continuation of the project is found to be inappropriate, it will be abandoned. **This procedure was introduced in FY 1998.**	Total : 5,615projects (FY2020 : 187projects)
3) Post-project evaluation Post-Project evaluation is carried out in order to confirm its effectiveness and environmental impacts. As necessary, improvements and appropriate planning and researching for similar projects are examined. **This procedure was introduced in FY 2003.**	Total : 596projects (FY2020 : 33projects)

Oversight of the third person — Independent Committee on Oversight of Project Evaluation is formed by each local office and public body for Periodic Assessment during Project and Postproject Evaluation

Cost-benefit analysis of a road project

Cost-benefit (B/C ratio) analysis for road project is made to assess adequacy of the project from the social and economic aspects.

■Cost-benefit (B/C Ratio) calculation



Benefits

Travel time savings

Time values of human activities, vehicle user and freight are considered.

Travel time savings

Measured as a difference in the value of travel time before and after a new road is opened.

Benefits from travel time savings = (Value of travel time Before the road is opened)-(Value of travel time After the road is opened)

The value of travel time is a product of the time value unit multiplied by travel time and by volume.

Value of travel time (yen) = time value unit (yen/vehicle-minutes) x travel time (min) x traffic volume (vehicles)

What consists of the time value unit?

Time value unit

The monetary value of one minute that is saved by one vehicle. (Unit: yen/vehicle-minutes)

- **Time value of *human activities***
  (Monetary) value of time savings that can be used for extra human activities such as labor and leisure.
- **Time value of *vehicle use***
  (Monetary) value of time savings that can be used for extra production activities by unused vehicle.
- **Time value of *freight***
  (Monetary) value of time savings from reduced travel time of freight

Operating cost savings

Costs for fuel, engine oil, tire and tube, maintenance and depreciation are considered.

Operating cost savings

Measured as a difference in operating cost before and after a road is opened.

Benefits from operating cost savings = (Operating costs Before the road is opened)-(Operating costs After the road is opened)

The operating cost is calculated by multiplying the operating cost unit by length and by traffic volume.

Operating cost (yen) = operating cost unit (yen/vehicle-km) x length (km) x traffic volume (vehicles)

What consists of the operating cost unit?

Operating cost unit

Fuel cost	Costs for fuel
Engine oil cost	Cost for engine oil
Costs for tire and tube	Costs for tire and other
Maintenance cost	Costs for maintenance and repair
Depreciation	Reduction of vehicle value after travelling a unit distance.

Accident cost savings

Congestion-induced cost, physical damage and human damage are considered.

Accident cost savings

Measured as a difference in accident cost before and after a road is opened.

Benefits from accident cost savings = (Accident costs Before the road is opened)-(Accident costs After the road is opened)

The accident cost is calculated by multiplying the cost per injury/fatal accident by the number of injury/fatal accidents.

Accident cost (yen) = number of injury/fatal accident (accidents) x cost per injury/fatal accident (yen/accident)

Formula for cost per injury/fatal accident

Injury/fatal accident rate x **Traffic volume** x **Road segment length or number of major intersections**

Formula for cost per injury/fatal accident

Per-accident cost due to congestion
+
Per-accident property damage
+
Per-accident human damage

Administrative Management

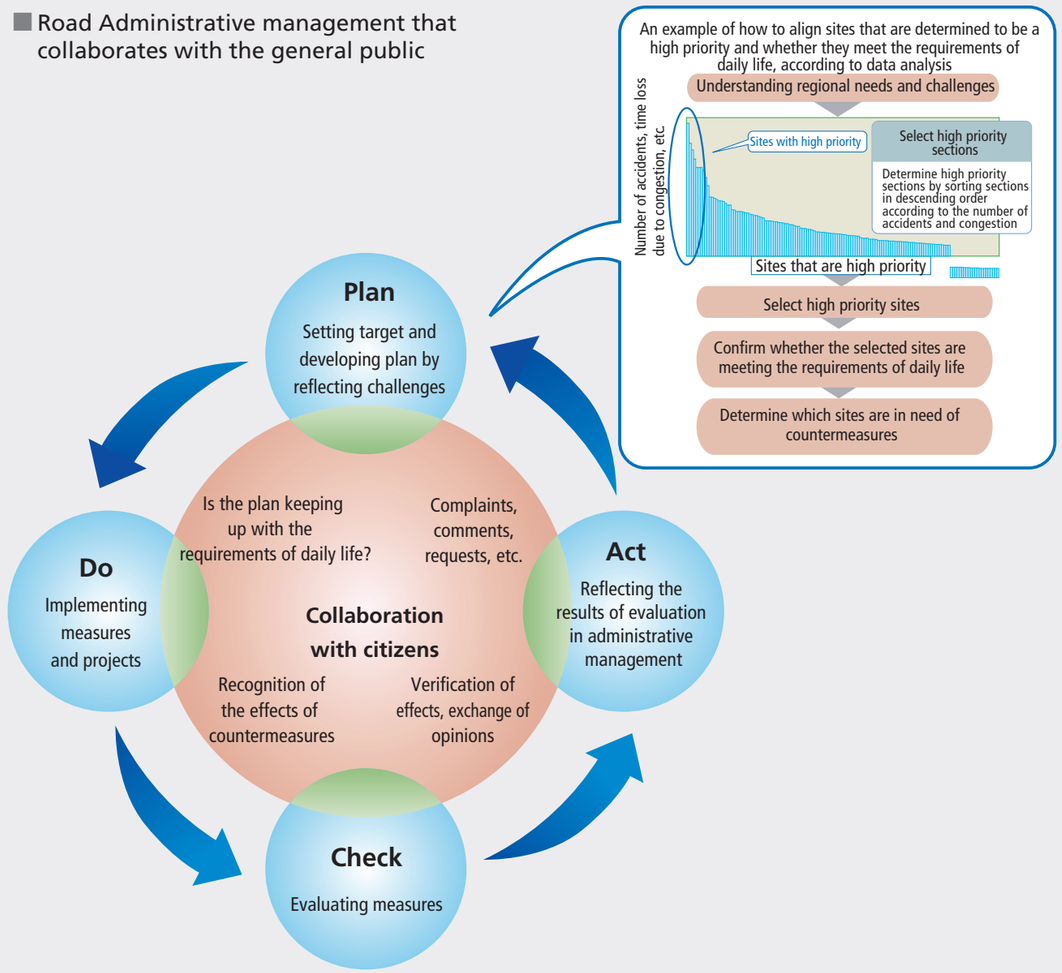
Together with regional public corporations, NPOs and other citizens' groups, the Japanese government is currently putting its efforts toward enhancing administrative management for roads. In order to achieve more effective, efficient and transparent road administration, Japan has promoted result-oriented administrative management for roads.

Establishing a well-organized evaluation system

Currently, road administrative management is conducted according to the PDCA cycle (PLAN-DO-CHECK-ACT cycle), whereby: policy goals are determined by using performance (outcome) indicators (PLAN); policy measures and projects are executed (DO); results are analyzed and achievements are evaluated (CHECK); and the results are reflected in subsequent administrative activities (ACT).

To effectively implement each project, data analysis is conducted on each policy issue. This allows for the clear identification of sites and sections that are in particular need of substantial countermeasures. Road administration becomes more effective, efficient and transparent when the general public is consulted at each stage of the PDCA cycle. For example, regional needs and challenges can be better understood and confirmed when input from the public is solicited about which sites to select.

Road Administrative management that collaborates with the general public



Priority objectives in Road sector

Every five years, the Government establishes the Priority Plan for Infrastructure Development. This plan contains priority objectives for the road sector and indices to measure the achievement of these objectives.

■ Key Performance Indicators (KPI) used in the Priority Plan for Infrastructure Development 2021-2025

Road Data Book 2021

Priority Objectives	Policy Packages	Index	Initial Value	Target Value for FY2025
1. Achieving a society where disaster prevention and mitigation is are mainstream issues	1-1 Promotion of river basin management where effects of climate changes are considered	Required measures to protect bridges and buildings facing rivers along the emergency transport roads	0% (FY2019)	Approx. 28%
		Development rate of locations for which measures are required on slopes and banks along emergency transport roads	Approx. 55% (FY2019)	Approx. 73%
	1-2. Mitigating risks of disasters that can occur at any time, including earthquakes, tsunami, etc.	Rate of reinforcement work for bridges located on emergency transportation roads	79%(FY2019)	84%
	1-3. Securing transport function when a disaster occurs	Start rate of four-lane conversion projects on high-standard (toll) roads in priority development sections	Approx. 13% (FY2019)	Approx. 47%
		Rate of improvement for missing links on high-standard roads (*)	0% (FY2019)	Approx. 30%
		Rate of reinforcement work for bridges on emergency transportation roads	79%(FY2019)	84%
		Start rate of utility pole removal on emergency transportation roads in urban areas, etc. where the risk of utility pole collapse exists	Approx. 38% (FY2019)	Approx. 52%
		Development rate for locations where measures are required on slopes and banks along emergency transport roads	Approx. 55% (FY2019)	Approx. 73%
	1-4. Promoting crisis management measures based on the risk of disasters	Improvement rate of evacuation facilities which require the use of elevated sections of directly-controlled national highways as emergency evacuation sites	Approx. 27% (FY2019)	100%
		BCP formulation rate at Roadside Rest Areas positioned in the regional disaster prevention plan.	3% (FY2019)	100%
2. Sustainable maintenance of infrastructure	2-1. Promoting planned maintenance of infrastructure	Roads (bridges, pavement): The rate of repair measures for bridges on roads managed by local governments that require urgent or early maintenance and the rate of pavement repair on roads important for disaster prevention	(Bridges) approx. 34% (Pavement) 0% (FY2019)	(Bridges) approx. 34% (Pavement) 0%
		Number of people trained in maintenance and management in local governments, etc. (roads)	6,459 (FY2019)	10,000
	2-2. Sophistication and efficiency improvement of infrastructure maintenance by using new technologies	Percentage of local governments that used new technologies in bridge and tunnel inspections from local governments that considered using new technologies in bridge and tunnel inspections.	Bridges) approx. 39% (Tunnels) 31% (FY2019)	(Bridges) approx. 50% (Tunnels) 50%
		Number of technologies published in the performance catalogue of inspection support technologies.(roads)	80 technologies (FY2020)	240 technologies
		Road: Data implementation rate of infrastructure ledger and maintenance/administration data	0% FY2020	100%
	2-3. Appropriation of infrastructure stock by consolidation and reorganization, etc.	Roads: Percentage of local governments considering consolidation, removal, or functional reductions of facilities	14% (FY2019)	100%
3. Achieving a local society that is sustainable and comfortable to for daily life	3-1. Creating attractive compact cities	Number of municipalities that have prepared Bicycle Utilization Promotion Plans that include plans for bicycle networks.	89 (FY2020)	400
	3-2. Infrastructure development for promoting a new flow of population and interregional exchange	Percentage of inter-city expressways secured by road (*2)	57% (FY2019)	63%
		Improvement rate of ring roads in the three major cities	83%(FY2020)	89%
	3-3. Developing safe traffic and living space	Improvement rate of sidewalks on school routes	53% (FY2019)	57%
		Start rate of utility pole removal on specific roads	31% (FY2019)	38%
		Reduction rate of fatal and injurious accidents on community roads through measures combining a 30km/h speed limit in Zone 30, etc., and maintenance of speed bumps and narrow strips	-	Reduced by approx. 30% (vs. FY2019)
		Reduction rate of fatal and injurious accidents at dangerous locations on arterial roads	-	Reduced by approx. 30% (vs. FY2019)
		Start rate of four-lane conversion projects on high-standard (toll) roads in priority development sections [Repeat]	Approx. 13% (FY2019)	Approx. 47%
		Number of municipalities that have prepared Bicycle Utilization Promotion Plans that include plans for bicycle networks.	89 (FY2019)	400
		Number of accidents at railroad crossings	-	Reduced by approx. 10% (vs. FY2020)
	3-4. Promoting barrier-free / universal designs	Barrier-free rate for specific roads	Approx. 63% (FY2018)	Approx. 70%
4. to support a favorable economic cycle	4-1. Enhancement and optimization of the whole supply chain	Improvement rate of ring roads in the three major cities	83% (FY2020)	89%
		Percentage of intercity expressways secured by road	57% (FY2019)	63%
	4-3. Enhancing cities' global competitiveness by encouraging private sector investment	Improvement rate of ring roads in the three major cities	83% (FY2020)	89%
5. Digital Transformation (DX) in the area of infrastructure	5-1. Reform of working practices and increase in productivity by digitalization and "smartification" of social capital development	Installation rate of CCTV cameras on sections of emergency transport roads where continuous observation is required	0% (FY2019)	Approx. 50%
6. Decarbonization in the area of infrastructure / improving the quality of life by utilizing i nfrastructure spaces in various ways	6-1. Achieving a green society	Time lost due to railroad crossing blockage	103 mil persons x time/day (FY2018)	98 mil persons x time/day
	6-2. Reviewing people-oriented infrastructure space	BCP formulation rate at Roadside Rest Areas positioned in the regional disaster prevention plan.	3% (FY2019)	100%

*1. Rate of sections that are fully or partly in service out of the total sections that are missing links on high-standard roads
*2. Rate of sections on inter-city links where inter-city transport speed** is ensured at least 60km/h.
** Minimal road distance between cities /minimal travel time required

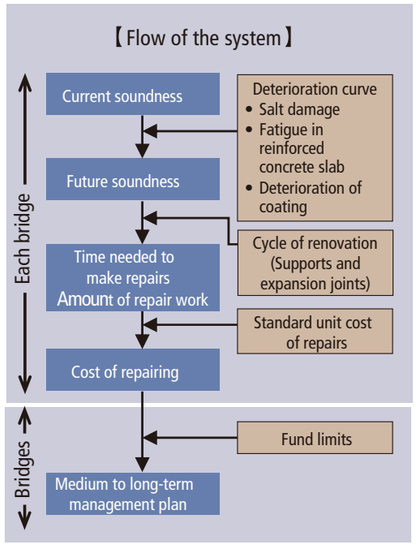
Asset Management

A great deal of Japan's infrastructure was constructed during the postwar reconstruction period, which was also a rapid economic growth period from the 1950s to the 1970s. As the Japanese society and its economy have matured, concerns have shifted to extending the use of accumulated capital stock in order to cope with a decreasing birthrate, aging population and the need to protect the global environment. Infrastructure management in Japan is in the process of switching its focus from construction to maintenance.

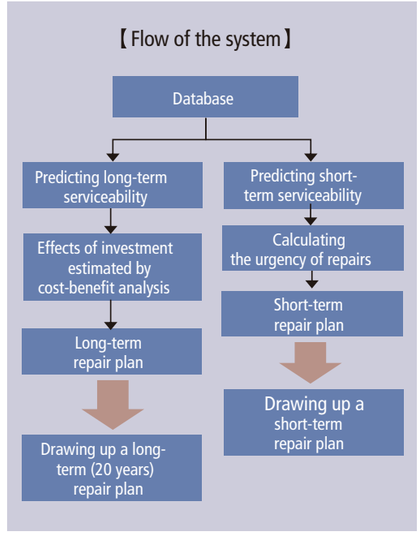
Development of road asset management

The Bridge Management System (BMS) and the Pavement Management System (PMS) are being developed to predict future deterioration of structures and to ultimately extend their lifetime by extending the time until renovations are needed and reducing the total costs of maintenance and renovation.

■ Overview of a Bridge Management System

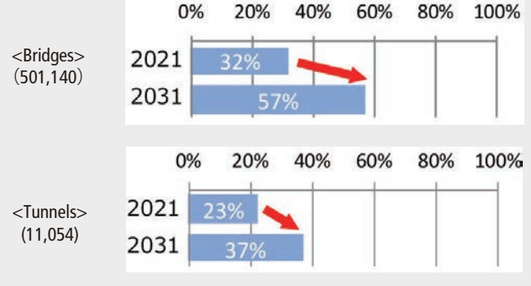


■ Overview of Pavement Management System



■ Percentage of bridges olderthan 50 years

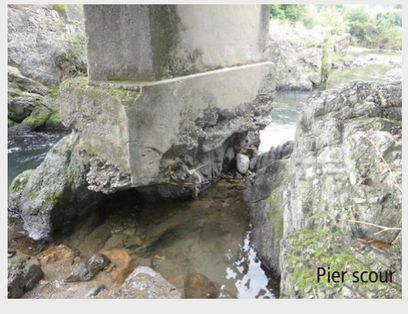
The percentage of infrastructure facilities that are more than 50 years old is increasing at an accelerating rate.



Facilities that are more than 50 years old

* ( ) is the number of bridges and tunnels covered, excluding bridges and tunnels where year of construction is unknown.

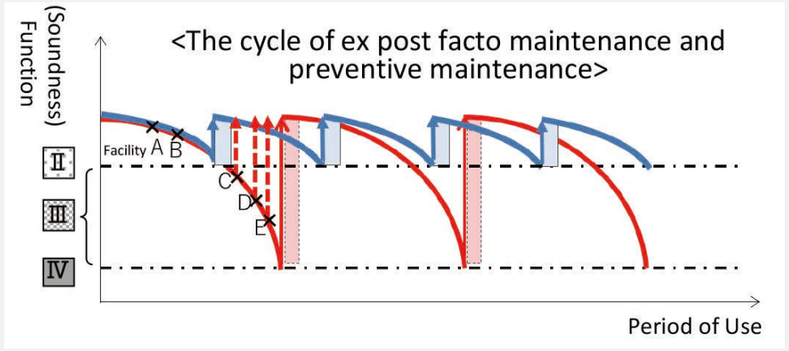
Judgment category IV (urgent measures should be taken)

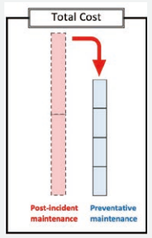


Efficient management of road assets

Preventive maintenance involves taking appropriate measures before roads are seriously damaged. This is vitally important for ensuring the safety of roads and minimizing the overall cost of repairs and renovation.
Efforts will be made to ensure long-term safety and security of road traffic by extending the service life of bridges that connect expressways with municipal roads. This will be completed, based on the periodic inspection of the bridges, using the planned implementation of “preventive maintenance, or early detection and early maintenance”.
Cost-saving and other measures will be carried out through efficient maintenance and through responsive management based on regional characteristics.

Medium- to long-term cost reduction through preventive maintenance





In order to shift to maintenance management based on preventive measures, and to reduce and equalize total costs over the medium to long term, it is urgent to take early countermeasures for facilities that require early or urgent action (evaluation categories III and IV).

Bridge inspection example

Collapsed slab due to fatigue

Deterioration due to salt damage

Deterioration due to an alkali aggregate reaction

History of maintenance activities for aging road

In the wake of Sanyo Shinkansen Tunnel Lining Concrete Collapse in 1999, the National Government established an inspection guideline along with various activities by road administrators. After Sasago Tunnel Ceiling Collapse in December 2012, the government amended the Road Act in 2013, prompting the 2014 Ministerial Ordinance which obligates road administrators to conduct close visual inspection once every 5 years.

History of the road asset management

2003: Recommendations for management and renewal of road structures
“Early preventive maintenance can reduce total cost”

2004: Notice of National Guideline for Periodic Bridge Inspection (for national road bridges)
Prescribes specific inspection procedures

2013: Called “The First Year of Infrastructure Maintenance Era”

2013: Amendment of the Road Act
Inspection standards were legislated with clear perspectives of preventive maintenance

2007: Break of diagonal truss of Kisogawa Ohashi Bridge over National Highway Not 23

Note: embeddedpart of diagonal truss in concrete

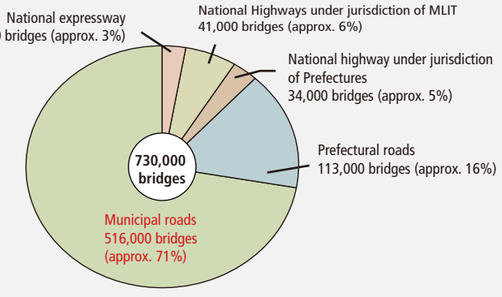
December 2, 2012:
Sasago Tunnel Ceiling Collapse

December 7, 2012:
Order of urgent inspection of road tunnel facilities
Jet fans, lighting and other

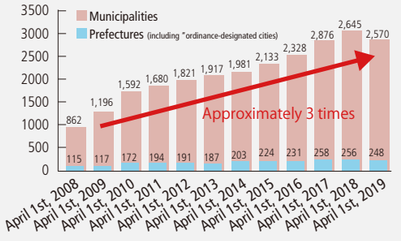
Current maintenance activities for aging roads activities

Of the 730,000 road bridges across Japan, 520,000 bridges, which account for 70% of all bridges, are situated on municipal roads. 10 years later, 57 % of all bridges are expected to be 50 years or older.
Deterioration is evident, especially in an infrastructure that was constructed in the short term, and other infrastructure that is in severe environments, such as under-water. Municipalities have increased traffic restrictions on their bridges in recent years.

Number of bridges by road type

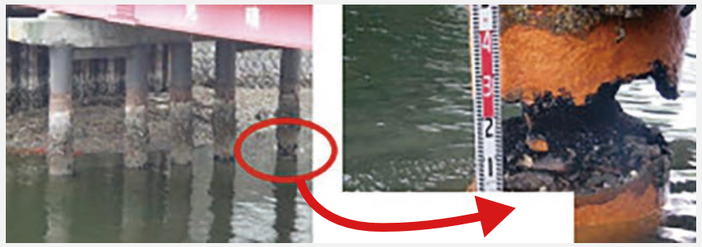


Increasing number of traffic restrictions on local roads



Source: Road Bureau (as of April 2019)
Note: the figure does not include some damaged areas from the Great East Japan Earthquake.

Serious damages on a bridge

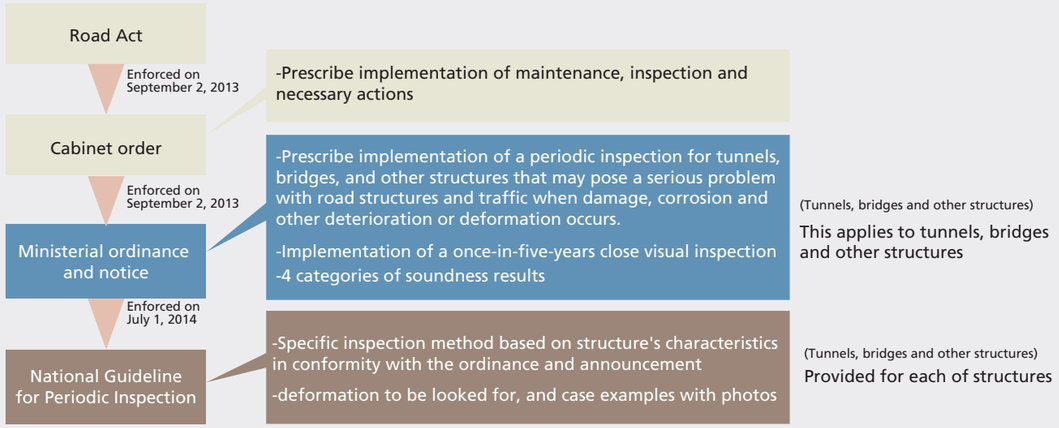


37-year old Miharashi Bridge (on Shinyamashita 8th municipal road) was found damaged.

Standards for statutory inspection

1. The ministerial ordinance and notice prescribes once-a-five-year close visual inspection and defines 4 categories of the soundness results (applied to tunnel, bridge and other structures).
2. Periodic Inspection Standard is established to provide specific procedures (by structure (e.g. tunnel, bridge))
3. The MLIT has developed a periodic inspection guideline containing bridge deformation to be looked for and case examples to technically assist municipalities to implement their inspections (by structure (e.g. tunnel, bridge)).

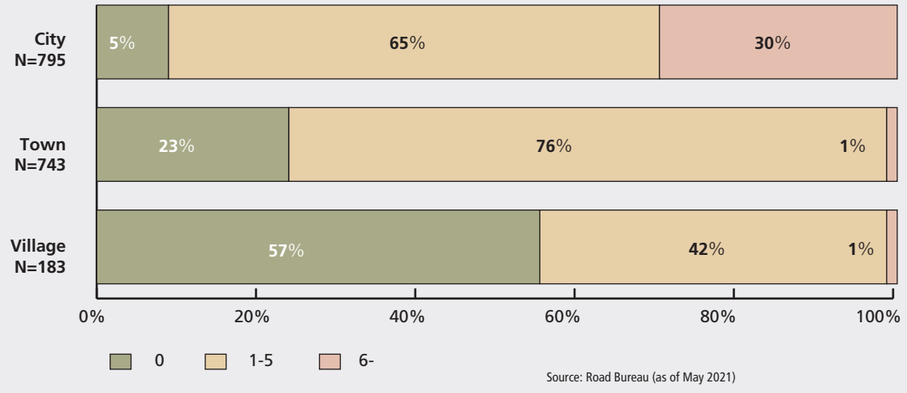
Legal system of the inspections



Maintenance by Municipalities (Technician and Inspection Method)

30% of towns and 60% of villages in the country have no civil engineering technicians for bridge maintenance in their workforce.

Number of bridge maintenance engineers in the workforce by types of municipal governments



Source: Road Bureau (as of May 2021)

Road Maintenance Panel

Through the Road Maintenance Panels, the National Government provides various technical supports to complement a shortage of human/technology resources of municipal governments. Road Maintenance Panels were launched in all prefectures in 2014 to facilitate cooperation with interested parties, to grasp and share the current issues, and to assist with promoting effective measures for aging roads.

Through "Road Maintenance Panel" the following activities are supported:

-Introduce an efficient procurement including area-wide lump sum ordering and multi-year contract for maintenance projects.

-Establish technical assistance system such as sending a "road maintenance specialist team", comprised of national government officials, to evaluate bridges of social importance or with complicated structure and record the results. This includes financial support from the national government.

-Utilize a new system that allows national government to immediately carry out technically-difficult maintenance work on behalf of a municipality.

-Combine or remove unnecessary bridges according to changing demands. For important bridges (e.g. bridges on expressways and other arterial road network and overpass of bullet train and other arterial railway network) or bridges in need of immediate repair, national government and expressway companies should carry out periodical inspections and repairs on behalf of municipalities.

-Provide a series of extensive training courses for municipal government officials and private business employees for better maintenance framework.

Composition of the Panel

Institutional framework

-Regional Development Bureau (under MLIT)

-Municipalities (prefectures, cities, towns and villages)

-Expressway Companies (NEXCOs, Tokyo Metropolitan Expressway, Hanshin Expressway, Honshu-Shikoku Bridge Road, designated urban expressways)

-Road Public Corporation

Roles

1. Facilitate training and presentation meetings for standards.
2. Facilitate training and presentation meetings for standards.
3. Organization, evaluation and publication of current inspection and repair work.
4. Assistance for area-wide lump sum ordering of inspection work
5. Technical assistance and other

Photo of the Panel (Nara Road Maintenance Panel on February 3, 2016)

New technologies and "InfraDoctor" (Infrastructure Doctor) Shutoko Engineering Company's Activities

*InfraDoctor, our service is provided in the cloud, in other words, in comfortable environment, accessible anytime, anywhere.

InfraDoctor is an innovative system, providing support to road structure maintenance through GIS (Geographical Information System) and 3D point cloud data. This can help achieve labor savings and advancing/streamlining inspection, repair and design work in the infrastructure maintenance. InfraDoctor has 3 main features:

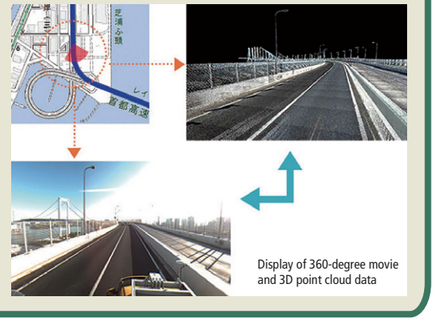
I. Basic features for GIS and 3D point cloud data

Advancing of road space examination feature and labor savings through use of 3D point cloud data

InfraDoctor provides an integrated management of 3D point cloud data and movies from laser scanner. With a replaying feature 360-degree movie and 3D dimension measurement feature, this allows operators to quickly understand the situation on site, realizing labor savings in infrastructure management.

Upgrading of road space examination feature and labor savings through use of 3D point cloud data

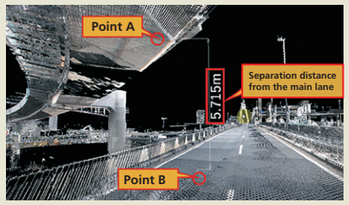
InfraDoctor displays 3D point cloud data and 360-degree movie in synchronization. Easy switching between these data enables to quickly understand the situation on site.



Display of 360-degree movie and 3D point cloud data

3D measurement

3D point cloud data has accurate 3D coordinate (X, Y, Z) for all points, allowing a distance measurement between any 2 points at your fingertips. This eliminates the need for traffic restriction at intersection which was previously necessary for measurement, a separation distance from railway facility and track closure which was necessary for checking clearance.



Dimension measurement between 2 points by point cloud data

Measurement of 3D point cloud data

3D point cloud data is obtained by Mobile Mapping System (MMS) equipped with laser scanner and cameras. For underneath the elevated road/track and side strips where MMS is not accessible, a fixed-type laser scanner is used for measurement.


Measurement by MMS

II. Management and search features for GIS records

Easy-to-use search system for management/inspection result records that meets needs of administrator]

InfraDoctor provides a customizable search system for management/inspection result records depending on the need of infrastructure administrator. This solution helps realize rational and efficient management.

Search system for various records for management

Maintenance and management work involves record data for structures, accessories, and underground utilities. InfraDoctor provides efficient management by associating record data with 3D point cloud data.

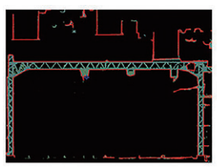
III. Further sophisticated management and advanced features

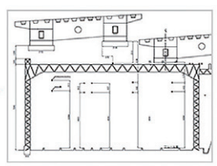
Further sophisticated infrastructure management through expanded features using GIS and 3D point cloud data

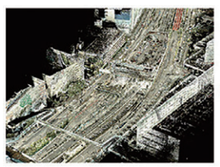
InfraDoctor provides various features, including drawing, deformation detection on pavement and walls, creation of traffic control plan drawing and 3D simulation, streamlining maintenance work through a good use of GIS and 3D point cloud data.

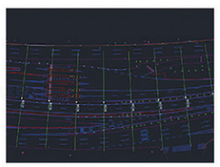
2D CAD drawing feature

InfraDoctor provides a semi-automatic feature of drawing floor plan/cross section from 3D point cloud data. InfraDoctor also provides a high measurement resolution with mm for cross section and sufficient resolution for a 500:1 scale floor plan.


Automatic contour extraction of 3D point cloud data

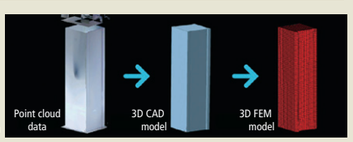

2D CAD drawing (cross section)


3D point cloud data


2D CAD drawing (floor plan)

3D CAD model drawing feature

InfraDoctor provides a semi-automatic feature of creating a 3D CAD model from 3D point cloud data that reflects the current condition of structure.

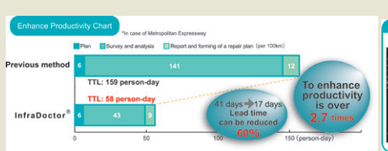


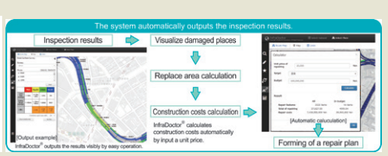
Creation of an FEM model from 3D point cloud data

Analysis of road surface deformation system

InfraDoctor provides a new road surface analysis from 3D point cloud data, displaying the inspection results automatically on the InfraDoctor system.

This feature enables us to make a repair plan easily by automatic cost estimation process and to enhance the efficiency of road maintenance work as a whole.





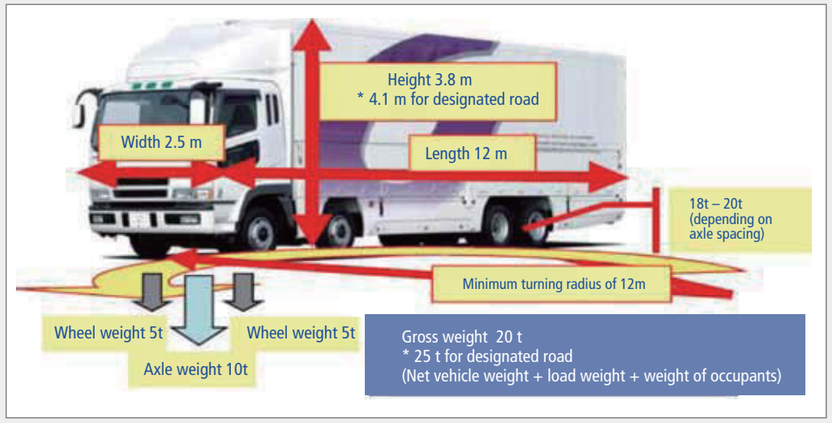
Road-related systems in Japan

Roads are designed to ensure safe and smooth traffic for vehicles with certain specifications. In principle, vehicles that do not meet size and weight requirements are not allowed to be on the road because they can potentially damage the roads and disrupt traffic.

However, road administrators are empowered to give permission to vehicles that exceed the size or weight regulation to use the road, only if the road administrator acknowledges that there are no alternatives after examining the vehicle's structural characteristics and the cargo. In these cases, the road administrator will require that the vehicle meets certain conditions in order to protect the road structure and prevent potential danger to other road users.

On general roads

General limit (upper limit) of vehicles according to Article 3.1, Vehicle Size and Weight Restrictions



Typical overweight or oversize vehicle types

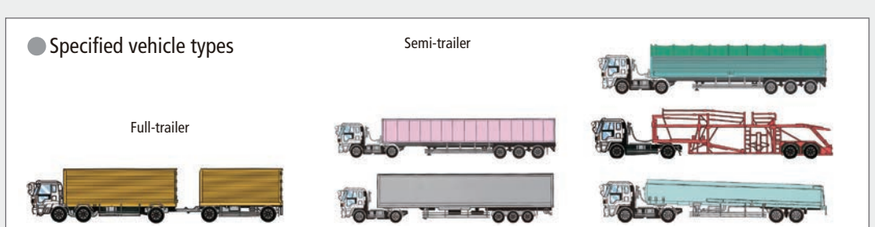
On expressways

Dimension and weight limits for specified vehicles on expressways are more lenient than the limits on general roads

combination vehicles	Length
Semi-trailer	16.5m
Full-trailer	18.0m

Distance from the foremost axle to the rearmost axle	8m or more	9m or more	10m or more	11m or more	12m or more	13m or more	14m or more	15m or more	15.5m or more
Gross weight	25t	26t	27t	29t	30t	32t	33t	35t	36t

Specified vehicle types



Approval system for transporting abnormal loads

Road administrators are authorized to permit the drivers of vehicles that exceed the size or weight limits to use the road, but only after the road administrator examines the vehicle's structure and cargo and determines that there are no alternatives. In these cases, the road administrator will put certain conditions in place to protect the roads and to prevent any potential danger to other road users. Road fatigue, which is caused by oversize or overweight vehicles, can have a significant impact on roads and pavement. In order to utilize our road stock effectively in the future, it is important to ensure the road structures are properly maintained.

Stopping unauthorized vehicles

1.Instructive enforcement
Drivers are told to pull over at "instruction stations", where vehicle weights and sizes are measured. If the vehicle exceeds the size or weight limits, the drivers are ordered or warned to reduce the weight and size of the vehicle by splitting the cargo.

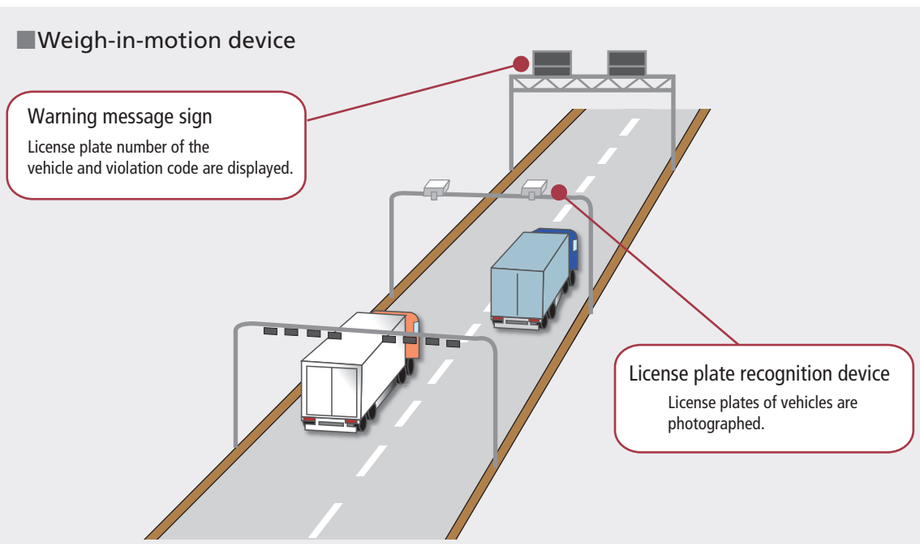
2. Weigh-in-motion (WIM)
A WIM device automatically measures a vehicle's gross weight. If the vehicle is over the weight limits, the WIM system then determines if the overweight vehicle has a permit by accessing the database. Based on the results, repeated violators will be given an instructive warning.

■Enforcing regulations

Instructive enforcement

License plate recognition device

■Weigh-in-motion device



Disaster Prevention

In order to secure safe and reliable road networks, construction of arterial high-standard highways, urban ring roads and other disaster-resistant roads has begun. Since roads are an important part of disaster relief, measures to respond to and reduce the damages of earthquakes, storms and heavy snows on roads are also being implemented.

Earthquake

The land area of Japan comprises only 0.25% of the world's total, but Japan experiences a large percentage of earthquakes. The probability of a large-scale earthquake, with a magnitude of 6.0 or more, is about 23%.

On March 11, 2011 a massive earthquake and the following giant tsunami caused an enormous amount of damage to the roads in Japan
(National Highway 6, Hirono-machi, Fukushima Prefecture)
(Photo: Tohoku Regional Development Bureau)

Heavy rain

Japan receives twice as much precipitation as the mean amount of precipitation in the rest of the world, especially during the heavy rain and typhoon seasons. Throughout the last decade, heavy rains have increased sharply, thereby increasing the risk of floods. The soft soil easily collapses during storms and is prone to sediment run-off, landslides and other sediment-related disasters.

Massive collapse from the top of the slope
Heavy rain in July 2020
(National highway 3, Ashikitamachi Kumamoto Prefecture)

Heavy snow

Since the Sea of Japan lies between Japan and the Asian continent, Japan receives heavy snows brought by prevailing winds from the continent in the winter, especially in areas closest to the sea. About 60% of the land is snowy and cold in the winter season, and approximately one-fifth of the population of Japan lives in this area. The population density in these snowy and cold areas is as high as 105 people per km^2, which far exceeds the density in other snowy countries.

In February 2014 there was a record-breaking heavy snow in the Kanto region.
(Japan Self-Defense Force clearing the snow on Route 20)
(Photo: Mainichi Shimbun)

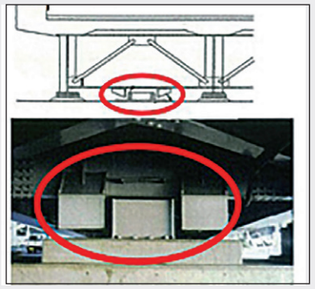
Measures against Earthquakes

In addition to bridge collapse prevention measures, the MLIT accelerates other anti-seismic measures for expressways and national highways under the jurisdiction of MLIT to prevent a large surface gap, including reinforcement and replacement of supports, based on the probability of large earthquake. In specific, the ministry reinforces support of bridges for immediate recovery from damages and takes other measures where the reinforcement is not possible.

Measures for immediate recovery

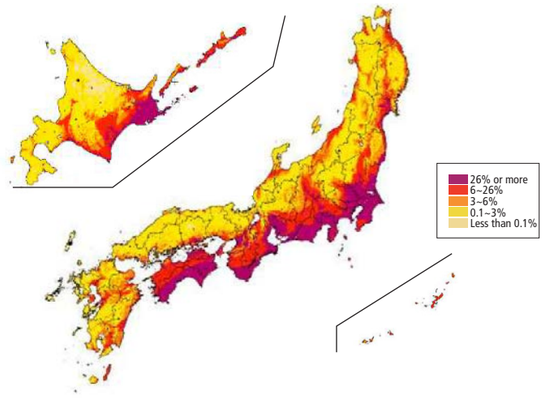
Bridge collapse prevention measures
+
Reinforcement/replacement of supports

Example of a support reinforcement



Structure to diverge horizontal force

Probability of an earthquake with a seismic intensity of 6- or higher in 30 years



Note: "26% and 6% of probabilities of an earthquake with a seismic intensity of 6- or higher" is equal to roughly once a 100 years and once a 500 years of event, respectively.

Source: 2020 National Earthquake Prediction Map (Headquarters for Earthquake Research Promotion)

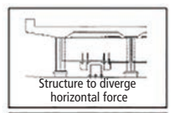
Example of earthquake preparedness

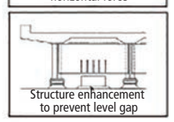
Implement bridge collapse prevention measures that add an ability of immediate recovery of functions.

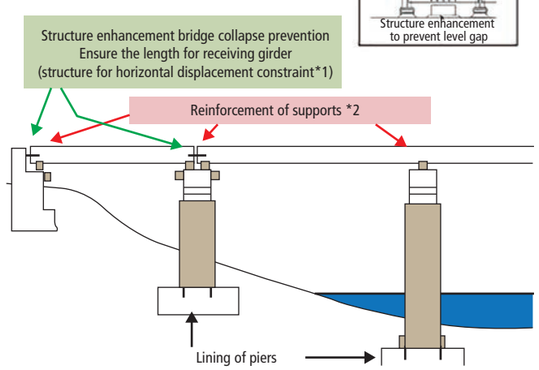
Bridge collapse prevention measures towards immediate recovery of functions (Level 2 in the Seismic resistance performance)

[Measures]
- Structure enhancement for bridge collapse prevention
- Reinforcement of piers
- Reinforcement of supports

-Replacement of supports
-Structure enhancement to divert horizontal force
-Structure enhancement to prevent level gap

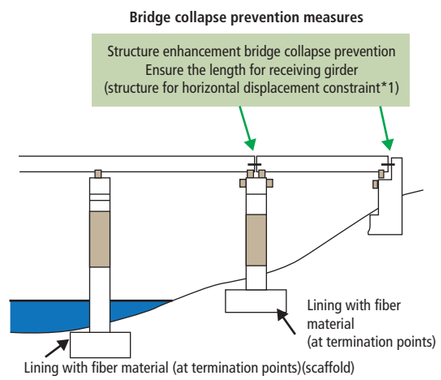






Bridge collapse prevention measures (Level 3 in the Seismic resistance performance)

[Measures]
- Structure enhancement for bridge collapse prevention
- Reinforcement of termination points of pier

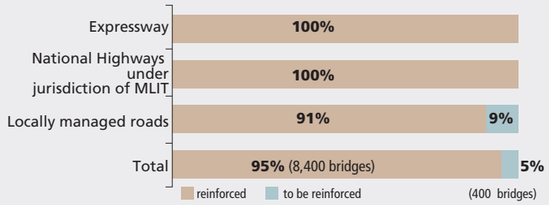


Note *1: only for curved and skew bridges
*2: Reinforcement of support (replacement of support and structure to diverge horizontal force and/or prevent difference in level)

A seismic retrofitting of overpass

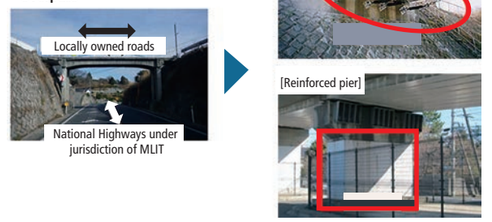
-Overpasses over expressways and national highways under jurisdiction of MLIT are given priority on the collapse prevention measures in the next 5 years (400 bridges are owned by local governments as of November 2016).

Progress of overpass collapse prevention measures for expressways and national highways under jurisdiction of MLIT



Note: expressways and national highways under jurisdiction of MLIT have already been reinforced for collapse prevention

Examples of the measures



Seismic strengthening for bridges with rocking piers

Seismic strengthening is conducted by the end of FY 2019 for bridges with rocking piers over expressways, national highways under jurisdiction of MLIT (450 bridges).

Example of seismic reinforcement

Challenges of seismic retrofitting identified after Kumamoto Earthquake (April 14, 2016)

1. A bridge with rocking piers was collapsed by Kumamoto Earthquake. There remains the possibility that measures in the past were insufficient to avoid collapse, considering peculiarities of Kumamoto Earthquake (consisting of 2 strong quakes) and structure itself.
2. Several overpasses over expressways and national highways under jurisdiction of MLIT have not been reinforced for collapse prevention (completion rate is 91% as of November 2016 for those owned by local governments).
3. Although collapse prevention measures have been completed for all the emergency transportation routes (consisting of expressways and national highways under jurisdiction of MLIT), the seismic reinforcement (including reinforcement of bridge shoes) that promptly enables emergency transport vehicles to pass the routes has not been completed (completion rate is 77% as of March 2017).

(1) Collapsed a rocking pier over Kyusyu Expressway (Prefectural road Ogawa-Kashima Line, Furyo Daiichi Bridge)

(2) Locally owned overpasses (have not been reinforced)

(3) Damages on supports and main girders of a bridge (Heiryu Bridge, Oita Expressway)

Countermeasures for heavy rains

The MLIT undertakes various initiatives to minimize the impact of heavy rainfall.

Protection of road slopes

Following works are used for slope protection from a heavy rain.
-Rock fall prevention fence work: installation of fence to protect from rock falls. Fence is installed along the road to catch falling rocks.
-Pocket-type rock fall prevention net work: installation of a net to catch falling rocks where they start falling.
-Wire rope that tie a rock: the rope will fix some rocks that may fall in the future.
-Concrete crib work: covers and fixes a slope that may collapse in the future.
-Concrete crib + anchoring: in some cases, concrete structure is supported by additional anchors.

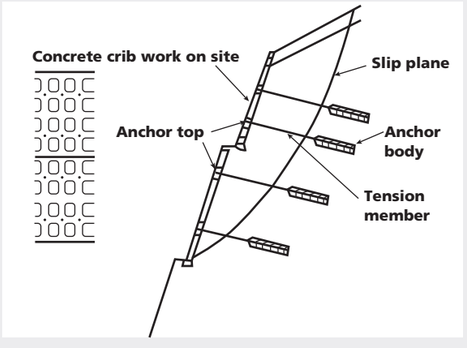
Rock falling protection fence

Pocket-type rock falling protection net

Wire rope work

Concrete crib work

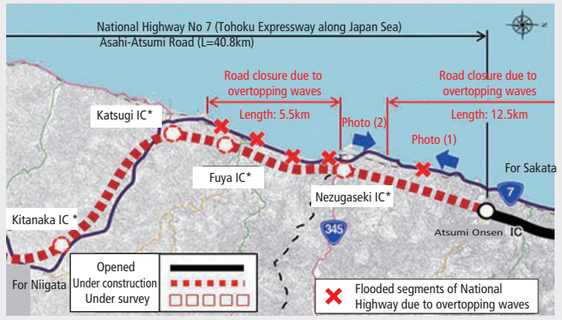
Crib work + anchoring



Illustrative description of anchoring

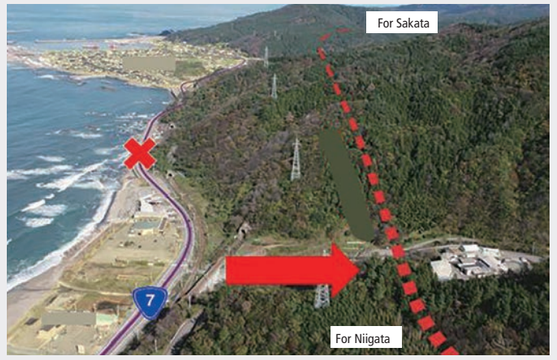
Enhancement of road network for redundancy

In the areas with frequent heavy rain, development of arterial high-standard roads is promoted to provide redundancy, rather than individual spot improvements. Given that overtopping waves frequently force to close National Highway No 7 around the border between Niigata and Yamagata, the Asahi-Atsumi Road is going to be developed as a high-standard road at a distant from the sea shore to ensure redundancy at the event of disaster and reliable transport between regions.



*provisional name

(1) Wracks from overtopping waves
(On April 4, 2012 in Wasada, Tsuruoka)



(2) Congestion due to traffic restrictions
(On April 4, 2012 in Nezugaseki, Tsuruoka)

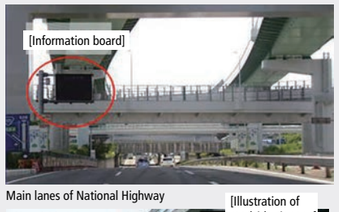
High-standard Arterial Highway is developed to ensure alternative route in the event of disaster (example of Asahi-Atsumi Road)

Protection of road from flooding

In urban areas, there are about 3,500 underpasses across the country as of April 1, 2015. A heavy rain exceeding the capacity of a drain pump under the underpass will make a pool on the underpass.

In the event of such a heavy rain, we will close the road and provide information for road users.

Example of road information provision



Main lanes of National Highway

Service road

Example of drain pump

Countermeasures for snowfall

Heavy snowfall hampers every year the improvement of living standards and industrial development of the residents. Sustainable support is required to minimize the impact of the snowfall.

Purpose of countermeasures for snowfall

About 60% of the country is in cold and snowy area where a quarter of the population lives.

-Although snowy areas in Japan are located at lower latitudes than many large cities in Europe and North America, they have a significant amount of snowfall with the similar snow depth*.
-A heavy snowfall causes avalanche and ice roads, resulting in slipping and congestion.
-To prevent these disasters, road administrators are responsible for ensuring stable road traffic during winter using antifreezing agent and other snow protection work.
-When heavy snowfall or blizzard may make vehicles stuck on the road, which block the emergency vehicles and constitutes a serious obstacle of emergency relief operation, road administrators will be entitled to remove those obstacles based on the Basic Act on Disaster Control Measures (amended in November 2014).
*Snow depth in Japan which is reported by JMA may be measured differently from city snow depth data published on websites in other countries.

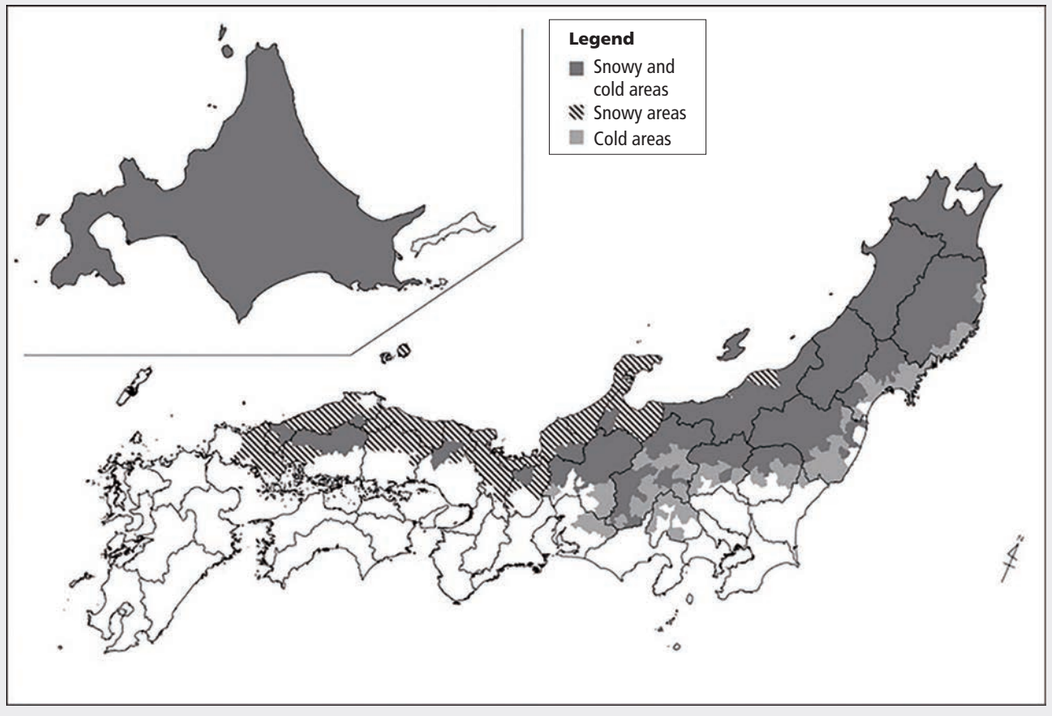


Figure: Snowy and Cold Areas

Vehicles stuck on road due to heavy snow
(Sanin Region, 2016)

Snow protection work
(Hokuriku Regional Development Bureau)

Removal of vehicles at a standstill on road
(Shikoku Regional Development Bureau)

Initiatives for Advance Restrictions of Road Traffic

- In light of the accidental bus fall at Hida River in 1968, we started implementing traffic restrictions in advance based on the "Guidelines for Road Traffic Restrictions in the Event of Extreme Weather" in 1969.

- Restriction standards were set based on “the continuous rainfall” measured by telemeter rain gauges installed at each restricted section.

[Restricted sections (national highways under jurisdiction of MLIT)]

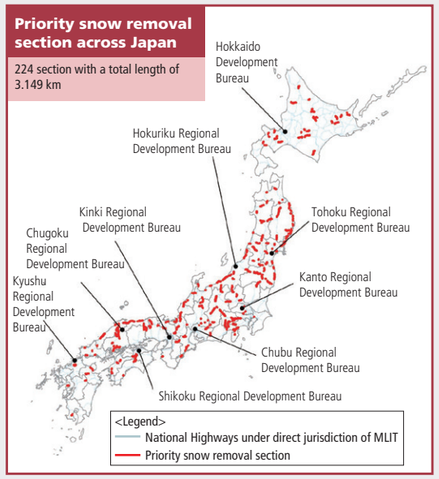
- national highways under jurisdiction of MLIT：175 sections, 980 km (total 4%)

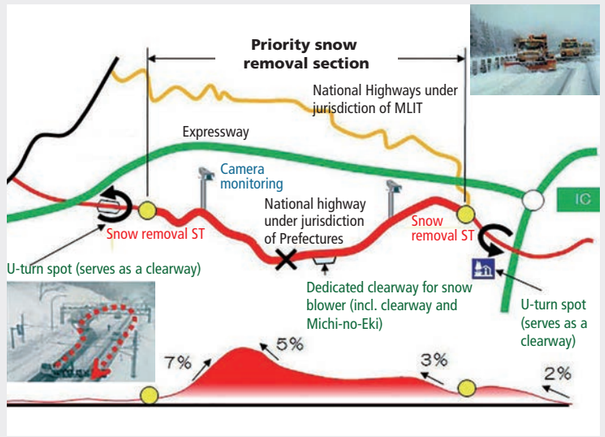
(As of April 1, 2014)

・Excluding particularly restricted sections against overtopping waves, road flooding, avalanches, etc.
・At the time the system was established (1969), 210 sections
・Set traffic restriction standards based on continuous rainfall.
・Restrictions will be lifted when the rainfall volume stays less than 2 mm/h for 3 hours, the road is patrolled, and safety is confirmed.

Advance Restrictions of Road Traffic on heavy snow

This refers to a section identified as a standstill-prone location in the event of heavy snow especially for heavy vehicles on a steep slope. This section receives intensive and efficient snow removal preferentially. 224 road sections were identified as priority snow removal section across Japan.





Illustrative description of "Priority snow removal section"

Ensuring smooth freight transport during disaster

After the Kumamoto Earthquake in 2016, 50 locations were closed on the emergency transportation routes which extends to about 2,000 km in Kumamoto Prefecture. To ensure smooth freight transport whether it is a normal time or at the event of disaster, the MLIT is committed to improving accessibility to key locations as well as enhancing functions of arterial network to support stable economy and everyday life by supporting and investing on a priority basis.

-About 100,000 km of roads were designated as Emergency transportation routes which should ensure smooth emergency transportation

-As a countermeasure of aging roads, about 35,000 km of roads were designated as "recommended roads for trucks" which should guide heavy trucks to desirable routes and promote proper road usage

-Improve accessibility of last-mile roads to airports, ports, freight rail stations and other key logistics hubs by reviewing the rural high-standard highways.

-Establish an arterial network (including planned roads) by selecting from various and complicated current network and key locations

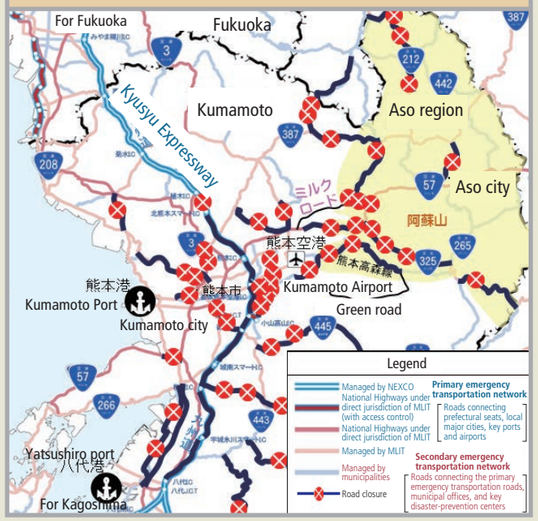
For the arterial network,

-reinforce road structures for quicker road reopening and recovery of alternative routes at the event of disaster and for extra large trucks

-more control over roadside usage by large-scale facilities through intensive support and investment

Closure of emergency transportation routes after Kumamoto Earthquake

(As of April 17, 2016, which is 24 hours after the event)



Chapter
2

Advanced Road Technologies

Work within a shield tunneling machine, which is constructing the Tokyo Bay Aqua-line Expressway.

Of Japan's total land area of 378,000km^2, only one-third is suitable for living. Due to its topographical, geological, meteorological and other natural conditions, Japan is prone to numerous natural disasters such as storms, heavy snowfall, floods, landslides, earthquakes and tsunamis. Consequently, various road construction technologies have been developed to overcome the resulting severe conditions and difficulties posed by these natural disasters.

Tunnels

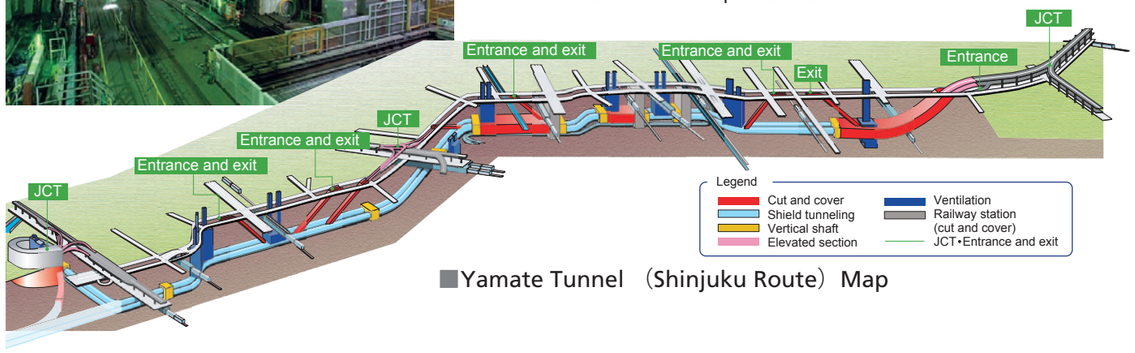
The long, thin chain of islands that compose Japan has a spine of steep mountains running north to south down the island chain. The elevations reach 2,000m to 3,000m above sea level and about 70% of the land is mountainous. Therefore, roads must be constructed on the narrow strips of land between steep slopes and the sea, alongside rivers winding between mountains, and sometimes through mountains. Tunnels are increasingly used when constructing roads in highly populated areas due to the shortage of land and to protect the environment.

Kan-etsu tunnel (Kan-etsu Expressway)

The Kan-etsu Tunnel is 11km long and is the longest mountain tunnel in Japan. At its lowest depth the tunnel passes 1,100m below the mountain's peak. Of its four lanes, the outbound lanes were opened in 1985 and the inbound lanes were completed in 1991.

Yamate tunnel
(Central Circular Oi～Ikebukuro Route of the Metropolitan Expressway)

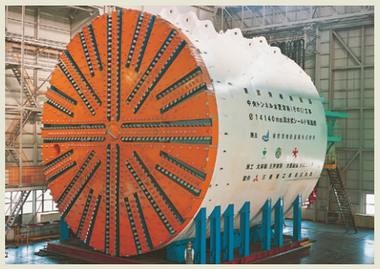
Yamate tunnel connects Shinagawa, Shibuya, Shinjuku and Ikebukuro, which are major sub-centers of Tokyo.
The tunnels is 18.2km long and is the longest Expressway tunnel in the world. The tunnel were completed in 2015.



■Yamate Tunnel （Shinjuku Route）Map

Tunnel boring machine

The tunnel boring machine consists of both a tunnel shield and a front rotating cutting wheel. As the front cuts into the ground, it assembles concrete segments inside the machine, and as it advances it constructs the tunnel behind it. Advanced robotic technologies are used, with a computer controlling a series of activities required for the tunneling work.



World class Large Tunnel boring machine (diameter: 14.14m) used to construct the Tokyo Bay Aqua-line Expressway

Bridges

Japan consists of four major islands, Hokkaido, Honshu, Kyushu, along with Shikoku, and a number of smaller islands. Straits and inland seas hinder traffic between the islands. For well-balanced development, transportation access is required, so bridges connecting islands have been constructed. Also, since Japan is highly prone to earthquakes, typhoons and strong winds, cutting-edge technologies are used to construct and maintain long-span bridges that can withstand severe weather and natural disasters

Honshu-Shikoku expressway

The Honshu-Shikoku Expressway was completed in 1999 and connects the main island of Honshu with the island of Shikoku. It has three routes, including: the Kobe-Naruto route (the Kobe Naruto Expressway), the Kojima-Sakaide route (the Seto-Chuo Expressway and the JR Seto-Ohashi line), the Onomichi-Imabari route (the Nishi-Seto Expressway). The total length of these roads is approximately 173km. The center span of the Akashi Kaikyo Bridge is 1,991m, making it the longest in the world. Additionally, the height of the main tower is approximately 300m above sea level.

Akashi Kaikyo Bridge

Tatara Bridge

Seto Bridge

Tokyo bay aqua-line expressway

The Tokyo Bay Aqua-line Expressway, which allows a motorist to transverse the Tokyo Bay, was completed in 1997. About 10km, out of its total 15.1km, are under the Bay and the remaining 5km are configured as the Aqua Bridge. A ventilation tower ("Kaze-no-to") was constructed in the middle of the tunnel, and a manmade island ("Umihotaru") was constructed where the tunnel and the bridge meet.

The manmade island "Umihotaru" and the Aqua-line Bridge

Reinforcement and management of long bridges

Long bridges are inspected daily using advanced technologies in order to prolong their service life. For instance nondestructive methods are used to inspect hangers on suspended bridges.
Implementation of damage control earthquake-resistant designs to retrofit existing long bridges has reduced the cost of constructing long bridges to 65%.

Non-destructive inspection of hangers

Use of a damage control earthquake-resistant design on the Minato-ohashi Bridge helped reduce the construction cost (Hanshin Expressway).

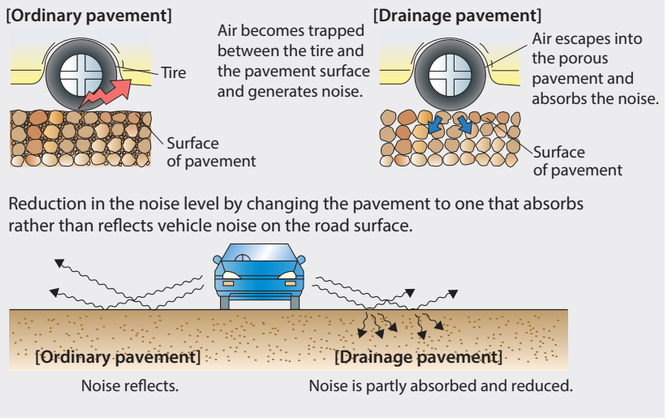
A model experiment using a 1/6-scale model of buckling restraint braces.

Pavement

In 1955, the percentage of paved national highways in Japan was less than 14% of the total road network. The percentage increased sharply thereafter as motorization rapidly progressed, reaching 57% in 1965, 79% in 1975, and over 90% today. Various paving technologies have been researched and developed since roads in Japan are subject to large seasonal temperature differences and heavy rainfall. New technologies are being developed to address an aging society and environmental issues.

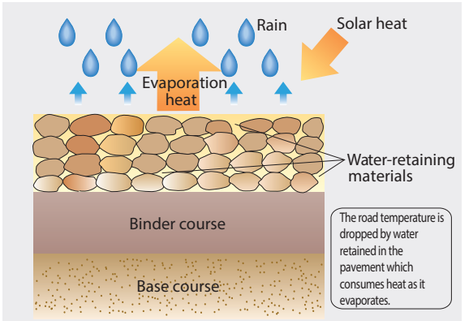
Drainage and low-noise pavement

The surface of a newly developed pavement is more porous than ordinary pavement and allows water to seep into and pass through the pavement. It flows along an inclined, impermeable course and is then discharged out the side gutters. The pavement drains the rain water and allows the road surface to remain non-slippery, controls spray and ensures good visibility. The porousness of the pavement also suppresses the noise generated by tires and traffic.



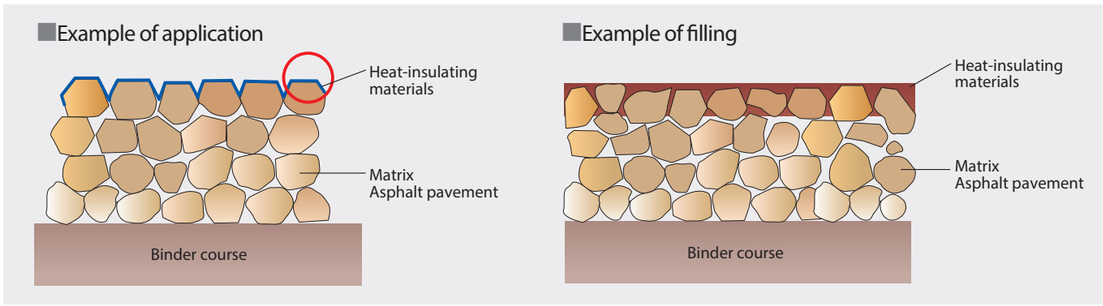
Water-retaining pavement

The pavement retains water and thus lowers the road temperature through water evaporation. Diverse techniques, from which rain water and underground water slowly evaporate, have been proposed. For example, injecting water-retaining materials like polymers into the voids of asphalt mixtures is one such option.



Heat-insulating pavement

Special paint is applied on the pavement surface to reflect infrared rays from the sun and thus reduce the amount of heat that is absorbed and accumulated in the pavement. The paint controls the rise in the surface temperature of the pavement and improves the thermal environment for pedestrians and road-side users, helping to mitigate the heat-island phenomenon.



Chapter 3

Summary of Principal Policies

Basic Policy of principal policies

In order to build a world-leading safe, smart, and sustainable road transportation system, we will implement road measures based on the following basic policies.

1 Disaster prevention and mitigation, national resilience
- Protecting people's lives and livelihoods from disasters –
With the goal of securing the passage of emergency vehicles within approximately one day, and general vehicles within approximately one week after a disaster strikes, we will work to build a disaster-resilient road network, and promote efforts to support evacuation, lifesaving emergency and recovery activities, and to strengthen crisis management measures.

2 Preventive maintenance measures to aging road
- Safe and secure roads for the next generation -
In order to make an early transition to preventive maintenance that reduces life-cycle costs and realizes efficient and sustainable maintenance management, we will accelerate measures for facilities that need repairs identified through periodic inspections and promote the active use of new technologies.

3 Development of networks and hubs to support flows of people and goods - Connecting people and regions –
In order to build a national arterial road network providing speed and accessibility, we will work on the development and functional enhancement of high-standard infrastructure, and the enhancement of modal connect through the development of transportation hub, the promotion of traffic congestion countermeasures, and logistics support.

4 Creating safety, security and activity in road space
- Creating regions and towns -
In order to realize a society in which all people can live in safety, security, and comfort, we will promote traffic safety measures, universal design, the elimination of utility poles, and the development of road space for bicycles, as well as initiatives to meet the diverse needs of road space, such as the creation of new forms of mobility and regional activities.

5 Road system DX - The realization of xROAD -
To realize the vision for a Digital Garden City Nation, we will accelerate "xROAD" efforts to reduce labor and improve the efficiency of road management and administrative procedures through the introduction of new and digital technologies.

6 Realization of a decarbonized society through promotion of GX - Contributing toward carbon neutrality in 2050 –
Toward carbon neutrality in 2050, we will promote the spread of next-generation vehicles, low-carbon road transportation, and energy-efficient and green road infrastructure.

※In addition to the above, we will promote road policies based on the "Comprehensive Strategy for the Vision for a Digital Garden City Nation"(cabinet resolution made on December 23, 2022), "Grand Design and Action Plan for a New Form of Capitalism" (cabinet resolution made on June 7, 2022) and, to be formulated this summer, the "National Spatial Strategy (National plan)" and the "Fundamental Plan for National Resilience.

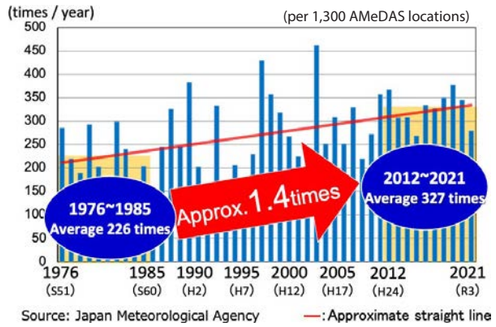
Disaster prevention and mitigation, national resilience

- Protecting people's lives and livelihoods from disasters -

People's lives and livelihoods must be protected from major earthquakes that can occur at any time, and increasingly severe and frequent weather disasters. With the goal of securing the passage of emergency vehicles within approximately one day, and of general vehicles within approximately one week after a disaster strikes, we will work to build a disaster-resilient road network, and promote efforts to support evacuation, lifesaving emergency and recovery activities, and to strengthen crisis management measures.

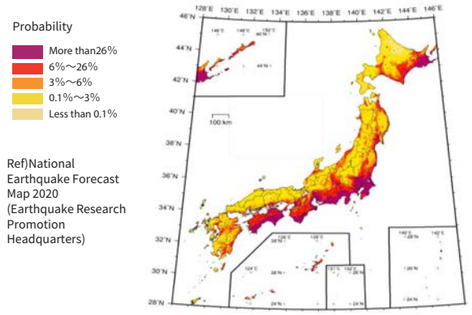
Increasingly severe and frequent weather disasters

■Annual incidence of precipitation of 50 mm/hour or greater



Major earthquakes that can occur at any time

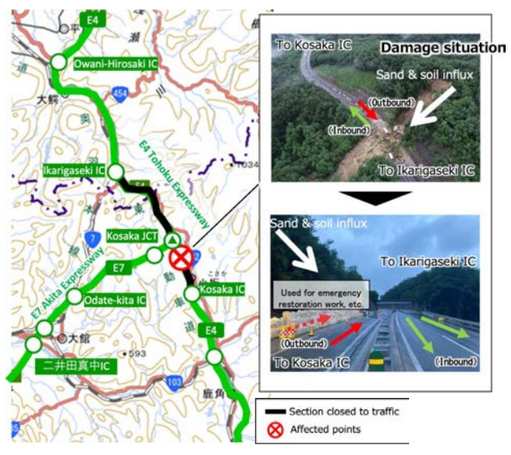
■Probability of being hit by an earthquake of intensity 6 or higher in the next 30 years



Disaster-Resilient Road Network Proves Effective (Case Study of heavy rain in 2022)

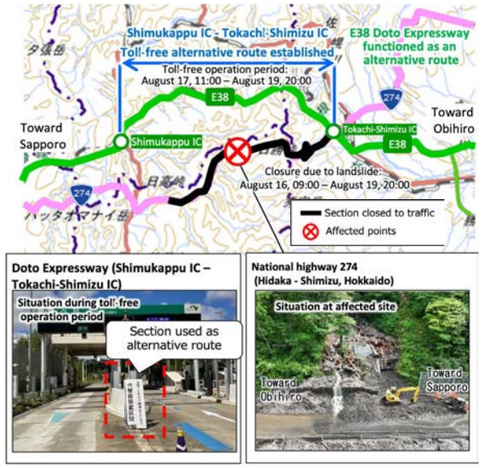
■Early reopening of four-lane sections to traffic

The Tohoku Expressway (Kosaka IC - Ikarigaseki IC) was closed to all traffic due to an influx of sand and soil, but with one of the two outbound lanes used for emergency restoration work, the remaining outbound lane was able to open to general traffic after approximately three days.



■Securing transportation functions through a redundant network

National Highway 274 (Hidaka - Shimizu, Hokkaido) was closed due to an influx of sand and soil, but traffic functions were secured by utilizing the Doto (East Hokkaido) Expressway, which forms a double network.



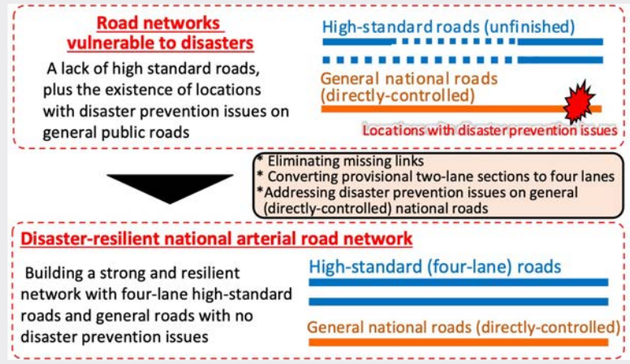
Radical and comprehensive disaster prevention and mitigation measures to be put in place in advance

Based on the "Five-Year Road Program for Disaster Prevention, Mitigation and National Resilience" , we are working to build a national arterial road network that is resilient to disasters by eliminating missing links on high-standard roads, converting temporary two-lane sections to four lanes, and strengthening the redundant network of high-standard roads and national highways under jurisdiction of MLIT that can function as alternatives.

Expressway Renewal

• To ensure the functioning of a disaster-resilient national arterial road network, we aim to secure passage for emergency vehicles within approximately one day after a disaster occurs, and for general vehicles within approximately one week.

• Based on the targets and scale of projects set out in the “Five-Year Acceleration Measures for Disaster Prevention, Mitigation, and National Land Resilience” (Ref.1), a “Five-Year Road Program for Disaster Prevention, Mitigation, and National Resilience” (Ref.2) showing the expected progress of specific projects in each prefecture over the five-year period, will be drawn up by regional development bureaus.

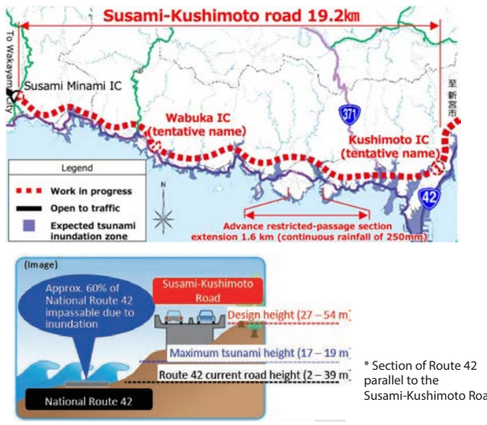


* Rate of improvement of missing links on high-standard roads (2019 -> 2025): 0% -> approx. 30%
・Percentage of 4-lane conversion projects in priority improvement sections (Ref.3,4) of high-standard toll roads started (2019 → 2025): approx. 13% → approx. 47%

Eliminating missing links

(National Highway 42 Susami-Kushimoto Road)

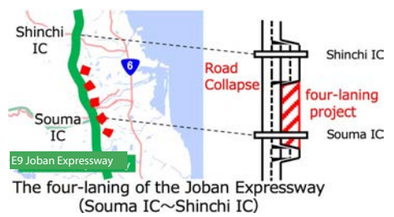
A tsunami from a Nankai Trough earthquake is expected to inundate approximately 60% of the parallel section of National highway 42. The construction of the Susami-Kushimoto road will eliminate the missing link and secure an emergency transportation route that avoids the expected tsunami inundation area .



* Section of Route 42 parallel to the Susami-Kushimoto Road

Conversion of provisional 2-lane sections to 4-lane (Joban Expressway)

In February 2021, an earthquake off the coast of Fukushima Prefecture caused the temporary two-lane section of the Joban Expressway to be closed to traffic due to a collapse of the adjacent embankment. With the completion of the four-lane project currentl y under way, traffic functions are expected to be secured in the event of a disaster by utilizing lanes not affected by the disaster.



The disaster of the Joban Expressway

Ref.1: December 11, 2020 cabinet resolution
Ref.2: April 27, 2021 decision
Ref.3: Approximately 880 km section as defined in the Basic Plan for Safety and Security on Expressways (decided September 10, 2019)
Ref.4: As of March 31, 2022, approximately 1,400 km had not yet been converted to four lanes (including priority improvement sections).

Radical and comprehensive advance disaster prevention and mitigation measures

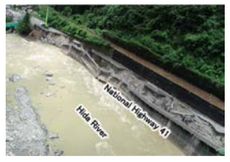
To build a disaster-resistant road network, we will promote disaster prevention and mitigation measures in line with the increasing severity of recent disasters and newly-identified disaster risks.

Measures to prevent the loss of bridges at road structures adjacent to rivers

In response to risks of disasters including scouring and washing out of bridges and roads, promote countermeasures such as anti-scouring and loss prevention works, and bridge replacement.

* Rate of construction work at locations on emergency transport roads that require countermeasures against scouring and loss of bridges at river crossings and structures adjacent to rivers: (2019 -> 2025): 0% -> approx. 28%

■Disaster examples (road loss)



Torrential rain in July 2020 on national highway 41

■Image of countermeasures

Kutchan, Abuta District, Hokkaido

Boosting earthquake resilience ofroad bridges

Promote seismic retrofitting of bridges on emergency transportation roads
(Measures to ensure that even in a major earthquake, only minor damage is sustained, and that functionality can be restored quickly)

* Rate of reinforcement work on bridges on emergency transportation roads: (2019 -> 2025): 79% -> 84%

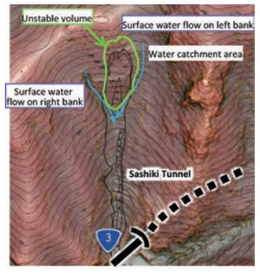
Landslide prevention measures for road slopes and embankments

Promote countermeasures on slopes and embankments against newly-identified disaster risks through advanced inspection methods, etc.

* Rate of construction work at locations on emergency transport roads that require slope and embankment countermeasures: (2019 -> 2025): approx. 55% -> approx. 73%

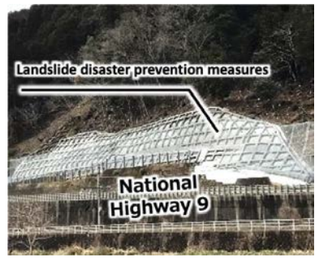
■Disaster case studies

<Large-scale landslide from the top of the slope>
National Highway 3, torrential rain of July 2020



Examples of advanced inspectionmethods
Laser profiler inspection results

■Mitigation case studies

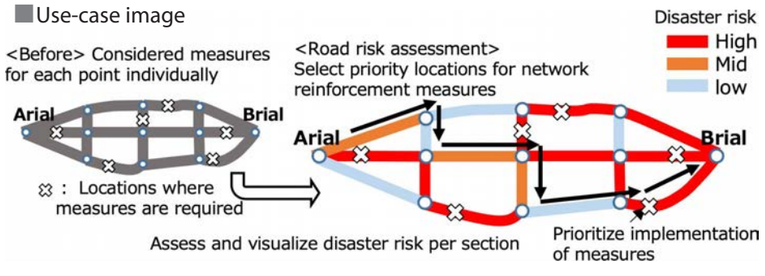


Fukuchiyama city, Kyoto

Implementation of road risk assessment Ref.1

Promote efficient and effective road network reinforcement through road disaster resilience (risk) assessments

■Use-case image



Ref.1 Deployment of road data platform “xROAD” etc.

Radical and comprehensive disaster prevention and mitigation measures

To protect people's lives and livelihoods from disasters, we will promote efforts to support evacuation, lifesaving emergency, and recovery activities

The use of elevated sections of roads as inundation evacuations.

Background / data

• About 1,800 km of road sections nationwide are higher than the submersion depth of tsunamis and floods. [Ref. 1]
* In the aftermath of the Great East Japan Earthquake, roads were used as emergency evacuation sites, demonstrating their secondary disaster prevention function. [Ref. 2]

* when constructing roads, consider the risk of inundation by tsunamis and other disasters
*In order to support local governments in their efforts to secure emergency evacuation sites, evacuation facilities will be constructed in elevated sections.

・Improvement rate of evacuation facilities with a need for use of elevated sections of national highways under jurisdiction of MLIT as emergency evacuation sites (2019 -> 2025): Approx. 27% -> 100%.

■Evacuation facility image

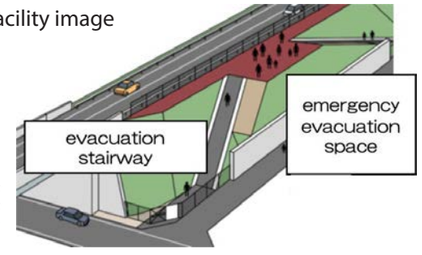
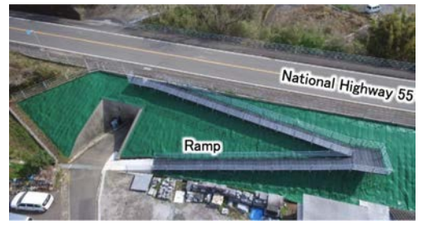


Image of an emergency evacuation facility in a road area

■Case study



Construct ramp to sidewalk higher than expected flood depth(National Highway 55, Nahari, Aki District, Kochi)

Use of Michi-no-Eki(roadside rest area) and other facilities as bases for recovery and reconstruction activities

Background / data

* In the aftermath of major disasters such as the 2016 Kumamoto earthquakes and the 2018 Hokkaido Eastern Iburi earthquake, Michi-no-Eki functioned as bases for recovery and reconstruction activities.

Reinforce disaster prevention functions through the selection of "Disaster Prevention Michi-no-Eki” Ref.2 and designation of "Disaster Prevention Base Parking Areas" Ref.3

* BCP formulation rate at Michi-no-Eki positioned in the regional disaster prevention plan: (2019 -> 2025): 3% -> 100%

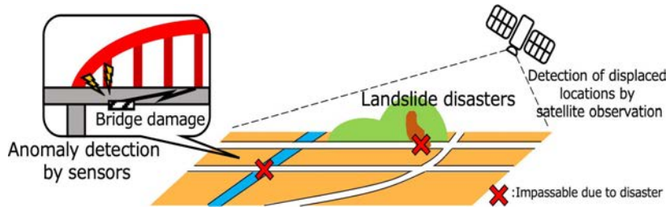
Information provision, road opening, and damage ascertainment in times of disaster

* In the event of a disaster, we will provide a "passible route map" that consolidates information on passability to support the transport of goods.

In the event of large-scale power outages due to typhoons, etc., coordinate with the Ministry of Economy, Trade and Industry (METI) and electric power companies on priority roads to be reopened, etc.

To provide rapid disaster responses, examine damage ascertainment methods to assess road damage immediately after a disaster

■Image of damage ascertainment methods



Ref. 1: Expressway and national highway under jurisdiction of MLIT
Ref.2：Designate roadside rest areas that serve as wide-area disaster prevention centers as "Disaster Prevention Michi-no-Eki "
Ref.3：Parking lots at Michi-no-Eki, etc. that serve as bases for emergency response measures in the event of a wide-area disaster

Radical and comprehensive disaster prevention and mitigation measures

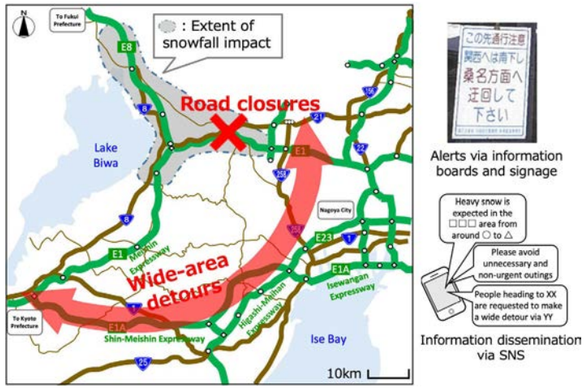
In the event of a disaster, while placing the highest priority on human lives, we will implement measures such as road closures so as to minimize the impact on socioeconomic activities.

Disaster preparedness and cooperation

Development, reviews and trainings of road reopening plans to improve the effectiveness of road reopening in the event of a major earthquake

In the event of extreme weather forecasts such as heavy rain and snow, strengthen efforts to encourage behavioral changes such as avoiding outings or making wide-area detours, by making emergency announcements in cooperation with the Japan Meteorological Agency and other organizations.

■Examples of calls for behavioral change



Alerts via information boards and signage

Information dissemination via SNS

Winter road traffic security Ref.1

To avoid vehicle blockage, swiftly implement planned and preventive road closures, including simultaneous closures of parallel expressways and national highways

Minimize the impact on socioeconomic activities by conducting intensive snow removal swiftly after road closures, and reopening the roads as soon as possible

Implementation of road closures

Conducting intensive snow removal

Spot measures at snow risk locations

Promote the introduction of snow removal and melting machinery and other equipment, as well as automation of snow removal and automatic traffic obstacle detection systems.Ref.2

Support for municipalities

Assist municipalities to strengthen their snow removal systems

Lending of small snowplows and other vehicles free of charge

Sending snow removal machine

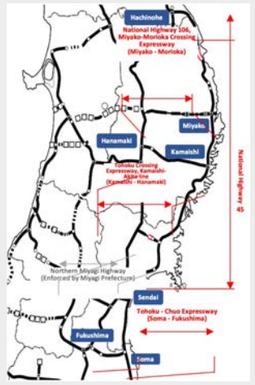
Ref.1：Measures to secure road traffic during heavy snowfall, interim report (revised March 2021)
Ref.2：Measures to strengthen road management systems using Information Technology

Recovery and restoration from large-scale natural disasters

We will promote road disaster recovery projects for the earliest possible restoration and reconstruction of areas severely damaged by natural disasters

Background / data

Recovery from the Great East Japan Earthquake



• Reconstruction road and Reconstruction support road (550km) for the Great East Japan Earthquake in 2011 fully opened on December 18, 2021.

• Sections started after an earthquake will be open in about 8 years on average.
・opened in 6 years at the earliest

• The opening of the entire line has greatly reduced travel time between cities.

(Before the earthquake (Mar. 2011) -> After the line was fully opened (Dec. 2021))

* Sendai - Hachinohe: From approx. 520 min. to approx. 320 min.
* Sendai - Miyako: From approx. 330 min. to approx. 210 min.
* Soma - Fukushima: From approx. 80 min. to approx. 50 min.

Disaster recovery projects on behalf of local governments

Promote projects for early restoration of bridges and other structures damaged by recent heavy rains and earthquakes, etc.

National government can implement disaster restoration projects on behalf of local governments upon request, when a high level of technical expertise is required in restoring local government managed roads

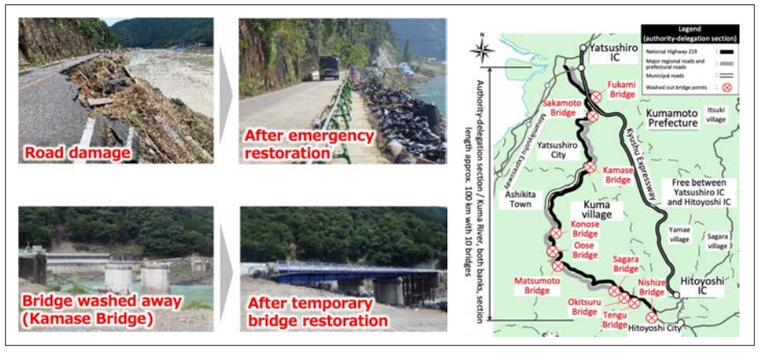
Rapid reopening to traffic secured by emergency-assembly bridges

In the event of bridge loss, on request from local government, the national government can lend emergency-assembly bridges to assist rapid reopening to traffic

■Examples of authority delegation

Heavy rain in August 2022 (National Highway 121, Yamagata Prefecture)

2022 Fukushima Earthquake in March 2022 (Date Bridge, Fukushima Prefecture)



2020 Kyushu floods (National Highway 219, Kumamoto Prefectural Road, etc.)

■Examples of emergency-assembly bridge deployment

Heavy rain August 2022, Yamagata Prefectural Road 10 (Omaki Bridge)

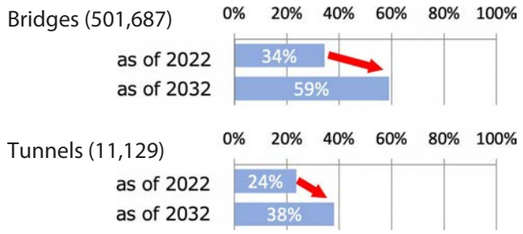
Preventive maintenance measures to aging road

- Safe and secure roads for the next generation -

Based on the lessons learned from “America in Ruins”, we have a responsibility to protect the safety and security of roads and to pass on reliable infrastructure to future generations. In order to make an early transition to maintenance based on preventive maintenance that reduces life-cycle costs and achieves efficient, sustainable management, we will accelerate measures for facilities that require repair as identified by periodic inspections and promote the active use of new technologies.

Increasingly serious aging of infrastructure

The percentage of infrastructure facilities that are more than 50 years old is increasing at an accelerating rate.

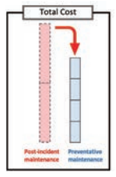


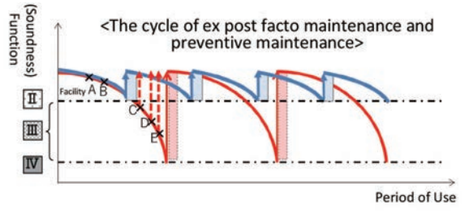
Infrastructure facilities more than 50 years old
*() indicates numbers of bridges and tunnels, excluding those where year of construction is unknown

Judgment category IV (urgent measures should be taken)

Medium- to long-term cost reduction through preventive maintenance

In order to shift to maintenance management based on preventive maintenance, and to reduce and equalize total costs over the medium and long term, it is vital to take early action on facilities that require early or urgent action (Judgment categories III and IV).





America in Ruins

In the 1980s in the U.S., several bridges, elevated roads, and other structures collapsed due to a failure to maintain aging road infrastructure, much of it dating from the 1930s, causing major social and economic impacts. Subsequently, road investment was secured through an expansion of financial resources and the number of defective bridges decreased, but serious accidents still occurred due to aging.

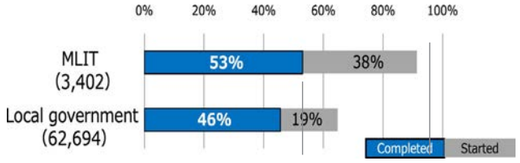
The Brooklyn Bridge’s sidewalk closed down after a cable cutting accident.
(Taken from “Highways and Automobiles, November, 1981.

Collapse of the Maianas Bridge (1983)

Fern Hollow Bridge collapse (2022) (from National Transportation Safety Board (NTSB) website)

Implementation status of repair and other measures for bridges in Judgment Categories III and IV

The proportion of bridges judged in need of early or urgent action (Category III/IV) in first-round inspections in the five years from FY2014 that have been repaired by local governments is lower than that of bridges managed by MLIT



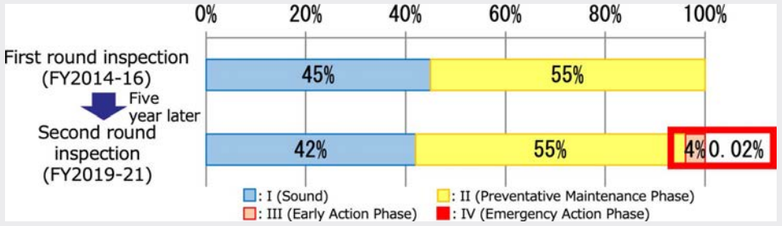
※ Facilities diagnosed in judgment categories III or IV in the first round of inspections from FY2014 to FY2018 (facilities newly diagnosed as judgment category III or IV in or after the second round of inspections are not included)

Promote Long Life Repair Plans

For facilities managed by local governments, we provide systematic and intensive financial support to the measures based on “Long-Life Repair Plans” by utilizing the Road Maintenance Project Subsidy Program, and technical support such as direct diagnosis and repair services on their behalf.

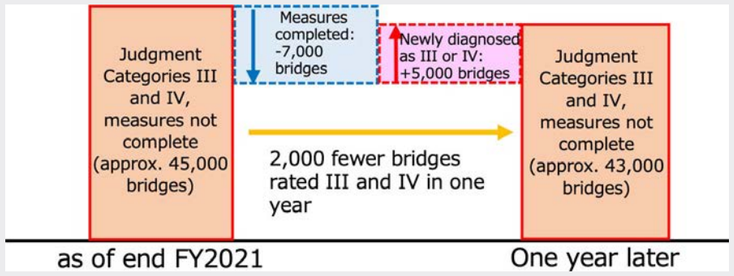
Background / data

[FY2022 annual road maintenance report]
• 46% of bridges managed by local governments that require urgent or early action have been repaired
• Proportion of bridges rated from I/II in the first round to III/IV in the second round of inspections five years later: 4%.



[Transition to preventative maintenance]
• At the current budget level, complete transition to preventative maintenance will take about 20 years (based on end FY2021 criteria).

Image showing changes in the number of bridges rated III and IV with measures completed by local governments



Financial support for local communities

Provide financial support to local governments through the Road Maintenance Project Subsidy Program

・Promote the shift to preventive maintenance by providing systematic and intensive financial support for facilities that require early repair and other measures
・Priority support will be given to projects that use new technologies and to the projects of local governments that have established short-term numerical targets for consolidation or removal of bridges as well as the use of new technologies and their cost reduction effects in their Long Life Repair Plans.

Technical support for local government

Technical support provided by the government, including repair services and training on repair. Ref.1

• The rate of repair measures for bridges that require urgent or early action on roads managed by local governments. （2019→2025）：Approx. 34% ⇒ Approx. 73%
• The number of those trained in maintenance and management at local governments. （2019→2025）：6,459 ⇒ 10,000

Ref 1: Directly managed diagnoses (FY2014-2020): 16 locations; repair and maintenance (FY2015-2021): 15 locations

Maintenance and management using new technology

We will promote the prompt development of catalogs and technical standards necessary for the introduction of new technologies, actively utilize new technologies, encourage the acquisition of qualifications for inspection engineers, and improve the efficiency and sophistication of maintenance and management

Background / data

• In order to promote the use of new technologies, create and publish an performance catalog of inspection support technologies(Ref.1)
• From FY2022, specify the use in principle of some of the technologies listed in the catalog for inspections under direct control (made explicit in particular specifications)

Improve efficiency, sophistication, and quality of periodic inspections

Develop and expand the performance catalog of inspection support technologies for bridges, tunnels, and pavements to promote more efficient and sophisticated periodic inspections

From 2023, qualifications etc. (Ref.2) are required for engineers in charge of bridge inspection on national highways under direct control

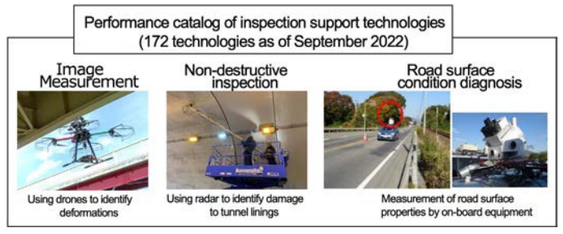
・Number of technologies listed in the performance catalog of inspection support technologies (FY2020 ⇒ FY2025): 80 ⇒ 240
・Among local governments that considered using new technology in bridge and tunnel inspections, proportion that have used it (FY2019 ⇒ FY2025): Bridges: 39% ⇒ 50%; Tunnels: 31% ⇒ 50%

Promoting the introduction of new technologies

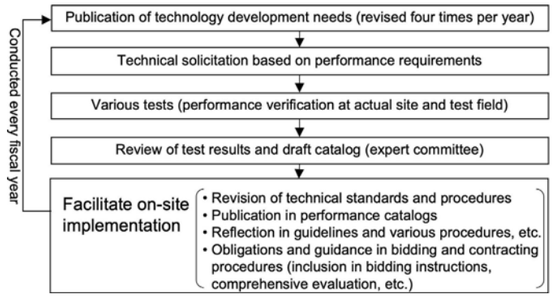
Promote technology research and development by start-up companies, etc. to improve the efficiency and sophistication of maintenance and management

Rapidly develop technical standards necessary for the introduction of new technologies

Priority support for the use of new technologies in the Road Maintenance Project Subsidy Program



■Flow of new technology introduction



Ref.1：Performance values for each technology are organized and published in catalog form according to standards https://www.mlit.go.jp/road/sisaku/inspection-support/
Ref.2：Qualifications required of management engineers in their work (e.g., professional engineer, doctoral degree, JSCE certified engineer, etc.), private qualifications registered as "Ministry of Land, Infrastructure, Transport and Tourism Registered Qualifications," certificates of passing road bridge maintenance technology training, etc.

Improving efficiency of maintenance and management measures in the regions

In order to reduce maintenance and management costs, support the consolidation and removal of aging bridges and other structures and their functional reduction, repair pavements with weakened roadbeds, and promote the use of concrete pavements in appropriate locations.
In order to provide good and efficient public services in the face of a decrease in the number of local construction companies and local government engineers, promote comprehensive private sector outsourcing of road maintenance.

Support for consolidation, removal, and reductions of functionality

Background / data

• Only 40% of municipalities have considered consolidation, removal. (as of the end of May 2021)

Support consolidation (Ref.1), functional reduction, and removal (Ref.2) of replaceable aging bridges and other structures through the Road Maintenance Project Subsidy Program

・Percentage of local governments considering consolidation, removal, or functional reductions of facilities:
（2019 -> 2025）：14% -> 100%

<Removal due to consolidation>

Removing the overpass and consolidating its functions to an adjacent bridge.

<Reduced functionality>

Renewed as a pedestrian bridge due to reduced functionality.
* Vehicles can use the bridge 60m away.

<Removal>

Ensuring the safety and security of the region by improving the flood control effect through removal

Reduction of Life Cycle Cost (LCC) of pavement

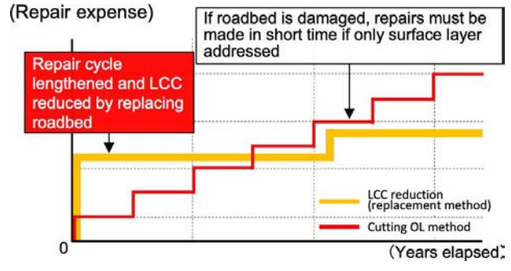
Background / data

• Damage to the roadbed causes premature deterioration of the surface layer and a large increase in LCC
• The percentage of pavements requiring repair, such as roadbed replacement, that have been started is only 15% for direct control and 32% for prefectures and ordinance-designated cities (Ref.3) (as of the end of FY2021)

Reduce LCC by replacing pavement beds and using concrete pavement in appropriate location

・Rate of pavement repair on roads important for disaster prevention for pavements with damaged roadbed or lower layer (approx. 2,700 km as of 2019). (2019->2025):0% ->100%

■Image of LCC reduction



Promotion of comprehensive private sector outsourcing

Promote comprehensive outsourcing of road maintenance by local governments to the private sector, including cross-functional projects with sewerage systems, rivers, parks, etc., in accordance with local conditions, so that good public services can be provided through private-sector vitality

Ref.1：Only in the case of repairing structures at the aggregation site or reconstructing roads for detouring to the aggregation site.
Ref.2： Only when removal of structures and road reconstruction are carried out at the same time or in cases where the removal is expected to have a flood control effect, and where a short-term numerical target for removal and its cost reduction effect are specified in the Long Life Repair Plan.
Ref.3: Roads that carry heavy traffic, such as Important Logistics Roads managed by prefectures and government ordinance-designated cities

Large-scale renewal of Expressways

We will engage in systematic large-scale renewal of expressways managed by expressway companies.

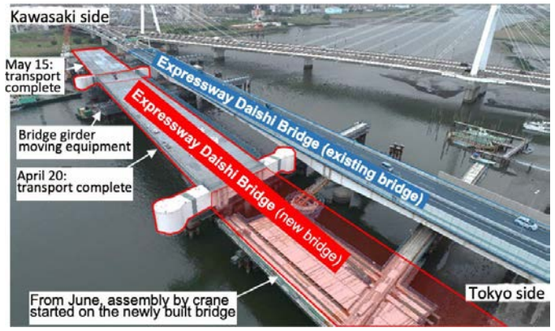
Expressway Renewal

Background / data

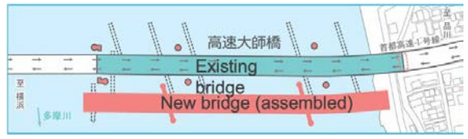
• Status of road closures related to specific renewals (2021, six Expressway companies in total): All-day road closures (main line): 13 locations, total of 442 days Two-way traffic restrictions: 56 locations for a total of 4,049 days

Systematically promote renewal projects while devising construction methods and utilizing new technologies to minimize the social impact of traffic restrictions

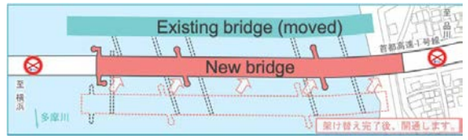
■Example: Metropolitan Expressway Daishi Bridge
(bridge replacement work)



Numerous fatigue cracks in longitudinal ribs, etc.



Assembly of new bridge downstream of existing bridge



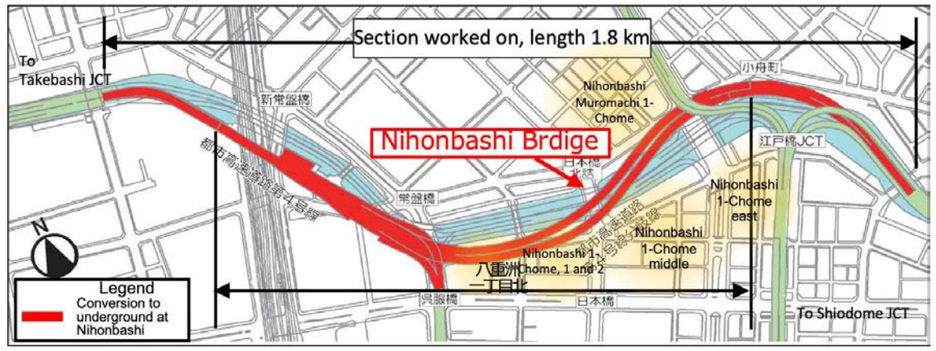
After existing bridge moved upstream, new bridge was moved into place

Devising construction methods to shorten the road closure period

Efforts to develop the Metropolitan Expressway underground in cooperation with urban development

In addition to measures for the aging of the Metropolitan Expressway, we will also work to improve its functionality by widening its shoulders, etc., and will collaborate with private redevelopment projects such as the revitalization of the waterfront area around the Nihonbashi River and the development of a business hub in the city center. [Ref. 1]

■Plan of the undergrounding of the Nihonbashi area of the Metropolitan Expressway



■Images showing before and after the conversion to underground in the Nihonbashi area

※Based on current information onredevelopment plans

Ref. 1: City planning changed in October, 2019, project approved in March, 2020, construction started in November, 2020, underground route scheduled to open in 2035, elevated bridge scheduled for removal in 2040.

Development of networks and hubs to support the flow of people and goods

- Connecting people and regions -

It is necessary to ensure the safe and smooth movement of people and goods throughout the country in order to respond to the creation of a multi-nuclear country and stable logistics by correcting the concentration in Tokyo. In order to build a national arterial road network that ensures speed and accessibility, we will work on the development and functional enhancement of high-standard roads. We will also promote measures to strengthen modal connections by developing transportation hubs, counter-congestion, and support logistics.

Express services between cities

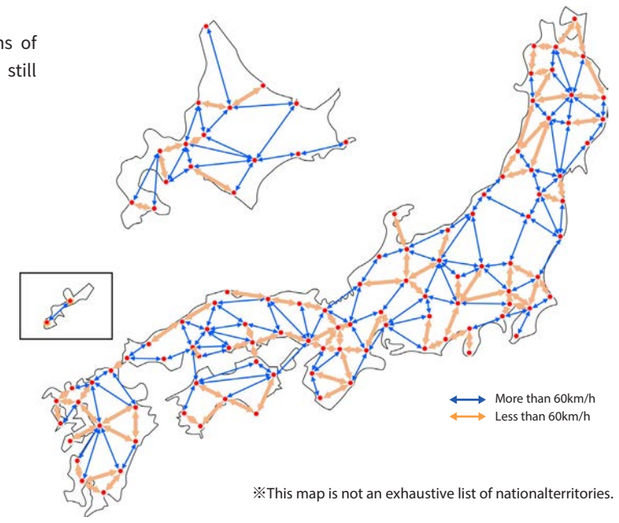
Japan is still lagging behind other countries in terms of inter-city speed, with about 40% intercity(90/208 links) still less than 60 km/h.

■Status of inter-city travel speed

（Note） Method of calculating the speed of inter-city communication
Covers 113 cities and 208 links. Calculated using ETC2.0 (2018 small car) travel speed data.

<Ref.> Average speed of inter-city communication in other countries

Japan	Germany	France	UK	China	Korea
62km/h	95km/h	96km/h	80km/h	79km/h	60km/h



※This map is not an exhaustive list of nationalterritories.

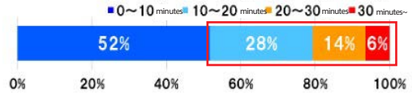
Accessibility to airports and harbors

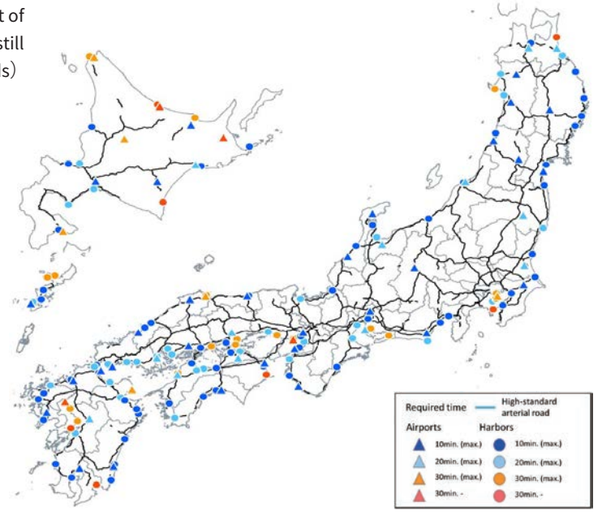
Airports and seaports are bases for the wide-area movement of people and logistics, but about half of them (82/170) still require 10 minutes or more from high-standard arterial roads）

■Access to major airports and harbors

* Major airports and ports: base airports and jet airports, international strategic harbors, international hub harbors, and important harbors.
* Travel times are calculated from ETC2.0 data for 12 hours during the daytime on weekdays in FY2019

Time required from IC
Approx. 50% requires more than 10 minutes





Construction and functional enhancement of the road network

- Development based on the new wide-area road transportation plan

To improve productivity and regional revitalization, etc. by facilitating and smoothing human and logistics flows, we will promote functional enhancements by surveying and improving road networks based on new wide-area road transportation plans formulated in each region.

Maintenance based new wide-area road transportation plans

Background / data

- A shift from concentrated unipolar to a multipolar socio economic model (Ref.1) is required
- Improving productivity in logistics is an urgent issue, as the shortage of truck drivers, who are essential workers, is becoming apparent
- The effectiveness of road development needs to be evaluated in line with the actual situation, taking into account changes in freight transport and mobility, etc.

Based on The "New Wide-area Road Transportation Plans (Ref.2) formulated in each region, promote functional enhancements by systematically surveying and improving road networks, while also utilizing individual subsidy programs for Important Logistics Roads

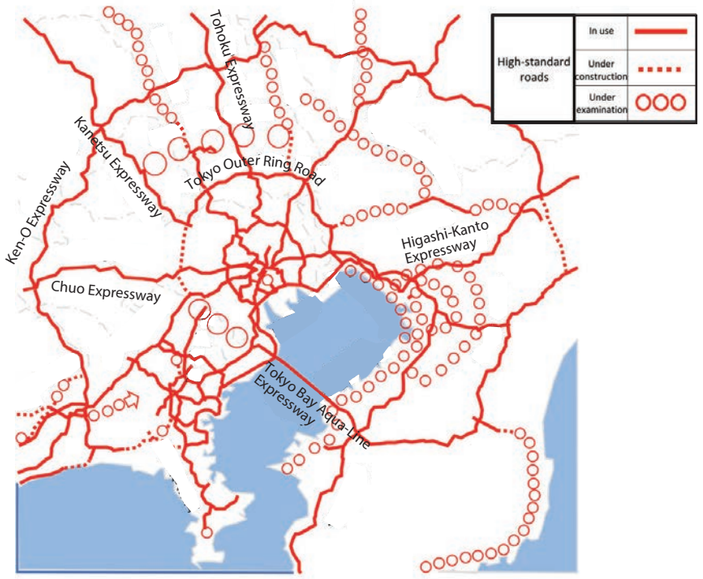
・ Rate of inter-city express delivery by road （2019→2025）：57%⇒63%
・ Development rate of ring roads in the three major cities （2020→2025）：83%⇒89%

Expanding the sections on Important Logistics Roads where special vehicle permits are not required for international marine container trucks (40ft long) (Ref.3)

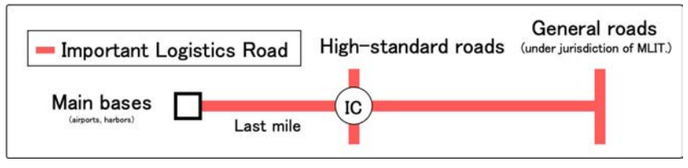
Based on performance indicators (Ref.4) for Important Logistics Roads, effectively and efficiently promote the elimination of obstacles, etc.

Conduct research on methods to understand and evaluate various effects of road maintenance based on changes in mobility, etc.

■High-standard roads in the metropolitan area (New wide-area road transportation plan)



■Image of Important Logistics Road



Ref. 1: Grand Design and Action Plan for the New Capitalism (cabinet resolution made on June 7, 2022)
Ref. 2: The plan consists of a wide area road network plan, a transportation and disaster prevention base plan, and an ICT transportation management plan.
Versions for prefectures, ordinance-designated cities, and blocks (formulated by regional development bureaus, etc.) have been formulated by July 2021.
Ref. 3: Designated approximately 31,300 km of road sections that do not require permits for international maritime container trucks (40ft long) (as of July 2022)
Ref. 4: Indicators to evaluate services provided by Important Logistics Roads (logistics, congestion, safety, deterioration, etc.)

Construction and functional enhancement of the road network

- Strengthening access to the network from transportation and logistics hubs

To improve accessibility from transportation and logistics hubs to expressways and other networks, we support the development of Smart IC and access roads.
Promote a smart IC system directly connected to private facilities, which allows the private sector to initiate and bear the burden of development.

Background / data

• The number of expressway interchanges in Japan is 1,521 (managed by expressway companies, including those under construction, excluding smart IC)
• The average spacing between expressway interchanges in Japan is approx. 10 km, which is about twice that of free expressways in the flatlands of Western countries.
• Access to major airports and seaports from high standard arterial road interchanges is 10 minutes or more in about half of cases.
• Smart IC: 150 open, 54 under construction
• Smart IC directly connected to private facilities: 2 locations opened in Japan (Awaji-Kita Smart IC, Taki Vison Smart IC)

All figures are as of September 30, 2022

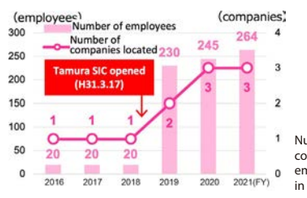
In order to promote more efficient logistics, regional revitalization, improved convenience, and enhanced disaster prevention functions, the need for Smart IC will be examined in the regions, and the development of Smart IC will be promoted

Focused support for the development of access roads in conjunction with the development of interchanges, ports, airports through individual subsidies.

Promote the development of smart IC directly connected to private facilities through interest-free loans to private business operators and exemption from registration and license tax.

■Effect of Smart IC development (Tamura Smart IC)

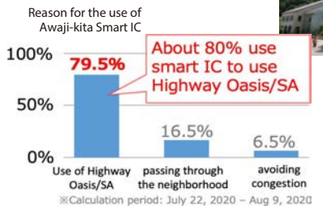
・Smart Interchanges will improve accessibility to expressways and surrounding businesses.
・Companies locating in the vicinity, creating approximately 300 new jobs.



Number of companies and employees located in industrial parks

■Construction of an IC with direct connection to the private sector (Awaji Kita Smart IC)

Awaji Highway Oasis



Strengthening the functions of transportation and disaster prevention centers

- Development based on the new wide-area road transportation plan

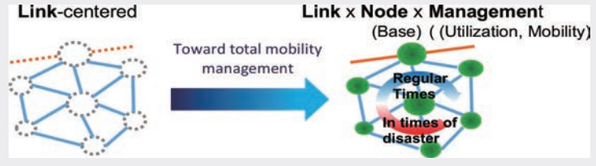
In addition to strengthening the link functions of the road network, we will promote efforts to strengthen the functions of nodes, such as transportation and disaster prevention centers, in order to respond to the introduction of diverse mobility and increasingly severe disasters.

Background / data

• From the Link-Centric Era to the Link x Node x Management Era

• Number of representative stations (nodes) developed (all as of August 2022)

Michi-no-Eki (Roadside restarea):1,198 stations. Disaster Prevention Michi no Eki: 39 stations
Bus terminals (Busta): 1 in service, 6 in operation
SA/PA: 884 locations (3 NEXCO companies, Metropolitan Expressway, Hanshin Expressway, Honshi Expressway)



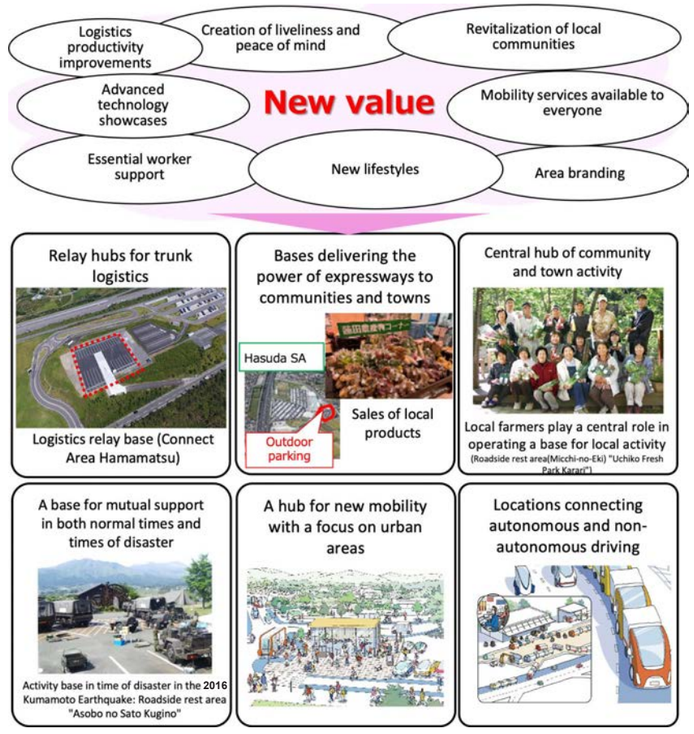
Develop measures to create new value, such as improving logistics productivity and creating liveliness and peace of mind, through the promotion of public-private partnerships

For SAs and PAs, study the possibility of utilizing PFI methods to improve functions other than the rest function. Also, support the development of parking lots that are integrated with electric vehicle charging facilities, base facilities for autonomous vehicles.

Conduct surveys on public involvement in relay transportation hubs and cargo handling spaces

Promote the enhancement of base functions by utilizing systems such as specified vehicle stopping facilities (Ref.1) and Disaster Prevention Base Parking Areas (Ref.2)

■Future direction of the “base” policy



Ref. 1: Under the revised Road Law of 2020, dedicated terminals for buses, taxis, trucks, and other vehicles (specified vehicle stopping facilities) were positioned as road accessories
Ref. 2: The system was established by the Road Law revised in 2021

Strengthening the functions of transportation and disaster prevention centers

- Nationwide expansion of the Busta Project

We will promote the Busta project to enhance connections between various modes of transportation (modal connect) and create new road spaces.
Promote the introduction of public transportation systems, such as BRT, that contribute to reducing the environmental burden and revitalizing local communities.

Background / data

- Busta Shinjuku consolidates express bus and cab stops (opened in 2016).
- Guidelines (Ref.1) were compiled as a reference for planning the functional enhancement of transportation hubs (April 2021).
- BRT is being introduced and studied nationwide, and is in operation at 28 locations (as of April 2022, including trial operations)

Busta project business development and deepening of initiatives

In addition to Busta Shinjuku, the Busta Project is being promoted in six areas nationwide, including Shinagawa West Exit and Sannomiya station in Kobe

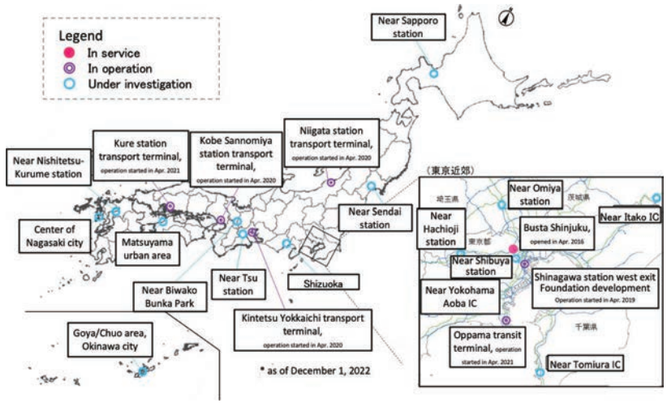
Study on qualitative and quantitative evaluation methods for the effects of functional enhancement of transportation hubs

Promote the introduction of public transportation systems such as BRT

Promoted the introduction of public transportation systems by disseminating guidelines(Ref.2) for local governments that outline the BRT study process, support menu, case studies, and linkage with mobility hubs

Focused support for the improvement of local public transport operating environments as defined in local government transportation and community development plans

■Major areas of study and progress in the Busta Project



■Image of enhanced traffic nodal function

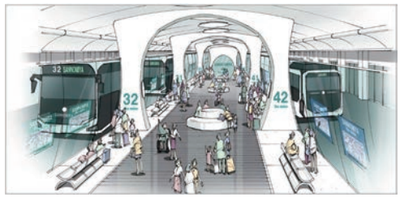


Image of bus boarding / alighting space (Kobe Sannomiya)

■Example of BRT

Articulated bus (Machida)

Ref. 1: Planning Guidelines for the Functional Enhancement of Transportation Hubs (Ministry of Land, Infrastructure, Transport and Tourism, Road Bureau)
Ref. 2: Guidelines for the Introduction of Regional Public Transport (BRT), etc. Utilizing Road Space (Ministry of Land, Infrastructure, Transport and Tourism, Policy Bureau, City Bureau, Road Bureau)

Development of ICT transportation management

Promote the sophistication of data acquisition and utilization, which is the foundation for effective and efficient implementation of road traffic demand control (TDM) etc. using ICT, and promote problem solving through data-driven management.

Advanced traffic data acquisition and utilization

Background / data

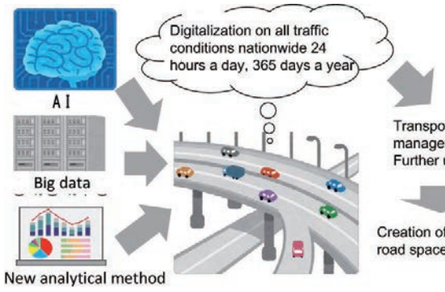
- Expanding market for traffic-related data and accelerating development of telematics services in the private sector
- Approx. 90% of new car sales are expected to be connected cars by around 2035

Establish a system for constant observation of traffic conditions by FY2027 by upgrading observation and estimation methods, and make traffic volume and other data open

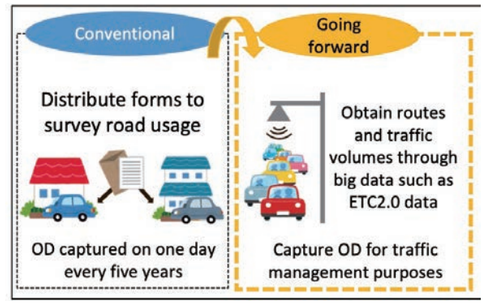
Review the conventional nationwide road and street traffic condition survey and establish a new road traffic survey system by utilizing big data such as constantly-monitored traffic data and ETC2.0

Promote initiatives to advance ICT traffic management by utilizing the forum of the Regional Road Economy Strategy Study Group (Ref.2)

■Continuous observation system



■New road traffic survey system



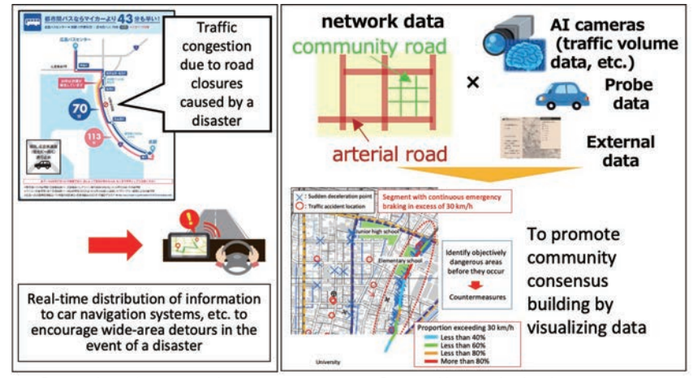
Problem solving through data-driven management

Promote collection and centralization of data in order to promptly implement disaster transportation management (Ref.3) after a disaster

Promote use of big data for effective and efficient traffic safety planning and community consensus building

Promote intangible and tangible measures for further effective utilization of traffic capacity based on analysis of current conditions and causes of traffic congestion.

■Image of data-driven management



Detour guidance for general vehicles

Road condition analysis using big data

Ref. 1: Fuji Keizai, "Future Outlook for Connected Car, V2X and autonomous Driving Related Markets 2021"
Ref. 2: Based on the opinions of experts, conduct research on regional economic revitalization strategies and social experiments/implementation using road space
Ref. 3: Implemented through the Disaster Traffic Management Study Group consisting of the Ministry of Land, Infrastructure, Transport and Tourism, police, local governments, expressway companies, academic experts, and related organizations.

Efficient and effective traffic jam countermeasures

In order to maximize road network functionality, strengthen cooperation with local governments and promote EBPM (Ref.1) in congestion countermeasures and the speeding up of the PDCA cycle through data-driven management

Background / data

• Approximately 9,000 major congestion points (as of September 2022) identified by the national traffic congestion countermeasures council based on the latest traffic data, etc.
• Annual congestion loss per person is approx. 40 hours, which is equivalent to approx. 40% of the time spent driving/riding (approx. 100 hours).

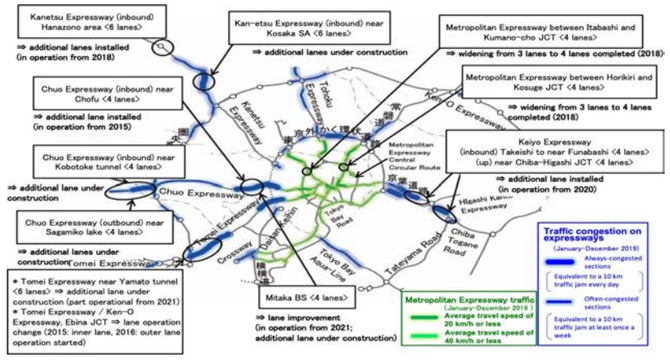
Promote efficient and effective intangible and tangible measures tailored to the current situation and causes of traffic congestion through data-driven management

Strengthen cooperation with truck, bus etc. user groups at the council on congestion countermeasures (Ref.2) to promote quick-acting countermeasures, and study more efficient and effective measures based on monitoring results

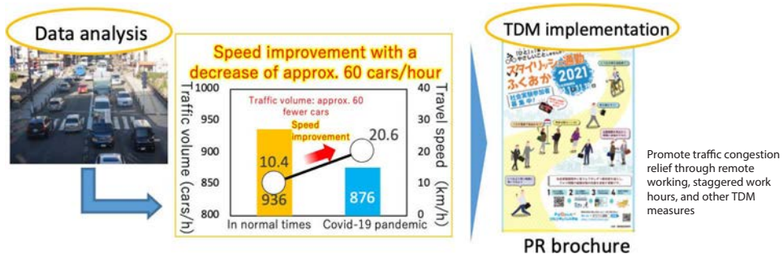
To ensure smooth traffic on Important Logistics Roads, continue to request road traffic assessments (Ref.3) to be conducted by facility owners along the road

Promote traffic congestion countermeasures in all prefectures through traffic demand management (TDM) using big data, etc.

■Examples of congestion countermeasures through data-driven management



Implementation of pinpoint countermeasures using big data on expressways in the Tokyo metropolitan area (12 locations in project)



Effective TDM by analyzing critical points of traffic volume at times of congestion based on traffic data before and after the covid-19 pandemic, and by targeting the number of vehicles to reduce peak hour traffic (Fukuoka Prefecture)

Ref. 1: Evidence-based policy making
Ref. 2: Established in each prefecture, etc., for road administrators, police, local governments, user groups, etc., to identify major congestion points in the region, and to study and implement countermeasures, including intangible and tangible
Ref. 3: By predicting the impact on the surrounding traffic before siting and implementing countermeasures, facilities can be located without disturbing existing traffic, and additional countermeasures considered if traffic situation deteriorates after siting

Introduction of toll measures to optimize traffic flow

Based on the interim report of the Committee on National Arterial Road (Ref. 1), we will promote studies such as the introduction of a new toll system to build a sustainable expressway system.
In order to use expressways more wisely, we will consider the full-scale introduction of tolls based on congestion.

Review of metropolitan area tolls

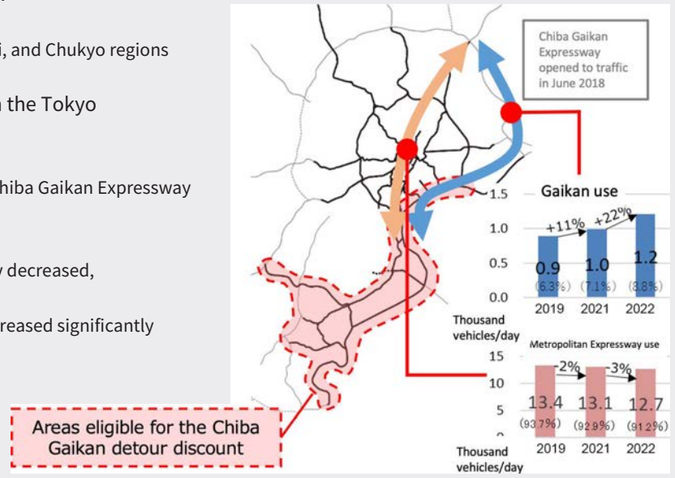
Background / data

[July 2015: Three Wise Principles of Tolls]
(1) A fair toll structure based on the level of usage
(2) A simple and seamless toll system that transcends management entities
(3) A strategic toll system to optimize traffic flow

Sequential toll rate revisions in the Tokyo, Kinki, and Chukyo regions

[April 2022: Revision of expressway tolls in the Tokyo metropolitan area]
• Revision of maximum tolls
• Introduction of discounts for detours via the Chiba Gaikan Expressway
• Introduction of late-night discounts etc.

• Long-distance use of Metropolitan Expressway decreased, while short-distance use increased
• Late-night use of Metropolitan Expressway increased significantly amid an increase in overall traffic volume
• Increased use of Chiba Gaikan Expressway, bypassing central Tokyo



Main initiatives based on the Interim Report

Implement a review of discounts to address the main current issues regarding nationwide toll discounts

• Removal of holiday discounts during peak periods (year-end / New Year, Golden Week, O-Bon vacation) in light of intensifying traffic congestion, etc.
• Review of the late-night discount system, such as making only the portion of travel during the discount period eligible for the discount and expanding the discount period accordingly, will be implemented in FY2024, taking into account vehicle waits at toll booths

Promote the introduction of a toll system that is proportional to the distance traveled in order to relieve chronic traffic congestion on expressways in metropolitan areas.

There will be full-scale introduction of congestion-based toll rates (discounts and surcharges) in metropolitan areas.

Continuation of measures to expand volume and frequency discounts

Continuation of measures to expand volume and frequency discounts for motor carriers using ETC2.0

(Implemented until the end of March 2024 through supplementary budget for FY2022)

Ref. 1: Official announcement on August 4th, 2021

Logistics support in the road sector

We will promote road-related initiatives to achieve “simple and smooth logistics”, “bearer-friendly logistics”, and “strong and flexible logistics” in line with the outline of comprehensive logistics measures approved by the Cabinet in June, 2021.
In order to improve the working environment of drivers who support logistics, we will promote the expansion of parking spaces for resting facilities, efforts to promote the use of relay transportation, and efforts to promote the use of double-trailer truck to save manpower.

Ensure truck drivers have reliable rest opportunities

Background / data

• Lack of parking spaces for large vehicles has become a problem on expressways
• According to the standard for improvement of working hours for truck drivers, a rest period is required every four hours of driving (penalties will be applied starting from 2024).

In addition to the expansion of the number of parking spaces, there will be an introduction of dual-use spaces that can be used by both standard and large vehicles.

Number of large vehicle parking spaces expanded by the three NEXCO companies		
Construction in FY2020	Construction in FY2021	FY2022 -2024 Construction Plan
Increased by around 750	Increased by around 900	Increase of approx. 1,500 (planned)

Conducted demonstration test of parking space reservation system

Study on securing rest opportunities for drivers, conducted by an expert committee of the Expressway Agency and expressway companies

Image for dual use spaces

■A parking lot reservation system that ensures drivers have a reliable opportunity to rest.

Demonstration tests confirm effectiveness of relay transportation
Promote the development of bases that contribute to practical application and dissemination

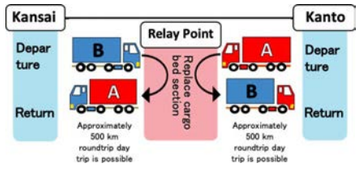


Image of relay transportation

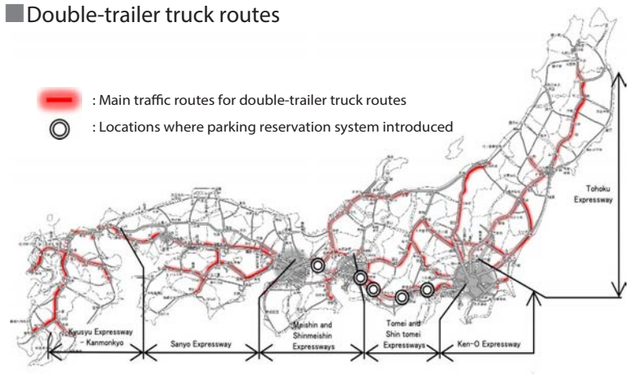

Demonstration experiment using roadside rest areas
(Michi-no-Eki) (Hokkaido)

Promote the use of double-trailer trucks to save manpower

Background / data

• 13 operating companies, 207 licensed units (as of the end of September, 2022)
• Double-trailer truck priority parking: 238 spaces (as of the end of September, 2022)

■Double-trailer truck routes



In November 2022, routes covered by double-trailer trucks were expanded (before expansion: approx. 2,050 km, after expansion: approx. 5,140 km)

Development of parking spaces to accommodate double-trailer trucks, demonstration of a reservation system, etc.

Promote 6-laning of Shin-Tomei and Shin-Meishin Expressways

Promote 6-laning of Shin-Tomei and Shin-Meishin to increase productivity by improving logistics efficiency.

Developing a new mobility and sharing use environment

In light of the emergence of electric kickboards, automated delivery robots, and the growing need for their use, we will promote the development of roads that contribute to the convenience of new mobility services
In light of the shift in usage patterns from ownership to sharing, we will promote the sharing of bicycles, automobiles, and other vehicles.

Providing envifonment for new mobility usage

Background / data

• In April 2022, the revised Road Traffic Act was enacted, establishing a new vehicle classification for electric kickboards as "specified small motorized bicycles" and for automatic delivery robots as "remote-controlled small vehicles"


Electric kickboard


Automated delivery robots

Photo courtesy of Council for Area Development and Management of Otemachi, Marunouchi, and Yurakucho, Luup, Inc., ZMP Inc.

Promote the development of riding space for bicycles and electric kickboards to ensure the safety of all road users, including new mobility

Consider support such as providing data on width, necessary for automated delivery robots to travel

Promote the use of sharing

Background / data

• The number of cities with full-scale introduction of shared bicycles increased from 87 (end FY2016) to 170 (end FY2020). (Ref.1)
• Number of domestic car sharing scheme members increased from about 2.25 million (2021) to about 2.64 million (2022), or about 400,000 in a year (Ref.2)

Promotion of shared cycle services

Further promote the spread of shared bicycles by providing know-how to local governments through guidelines (Ref.3) and visualizing the effects of their introduction

Use of road space for car sharing

Based on the results of social experiments (Ref.4) using road space as car sharing stations, guidelines were established for nationwide deployment


Car sharing
(Highway 1, Otemachi Station ST)


Cycle sharing
(Shizuoka City, Shizuoka Prefecture)

Ref. 1: According to Ministry of Land, Infrastructure, Transport and Tourism, City Bureau
Ref. 2: According to Fouincation for Promoting Personal Mobility and Ecological Transportaion
Ref. 3: To be established in FY2022

Ref. 4: Install and operate car sharing stations on roads with high transfer convenience from public transportation, and verify vehicle usage and the effect of improved convenience (near Otemachi Station on National Highway 1 and near Shimbashi Station on National Highway 15)

Support for the diffusion and promotion of autonomous driving

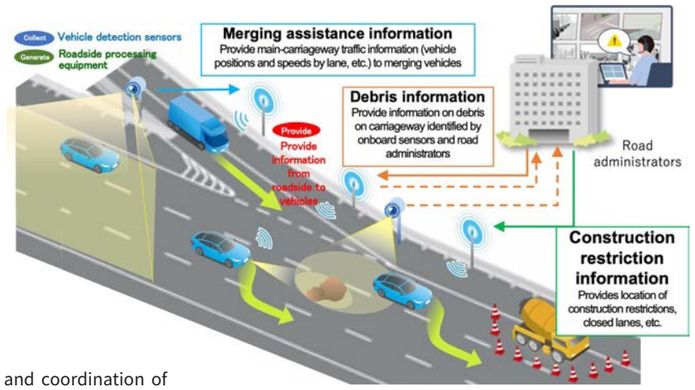
Focused support local government that aim to develop communities and regions utilizing autonomous driving, and promote joint research with the private sector toward the realization of autonomous driving on expressways.

Creation of road environment necessary for autonomous vehicles

Background / data

• [Government target] Realization of Level 4 autonomous driving on expressways by 2025

Promote joint research through public-private partnerships on methods to provide information such as guidelines for managing lane markings and advance signage (lane-merging information, construction restriction information) in order to realize safe and smooth autonomous driving on expressways.



Conduct demonstration experiments on provision of lane-merging information on expressways, utilizing the results of joint research.

Promote next-generation ITS and construction and coordination of platforms for efficient and effective information generation

Regional support using autonomous driving

Background / data

• [Government Target] Realization of regional unmanned autonomous driving services in about 50 locations by FY2025, and more than 100 locations nationwide by FY2027

• Conducted demonstration experiments of autonomous driving services at a cumulative total of 18 roadside rest areas (Michi-no-Eki), with full social implementation at four of them (Kamikoani, Okueigenji Keiryu no Sato, Miyama City Yamakawa Branch, and Akagi Kogen)

Focused support for the development of a driving environment based on development community plans utilizing autonomous driving, and technical support for planning driving space.

Conduct surveys, studies, and demonstration experiments on traffic safety measures and provision of information on road traffic conditions from infrastructure for the realization of urban autonomous driving services

Providing information on intersection status (image)

Traffic safety measures at complex intersections (image)

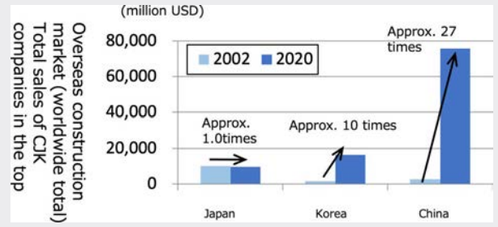
Export infrastructure systems in the road sector

In order to capture the global demand for infrastructure, we will work together with the public and private sectors to promote the acquisition of overseas road projects based on the “Strategy for Overseas Development of Japanese Infrastructure Systems 2025” [Ref. 1] and the “Strategy for Overseas Development of the Road Sector (Ref.2)

Background / data

• Demand for transportation infrastructure (road, rail, ports, airports) in Asia will be US$520 billion/year (2016-2030) [Ref. 3]

• In the overseas construction market, Chinese and Korean companies have been rapidly increasing their orders in recent years. [Ref. 4]



In accordance with the “Act on Promotion of Japanese Companies' Participation in Overseas Social Infrastructure Projects”, we promote the overseas development of Japanese companies together with expressway companies.

We provide support and encouragement to obtain O&M projects [Ref. 5] for tunnels and bridges to be constructed with loans in yen

Examples of tendering support

Conclusion of MOC for cooperation over tunnels (Philippines)
Further strengthen ties with Japanese expressway companies by sharing O&M technologies and holding workshops on the occasion of the groundbreaking of the first full-scale road tunnel (Davao Bypass) in the Philippines

Signing Ceremony of Memorandum of Cooperation (October 4, 2022)

Examples Overseas Development by Expressway Companies

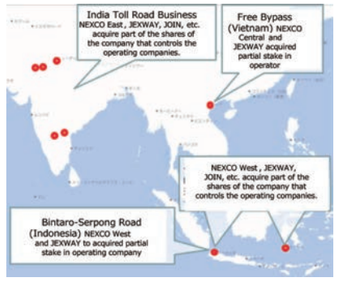
Non-Destructive Inspection of Structures (US) NEXCO
West Japan established NEXCO-West USA, Inc. to enter the bridge inspection business in the U.S.A. and to investigate advanced technologies. They received orders for non-destructive point infrared camera inspection of concrete slabs using an infrared camera, etc.

Inspection of concrete slabs using an infrared camera

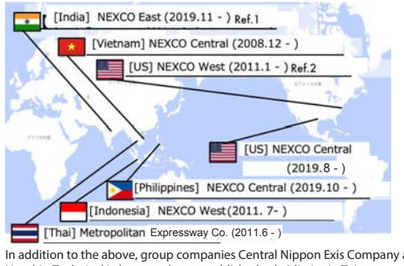
Technical assistance for road operation and maintenance (Bangladesh)
JV including NEXCO East received an order from the Asian Development Bank (ADB), the first Japanese expressway company to receive an order from the ADB

Condition of Roads in Bangladesh

■Major participation road PPP projects



■Overseas offices of expressway companies



In addition to the above, group companies Central Nippon Exis Company and Hanshin Technical Laboratory have established subsidiaries in Taiwan and China, respectively

Ref. 1:Decided by the Keikyo Infra Strategy Council in June 2022, the Strategy is based on the "Strategy for Overseas Development of Japanese Infrastructure Systems 2025," which includes the formulation of sector-specific action plans and the creation of multiple layers of action KPIs, plus specific measures
Ref. 2: Decided by the Keikyo Infrastructure Strategy Council in February 2019 Ref. 3: Asian Development Bank Meeting Asia’s Infrastructure Needs
Ref. 4:ENR’s The Top International Contractors （2003,2021）Orders received by top companies in terms of global market share for each year, as calculated by ENR's questionnaire and aggregated by country. Subject companies vary each year. Ref. 5: O&M: Operation & Maintenance

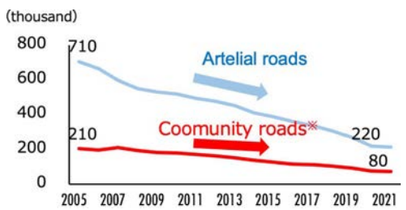
Creating safety, security and activity in road space - Creating regions and towns -

In order to achieve a society in which all people can live in safety, security, and comfort, we will promote traffic safety measures, universal design, the removal of utility poles, and the development of spaces for bicycle traffic, as well as initiatives to meet the diverse needs of road space, such as the creation of new forms of mobility and regional activities.

Creating safe and secure road space

Although the number of traffic accidents is on the decline, the rate of decrease in the number of fatal and injury accidents on roads is small,many accidents still occur.

■Trends in the number of accidents resulting in death or injury by road type



* Roadway width less than 5.5m, arterial roads: counted as roadway width of 5.5m or more
Source: based on annual report of traffic accident statistics

Elementary school students passing on the narrow shoulder

In Japan, with its declining birthrate and aging society, it is necessary to develop safe, secure, and universally designed spaces.

■Universally designed walking space

■Universally designed bicycle lane

National Highway 246: Aoyama area

Realization of diverse needs for road space

Diverse needs for road space, including the installation of open cafes and parklets on sidewalks* to create liveliness and improve the attractiveness of the city

*Efforts to create stagnant space mainly by utilizing shoulders and stopping lane

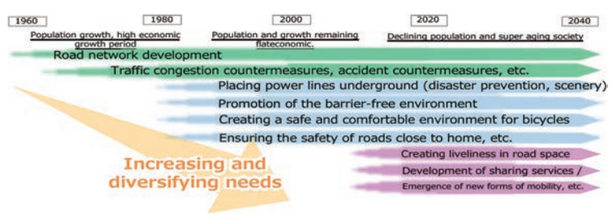
■Open cafe on the sidewalk

Bandai City Street: Niigata City

■Installation of parklets

Honeycomb Square: Shizuoka City

Road policies diversifyin response to the needs of the world

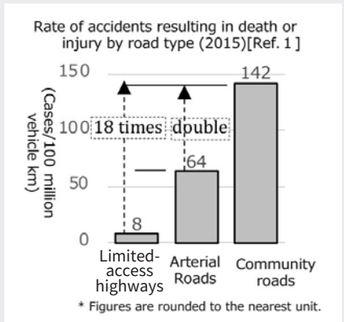


Development of a safe and secure transportation space

While further improving the safety of arterial roads, we will promote the creation of pedestrian- and bicycle-oriented spaces by diverting automobile traffic, and implementing comprehensive measures to control the speed of traffic and the entry of through-traffic on community roads.

Background / data

- The number of traffic fatalities in 2022 was 2,610, the lowest in the postwar period
- On the other hand, the rate of fatal and injurious accidents on community roads is significantly higher than on other roads
- As a result of joint inspections of school routes (Ref.2), measures have been completed at approximately 17,000 of the 40,000 spots that need to be addressed by road administrators (as of March 31, 2022).
- “Zone 30 Plus" (Ref.3) development plans have been established in 33 districts nationwide (as of July 31, 2022).



Promote intensive countermeasures at accident-prone spots (Ref.4)

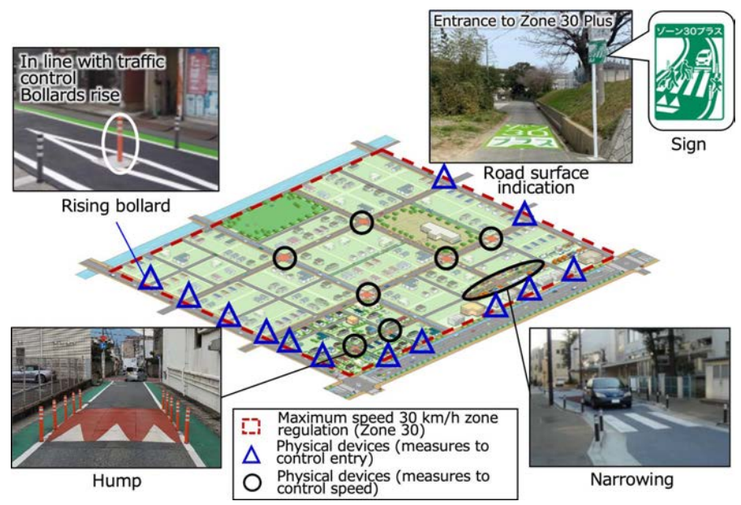
Promote the conversion of automobile traffic to trunk and arterial roads, and promote the functional differentiation of roads from community roads.

Promote measures such as the construction of sidewalks and protective fences based on the results of joint inspections of school routes through the Traffic Safety Measures Subsidy System (Emergency Measures for School Routes)

Promoting the use of big data for efficient and effective traffic safety planning and community consensus building

Promote "Zone 30 Plus" on community roads through traffic safety measure subsidy system (in cooperation with other districts), etc.

■Image of “Zone 30 Plus”



- Improvement rate of sidewalks on school routes (2019 to 2025): 53% -> 57%.
- Reduction rate of fatal and injurious accident-prone spots on arterial roads (2025): about 30% reduction compared to 2019
- Reduction rate of fatal and injurious accidents on community roads (2025) by measures combining 30km/h speed limit in Zone 30, etc., and maintenance of humps and narrow strips: about 30% reduction compared to 2019

Ref.1: Arterial roads (national highways, major regional roads, prefectural roads (excluding limited-access highways)), and community roads (roads other than limited-access highways and arterial roads (including roads other than those under the Road Act))
Ref.2: Implemented in response to a traffic accident that occurred on a school road in Yachimata City, Chiba Prefecture, in June 2021
Ref.3: Cooperative measures to ensure traffic safety for pedestrians and others through close cooperation between police and road administrators from the study stage and through an appropriate combination of zone restrictions (Zone 30) with a maximum speed of 30 km/h and physical devices
Ref.4: Areas on arterial roads where there is a high risk of accidents (frequent accidents, potentially dangerous areas, etc.) and where countermeasures are intensively implemented, as designated jointly by the Ministry of Land, Infrastructure, Transport and Tourism and the National Police Agency

Promotion of railroad crossing countermeasures

In accordance with the Act on Promotion of Railway Crossings, promote the designation of railroad crossings to be improved, measures such as grade-separated crossings, and barrier-free measures

Crossing countermeasures

Background / data

- Railroad crossings requiring urgent consideration of countermeasures (chart crossings) 1,336 locations
- Ministerial designation of railroad crossing roads to be improved 241 locations
- Ministerial designation of railroad crossing roads with disaster management methods 372 locations

Support for railroad crossing improvement projects through the use of the railroad crossing improvement project subsidy to systematically and intensively support crossing roads that need to be improved.

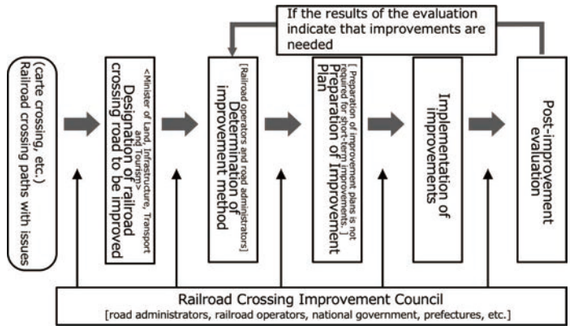
Promoting transparency of the consultation process by opening railroad crossing road improvement council meetings to the public, and "visualization" of the status of countermeasures by publishing the “Railroad Crossing Road Safety Passage Chart"

Promote barrier-free measures at railroad crossings by studying detailed specifications and structures based on the guidelines (Ref.1) revised in response to accidents at railroad crossings involving persons with visual impairment

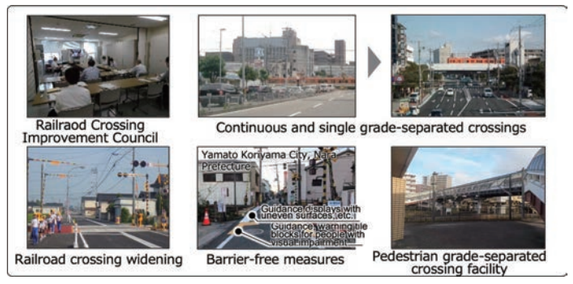
Designate railroad crossing roads for which disaster management methods are to be determined, and promote efforts to ensure that priority is given to openings and other measures to prevent long-term blockages in the event of a disaster

・Number of railroad accidents (2025): Approx. 10% decrease from FY2020
・Time lost due to railroad crossing blockage (2018 -> 2025): 1.03 million man-hours/day => 980,000 man-hours/day

■Flow of measures based on the Act on Promotion of Railway Crossings



■Example of a railroad crossing countermeasure



Ref.1：Guidelines for Facilitating Road Transportation(revised June 2022)

Improving the safety and reliability of expressways

To prevent head-on collisions, new technology will be installed on long-span bridges and tunnel sections on a trial basis on actual roads to verify its effectiveness.
With the aim of achieving zero serious accidents due to wrong-way driving by 2029, we will promote measures to prevent wrong-way driving on expressways, as well as measures to prevent pedestrians and mopeds from entering expressways by mistake.

Measures to prevent head-on collisions in provisional two-lane sections

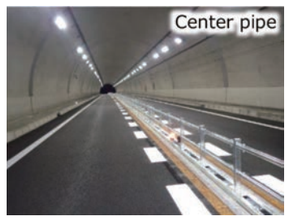
Background / data

- The rate of fatal accidents on temporary two-lane sections of expressways is about twice that of sections with four or more lanes.[Ref. 1]
- As of November 2022, out of 6,257 contact accident, there were 13 accidents in which the driver ran into oncoming trafficing wire rope barriers into oncoming traffic, of which there were no fatalities .[Ref. 2]

New technology that meets the performance requirements for preventing vehicles from deviating from the road on long bridges and tunnel sections is being installed on a trial basis at 6 locations (approx. 1 km) on actual roads nationwide to verify the effectiveness of the new technology

Plans are in place to expand the trial locations by approximately 13 km to verify the effectiveness of the technology

■New technologies that are to be installed on actual roads on a trial basis among publicly solicited technologies



Selected 2 technologies for long-span bridge and tunnel sections

Countermeasures to prevent wrong-way driving and wrong-way entry

Background / data

- The average number of incidents of wrong-way driving on expressways has been approximately190 per year for the past four years.
- Of the 3,392 incidents (Ref.4) of pedestrians and other vehicles entering expressways (in FY2021), 57% were mopeds, 30% were pedestrians, and 13% were bicycles.

Promote the practical application of color pavement on public roads as a countermeasure for expressway entrances and exits, which account for approx. 30% of reverse driving incidents, and communication technology vehicle to road infrastructure using image recognition technology.

At the entrance and exit of the expressway, measures to prevent pedestrians and mopeds from entering the expressway by mistake will be promoted in addition to measures to prevent wrong-way driving.

Measures at the entrance and exit of expressways
(Colored pavement)

The in-vehicle camera recongnises the wrong-way driving and warns the driver

Signs for image recognition

Ref. 1: Expressway (toll) (2013-2021) Ref. 2: Wire rope installed: approx. 1,430 km (as of November 2022)
Ref.3: Number of cases of wrong-way driving: 2017: 207, 2018: 200, 2019: 200, 2020: 148, 2021: 188
Ref.4: Number of cases of wrong-way entry: 2017: 3,733, 2018: 3,823, 2019: 3,998, 2020: 3,662, 2021: 3,392

Utilization of space to meet various needs

In order to respond to various needs for roads, such as the creation of liveliness, and to improve the attractiveness and revitalization of the community, we will work on the flexible use of sidewalks and shoulders, and the realization of "road spaces focused on people".

Background / data

• Needs for road space is diversified, such as "liveliness," "safety," and “support for new mobility”
• In order to create lively roads, the Hokomichi (Pedestrian Convenience Road System) system was established (Ref.1) and 92 routes were designated by 33 road administrators (as of November, 2022)

Flexible use of sidewalks, shoulders, etc.

Promoting the Hokomichi system to create a lively community

To make effective use of road space and create a bustling atmosphere,

・Establish and disseminate guidelines for flexible use of road shoulders
・Consider multifaceted use of space, including shoulders

To improve road maintenance and management, promote the development of a road cooperative group system (Ref.2) and linkage with the Hokomichi system

■Examples of Hokomichi utilization (Kobe City)

Sannomiya Chuo Dori

■Example of multifaceted use of shoulders (Sendai City)

Roadside car sharing

Background / data

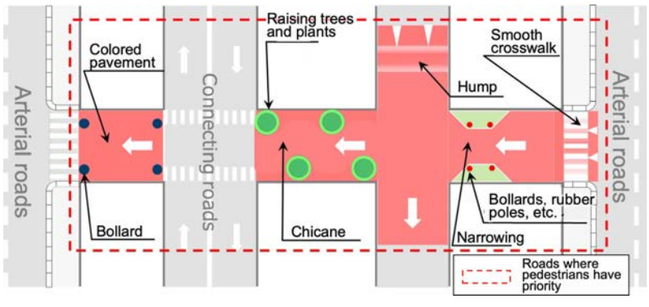
• Increasing needs for safe and secure walking spaces that prioritize people and road spaces where people can stay and interact with each other have led to the need to realize "road spaces focused on people"

Realization of road spaces focused on people

Promote spatial reorganization by analyzing existing cases, developing good practices, and disseminating "Guidelines for Roads Responding to Diverse Needs" in order to create bustling spaces

To create road spaces where pedestrians can coexist with vehicles, a mechanism to focus on curbing the entry and speed of cars will be studied as a way to "create roads where pedestrians have priority"

■Image of measures to suppress entry and speed



Ref.1: Due to the enforcement of the revised Road Act (November 2020)
Ref.2: A system for road management through cooperation between road administrators and private organizations that utilize roads

Improving the environment for bicycles and promoting their use

Based on the Second Bicycle Use Promotion Plan, which was formulated in May 2021, we will promote the creation of a safe and comfortable environment for bicycle use by promoting formulation of bicycle utilization promotion plans in local governments.

Creating a safe and comfortable environment for bicycle use

Background / data

• Extension of bicycle traffic space separated from pedestrians: approx. 3,599 km (as of the end of FY 2020)
• Following the revision of the Road Traffic Act in 2022, new mobility devices such as electric kickboards entered the bicycle traffic space

Accelerate the development of appropriately separated bicycle traffic space through the review of guidelines (Ref.1) and other measures

Establish a regional promotion system to strengthen cooperation among related parties and promote the formulation of Local Bicycle Use Promotion Plans (Ref.2) through the provision of new know-how.

・89 municipalities developed the plans (Ref.3) ⇒400 municipalities （2020→ 2025）

■Bicycle traffic space

Bicycle Track

Bicycle lane

Promoting the introduction of bicycle commuting

Promote the introduction of bicycle commuting through the "Bicycle Commuting Promotion Company" declaration project (Ref.4)
・Share of bicycles used for commuting (2015→2025): 15.2% → 18.2%

Promotion of cycle tourism

Promote the development of the riding environment on the National Cycle Route (Ref.5) improve the reception environment through cooperation with commercial facilities and public transportation and disseminate information domestically and internationally

Prepare a collection of case studies on cooperation with public transportation systems and disseminate them to relevant parties

・The number of model routes aiming to develop an advanced bicycle user environment （2020→2025） ： 56 routes ⇒ 100 routes

■Example of collaboration with public transportation

Cycle Train(JR Kinokuni Line, Wakayama Prefecture)

Promote the purchase of bicycle liability insurance

Background / data

• Status of subscription obligation by ordinance, etc.: Mandatory in 31 prefectures, effort required in 9 prefectures (as of October 2022)

Provide support to prefectures and other entities in enacting ordinances and providing information on the need for insurance coverage.

・Purchase rate of bicycle insurance （2020→ 2025） ： 59.7% ⇒ 75%

Ref.1: Guidelines for Creating Safe and Pleasant Cycling Environment (July 2016)
Ref.2: According to the Bicycle Use Promotion Act, prefectures and municipalities must endeavor to establish local bicycle use promotion plans
Ref.3: Number of local Local Bicycle Use Promotion Plans that include a plan for bicycle networks
Ref.4: Number of declared companies: 55 (as of November 2022)
Ref.5: Designation status: 6 routes (as of November 2022)

Promotion of universal design

We will promote the universal design of roads around major railroad stations throughout Japan in order to achieve communities where all people, including elderly and disabled, can move around smoothly and safely.
Promote the development of child-rearing support facilities at Michi-no-Eki (roadside rest area) nationwide.

Background / data

• Expansion of the designation of specific roads [Ref. 1] based on the Barrier-Free Act (July, 2019)

Expanded designation: approx. 1,700 km -> approx. 4,450 km

• Major child-rearing support facilities at service areas and Michi-no-Eki

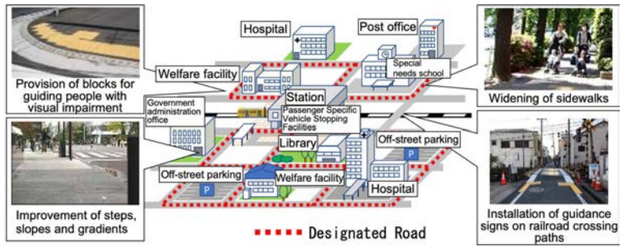
Maintenance rate (as of April 2022)	Baby Corner available 24 hours a day	Covered priority parking spaces for pregnant women
Michi-no-Eki in Japan (1194 facilities)	18% (218 facilities)	21% (256 facilities)

:*Completed at 220 SAs with commercial facilities on expressways

Promotion of Barrier-Free Accessibility of Specified Roads

Promotion of barrier-free access to specified road designated under the Barrier-Free Act.

・Rate of creating barrier-free specified roads (2018 -> 2025): approx. 63% -> approx. 70%



Development of road space with consideration for universal design

Dissemination of the Guidelines for Facilitating Road Transportation (revised June 2022) which set forth barrier-free standards and universal design for roads, etc.

Continued consideration of measures to accommodate the various characteristics of disabilities and the installation of guidance signs at railroad crossings, based on hearings with concerned parties, etc.


inspection concerned parties


A curb that allows buses to stop at the stop without leaving gaps


Edge structure of crosswalk which considers for the visually impaired, wheelchair users, etc.

■Image of a child-rearing support facility

Promote the development of childcare support facilities at Michi-no-Eki nationwide


Baby corner available 24 hours a day.

Covered priority parking spaces for pregnant women

Target for development of childcare support facilities at Michi-no-Eki nationwide (2019→2025): approx. 4% ⇒ approx. 50% or more

Ref. 1: Roads that constitute major community routes in the priority development areas and that are designated by the Minister of Land, Infrastructure and Transportation.

Promoting the removal of utility poles

From the perspective of improving the disaster-prevention capability of roads, ensuring safe and comfortable traffic space, creating a favorable landscape, and promoting tourism, we will promote the removal of utility poles in accordance with the Removal of Utility Poles Promotion Plan [Ref. 1] formulated in May, 2021.

Background / data

• Japan is behind other major cities in other countries in terms of removing utility poles.

◇ Tokyo 23 wards: 8%, Osaka City: 6% (2020) *Road extension base
◇ London, Paris, Hong Kong: 100% (2004), Taipei: 96% (2015)*Cable extension base

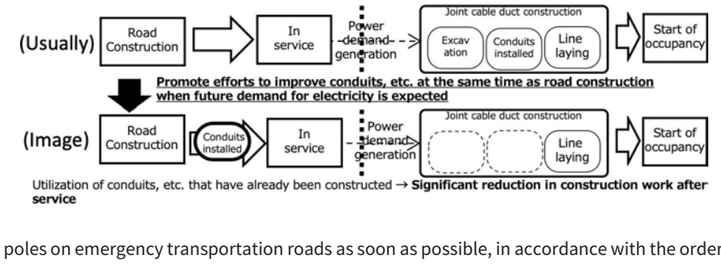
• Based on the Removal of Utility Poles Promotion Plan, the company started to eliminate approximately 4,000 km of poles over a five-year period starting in FY2021
• The number of utility poles nationwide is approximately 36 million, and the number of new poles increased by 48,000 in FY2021.
• The implementation rate of occupancy restrictions on new utility poles on emergency transportation roads is approximately 85% (100% for national highways under jurisdiction of MLIT)

Dealing with new and existing utility poles

Related ministries and agencies collaborate to promote measures to control new utility poles Ref.2

• In principle [Ref. 3] , when implementing road projects and urban development projects, etc., install no utility poles
• Promote efforts to improve conduits at the same time as road construction when future demand for electricity is expected

■Maintenance in case of expected future electricity demand (image)]



Start restricting occupancy of existing utility poles on emergency transportation roads as soon as possible, in accordance with the order of priority.

■Utility poles on emergency transportation roads

■Road blockage caused by collapsed utility pole


August 2012 Tornado Disaster (Kochi Prefecture)

Commenced operation of the "Notification and Recommendation System," which recommends that utility poles and other objects along emergency transportation roads be relocated to locations that will not block the road in the event of a collapse

Extensive cost reductions

Further cost reductions through the use of low-cost methods such as shallow burial and the introduction of new technologies.

Reduce costs by an average of 20% by FY2025 Ref.4

Speeding up the project

Promote innovations in ordering, such as the introduction of comprehensive ordering, and the use of private-sector funds through the adoption of PFI methods

Target to halve the project period by FY2025 (from an average of 7 years to 4 years) Ref.4

Ref. 1: May 25, 2021 Ministerial Decision Ref.2: April 20, 2022 Publication Ref.3: Except in cases of technical difficulties Ref.4: Covers joint cable conduits to be started within the period of the promotion plan

Promotion of the third stage of “Michi-no-Eki (Roadside rest area)”

The third stage of "Michi-no-Eki" will be comprehensively promoted in order for "Michi-no-Eki" to become "bases for accelerating regional development and tourism" and to contribute to the design of vibrant regions through networking.

Background / data

- **1,198 rest areas installed nationwide (August 2022)**
- **39 "Disaster Prevention Michi-no-Eki" were selected (June 2021) and 332 Michi-no-Eki were designated as "Disaster Prevention Base Parking Areas" (March 2022)**

Efforts to strengthen disaster prevention functions

Promoting the enhancement of disaster prevention functions of "Disaster Prevention Michi-no-Eki " [Ref. 1] and "Disaster Prevention Base Parking Areas"

Promote installation of high value-added containers [Ref. 2] that can be used even in times of disaster and renewable energy power generation equipment (solar panels, etc.) at "disaster-prevention Michi-no-Eki" and other facilities

■Efforts to create a disaster prevention center

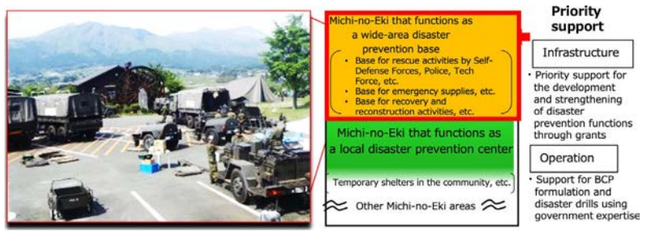


Image of "Disaster Prevention Michi-no-Eki"

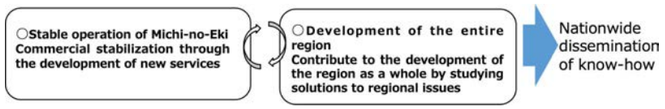
The “new normal” and region-centered response

Promote horizontal development of initiatives such as promotion of improved sanitation, cashless payment, mail order and e-commerce support, etc.

Implementation of model projects

Utilizing data on the actual usage of "Michi-no-Eki", etc. to ensure the stable operation of "Michi-no-Eki" and the development of the region as a whole

■Image of model project



Implement initiatives and disseminate the know-how gained throughout the country.

Strengthening on-site support

Strengthen on-site support for issues such as aging facilities by introducing support menus that can be utilized for renewal and establishing a consultation service

■Example of renewal ((Mutsuzawa Smart Wellness Town, Michi-no-Eki, Tsudui no Sato)

Before renewal

After renewal (left: overall view, center: market, right: Tsudoi no Hako)

Right side photo source: https://mutsuzawa-swt.jp/

Ref. 1: Requirements for selection as a "Disaster Prevention Michi-no-Eki"
①Positioning as a wide-area disaster prevention center in prefectural wide-area disaster prevention plans and new wide-area road transportation plans
②The facility must have a BCP (Business Continuity Plan) in place (or a concrete plan to establish facilities and systems within about 3 years of selection), with facilities that can conduct business even in the event of a disaster by making the building earthquake-proof, uninterruptible, and ensuring communication and water supply, and a parking area of 2,500 m2 or more
Ref. 2: Promote utilization of high value-added containers
Movable containers capable of providing services such as rest and regional promotion are to be installed at "Michi-no-Eki" and transported to disaster-stricken areas for wide-area utilization in the event of a disaster. Direct project cost (1,595.3 billion yen)

Promotion of Tourism

In order to realize a tourism-oriented country, we will promote the creation of a post-COVID environment, the creation of local tourism content, and regional congestion countermeasures in tourist areas

Background / data

- **Japan is No. 1 in the world in terms of the countries and regions where people would like to take their next sightseeing trip[Ref.1]**
- **Interest in outdoor activities and seeing nature and scenery increased as things people want to experience when they travel to Japan[Ref.2]**
- **The percentage of domestic travel by private car, etc. increased after the spread of COVID-19 [Ref.3](54% (July-September 2019) → 71% (July-September 2021))**

The post-COVID environment

Promote initiatives (e.g., holding hands-on events, selling specialty products along scenic roads) in collaboration with the Japan Scenic Byway and Michi-no-Eki (Roadside rest area), etc.

Promote directions that are easy for everyone to understand, including multilingual signs, use of map signs.

Expanding the average 30% discount of the expressway excursion pass to about 40% discount only on weekdays to equalize tourism demand

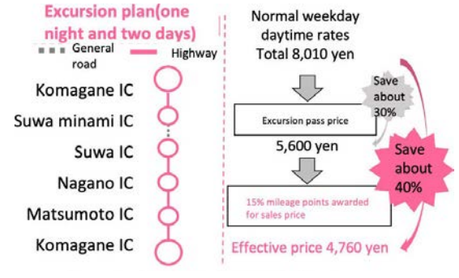
Creation of local tourism content

Create world-class cycling environments such as national cycle routes and promote them domestically and internationally

Measures to prevent traffic congestion in tourist areas

Promote surface congestion countermeasures through the use of parking reservation services, Park & Ride, etc.

■Promoting weekday use of the excursion pass



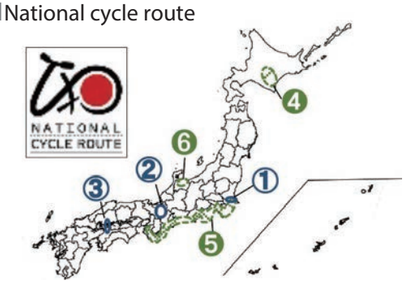
Example from NEXCO East

■Support for wide-area sightseeing tours

World Heritage guide sign (Hagi City, Yamaguchi Prefecture)

Pictogram of "Sites of Japan's Meiji Industrial Revolution: Iron and Steel, Shipbuilding and Coal Mining" (World Heritage)

■National cycle route



Tier 1 designation (November 2019)

①Tsukuba-Kasumigaura ring ring road (Ibaraki prefecture)
Extension : Approx. 180km

②Biwaichi (Shiga Prefecture)
Extension : Approx. 190km

③Shimanami Kaido Cycling Road (Hiroshima, Ehime Pref.)
Extension: Approx. 70 km

Tier 2 designation (May 2021)

❹ Tokapuchi 400 (Hokkaido)
Extension: 403km

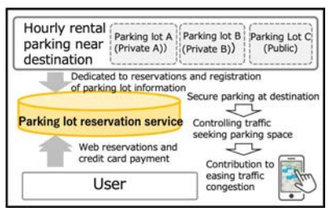
❺ Pacific Cycling Road (Chiba Prefecture - Wakayama Prefecture)
Extension: 1,487km

❻ Toyama Bay Cycling Courses (Toyama Prefecture)
Extension: 102km

■Creating a cycling environment

Improvement of the environment for cyclists

■Parking Reservation Service



Ref. 1: Development Bank of Japan and the Japan Travel Bureau Foundation, "Survey on Tourist Travel to Japan from Asia, Europe, the United States, and Australia (October 2021)"
Ref. 2: From the 2022 White Paper on Tourism
Ref. 3: Compiled by the Road Bureau from the Japan Tourism Agency's "Survey of Travel and Tourism Consumption Trends".

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.

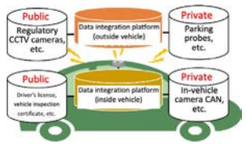
Promote increased convenience through the use of ETCs for various payments on and off expressways.

■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.

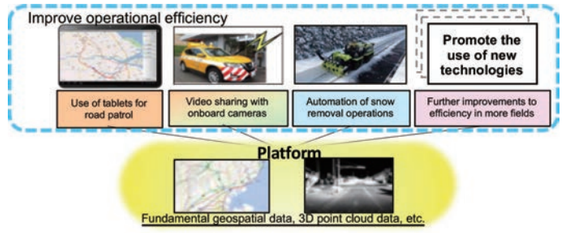
Measures to strengthen the road management system using IT

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

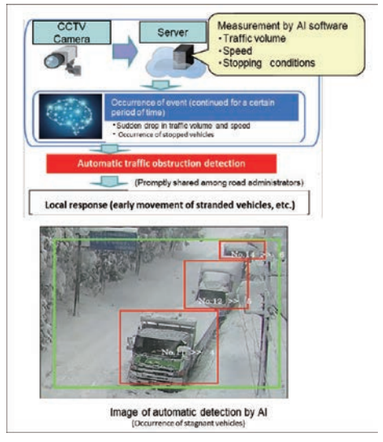
Installation rate of CCTV cameras on emergency transport routes where constant observation is required.（2019→2025）：0% => Approx. 50%

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

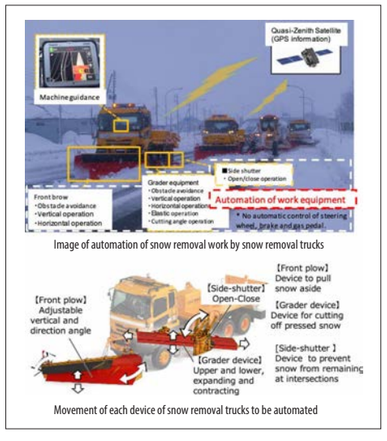


Examples of use at Regional Development Bureaus, etc.



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

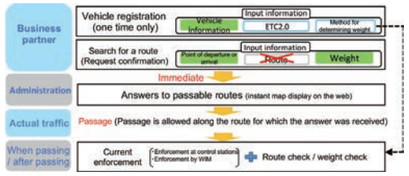
Background / data

<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

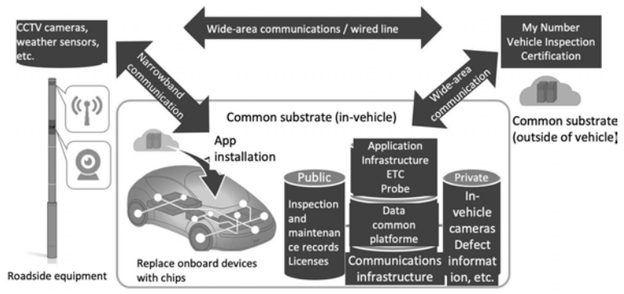
In anticipation of the era of autonomous driving, promote next-generation ITS by building an infrastructure that securely links data from inside and outside the vehicle in order to dramatically improve the safety and convenience of road users

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

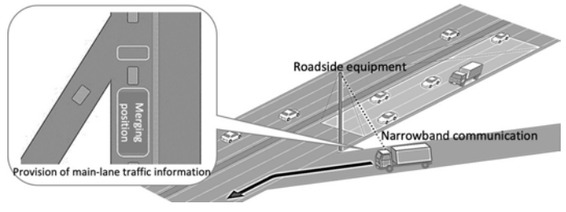
■Image of the data linkage infrastructure inside and outside the vehicle



Service image we aim to realize

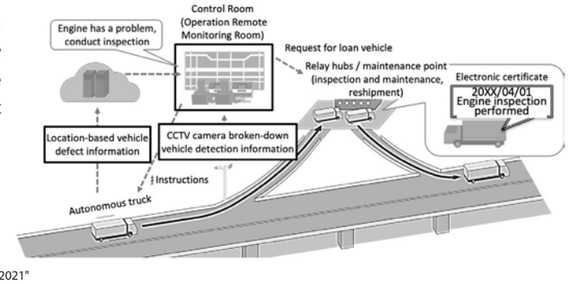
■Merging support at expressway interchanges using narrowband communications

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

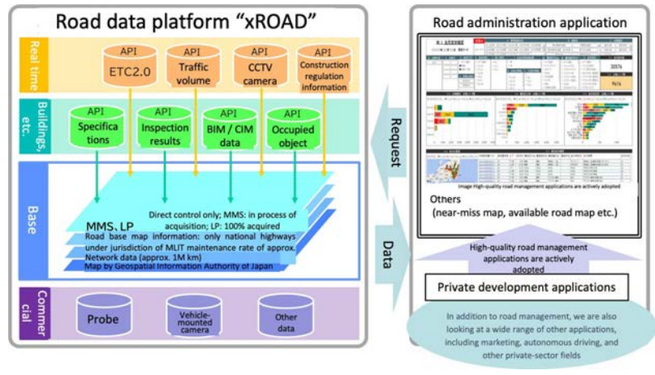
- Accumulated data on inspection and diagnosis of road facilities (about 730,000 bridges, 10,000 tunnels, and 40,000 road accessories)
- ETC2.0 on-board unit number approximately 8.62 million units (as of the end of November, 2022)
- Obtained 3D point cloud data of 19,000 km of national highways under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

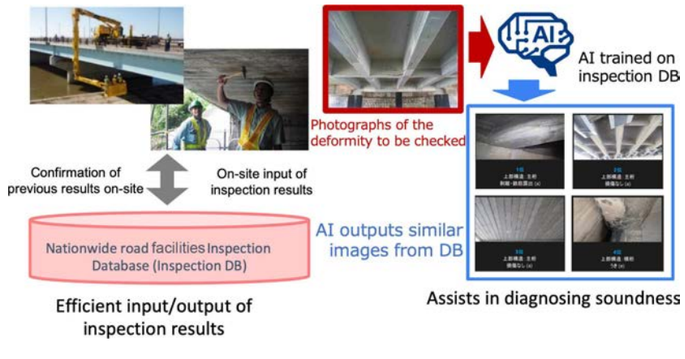
Develop applications that utilize data from traffic volume, ETC2.0, road facilities inspection results, and other sources to make road management and ICT traffic management more sophisticated and efficient

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



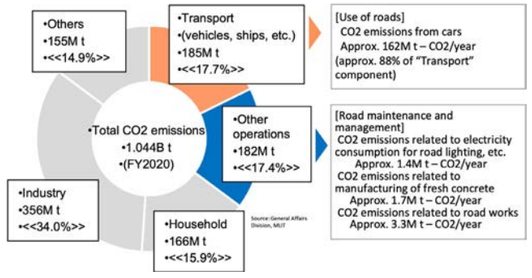
Realization of a decarbonized society through promotion of GX

- Contribution to 2050 carbon neutrality -

As natural disasters become more severe and frequent due to climate change, global warming countermeasures are an issue that cannot wait. We will contribute to the realization of a decarbonized society by promoting GX (Green Transformation), including the spread of next-generation automobiles, low-carbon road transportation, and energy-saving and green road infrastructure.

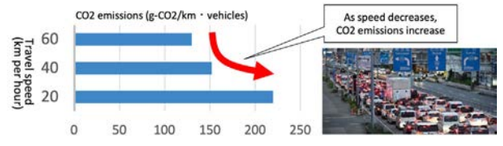
CO2 emissions in Japan

In the road sector, the "transportation" and "business and other sectors" emit about 170 million tons of CO2 (about 16% of the total).



■Relationship between CO2 emission and driving speed

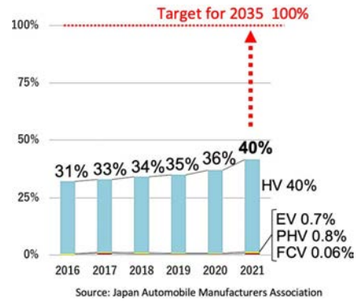
Decreased driving speed due to traffic congestion contributes to increased CO2 emissions



Uptake of next-generation vehicles

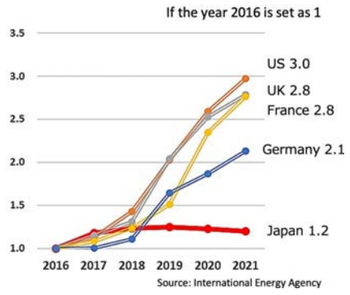
With the government target of 100% electric vehicles in new passenger car sales by 2035, it is necessary to improve the environment for the uptake of next-generation vehicles such as electric vehicles

■Percentage of new electric vehicles sold



Source: Japan Automobile Manufacturers Association

■Number of EV chargers installed



Source: International Energy Agency

Energy saving and greening of road infrastructure

Contribute to the realization of carbon neutrality through energy conservation and the use of renewable energy in road management, etc.

Renewable energy generated at roads: approx. 13000 MWh
(approx. 0.4% of power consumption by road administration)

Energy-saving effects with LED lighting
Power consumption reduced by approx. 60% (relative to high-pressure sodium lamps))

Source: FY2021 Road Committee, Basic Policy Committee

Creating an environment for the uptake of next-generation vehicles

To promote the spread of next-generation vehicles, we will support research and development for their social implementation, and in cooperation with business operators, we will promote the development of road environments that contribute to improving the convenience of next-generation vehicles.

Background / data

- Number of quick charging facilities installed for EV Approx. 8,000 (Mar. 2021) -> government target (Ref. 1): 30,000 (2030)
- Status of EV charging facilities
  Michi-no-Eki (Roadside rest area)：862（72% of total）※April, 2022
  SA・PA：397（45% of total）※April , 2022
- Number of EV charging facility information signs installed
  Michi-no-Eki 84 stations (Ref. 2) SA/PA 265 locations as of March 2022

Enhancing the environment for the spread of electric vehicles

Supporting research and development of pavement impact and power transfer efficiency by wireless power transfer systems while driving (Ref. 3)

Establish and disseminate guidelines for the installation of EV charging facilities on public roads and promote their introduction

Cooperate with businesses to provide locations for EV charging facilities and hydrogen stations in SA/PA and Michi-no-Eki.

Promote the development of EV charging facility information signs

Study on temporary exit from expressways for the purpose of recharging, based on the premise of introducing a payment system for EV recharging fees using ETC cards, in cooperation with METI and business operators

■Research and development support for dynamic wireless power transfer systems

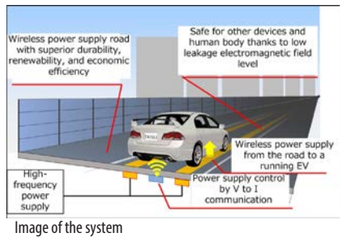
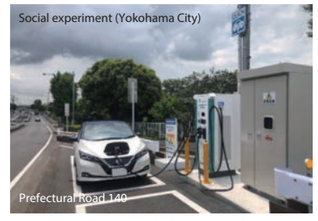


Image of the system

Strength verification at experimental facility

■Installation of EV charging facilities



Installation of EV charging facilities on public roads

Installation of EV charging facilities at Michi-no-Ekii

■Maintenance of hydrogen rest areas

Hydrogen stations (image)

■EV charging facility information signs

EV charging facility information signs

Ref. 1: Growth Strategy Action Plan (Cabinet Decision on June 18, 2021) Ref. 2: Target roadside rest areas with EV charging facility information signs installed on national highways under jurisdiction of MLIT
Ref. 3: Supporting technological development in the "Technical Research and Development for Road Policy Quality Improvement" Study Summary (New Committee on Advanced Road Technology)"

Low-carbonization of road transportation, energy saving and greening of road infrastructure

We will promote low-carbon road transportation through traffic flow measures and promotion of bicycle use, and promote energy saving and greening of road infrastructure by curbing energy used for road maintenance and management, utilizing renewable energy, and greening roads.

Background / data

- CO2 emissions in the road sector (FY2020): Approx. 170 million tons (approx. 16% of total)
- Renewable energy generation on roads (FY2021): Approx. 13000 MWh (approx. 0.4% of power consumption)
- LED road lamps for national highways under jurisdiction of MLIT: approx. 40%: as of March 2022

Low-carbonization of road traffic

Promote low-carbon road transportation through road traffic flow measures such as road network improvement and traffic congestion countermeasures, improving logistics efficiency through double-trailer trucks, etc., and promoting the use of public transportation by promoting the bicycle use and enhancing the functions of transportation hubs

Energy saving and greening of road infrastructure

Promote the use of LED lighting for roads, as well as advanced lighting

Develop and disseminate technical guidelines for solar power generation facilities utilizing road space and promote their introduction

Technical solicitation and trial for installation of roadside solar power generation※1

Promote road greening and maintenance of green infrastructure

■Continuous efforts for low-carbonization of road traffic

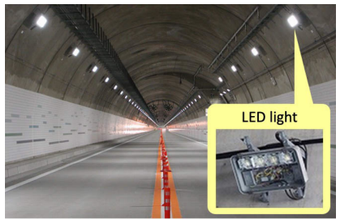
Congestion mitigation


Promoting the bicycle use

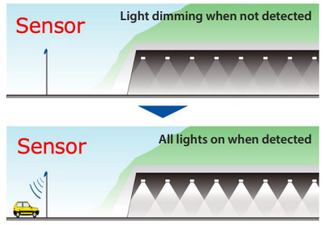
■Use of renewable energy


Solar power generation in road space

■Reduction of energy consumption



LED lighting



Advanced lighting (image)

■Promotion of road greening


Rain garden (*2) (Shijyo Horikawa junction)

※1：Positioned in the plan to promote the introduction of new technology, and technical verification was conducted by the organization to promote the introduction of new technology
※2：Space with a structure to store and infiltrate rainwater

Appendix

-History of Roads in Japan
-Technical Standards
-2040 Vision for Roads in Japan
-Statistics

History of Roads in Japan

Japan is a country comprised of four major islands and numerous minor islands. It is configured as a crescent shape and situated to the east of the Asian continent in the Northwestern Pacific Ocean. Of its 378,000 square km of land, about 70% is comprised of mountainous terrain. It is inhabited by more than 120 million people.
It is a country that has achieved harmony between its traditional culture from ancient eras and its modern society with advanced technology. Yet, Japan's fascinating natural environment is one that changes from season to season.
The history of land transport in Japan began over two thousand years ago and can roughly be categorized into the following four eras: 1) Age of People and Nature (ancient times until the Meiji Restoration in 1867), 2) Age of Modernization (from the Meiji Restoration until the 1950s), 3) Age of High Efficiency Networks (from the 1950s to the present day) and 4) Age of Optimal Maintenance and Management for Maximum Utilization of Existing Roads.

I. Age of People and Nature (ancient times until the Meiji Restoration in 1867)

1) The Ancient Foundations of Modern Japan

The oldest written record of roads in Japan appeared in a Chinese history book from the 3rd Century called Gishi-wajin-den. At that point in time, Japan was in the process of unifying the country under the Yamato Dynasty. People travelled on foot or horseback for hundreds of years until the Meiji Restoration, when Japan opened its doors to the modern nations of the West late in the 19th century, which resulted in modern conveniences becoming available and then prominent in Japan.
Unlike in China and the European countries, horse-drawn carriages never fully evolved in Japan. The historical lack of use of horse-drawn carriages could be due, in part, to the country's terrain which is mostly mountainous and criss-crossed by numerous creeks and inlets.
After the Reformation of the Taika Era (645 C.E.), an elaborate central government system, characterized by emerging administrative and judicial institutions, was established. A new road network was developed at this time that connected Honshu (the largest island) to Shikoku (the smallest of the four main islands) and then continued all the way down to Kyushu (the southernmost and third largest island).
This nationwide public road network was called "Seven Roads" and was composed of Tokaido, Tosando, Hokurikudo, San-indo, San-yodo, Nankaido and Saikaido ('-do' in Japanese means 'road'). After bitter struggles with the rough terrain of the country, the Seven Roads were completed and in later years were used as the prototype for highways and roads. Almost all of the Seven Roads routes were used as arterial railways during the Meiji Era (1868-1921 C.E.) and then expressways that opened after 1964. In short, ever since the Seven Roads were first established during this age, they have continued to serve as the backbone for transport routes in Japan.

2) User-friendly Roads Can Be Traced Back to Early Times

Along with the establishment of the Seven Roads came another system called "Ekiba, Tenma" (Post Horse System), which eventually became the modern international word "Ekiden" (a relay road race). In this Chinese-originated system, an "Eki" (meaning station) was located at each interval of 16km along a road and would provide necessary services for the officials and people of high rank who travelled that road on their journeys. Approximately 400 "Eki" were developed across the country. In the mid-8th century, a number of fruit trees were systematically planted along the Seven Roads, which eventually led to the tree lined roads of today.
Later, in the 16th century, a road signage system called "Ichirizuka" was established by referencing a similar practice from ancient China. This system can be viewed as the Asian version of the Roman milestone-system. After the Edo Shogunate was established in 1603 C.E., the ichirizuka system was transformed when ample facilities were created and the 5 Major Highway System, radiating from Edo (the old name for Tokyo), was formed. The Shogunate specified that the five major highways should be about 11m wide and

Numazu-juku as depicted by Hiroshige
Source: National Diet Library

Nihombashi in the Meiji Era
Source: National Diet Library

secondary roads should be 5.5m wide. The roads were to be filled with gravel and cobbles to a depth of 3cm and topped with sand after treading them down.
Sir Rutherford Alcock, the first British Minister to visit Japan, wrote about his visit at the end of the Shogunate era, saying, "Their highways, the Tokaido, the imperial roads throughout the kingdom, may challenge comparison with the finest in Europe. Broad, level, carefully kept and well macadamized, with magnificent avenues of timber to give shade from the scorching heat of the sun, it is difficult to exaggerate their merit."

3) Road Construction with Consideration for People and Scenery

Japanese people frequently traveled, to such a degree that foreigners were astounded by how far and how often they traveled in comparison to themselves. The Japanese did not hesitate to travel because there were such excellent road facilities and services even back then.
In the middle of the Edo Era (1690 C.E.), Englebert Kaempfer, a German doctor who came to Japan to work for a Dutch trading house, wrote: "An unbelievable number of people travel the highways of this country every day. The reason for this is the high population of this country, but another reason is that, unlike inhabitants of other nations, the Japanese travel extremely often."[1]
The Hakone Road was already paved by 1680 C.E. Sir Ernest Satow, a British diplomat who came to Japan at the end of the Edo Shogunate (mid-19th century), wrote in his book, "A Diplomat in Japan," about his astonishment at the pavement there: "Next morning, we started at half-past six to ascend the pass which climbs the range of mountains by an excellent road paved with huge stones after the manner of the Via Appia where it leaves Rome at the Forum, and lined with huge pine trees and cryptomerias."
Unlike the Via Appia, Japanese surface transport routes were developed primarily for people and horses, because horse-drawn carriages were not common prior to the Meiji Era (~1868 C.E.) For this reason, roads were usually in good condition since damage caused by traffic was not severe and maintenance was relatively easy to complete. Road cleaning and other regular maintenance was not performed by the Shogunate or the government of feudal clans, but by roadside residents on a voluntary basis. This implies that there was a general understanding that roads were not the exclusive property of the overlords, but considered to be "public property".

[1] "Geschichte und Beschreibung von Japan"

The state of roads in the mid-1950s was as "incredibly bad" as Watkins wrote in his report.

2. Age of Modernization
(from Meiji Restoration to the 1950s)

After ending two hundred years of isolation, the revolutionary government of the Meiji Era (1868-1912 C.E.) quickly started modernizing the surface transport system by importing new technologies from Europe. Unlike China and Europe, Japan did not have a history of horse-drawn carriages as a method of transport. It was thus impossible to transform the ancient roads, designed strictly for the passage of people and horses, into modern roads in a single step.

The beautifully maintained pre-modern roads of the Edo Era began to deteriorate under the burden of modern horse-drawn carriages and human-powered vehicles (or rickshaws). Arthur Crow, who visited Japan in 1881 C.E., recorded this observation in "Highways and Byways in Japan": "The Tokaido is in a dreadfully bad state, with ruts and holes large enough almost to swallow a cart, and yet traffic is very heavy, both for horse and man-power vehicles".

The slow improvement of roads can be partially attributed to the decision by the Meiji Government to give rail and sea transport higher priority over roads. This decision was intended to allow Japan to catch up with the advanced nations of the West as quickly as possible. The backwardness of the road system in Japan continued until 1945 when the World War II ended and the entire national landscape was devastated by bombings and other catastrophes of war. During the reconstruction process in Japan, the modernization of roads in Japan was fully accelerated along with the development of railways.

April 1968
Vehicles driving from Okazaki IC to Komaki IC after the opening ceremony of the Tomei Expressway
(Photo: Mainichi Shimbun)

3. Age of High Efficiency Networks
(from the 1950s ~ today)

1) Arrival of the Motorization Age

Automobiles proliferated quickly as the Japanese economy recovered from hardship after the war and the standard of living improved. Only 130,000 vehicles were registered at the end of World War II, but the number increased rapidly, reaching 500,000 vehicles by 1951, then doubling to one million in 1953, and doubling again to two million in 1957. The Age of Motorization had finally arrived in Japan.

However, the road system in Japan remained insufficient to support the ongoing rapid motorization. Ralph J. Watkins, an economist invited by the Japanese Government to conduct research on the Meishin Expressway, wrote in his 1956 report, "The roads of Japan are incredibly bad. No other industrial nation has so completely neglected its highway system."

Indeed, Japan's road system in those days was truly terrible. Only 23% of the first-class arterial national highway system was paved. Only two-thirds of national Highway Route 1, supposedly the major arterial highway connecting Tokyo with Osaka, was paved. The Japanese Government at that time accepted Mr. Watkins' proposals and immediately put them into practice. Thus, road improvement in Japan moved into high gear, propelling the nation into the high economic growth era of later years.

2) The Five-Year Road Development Program, Toll Road System and Tax Revenue System with Earmarks for Roads

Without a long history of horse-drawn carriages, the roads in Japan were severely underdeveloped. What was worse, road development was inevitably slow because the development of railways was given priority over the development of roads. Under these circumstances, the Five-Year Road Development Program was launched so that road development could be fully accelerated.

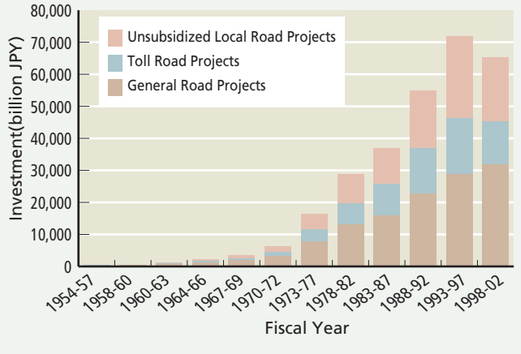
Since the public works budget, under the general revenue scheme, was insufficient in meeting the ever-increasing road traffic demand, two new financing systems were introduced: the toll road system and the tax revenue system with earmarks for roads. These systems allowed for a significant number of road projects to be undertaken in a short period of time.

The former "Act on Special Measures concerning Road Construction and Improvement", which was enacted in 1952, introduced the toll road system and enabled the national and municipal governments to borrow sufficient funds to develop roads. After the new roads were complete, the borrowed money would be repaid using the toll revenue from the roads.

The toll road system was used primarily for national expressway projects. In 1956, the Japan Highway Public Corporation was founded, so that expressways would be efficiently managed and financial resources from the private sector could be widely utilized.

With its founding, toll road development was now led by JH instead of the National Government. Although the mechanisms of the toll road system are similar to that of current PPP projects, the former included an ingenious system that enabled them to carry out unprofitable road projects if the road was recognized as necessary from a point of social benefit. The National Government reduced the business risk of unprofitable road projects by guaranteeing the loan and by paying a fixed rate of interest. In addition, the Government utilized the pool system, in which revenues and expenditures were balanced throughout the toll expressway network. This system enabled them to develop not only profitable expressways in urban areas but also unprofitable expressways in rural areas across the country.

■Investment change in the Five-Year Road Development Program

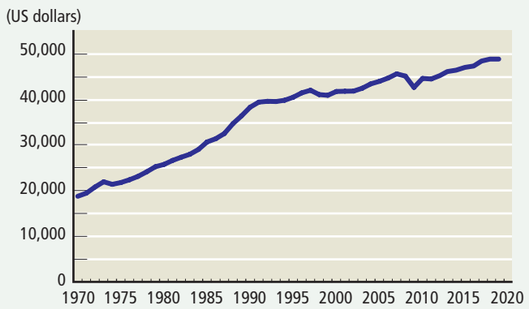


Note:
1) Reserve fund (150 billion) is included.
2) Reserve fund (100 billion) is included.
3) Reserve fund (500 billion) is included.
4) Reserve fund (700 billion) is included.
5) Adjustment cost (1,300 billion) is included.
6) Adjustment cost (1,300 billion) is included.
7) Adjustment cost (1,400 billion) is included.
8) Adjustment cost (5,000 billion) is included.
9) Reserve fund (11.2 billion for Okinawa) is included in the total of the 6th plan.

In 1953, the “Act on State’s Tentative Financial Measures for Road Construction Projects” was enacted and thus ushered in a new tax revenue system with earmarks for roads. This system, based on the “beneficiary-pays” principle, earmarked the revenue from fuel tax and other automobile-related taxes for road projects. This measure secured stable financial resources for the long-term development of roads, including the 1st Five-Year Road Development Program and the subsequent 11 programs that followed.
The toll road system and the tax revenue system with earmarks for roads supported the development of the nationwide road network for more than 50 years. During those years, all major roads were paved and more than 10,000km of expressways were developed across the country.
However, there were increasing calls for a change in both of the financial revenue systems since the road network in Japan had reached an almost adequate level of development. There were various critiques and opinions about road development, including the belief that roads were developed wastefully and sometimes redundantly, spending a large amount of both borrowed money and the national budget. At the same time, the repayment and management costs were not being sufficiently preserved due to the high-cost structure of JH’s toll road system. As a result, JH was privatized and reorganized into the Japan Expressway and Debt Repayment Agency (JEDRA) and 6 regional Expressway Companies. The main purposes of this change were to ensure the repayment of the massive road debt that had reached 40 trillion yen, to streamline the administrative authority and to provide various services for road users by utilizing experience from the private sector. When the expressway companies were privatized, the toll collection period was set at 45 years (until 2050). However, in 2014, in order to cover the increasing costs related to the maintenance and renewal of the expressways, the period was extended by 15 years to 2065

There was also increasing criticism of the tax revenue system with earmarks for roads. Critics argued that fixed expenditures from the abundant financial resources resulted in unnecessary road development. In 2009, the tax revenue system with earmarks for roads was abandoned and the Government decided to pay for road expenditures using funds from the general revenue.

■Change in real GDP per capita



4. Age of Optimal Maintenance and Management for Maximum Utilization of Existing Roads

By the beginning of the 21st century, the total length of expressways had reached more than 8,000 km and the public opinion was that Japan had almost sufficient road networks, especially in urban areas. At the same time, Japan entered an age of declining birthrates and an aging population (the national population has been declining since it peaked in 2008).
In addition to these social changes, ever-increasing social security costs and the fragile national financial condition brought about the wide-spread belief that public investments should be economized. As discussed in the previous section, this led to the abolition of the tax system with earmarks for roads and the reorganization and privatization of JH. While road development is slowing down, utilization of existing road networks and improvement of asset management is becoming the focus of current programs.
The first task of asset management is to map out strategies for the aging road infrastructure, which was largely developed during the high-growth period of the Japanese economy (from the late 1950s to the 1960s).
The second task is to continually provide road transport services and to support the lives and economies of the people who live in a country that is prone to natural disasters such as earthquakes and typhoons.
The third task is to provide road services that are safe, accessible and environmentally friendly by utilizing evolving ITS technologies and by improving the quality of roads. The third task is to provide road services that are safe, accessible and environmentally friendly by utilizing evolving ITS technologies and by improving the quality of roads.

1)Strategies for Aging Road Infrastructure

The majority of roads and bridges were constructed in the high-growth period of the Japanese economy and will be 50 years old in the next 10 years. To maintain the safety of this aging infrastructure, periodic investigation and database management, as well as systematic repair work, are required. It is a new technical challenge to efficiently investigate and repair 5.2 million bridges and 10,000 tunnels. At the same time, this is also a significant challenge in terms of the financial and human resources that are needed to meet road demands. The Road Act was amended in 2013 and the 2014 Ministerial Ordinance obligates road administrators to conduct close visual inspections once every 5 years.

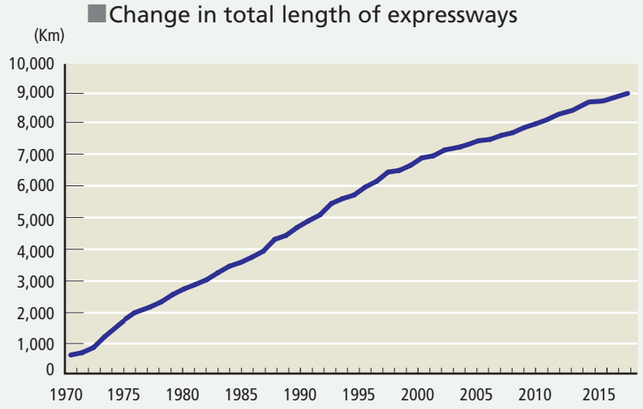
2)Preparing for Natural Disasters

The Great East Japan Earthquake in March 2011 forced the reevaluation of the importance of road networks in the face of large-scale natural disasters. 20% of world-wide earthquakes with a magnitude of 6 or higher occur in Japan. As an earthquake-prone country, disaster prevention measures, including improvement of bridges’ quake resistance, have been deemed necessary after the repeated experience with these disasters. In addition, it is necessary to enhance road networks to guarantee alternative routes in the event of road closures after a large-scale disaster and in order to add disaster prevention functions to existing roadside service facilities. As climate change is increasingly occurring on a global scale, Japan has been experiencing more frequent heavy rains and snows. Overcoming landslides on slopes and snowbound traffic are always serious challenges in a country with precipitous terrain. Japan road administration has been implementing countermeasures that include: constructing slope protection, establishing a snow removal system, installing road monitoring systems and improving operations.

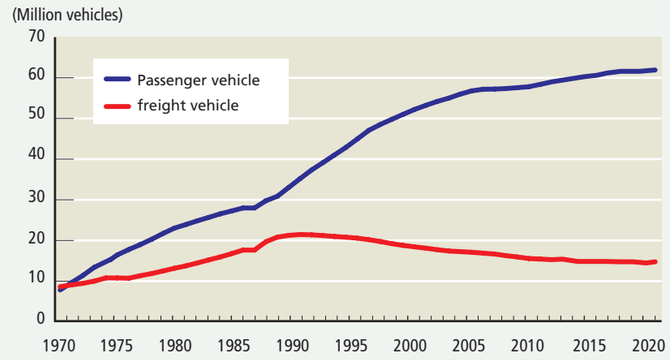
3)Improvement of Road Service Provisions using Intelligent Transport Systems (ITS)

Ring roads are being developed in the Tokyo Metropolitan Area, where traffic congestion is a serious problem. Once complete, ring roads are expected to provide more route options and smoother traffic flow.
Since they were introduced in the 1990s, ITS technologies have provided various services, including car navigation systems and Electronic Toll Collection (ETC). Even now, the technologies are evolving to meet the demands of road infrastructure and the automobile sectors. Newly introduced automobiles with crash-avoidance systems offer the potential for fully automatic driving systems sometime in the near future. In the road infrastructure sector, dynamic traffic guidance, warning messaging and vehicular controlling technologies are being studied as part of road-to-vehicle and/or vehicle-to-vehicle communication systems.
The advancement of technology is going to integrate road infrastructure and automobiles into a new synthetic transport system and will provide a breakthrough solution for traffic congestion, traffic accidents and environmental pollution, all of which have been major issues since the modernization of the road system began.

■Change in total length of expressways



■Change in number of registered vehicles

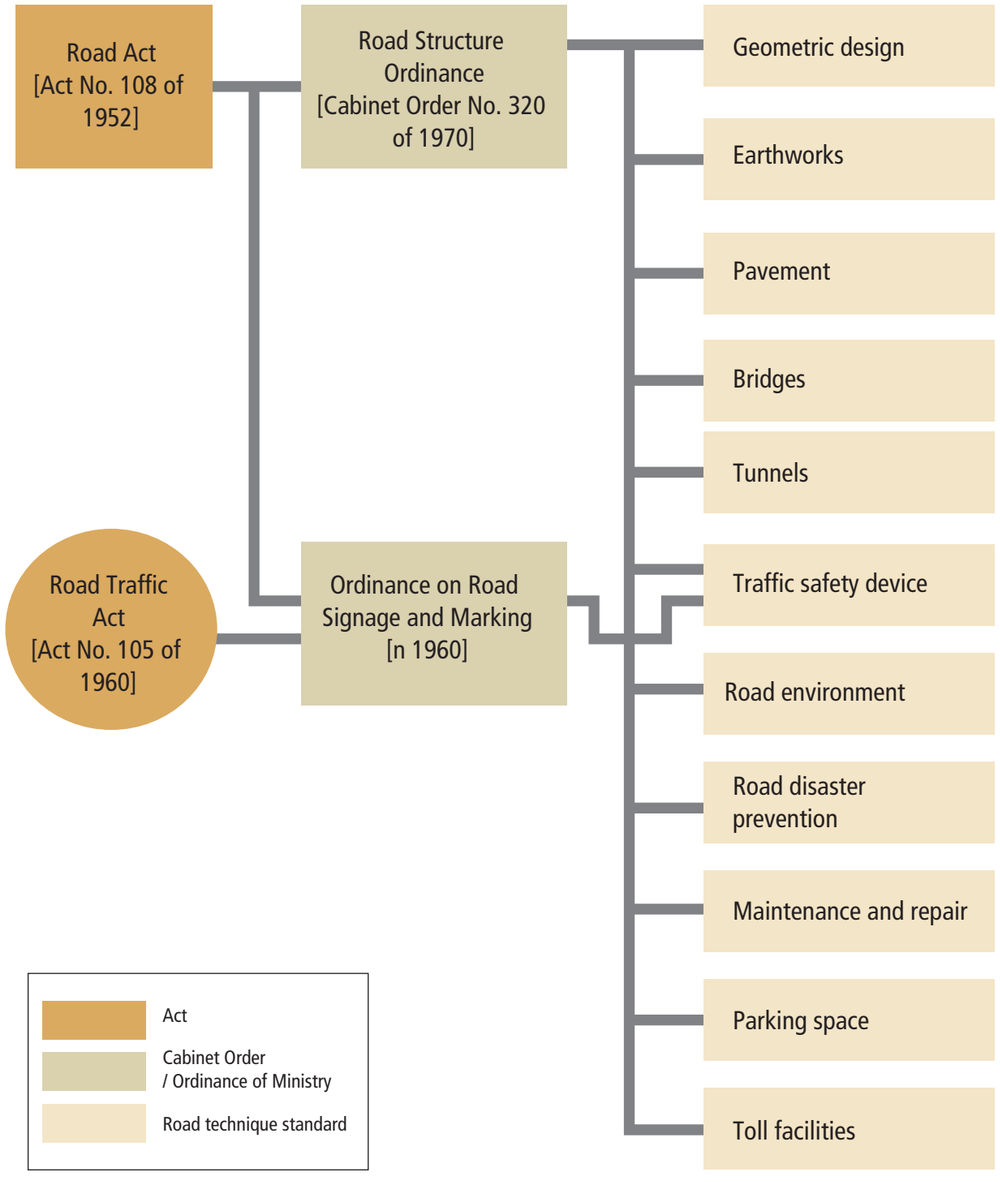


Technical Standards

(Government Ordinance No.320 of 29th October, 1970)

[Provisional translation]

Structure of Road Technical Standards



(Purpose of This Ordinance)

Article 1

This Ordinance specifies general technical standards (limited to the provisions of the Road Act (hereinafter "Act") Article 30.1.1, 30.1.3 and 30.1.12 for general technical standards of the structure of prefectural roads and municipal roads) for the structure of national expressways and national highways when these roads will be newly constructed or reconstructed and also specifies general technical standards that should be taken into account when technical standards (except for the provisions in Article 30.1.1, 30.1.3 and 30.1.12) for the construction of prefectural roads and municipal roads are required under the ordinances of prefectural or municipal governments, who also serve as a road administrator.

(Definition)

Article 2

The following terminology definitions shall apply to the corresponding terms in this Ordinance:

1. Sidewalk: A road section provided for dedicated pedestrian traffic, which is separated by curb lines or fences or other similar structures.
2. Bicycle track: A road section provided for dedicated bicycle traffic, which is separated by curb lines or fences or other similar structures.
3. Bicycle/pedestrian track: A road section provided for dedicated bicycle/pedestrian traffic, which is separated by curb lines or fences or other similar structures.
4. Carriageway: A road section used by dedicated vehicular traffic, except for bicycles.
5. Lane: A strip section of the carriageway (except for the service road) provided for safe and smooth traffic by directional separation of vehicles traveling in a single direction.
6. Additional overtaking lane: An additional lane (except for climbing, turning and speed change lanes) provided specifically for vehicles to overtake other vehicles.
7. Climbing lane: A lane for slower vehicles to be separated from other vehicles on uphill roads.
8. Turning lane: A lane for vehicles to turn right or left.
9. Speed change lane: A lane for vehicles to accelerate or decelerate.
10. Median: A strip road section provided to separate a lane from the traffic in the opposite direction and ensure lateral clearances.
11. Service road: A strip of carriageway provided to applicable sections, parallel to the carriageway, to ensure access of vehicles to roadsides where access is prevented by embankment and/or cut, or other means.
12. Shoulder: A strip of road section connected with carriageway sidewalks, bicycle tracks or bicycle/pedestrian tracks to protect major road structure sections and to maintain carriageway functions.
13. Marginal strip: A strip section of the median or shoulder connected with the carriageway to provide optical guidance for drivers and ensure lateral clearance.
14. Stopping lane: A strip of carriageway section principally used to park vehicles.
15. Bicycle lane: A strip of carriageway section designated by striping markings for the safe and smooth passage of bicycles.
16. Track bed: A road section dedicated for use by streetcar traffic (streetcars as specified in Article 2.1.13 of the Road Traffic Act [Act No.105 of 1960]; this definition of streetcars shall apply hereinafter).
17. Island: An area facility provided at intersections, carriageway separation points, bus bays, streetcars stops, or other areas to ensure safe and smooth vehicular traffic or the safety of pedestrians crossing streets or bus and streetcar passengers boarding or alighting.
18. Planted strip: A strip of road section provided for tree planting in order to improve road traffic environment and ensure a better living environment along roadsides, which is separated by using curb lines or fences or other similar structures.
19. On-street facility: A road accessory facility on sidewalks, bicycle tracks, bicycle/pedestrian tracks, median, shoulders, bicycle paths and bicycle/pedestrian paths, except for common ducts and common cable ducts.
20. Urban area: An area forming or expected to form a city or town.
21. Rural area: Other areas than urban areas.
22. Design traffic volume: Daily vehicular traffic volume determined by planners for road construction or reconstruction planners designated by the Land, Infrastructure and Transport Ministry's ordinance according to requirements in the same ordinance for the basis of road design, in consideration of trends of development in the area and vehicular traffic conditions in the future.
23. Design speed: Vehicle speed that is used as a basis for road design.
24. Sight distance: The distance measured along the lane (or carriageway (except bicycle lane) in the case of a road without a lane and the same is applied hereinafter) centerline at which an apex of a 10cm high object on the lane centerline is visible from 1.2m on the lane centerline.

(Road Classification)

Article 3

1. Roads shall be classified into Types 1 through 4 as listed in the following table.

National expressways and access-controlled highways or other roads. \ Area where road is located	Rural Area	Urban Area
National expressways and access-controlled highways	Type1	Type2
Other Roads	Type3	Type4

2. Type 1 roads shall be classified into classes 1 through 4 as listed in Table 1, Type 2 roads shall be classified into Class 1 or 2 as listed in Table 2, Type 3 roads shall be classified into classes 1 through 5 as listed in Table 3, and Type 4 roads shall be classified into classes 1 through 4 except where topographic conditions or other circumstances do not permit such provision. Roads can be classified into one class lower than the original class unless roads are otherwise applicable to Type 1 Class 4, Type 2 Class 3, Type 3 Class 5, or Type 4 Class 4.

Table 1 Type 1 Roads

Road type	Type of Terrain	Designed traffic volume (vehicles/day)			
		More than 30,000	20,000~ 30,000	10,000~ 20,000	Less than 10,000
National Expressway	Level	Class 1	Class 2		Class 3
	Mountainous	Class 2	Class 3		Class 4
Roads other than National Expressway	Level	Class 2		Class 3	
	Mountainous	Class 3		Class 4	

Table 2 Type 2 Roads

Road type \ Area where road is located	Areas other than Central Business District in Large Metropolitan areas	Central Business District in Large Metropolitan areas
National Expressway	Class 1	
Roads other than National Expressway	Class 1	Class 2

Table 3 Type 3 Roads

Road type	Type of Terrain	Designed traffic volume (vehicles/day)				
		More than 20,000	4,000~ 20,000	1,500~ 4,000	500~ 1,500	Less than 500
National Highway	Level	Class 1	Class 2	Class 3		
	Mountainous	Class 2	Class 3	Class 4		
Prefectural Roads	Level	Class 2		Class 3		
	Mountainous	Class 3		Class 4		
Municipal Roads	Level	Class 2		Class 3	Class 4	Class 5
	Mountainous	Class 3		Class 4		Class 5

Table 4 Type 4 Roads

Road type \ Designed traffic volume (vehicles/day)	More than 10,000	4,000~ 10,000	500~ 4,000	Less than 500
National Highway	Class 1		Class 2	
Prefectural Roads	Class 1	Class 2	Class 3	
Municipal Roads	Class 1	Class 2	Class 3	Class 4

3. Roads shall be classified as specified in the previous paragraph 2 based on traffic conditions.
4. Type 1, 2 and 3 Class 1 through 4 roads or Type 4 Class 1 through 3 roads (limited to elevated roads and other structures from which vehicles cannot access roadsides for Type 3 Class 1 through 4 roads and Type 4 Class 1 through 3 roads) can be specified as the roads exclusively for the traffic of smaller motor vehicles (hereinafter indicating small-sized vehicles and other similar small vehicles; and pedestrians and bicycles in the case of Type 3 Class 1 through 4 and Type 4 Class 1 through 3 roads), in an unavoidable case such as for a topographical reason and due to conditions of urbanization, there shall be a neighboring detour road for other types of vehicles, other than smaller motor vehicles.
5. A lane specifically for the traffic of smaller motor vehicles can be provided, by separating other lanes on Type 1, 2 and 3 Class1 through 4 roads or Type 4 Class 1 through 3 roads, in unavoidable cases such as for a topographical reason and due to conditions of urbanization. In the case of Type 3 Class 1 through 4 roads and Type 4 Class 1 through 3 roads, the lane specifically for the traffic of smaller motor vehicles shall be limited to elevated roads or other structures from which vehicles cannot access roadsides.
6. Roads shall be classified into smaller motor vehicle roads (hereinafter indicating the roads provided specifically for the traffic of smaller motor vehicles specified in the paragraph 4 and smaller motor vehicles and pedestrians and bicycles in Type 3 Class 1 through 4 and Type 4 Class 1 through 3 roads and vehicles specified in the previous paragraph) and regular motor vehicle roads (hereinafter indicating roads and road sections other than smaller motor vehicle roads).

(General Technical Standards for Construction of National Expressways and National Highways Structures)

Article 3-2

The next Article through Article 40 specify general technical standards for the construction of national expressways and national highways structures, when these roads will be newly constructed or reconstructed.

(Design Vehicles)

Article 4

1. Roads shall be so designed for the smooth and safe passage of small-sized motor vehicles and semitrailers (hereinafter indicating combined body consisting of trailing motor vehicle and trailed vehicle without front axle, in which a part of the trailed vehicle rests on the motor vehicle and substantial weight of the trailed vehicle and its load are supported by the motor vehicle) on Type1, Type 2, Type 3 Class 1 or Type 4 Class1 regular motor vehicle roads, small-sized motor vehicles and regular-sized motor vehicles on other regular motor vehicle roads or important logistics road under the article 48 of the Road Act and smaller motor vehicles on smaller motor vehicle roads).
2. Specifications for the vehicle that is a basis of road design (hereinafter referred to as “design vehicle”) by Type shall be listed below.

	Length	Width	Height	Front-edge overhang	Wheelbase	Rear-edge overhang	Minimum turning radius
Small-sized motor vehicle	4.7	1.7	2.0	0.8	2.7	1.2	6.0
Smaller motor vehicles	6.0	2.0	2.8	1.0	3.7	1.3	7.0
Regular-sized motor vehicle	12.0	2.5	3.8	1.5	6.5	4.0	12.0
Semi-trailer	16.5	2.5	3.8 (4.1 on general roads designated as important logistics roads)	1.3	Front section wheelbase: 4.0 Rear section wheelbase: 9.0	2.2	12.0

For this table, the following terminology definitions shall apply to the corresponding terms.
1. Front-edge overhang: Distance from the front face of the vehicle body to the center of the front-wheel axle of a vehicle.
2. Wheelbase: Distance from the center of front-wheel axle of a vehicle to the center of the rear-wheel axle.
3. Rear-edge overhang: Distance from the rear face of the vehicle body to the center of the rear-wheel axle of a vehicle.

(Lane)

Article 5

1. The carriageway (except for the service road, stopping lane, bicycle lane and other sections specified by the ordinances of Ministry of Land, Infrastructure, Transport and Tourism) shall consist of the below-specified lanes, except for those classified as Type 3 Class 5.
2. The number of lanes shall be 2 (except for additional overtaking, climbing, turning and speed change lanes and the same is applied in the following paragraph) in accordance with the road classification and on rural roads where design daily traffic volume is no more than values of standard design volume (hereinafter indicating maximum allowable traffic volume) as listed in the following table, while taking into account topographic conditions.

Classification		Type of Terrain	Standard Design Volume (vehicles/day)
Type1	Class 2	Level	14,000
	Class 3	Level	14,000
		Mountainous	10,000
	Class 4	Level	13,000
		Mountainous	9,000
Type3	Class 2	Level	9,000
	Class 3	Level	8,000
		Mountainous	6,000
	Class 4	Level	8,000
		Mountainous	6,000
Type4	Class 1		12,000
	Class 2		10,000
	Class 3		9,000

As for Type 4 roads with many intersections, standard design traffic volume shall be calculated by multiplying standard design traffic volume herein by 0.8.

3. The number of lanes on roads, other than those specified in the provision above, (except for Type 2 one-way roads and Type 3 Class 5) shall be more than 4 (a multiple of 2 unless otherwise required depending on traffic conditions) on Type 2 roads and one-way roads shall be more than 2 on roads that meet the road classification and are located in rural areas, and shall be determined by the rate of design daily traffic volume on the road according to standard design daily traffic volume per lane as listed in the following table, taking into consideration topographic conditions.

Classification		Type of Terrain	Standard Design daily Traffic Volume per Lane (vehicles/lane/day)
Type1	Class 1	Level	12,000
	Class 2	Level	12,000
		Mountainous	9,000
	Class 3	Level	11,000
		Mountainous	8,000
	Class 4	Level	11,000
		Mountainous	8,000
Type2	Class 1		18,000
	Class 2		17,000
Type3	Class 1	Level	11,000
	Class 2	Level	9,000
	Class 3	Mountainous	7,000
		Level	8,000
	Class 4	Mountainous	6,000
		Mountainous	5,000
Type4	Class 1		12,000
	Class 2		10,000
	Class 3		10,000

In the case of Type 4 roads with many intersections, standard design traffic volume per lane shall be calculated by multiplying standard design traffic volume per lane herein by 0.6.

4. Lane width (except for climbing, turning, and speed change lanes,) shall be the values as listed in the columns for lane width, in the following table, in accordance with road classification. However, the lane width on Type 1 Class 1 and 2 or Type 3 Class 2 or Type 4 Class 1 regular motor vehicle roads may add 0.25m to the values as listed in the columns depending on the traffic situation. Lane width on Type 1 Class 2 or 3 smaller motor vehicle roads or Type2 Class 1 roads may be reduced 0.25m from the values as listed in the columns in unavoidable cases, such as for topographical and other reasons.

Classification			Lane Width (m)
Type1	Class 1		3.5
	Class 2		
	Class 3	Regular motor vehicle roads	3.5
		Smaller motor vehicle roads	3.25
	Class 4	Regular motor vehicle roads	3.25
		Smaller motor vehicle roads	3.0
Type2	Class 1	Regular motor vehicle roads	3.5
		Smaller motor vehicle roads	3.25
	Class 2	Regular motor vehicle roads	3.25
		Smaller motor vehicle roads	3.0
Type3	Class 1	Regular motor vehicle roads	3.5
		Smaller motor vehicle roads	3.0
	Class 2	Regular motor vehicle roads	3.25
		Smaller motor vehicle roads	2.75
	Class 3	Regular motor vehicle roads	3.0
		Smaller motor vehicle roads	2.75
	Class 4		2.75
Type4	Class 1	Regular motor vehicle roads	3.25
		Smaller motor vehicle roads	2.75
	Class 2 and 3	Regular motor vehicle roads	3.0
		Smaller motor vehicle roads	2.75

5. Carriageway width on Type 3 Class 5 regular motor vehicle roads (except bicycle lane) shall be 4m. However, the width could be reduced to 3m where design daily traffic volume is extremely low and topographic conditions or special reasons do not permit such provisions or where bulb-out is created on regular motor vehicle roads pursuant to the provisions of Article 31.2.

(Lane Division)

Article 6

1. The lanes (hereinafter this applies for all except one-way roads) on Type 1, Type 2 or Type 3 Class 1 roads shall be directionally divided. It is also applied to other roads with four or more lanes if necessary for safe and smooth traffic.
2. Notwithstanding the provisions of the first sentence of the preceding paragraph, Type 1 roads with three or less lanes (hereinafter, this applies for all except for climbing, turning and speed change lanes) may be left directionally undivided in unavoidable cases, such as for topographical conditions or any other reasons.
3. A median shall be provided, when required, for directional lane division.
4. Median width shall be no less than the values indicated in the left columns in the following table. However, the median width can be reduced to values listed in the right columns, in the same table, where tunnels longer than 100m, bridges longer than 50m, elevated roads, topographic conditions or other special conditions do not permit.

Classification		Median Width(m)	
Type1	Class 1	4.5	2.0
	Class 2		
	Class 3	3.0	1.5
	Class 4		
Type2	Class 1	2.25	1.5
	Class 2	1.75	1.25
Type3	Class 1	1.75	1.0
	Class 2		
	Class 3		
	Class 4		
Type4	Class 1	1.0	
	Class 2		
	Class 3		

5. A marginal strip shall be provided to the median.
6. The width of the marginal strips shall be the values listed in the left column of the following table in accordance with road classification. However, the median width can be reduced to the values listed in the right columns of the same table when the median width of the road or road section is reduced in accordance with paragraph 4.

Classification		Width of Marginal Strip Provided to Median(m)	
Type1	Class 1	0.75	0.25
	Class 2		
	Class 3	0.5	
	Class 4		
Type2		0.5	0.25
Type3	Class 1	0.25	
	Class 2		
	Class 3		
	Class 4		
Type4	Class 1	0.25	
	Class 2		
	Class 3		

7. Fences, or other similar structures, or curb lines connected to the marginal strip shall be provided to sections other than the marginal strip of the median (hereinafter referred to as the "median").
8. When on-street facilities are provided on the median, the median width shall be determined considering clearances as specified in Article 12.
9. If necessary, additional overtaking lanes shall be provided to the carriageway of Type 1 roads with single lanes in each direction.

(Service Roads)

Article 7

1. The service roads shall be provided to Type 3 or 4 roads with more than four lanes (except for climbing, turning and speed change lanes) if necessary.
2. Service road (except bicycle lane) width shall be a standard 4m

(Shoulders)

Article 8

1. Shoulders shall be provided to roads connected to carriageways, except where a median or stopping lane is provided.
2. Shoulder width on the left side of the carriageway shall be, in accordance with road classification, no less than the values listed in the left column of the following table. However, road width may be reduced to the values listed in the right columns in the same table where additional overtaking lanes, climbing lanes or speed change lanes are provided, or on road sections of bridges 50m or longer or elevated roads or other road sections in unavoidable cases such as for a topographical or other special reasons.

Classification			Width of Shoulder Provided on Left of Carriageway(m)	
Type1	Class 1 and 2	Regular motor vehicle roads	2.5	1.75
		Smaller motor vehicle roads	1.25	
	Class 3 and 4	Regular motor vehicle roads	1.75	1.25
		Smaller motor vehicle roads	1.0	
Type2		Regular motor vehicle roads	1.25	
		Smaller motor vehicle roads	1.0	
Type3	Class 1	Regular motor vehicle roads	1.25	0.75
		Smaller motor vehicle roads	0.75	
	Class 2 through 4	Regular motor vehicle roads	0.75	0.5
		Smaller motor vehicle roads	0.5	
	Class 5		0.5	
Type4			0.5	

3. Notwithstanding the provisions of the preceding paragraph, shoulder width on the left side of carriageways on Type 1 roads with directionally divided lanes shall be, in accordance with road classification, no less than the values listed in the left column of the following table. However, shoulder width on the left side of the carriageway may be reduced to the values listed in the right columns in the same table where the road section is in a tunnel of no shorter than 100m, on bridges of no shorter than 50m, on elevated roads with low traffic volume of larger vehicles, or in unavoidable conditions such as for topographic or other reasons.

Classification		Width of Shoulder Provided on Left of Carriageway(m)	
Class 2 and 3	Regular motor vehicle roads	2.5	1.75
	Smaller motor vehicle roads	1.25	
Class 4	Regular motor vehicle roads	2.5	2.0
	Smaller motor vehicle roads	1.25	

4. Width of the shoulders provided on the right of carriageway shall be, in accordance with road classification, no less than the values listed in the right column of the following table.

Classification			Width of Shoulder Provided on Right of Carriageway(m)
Type 1	Class 1 and 2	Regular motor vehicle roads	1.25
		Smaller motor vehicle roads	0.75
	Class 3 and 4	Regular motor vehicle roads	0.75
		Smaller motor vehicle roads	0.5
Type 2		Regular motor vehicle roads	0.75
		Smaller motor vehicle roads	0.5
Type 3			0.5
Type 4			0.5

5. Shoulder widths of the regular motor vehicle roads in tunnels (except for shoulders specified in the paragraph 3) or shoulder widths on the left side of smaller motor vehicle roads (except for shoulders specified in the paragraph 3) may be reduced to 1m on Type 1 Class 1 or 2 roads, 0.75m on Type 1 Class 3 or 4 roads and 0.5m on Type 3 (except for Class 5) regular motor vehicle roads or Type 3 Class 1 smaller motor vehicle roads.
6. As for the shoulder connecting to the service road, values of "1.25" and "0.75" in the left column of Type 3 carriageway as tabulated in Section 2 shall be regarded as "0.5" and provisory requirements in Section 2 shall not be applied.
7. On roads where sidewalks, bicycle tracks or bicycle/pedestrian tracks are provided, major road structures shall be protected. If smooth carriageway traffic can be maintained, the shoulder connecting width can be omitted or the width can be reduced.
8. A marginal strip shall be provided to the shoulder connecting with the carriageway on Type 1 or 2 roads.
9. The width of the marginal strips for regular motor vehicle roads shall be the values listed in the left column of the following table in accordance with road classification. The width of the marginal strips on smaller motor vehicle roads shall be 0.25m. However, shoulder widths for the regular motor vehicle roads in tunnels may be the values listed in the right columns in the same table.
10. Where it is necessary to protect major road structures, the shoulder shall be provided on road ends so as to be connected to the sidewalk, bicycle track or bicycle/pedestrian track.
11. Where on-street facilities are provided on the shoulder connected to the carriageway, shoulder width shall be the values of shoulder width provided for the left side of the carriageway listed in paragraph 2 or the values of shoulder width provided for the right side of the carriageway listed in paragraph 4, plus the values required for the on-street facilities.

Classification		Width of Marginal Strip Provided to Shoulder (m)	
Type1	Class 1	0.75	0.5
	Class 2		
	Class 3	0.5	0.25
	Class 4		
Type2	Class 1	0.5	
	Class 2		

(Stopping Lane)

Article 9

1. A stopping lane shall be provided on the left carriageway end on Type 4 roads to prevent stopping vehicles from impeding safe and smooth traffic.
2. The stopping lane width shall be 2.5m. However, the width may be reduced to 1.5m where the traffic volume of larger vehicles is low.

(Bicycle Lane)

Article 9.2

1. Bicycle lanes shall be provided on both sides of roads on Type 3 or 4 roads (except for the roads where a bicycle track will be provided) with higher vehicle and bicycle traffic volume, except where topographic conditions or other special reasons do not permit such provision.
2. Bicycle lanes shall be provided on the left side of the carriageway to ensure safe and smooth traffic on Type 3 or 4 roads with higher bicycle traffic volume or on Type 3 or 4 roads with higher vehicle and pedestrian traffic volume (except for roads specified in the preceding paragraph), if separation of bicycle traffic is considered necessary, except where topographic conditions or other special reasons do not permit such provision.
3. Bicycle tracks shall be wider than 2m, except where topographic conditions or other special reasons do not permit such provision, in such cases the width can be reduced to 1.5m.
4. Bicycle lanes shall be wider than 1.5m, except where topographic conditions or other special reasons do not permit such provision, in such cases the width can be reduced to 1.5m.
5. Bicycle lane width shall be determined in consideration of bicycle traffic conditions on roads.

(Track Bed)

Article 9.3

The track bed width shall be, in accordance with single or double track, wider than the values listed in the bottom columns of the following table.

Single or Double Track	Track Bed Width(m)
Single Track	3
Double Track	6

(Bicycle Track)

Article 10

1. Bicycle tracks shall be provided on both sides of roads on Type 3 or 4 roads with higher vehicle and bicycle traffic volume, except where topographic conditions or other special reasons do not permit such provision.
2. Bicycle tracks shall be provided on both sides of the roads to ensure safe and smooth traffic on Type 3 or 4 roads with higher bicycle traffic volume or on Type 3 or 4 roads with higher vehicle and pedestrian traffic volume (except for roads specified in the preceding paragraph), if separation of bicycle traffic is considered necessary, except where topographic conditions or other special reasons do not permit such provision.
3. Bicycle tracks shall be wider than 2m, except where topographic conditions or other special reasons do not permit such provision, in such cases the width can be reduced to 1.5m.
4. Where on-street facilities are provided on the bicycle tracks, the road width shall be determined in consideration of clearances as specified in Article 12.
5. Bicycle track width shall be determined in consideration of bicycle traffic conditions on roads.

(Bicycle/Pedestrian Track)

Article 10.2

1. Bicycle/pedestrian tracks shall be provided on both sides of Type 3 or 4 roads with large traffic volume (except for roads where the bicycle tracks or lanes would already be provided) except where topographic conditions or other special reasons do not permit such provisions.
2. Bicycle/pedestrian track width shall be wider than 4m for roads with higher pedestrian traffic volume and wider than 3m for other roads.
3. Where pedestrian bridges or pedestrian underpasses (hereinafter referred to as “pedestrian bridges etc.”) or on-street facilities

are provided, the bicycle/pedestrian track width shall be increased by 3m where pedestrian bridges etc. are to be constructed, 2m where a roofed bench is to be installed, 1.5m where a row of trees is to be planted, 1m where a bench is installed or 0.5m in other cases, respectively to the values given in the preceding paragraph.The requirements as specified above shall be applied except for Type 3 Class 5 roads where topographic conditions or other special reasons do not permit such provisions.

4. The bicycle/pedestrian track width shall be determined in consideration of bicycle and pedestrian traffic conditions on the road.

(Sidewalk)

Article 11

1. A sidewalk shall be provided on both sides of Type 4 roads (excluding those roads provided with bicycle/pedestrian tracks),Type 3 roads (except for Class 5 and excluding those roads provided with bicycle/pedestrian tracks) with higher pedestrian traffic volume or Type 3 roads already provided with bicycle tracks or lanes , except where topographical conditions or any other reasons prevent such provision.
2. Sidewalks shall be provided on Type 3 roads (excluding those roads already provided with bicycle/pedestrian tracks and those roads stipulated in the preceding paragraph) where it is required for safe and smooth traffic, except where topographic conditions or any other reasons do not permit such provision.
3. The sidewalk width shall be wider than 3.5m for roads with higher pedestrian traffic volume and wider than 2m for other roads.
4. Where pedestrian bridges etc. or on-street facilities are provided, bicycle/pedestrian track width shall be increased by 3m where pedestrian bridges etc. are to be constructed, 2m where a roofed bench is to be installed, 1.5m where a row of trees is to be planted, 1m where a bench is installed or 0.5m in other cases, respectively to the values given in the preceding paragraph, and requirements as specified above shall be applied, except for Type 3 Class 5 roads where topographic conditions or other special reasons do not permit such provisions.
5. The sidewalk width shall be determined in consideration of pedestrian traffic conditions on the roads.

(Waiting Area for Pedestrians)

Article 11.2

Waiting space for pedestrians shall be provided on sidewalks, bicycle-and pedestrian tracks, bicycle-and pedestrian paths or exclusive pedestrian roads, in the case that it is necessary to ensure that the safe and smooth passage of pedestrians or bicycle riders will not be impeded due to the accumulation of pedestrians at the pedestrian crossings or at bus stops.

(Median Width in Snowy Areas)

Article 11.3

Center strip, shoulder, bicycle/pedestrian track and side walk width in snowy areas shall be determined in consideration of snow removal.

(Planted Strip)

Article 11.4

1. The planted strip shall be provided to Type 4 Class 1 and Class 2 roads and if necessary to other roads, except where topographic conditions or other special reasons do not permit such provisions.
2. The planted strip width standard shall be 1.5m.
3. The planted strips provided between road sections as described below shall have proper width values, exceeding values specified in the section above when required for conditions in comprehensive consideration of road structure, traffic condition, and land use of adjoining areas and other measures taken to improve road traffic environment or to ensure a better living environments along adjoining areas irrespective of the requirements above:

1) Sections of arterial roads and central business districts in large cities running through scenic spots.
2) Sections of arterial roads running through residential areas or areas that are expected to become residential.

4. For planted strips, the selection of plant species and arrangement of trees shall take into account with the ecological characteristics of the area.

(Clearances)

Article 12

Clearances on roads shall be shown in Fig.1 for carriageways and in Fig.2 for sidewalks and bicycle tracks or bicycle/pedestrian tracks (hereinafter referred to as "bicycle tracks").

Fig.1

(1)		(2)	(3)
Carriageway of roads where the shoulder is provided by connecting with the carriageway [except for the road sections specified in (3)]		Carriageway of roads where the shoulder is not provided by connecting with the carriageway[except for the road sections specified in (3)]	Of carriageway, sections related to Separator or Island
Carriageway of roads other than tunnels without sidewalk or bicycle track, bridge longer than 50m or elevated road	Carriageway in tunnels without sidewalk or bicycle track, on bridges longer than 50m or elevated road		

Figure (omitted)

In this figure, H, A, b, c, d and e indicate the following values.

H: 4.8m for regular motor vehicle roads designated as important logistics roads, 4.5m for other regular motor vehicle roads and 3m for smaller motor vehicle roads except for Type 3 Class 5 regular motor vehicle roads (except for the designated important logistics roads) where the value may be reduced to 4m in unavoidable cases such as for a topographical reason (or 3m when traffic volume of large-sized motor vehicles is extremely small and these may access neighboring bypass roads).

a: The width of the shoulder connected with the carriageway on regular motor vehicle roads (for shoulders where on-street facilities are provided, shoulder width minus value required for on-street facilities), provided that the value exceeds 1m shall be 1m. The width of the shoulder connected with the carriageway on smaller motor vehicle roads shall be 0.5m.

b: Value subtracting 4.1m from H (regarded as 4.1m where H is less than 4.1m) for regular motor vehicle roads designated as important logistics roads and this value shall be value subtracting 3.8m from H (regarded as 3.8m where H is less than 3.8m) for regular motor vehicle roads and this value shall be 0.2m for smaller motor vehicle roads.

c and d: Concerning the separator, values listed in columns c and d in accordance with road classification and concerning the island, the value of c shall be 0.25m and the value of d shall be 0.5m.

Classification			c (Unit: m)	d (Unit: m)
Type 1	Class 1	Regular motor vehicle roads	0.5	1.0
		Smaller motor vehicle roads		0.5
	Class 2	Regular motor vehicle roads	0.25	1.0
		Smaller motor vehicle roads		0.5
	Class 3 and 4	Regular motor vehicle roads	0.25	0.75
		Smaller motor vehicle roads		0.5
Type 2	Regular motor vehicle roads		0.25	0.75
	Smaller motor vehicle roads			0.5
Type 3			0.25	0.5
Type 4			0.25	0.5

e: Width of the shoulder connected with the carriageway (for shoulders where on-street facilities are provided, shoulder width minus value required for on-street facilities).

Fig. 2 (omitted)

(Design Speed)

Article 13

1. Design speed on roads, except for service roads, shall be the values listed in the left column of the following table, in accordance with road classification, except where topographical conditions or any other reasons do not permit such provisions. Design speed on roads may be the values listed in the right column of the same table when dealing with these exceptions, however this does not apply to Type 1 Class 4 roads that are national expressways.
2. Design speed on the service roads shall be 40km, 30km, or 20km per hour.

Classification		Design Speed (km/h)	
Type1	Class 1	120	100
	Class 2	100	80
	Class 3	80	60
	Class 4	60	50
Type2	Class 1	80	60
	Class 2	60	50 or 40
Type3	Class 1	80	60
	Class 2	60	50 or 40
	Class 3	60,50 or 40	30
	Class 4	50,40 or 30	20
	Class 5	40,30 or 20	
Type4	Class 1	60	50 or 40
	Class 2	60,50 or 40	30
	Class 3	50,40 or 30	20

(Carriageway Bend Section)

Article 14

Carriageway bend sections shall be curved in shape, except for transition sections, (hereinafter indicating certain sections, provided at the carriageway bend sections, that allow for smooth vehicle traffic) or bend sections provided pursuant to the provision of Article 31.2.

(Radius of Curve)

Article 15

Radii of curve at the centerline of the carriageway (hereinafter referred to as "radius of curve"), except for transition sections, (hereinafter referred to as "carriageway curve section") shall not be less than the values as listed in the left column of the following table according to design speed, except when unavoidable due to, for example, topographical reasons, in which case the radii of curve may be reduced to the values as listed in the right column of the same table.

Design Speed (km/h)	Radius of Curve (m)	
120	710	570
100	460	380
80	280	230
60	150	120
50	100	80
40	60	50
30	30	
20	15	

(Superelevation at Curve Section)

Article 16

Appropriate Superelevation with no more than the values as listed in the right column of the following table (6% for Type 3 roads without bicycle track) shall be provided on curves of the carriageway, the median (except for divider), and the shoulder connected with the carriageway, according to road classification and degree of snow fall or cold climate in the areas where the roads are located, in consideration of design speed, radii of curve, and topographical conditions, unless the radius of the curve is too large, except for Type 4 roads which can be omitted in such unavoidable cases as topographical conditions or any other reasons.

Classification	Area Where Road is Located		Maximum Super-elevation (%)
Type 1,2 and 3	Snowy or Cold Area	Severely Snowy or Cold Area	6
		Other Areas	8
	Other Areas		10
Type4			6

(Widening Lane at Curve Section)

Article 17

The lane width on carriageway curve sections (or carriageway width in the case of roads without lanes) shall be appropriately widened except for Type 2 and 4 roads, where topographical conditions or any other reasons do not permit such provisions.

(Transition Section)

Article 18

1. Transition sections shall be provided on carriageway bend sections for Type 4 roads where topographical conditions or any other reasons do not permit such provisions.
2. When a curved section is widened and/or provided with Superelevation, a runoff for this widening and/or Superelevation shall be completed in the transition section.
3. The transition curve length shall not be less than the right side value as listed in the following table according to design speed (or length required for runoff when length required for runoff as specified in Section above exceeds values as listed in the same column).

Design Speed (km/h)	Transition Section Length (m)
120	100
100	85
80	70
60	50
50	40
40	35
30	25
20	20

(Sight Distance)

Article 19

1. Sight distance shall not be less than the values below, as listed in the following table according to design speed.
2. For roads with two lanes (except for one-way roads), sufficient sections of oncoming highway visible to the driver shall be provided for overtaking.

Design Speed (km/h)	Transition Section Length (m)
120	210
100	160
80	110
60	75
50	55
40	40
30	30
20	20

(Grade)

Article 20

Carriageway grades shall be no more than the values listed in the left grade column of the following table according to road classification and design speed, except where topographical conditions or any other reasons do not permit such provisions; in such cases the values of the grade may be reduced to the values listed in the right grade column of the same table.

Classification		Design Speed (km/h)	Grade (%)	
Type 1, Type 2 & Type3	Regular motor vehicle roads	120	2	5
		100	3	6
		80	4	7
		60	5	8
		50	6	9
		40	7	10
		30	8	11
		20	9	12
	Smaller motor vehicle roads	120	4	5
		100		6
		80	7	
		60	8	
		50	9	
		40	10	
		30	11	
		20	12	
Type 4	Regular motor vehicle roads	60	5	7
		50	6	8
		40	7	9
		30	8	10
		20	9	11
	Smaller motor vehicle roads	60	8	
		50	9	
		40	10	
		30	11	
		20	12	

(Climbing Lane)

Article 21

1. A climbing lane, if necessary, shall be provided to the carriageway of the regular motor vehicle roads where grades exceed 5% (or 3% when the design speed is no less than 100 km per hour on other regular motor vehicle roads than national expressways and national highways).
2. The climbing lane width shall be 3m.

(Vertical Curve)

Article 22

1. Vertical curves shall be provided where grades change on the carriageway.
2. Radii of vertical curves shall be more than the values listed in the radius of vertical curve column of the following table according to design speed and Types of vertical curves, except when the radii of crest vertical curves on Type 4 Class 1 roads, when design speed is 60km per hour, the radii shall be reduced to 1,000m, where topographical conditions or any other reasons do not permit such provisions.
3. Vertical curve lengths shall be more than the values listed in the below right column of the following table according to design speed.

Design Speed (km/h)	Type of Vertical Curve	Radius of Vertical Curve(m)
120	Crest	11,000
	Sag	4,000
100	Crest	65,00
	Sag	3,000
80	Crest	3,000
	Sag	2,000
60	Crest	1,400
	Sag	1,000
50	Crest	65,00
	Sag	800
40	Crest	700
	Sag	450
30	Crest	250
	Sag	250
20	Crest	100
	Sag	100

Design Speed (km/h)	Vertical Curve Length(m)
120	100
100	85
80	70
60	50
50	40
40	35
30	25
20	20

(Pavement)

Article 23

1. Carriageways, median (except for divider), shoulders connected with carriageways, bicycle tracks and sidewalks shall be paved except in unavoidable cases, such as extremely small traffic volume.
2. The pavement of carriageways and marginal strips shall be constructed so that safe and smooth vehicular traffic can be ensured on the basis of the design wheel load of 49 kN, in consideration of designed traffic volume, vehicle weight, subgrade conditions, and meteorological conditions and that shall meet the standards laid down in the Ordinance of Ministry of Land, Infrastructure, Transport and Tourism, except in the case of traffic volume of small vehicles or any other unavoidable conditions.
3. Type 4 roads (except for tunnels) shall be constructed so that it shall be capable of causing storm water to permeate smoothly under the road surfaces and reducing the traffic noise level, in consideration of the land uses and vehicle traffic conditions in the area where the roads are located or along them, except where road structure, meteorological conditions or other special reasons do not permit such provisions.

(Cross Slope)

Article 24

1. Cross slopes shall be provided to the carriageway, median(except for divider) and shoulder connected with the carriageway according to road surface Type and the right side values as listed in the following table unless Superelevation is provided.
2. 2% of cross slope as a standard shall be provided to sidewalks and bicycle tracks.
3. The paved road of the structure specified in paragraph 3 of the previous Article may dispense with or reduce cross slope, if proper road surface drainage can be ensured in consideration of meteorological conditions.

Road Surface Type	Cross Slope (%)
Paved Road Complying with Standards Specified in Article 23.2	1.5-2
Others	3-5

(Compound Grade)

Article 25

1. Compound Grades (hereinafter indicating combination of vertical grade and Superelevation or cross slope) shall be no more than the right side values as listed in the following table according to design speed, except for roads with design speed of 30km/h or 20km/h where compound grades may be 12.5% in unavoidable cases, such as topographical conditions or any other reasons.
2. Compound grades shall be not more than 8% on those roads located in severely snowy or cold areas.

Design Speed (km/h)	Compound Grade (%)
120	10
100	
80	10.5
60	
50	11.5
40	
30	
20	

(Drainage Facility)

Article 26

Gutter, gully, or other drainage facilities shall be provided to roads if necessary.

(At-grade Intersection or Connection)

Article 27

1. An intersection shall be designed so as to contain no more than five intersecting legs, except when it is located in a special place such as in front of a station.
2. At an intersection where two or more roads join or intersect at grade, if necessary, a turning lane, speed change lane, or island shall be provided, and corners of intersection shall be cut, and unobstructed sight shall be ensured.
3. Where the turning lane or speed change lane is provided, lane width (except for the turning lane or speed change lane) of the related section may be reduced to 3m for Type 4 Class 1 regular motor vehicle roads or to 2.75m for Type 4 Class 2 or 3 regular motor vehicle roads or to 2.5m for Type 4 smaller motor vehicle roads.
4. The standard width of turning and speed change lanes shall be 3m for regular motor vehicle roads and 2.5m for smaller motor vehicle roads.
5. Where a turning or speed change lane is provided, proper runoff shall be provided according to design speed.

(Grade Separation)

Article 28

1. When two regular motor vehicle roads having four or more lanes intersecting mutually, excluding climbing lanes, turning lanes and speed change lanes, the intersection shall be separated by grades as a rule, except when the grade separation is unsuitable due to traffic conditions or in an unavoidable case such as a topographical reason.
2. When a smaller motor vehicle road with four or more lanes (except for turning lanes and speed change lanes) crosses another smaller motor or a regular motor vehicle road, the intersection shall be separated by grades.
3. Where the grade separation is provided, a road linking intersecting roads mutually (hereinafter referred to as a “ramp”) shall be provided if necessary.
4. Provisions of Articles 5 through 8, Article 12, Article 13, Article 15, Article 16, Articles 18 through 20, Articles 22 and 25 shall not be applied to the ramp.

(At-grade Intersection with Railway)

Article 29

When a road intersects at a grade with a railway or street railway newly constructed in accordance with the Street Railway Act (Act No.76 1921) (hereinafter referred to as a “railway”), the road shall be so constructed as specified below.

1. Intersection angles shall be not less than 45 degrees.
2. Sections 30m from both ends of railroad crossing and the railroad crossing section shall be straight and vertical carriageways, grades for these sections shall be less than 2.5%, except where there is extremely small vehicular traffic volume or topographical conditions or any other reasons do not permit such provisions.
3. A visible distance, distance from the intersection point of the railway end track centerline and the carriageway centerline to the point on the track centerline visible at the height of 1.2m at point 5m on the carriageway centerline from the track, shall not be less than the values listed in the following table, except for where a crossing gate or other security facilities are provided or with smaller vehicular traffic volume and fewer passing trains.

Maximum Train Speed at Railroad Crossing (km/h)	Visible Distance (m)
Less than 50	110
50-70	160
70-80	200
80-90	230
90-100	260
100-110	300
More than 110	350

(Turnout)

Article 30

Turnout shall be provided on Type 3 Class 5 roads as specified elow, except for on roads where smooth traffic can be ensured.
1. Distance between two turnouts shall be within 300m.
2. Roads between two turnouts shall be visible from one of these turnouts.
3. The length shall be more than 20m and the total width of the carriageway (except bicycle lane) shall be more than 5m.

(Traffic Safety Device)

Article 31

When it is necessary for traffic accident prevention, the pedestrian bridge, fence, lighting, safety post, emergency notification facility, and other similar facilities, as specified by the Land, Infrastructure and Transport Ministry's Ordinances, shall be provided.

(Speed Hump, Builb-out, etc.)

Article 31.2

When it is necessary for slowing down vehicles, to ensure safe pedestrian or bicycle traffic, speedhump shall be provided on the surface of the carriageway or on the shoulders connecting to the carriageway, or builb-out or bend sections shall be provided on the carriageway, on Type 3 Class 5 roads intended primarily for use by nearby residents.

(Islands at Bus/Tram stops)

Article 31.3

Islands shall be provided as necessary at bus bays or streetcar stops that do not connect to bicycle tracks, bicycle/pedestrian tracks or sidewalks.

(Automobile Parking Lot, etc.)

Article 32

Automobile parking lots, bicycle parking lots, bus bays, emergency parking basis or other similar facilities specified by the Land, Infrastructure and Transport Ministry's Ordinances shall be provided, if necessary, to ensure safe and smooth traffic or to contribute to public convenience.

(Snow Protection Facility and Other Protector)

Article 33

1. Where an avalanche, blizzard, snowfall or other meteorological events could prevent smooth traffic, snow shed, drain for snow removal, snow melting facilities or other facilities shall be provided as specified by the Land, Infrastructure and Transport Ministry’ s Ordinances.
2. Unless specified above, a fence, retaining wall, and other proper protectors shall be installed where falling stone, slope failure, billow, etc. could prevent traffic or damage road structure.

(Tunnel)

Article 34

1. To ensure safe and smooth traffic, proper ventilation facilities shall be provided in the tunnel when required in consideration of design traffic volume and tunnel length on the road.
2. When required for safe and smooth traffic, proper lighting shall be provided in the tunnel in consideration of design speed.
3. When a vehicle fire or other accidents in the tunnel could cause risks to traffic, the communication facilities, warning facilities, firefighting facilities and other emergency facilities shall be provided in the tunnel if necessary.

(Bridge and Elevated Road)

Article 35

1. Bridges, elevated roadss, or other similar roads shall be steel or concrete structure or the equivalent.
2. Design vehicle load for bridges, elevated roads, and other similar regular motor vehicle roads shall be 245kN. The structures of said bridges, elevated roads, and other similar regular motor vehicle roads shall secure safe traffic in view of large-sized vehicle traffic conditions for these roads.
3. Design vehicle load for bridges, elevated roads, and other similar smaller motor vehicle roads shall be 30kN. The structures of said bridges, elevated roads, and other similar smaller motor vehicle roads shall secure safe traffic in view of smaller vehicular traffic conditions for these roads.
4. In addition to the requirements in the three previous paragraphs, necessary matters regarding construction standards for bridges, elevated roads, or other similar roads shall be specified by the Ordinances of the Ministry of Land, Infrastructure, Transport and Tourism.

(Exception to Incidental Work)

Article 36

After a case is identified in which road work executed on others roads or work other than road work is executed and determined to be influencing roads, provisions from Articles 4 to 35 (except for Article 8, Article 13, Article 14, Article 24, Article 26, Article 31 and Article 33) may be exempted from application after it is approved that the case is not subject to these requirements.

(Exception to Change of Road Classification)

Article 37

When classification, as specified in Article 3.2, is changed by plans as to change a part of national highways to prefectural or municipal roads, classification following the change shall result in applying requirements of Article 3.4, Article 3.5, Article 4, Article 5, Article 6.1, Article 6.4, Article 6.6, Article 8.2 through 8.6, Article 8.9, Article 8.11, Article 9.1, Article 10.2.3, Article 11.1, Article 11.2, Article 11.4, Article 11.4.1, Article 12, Article 13.1, Article 16, Article 17, Article 18.1, Article 20,Article 22.2, Article 23.3, Article 27.3, Article 30 and Article 31.2. In this case, "Type 3 Class 5 roads" in proviso of Article 5.1, Article 5.5, proviso of Article 10.2.3, proviso of Article 11.4 and Article 12 shall be read as "Type 3 Class 5 or Type 4 Class 4 roads". "Type 3 Class 5 roads" in Article 5.3 shall be read as "Type 3 Class 5 and Type 4 Class 4 roads". "Type 4 roads" in Article 9.1 and Article 11.1 shall be read as "Type 4 (except for Class 4)". "Type 3" in these paragraphs shall be read as "Type 3 or Type 4 Class 4". "Type 3" in Article 11.2 shall be read as "Type 3 or Type 4 Class 4". "Values listed in the top column" in Article 13.1 shall be read as "Values listed in the top column (for Type 4 Class 4 roads, 40km/h, 30km/h or 20km/h)". "Mainly" in Article 31.2 shall be read as "Type 4 Class 4 roads or mainly".

(Exception to Reconstruction of Short Section)

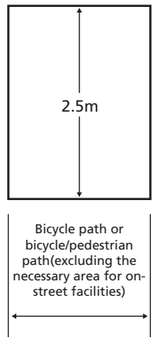
Article 38

1. When a short section on roads that severely prevents traffic is reconstructed as an emergency measure, except for reconstruction as listed in the following requirements, this section may be exempted from application of Article 5, Article 6.4 through Article 6.6, Article 7, Article 9, Article 9.2, Article 10.3, Article 10.2.2, Article 10.2.3, Article 11.3, Article 11.4, Article 11.4.2, Article 11.4.3, Article 15 through Article 22, Article 23.3, and Article 25, if it is approved that the road structure of sections adjacent to this section do not satisfy these requirements.
2. When a short section of roads that severely impact safety is reconstructed as an emergency measure, this section shall be exempt from application of Article 5, Article 6.4 through Article 6.6, Article 7, Article 8.2, Article 9, Article 9.2, Article 10.3, Article 10.2.2, Article 10.2.3, Article 11.3, Article 11.4, Article ll.4.2, Article 11.4.3, Article 19.1, Article 21.2, Article 23.3, Article 39.1, Article 39.2, and Article 40.1, if it is determined in consideration of road conditions that it is not proper to apply these requirements.

(Bicycle Path and Bicycle/Pedestrian Path)

Article 39

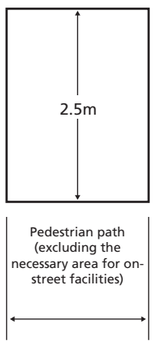
1. Bicycle path width shall be not less than 3m, while bicycle/pedestrian path width shall be no less than 4m. However, where topographical conditions or any other reasons do not permit such provisions, bicycle path width can be reduced to 2.5m.
2. Lateral clearances wider than 0.5m shall be provided to both sides of bicycle paths or bicycle/pedestrian paths as a part of the roads.
3. Where on-street facilities are provided on bicycle tracks or bicycle/pedestrian tracks, width of these tracks shall be determined in consideration of clearances as specified in the following provision.
4. Bicycle path and bicycle/pedestrian path clearances shall be in accordance with the following figure.
5. Alignment, grade, and other features of bicycle paths and bicycle/pedestrian paths shall be determined so as to ensure safe and smooth bicycle and pedestrian traffic.
6. Requirements of Article 3 through 37 and Section 1 of the preceding Article (excluding Article 1 1.2 for bicycle/pedestrian path) shall not be applied to bicycle paths and bicycle/pedestrian paths.



(Pedestrian Path)

Article 40

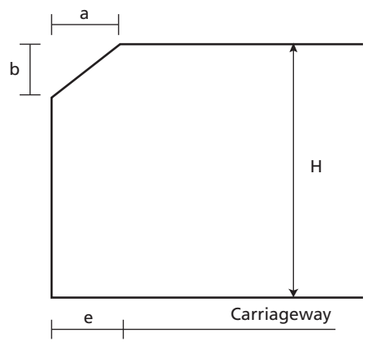
1. Pedestrian path width shall be not less than 2m in consideration of pedestrian traffic conditions and areas where the track is located, except where topographical conditions or other reasons do not permit such provisions, in which case the width can be reduced to 1m.
2. Where on-street facilities are provided on pedestrian paths, width shall be determined in consideration of clearances as specified in the following provision.
3. Pedestrian path clearances shall be in accordance with the following figure.
4. Alignment, grade and other features of pedestrian paths shall be determined so as to ensure safe and smooth pedestrian traffic.
5. Requirements of Articles 3 through 11, Article 11.3 through 37 and Section 1 of Article 38 shall not be applied to pedestrian paths.

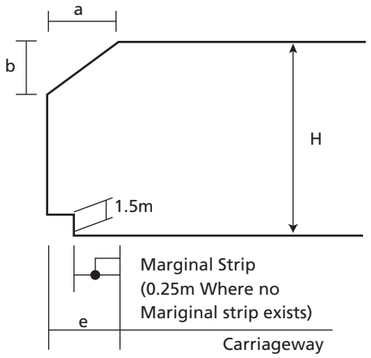


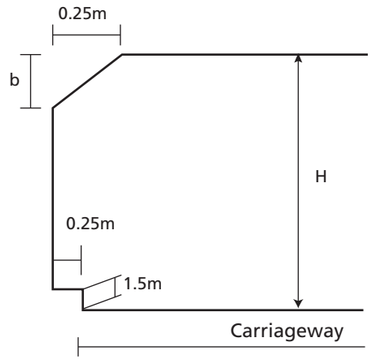
(General technical standards for structure of prefectural and municipal roads)

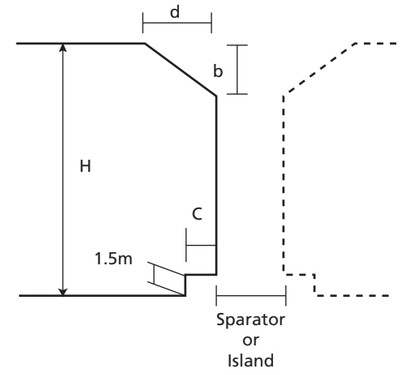
Article 41

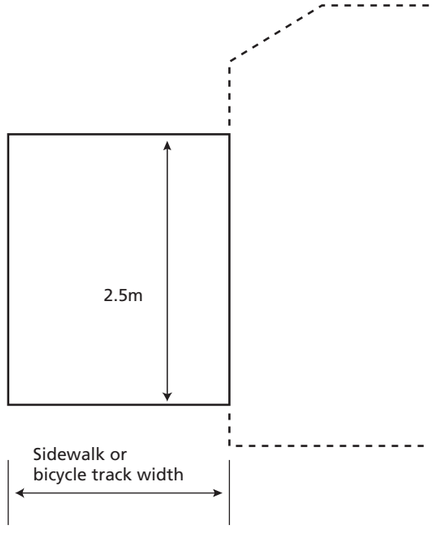
1. The provisions of Article 4, 12, 35.2, 35.3, 35.4 (limited to the matters listed in Article 30.1.12), 39.4, and 40.3 shall apply mutatis mutandis to general technical standards for the structure of prefectural or municipal roads when these roads are newly constructed or reconstructed. In this case, "Type 3 Class 5" in Article 12 shall be read as "Type 3 Class 5 or Type 4 Class 4".
2. The provisions of Article 5 through Article 11.4, Article 13 through 34, Article 35.1 and 35.4 (except for the provisions listed in Article 30.1.12), Article 36 through 38, Article 39.1 through 39.3, Article 39.5 and 39.6, Article 40.1, 40.2, 40.4, and 40.5 shall apply mutatis mutandis to the standard specified in Article 30.3. In this case, "Type 3 Class 5 roads" in proviso of Article 5.1, Article 5.5, proviso of Article 10.2.3, and proviso of Article 11.4 shall be read as "Type 3 Class 5 or Type 4 Class 4 roads". "Type 3 Class 5 roads" in Article 5.3 shall be read as "Type 3 Class 5 and Type 4 Class 4 roads". "Type 4 roads" in Article 9.1 and Article 11.1 shall be read as "Type 4 (except for Class 4)". "Type 3" in these paragraphs shall be read as "Type 3 or Type 4 Class 4". "Type 3" in Article 11.2 shall be read as "Type 3 or Type 4 Class 4". "Values listed in the left column" in Article 13.1 shall be read as "Values listed in the left column (for Type 4 Class 4 roads 40km/h, 30km/h or 20km/h)". "Primarily for use" in Article 31.2 shall be read as "Primarily for Type 4 Class 4 roads or use". In Article 37 "National highways" shall be read as "prefectural roads", "prefectural roads or municipal roads" and "other roads" shall be read as "municipal roads", "subject part" shall be read as "subject prefectural roads".

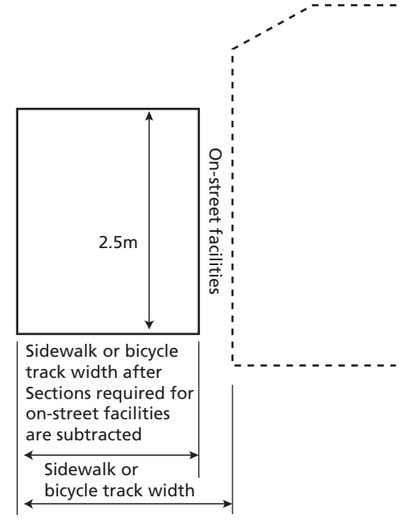












2040 Vision for Roads in Japan

2040 Vision for Roads in Japan

- To shape a better future for people -

(Summary)

2040 Vision for Roads in Japan

- To shape a better future for people -

To find out more about "2040 Vision for Roads in Japan" please visit our website.

https://www.mlit.go.jp/road/vision/pdf/03.pdf

2040 Vision for Roads in Japan - To shape a better future for people -

◆ Backgrounds and purpose

New Normal Post-Covid-19

Declining - population society

Digital transformation (DX)

Disasters and climate change Aging infrastructure

We propose a vision that creates a Sustainable Society in 2040 and Policy Directions achieved through our road administration.

◆ Basic concept

- "SDGs" and "Society 5.0" aim for a "human-centered society"
  - ***The starting point of road policy is "achieving people's happiness"***
- Social issues such as efficiency, safety, and environmental impact of travel
  - ***Full use of digital technology to "evolve" roads and solve problems***
- Since ancient times, roads have been a place where people interact, where they chat, and where children play
  - ***"Restore" the function of roads as communication spaces***

<Related Sustainable Development Goals (SDGs)>

◆ Changing scenery - Five images for the future -

1. Rush-hour commuting disappears

- The prevalence of telework dramatically reduces mandatory trips such as job commuting
- More people will migrate to and live in the countryside as restrictions due to distance from residence to work disappears

2. Many people on park-like roads

- More leisure trips and visits such as discretionary travel and pedestrian strolls
- Roads fulfill their potential as amenity spaces

3. Movement of people and goods automated and unmanned

- Automated driving services make the car-owning lifestyle a thing of the past
- The penetration of e-commerce leads to the increase of small-lot distribution and the spread of unmanned logistics

4. Cities keep changing as shops keep moving

- In response to customer demand, restaurants, supermarkets etc. locate along the roads
- In hilly and mountainous areas, Michi-no-Eki stations and small mobile shops provide services to residents

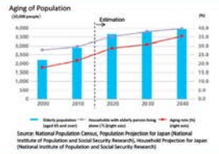
5. From "Road to be Affected" to "Road to Relief"

- Disaster-resistance road networks ensure uninterrupted traffic, communication and power, helping to save lives and restore affected areas

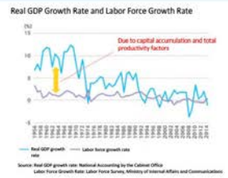
◆ "Sustainable Society" and "Policy Directions" aimed for by road administrations

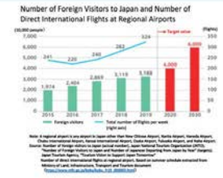
<Backgrounds & Issues >

Although the populations of both urban and mountainous areas will decrease in the future, it is necessary to create local communities where residents' lives and livelihoods are sustainable. The goal should be to build a society where, by using new technologies to enhance services, everyone can move around freely without worrying about modes of transport or traffic accidents, where they can interact and participate in society, and where they can experience happiness.

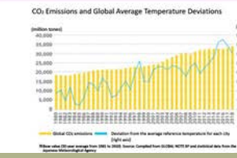


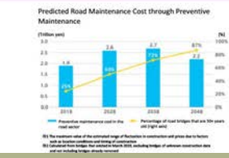
Economic growth is essential to enhance the sustainability of society. Economic vitality must be generated by attracting people and goods from abroad to the domestic market, as well as by having Japan actively promote the flow of people and goods overseas. A vibrant society where people and goods are exchanged globally should be built by transforming the services provided by roads and contributing to increased productivity.





Disasters have the power to disrupt the growth path of a nation or region instantly, and it is no exaggeration to say that they are the biggest challenge to Japan's quest for sustainable growth. We should overcome challenges such as vulnerability to disaster, climate change and aging infrastructure, and should aim to build a society where everyone can live safely and securely.





1 A society where everyone can move, interact and participate in society freely, no matter where they are located in Japan

1. Road energizes the land, people utilize the road

The arterial roads network across the country and advanced traffic management enable people to live, move and work freely everywhere in Japan

- Road network for automated-driving
- Cashless toll system

2. Get around conveniently without a privately-owned car

Mobility as a service (MaaS) provides a convenient way for everyone to get around without a privately- owned car

- Mobility hub
- Unmanned, automated ride sharing services at Michi-no-Eki stations

3. Zero road accidents

Universal-design roads that allow people and vehicles to share space safely and comfortably, creating a living space free of road accidents

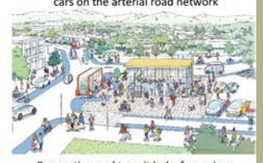
- Rising bollards restricting access to community roads
- Roads where pedestrians and cars coexist

4. Roads where people want to go and linger

Main streets in towns will be reborn as beautiful spaces that make people want to go and linger, creating lively community spaces

- Main streets and Michi-no-Eki stations that serve as regional cores
- Road design reform: Removing utility poles, lighting in harmony with roadside buildings, etc.

Dedicated paths for automated-driving cars on the arterial road network



Connection and transit hubs for various transportation modes (mobility hubs)

Safe and comfortable community road

◆ "Sustainable Society" and "Policy Directions" aimed for by road administrations

2 A society energized by the interaction of people, goods, and services that can be enjoyed around the world

5. Attractive international cities

Road spaces for excellent mobility and public interaction significantly enhance the investment attractiveness as international cities

- Urban transportation systems that are adapted for automated driving and MaaS
- Road shoulders that change functions depending on the time of day

A user friendly urban transportation terminal that supports MaaS and automated driving

6. Sustainable logistics systems

Trunk-route haulage by automated-driving trucks, and autonomous and labor-saving logistics through robot delivery etc. in the last mile can function as a sustainable system both in normal times and during disasters

- Haulage by automated trucks
- Last-mile unmanned transportation by robots and drones

Automated and labor-saving last-mile transportation through robot delivery

7. Attracting tourists from around the world

The Japan Scenic Byways, National Cycle Routes, and Michi-no-Eki stations, etc., will be tourist destinations for domestic and foreign visitors, and sophisticated services such as multilingual road guidance will improve convenience and satisfaction for international visitors and foreign residents

- Going cashless
- Multi-lingual road guidance using smartphone applications, etc.

Multi-lingual street and city information through digital devices and smartphone applications

3 A society where everyone can live safely and securely, eliminating vulnerability to disaster and ageing infrastructure

8. Roads that protect people's lives and property from disasters

In the face of increasingly severe and widespread disasters, a disaster-resistance road network will ensure uninterrupted flow of people and goods to the affected areas, minimizing loss of life and economic losses

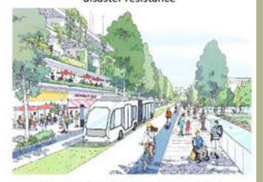
- Expressways in disaster mode
- Making Michi-no-Eki stations and SA/PAs disaster prevention centers

An arterial road network with enhanced disaster resistance

9. Low-carbon road transport

Low-carbon road transport systems, comprising the best mix of electric vehicles, fuel cell vehicles, public transport and bicycles, will contribute to curbing global warming

- Contactless power supply system
- Shared cycle system

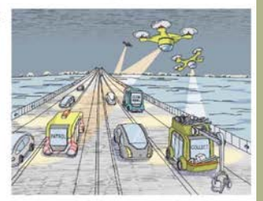


A low-carbon transportation system centered on BRT (Bus Rapid Transit) and bicycles, etc.

10. Extending the life of the road network

The road network is operated sustainably through more efficient and sophisticated preventive maintenance due to the introduction of new technologies

- Automation and labor-saving methods for inspection and diagnosis using AI and measurement/monitoring technologies
- Automation of maintenance work such as snow removal and cleaning



Automated maintenance tasks such as street cleaning and debris collection

Statistics

Road Statistics of Japan

Road Length by Category (Mar. 31, 2020)

Category	Unit : km
Motorways (National expressways)	9,050
Highways, Main or National Roads (National highways)	52,243
Secondary or Regional Roads (Prefectural roads)	94,009
Other Roads (Municipal roads)	200,282
Total	355,583

・Roads less than 5.5m in width have been excluded from the statistics.
(Source: Road Statistics Annual Report [Douro Toukei Nenpo] 2021, Road Bureau, MLIT)

Vehicular Traffic Volume (2020)

Vehicle type	Unit: Million vehicle kilometers/year
Passenger cars	479,611
Buses & Motor coaches	7,278
Vans, pick-ups, lorries, road tractors	178,975
Total	665,864

Source: Vehicle Fuel Consumption Surveys 2020, Policy Bureau, MLIT

Freight Transport (2020)

Modes	Unit: million ton-km/year
Road	213,419
Rail	18,340
Waterway	153,824
Total	385,583

Source: (Road) Annual Report of Automobile Transport 2020, Policy Bureau, MLIT
(Rail) Annual Report of Rail Transport 2020, Policy Bureau, MLIT
(Waterway) Statistical Survey of Coastal Shipping Transport 2020, Policy Bureau, MLIT

Passengers Transport (2019)

Modes	Unit: million passenger-km/year
Road, public transport	60,070
Road, private transport	844,042
Rail	435,063
Total	1,339,175

Source: (Road, public transport) Annual Report of Automobile Transport 2019, Policy Bureau, MLIT
(Road, private transport) Annual Report of Automobile Transport 2019, Policy Bureau, MLIT
(Rail) Annual Report of Rail Transport 2020, Policy Bureau, MLIT

Vehicles in Use (Mar. 31, 2021)

Vehicle type	Unit: vehicles
Passenger cars	61,917,112
Buses & Motor coaches	222,326
Vans, pick-ups, lorries, road tractors	14,395,843
Total	76,535,281
(Reference) Motorcycles & Mopeds	3,762,277

Source: Vehicles in use by category, Automobile Inspection ＆Registration Information Association

Road Accidents (2020)

	Unit: accidents, or persons
Number of Injury Accidents	309,178
Number of Persons Injured	369,476
Number of Persons Killed	2,839

Source: Traffic accidents per 100,000 persons, Statistics about Road Traffic 2020, National Police Agency

Road Expenditure (2019)

	Unit: million yen
Gross investment	4,006,026
Maintenance expenditures	2,643,738
Total	6,649,764

・Expenditures for toll roads are excluded.
(Source: Road Statistics Annual Report [Douro Toukei Nenpo] 2021, Road Bureau, MLIT)

Change in Investment in the Five-Year Road Development Program

The Five-Year Road Development Plans	General Road Projects		Toll Road Projects		Unsubsidized Local Road Projects		Total ¥billions
	Investment ¥billions	Ratio %	Investment ¥billions	Ratio %	Investment ¥billions	Ratio %	
1st Plan	260.0	100.0	-	-	-	-	260.0
FY1954-57	182.1	59.0	146.0	4.7	111.9	36.3	308.6
a/A (%)	70.0	-	-	-	-	-	-
2nd Plan	610.0	61.0	200.0	20.0	190.0	19.0	1,000.0
FY1958-60	322.2	61.3	51.0	9.7	152.1	29.0	525.2
b/B (%)	52.8	-	25.5	-	80.0	-	52.5
3rd Plan	1,300.0	61.9	450.0	21.4	350.0	16.7	2,100.0
FY1960-63	722.2	57.7	225.5	18.0	304.5	24.3	1,252.2
c/C (%)	55.6	-	50.1	-	87.0	-	59.6
4th Plan	2,200.0	53.7	1,100.0	26.8	800.0	19.5	4,100.0
FY1964-66	1,244.1	56.8	443.2	20.2	502.3	23.0	2,189.6
d/D (%)	56.6	-	40.3	-	62.8	-	53.4
5th Plan	3,550.0	53.8	1,800.0	27.3	1,100.0	16.6	1) 6600
FY1967-69	1,795.6	51.9	753.5	21.7	912.7	26.4	3,461.8
e/E (%)	50.6	-	41.9	-	83.0	-	52.5
6th Plan	5,200.0	50.2	2,500.0	24.2	2,550.0	24.6	2) 10300
FY1970-72	3,108.0	49.9	1,317.9	21.2	1,786.3	28.8	9) 6223.5
f/F (%)	59.8	-	52.7	-	70.1	-	60.1
7th Plan	9,340.0	47.9	4,960.0	25.4	4,700.0	24.1	3) 19500
FY1973-77	7,757.8	47.3	3,960.8	24.1	4,693.9	28.6	16,412.5
g/G (%)	83.1	-	79.9	-	99.9	-	84.2
8th Plan	13,500.0	47.4	6,800.0	23.9	7,500.0	26.3	4) 28500
FY1978-82	12,947.9	45.0	6,614.5	23.0	9,231.4	32.0	28,793.8
h/H (%)	95.9	-	97.3	-	123.1	-	101.0
9th Plan	16,000.0	41.9	9,200.0	24.1	11,700.0	30.6	5) 38200
FY1983-87	15,926.5	43.1	9,740.3	26.4	11,252.7	30.5	36,919.4
i/I (%)	99.5	-	105.9	-	96.2	-	96.6
10th Plan	23,800.0	44.9	14,000.0	26.4	13,900.0	26.2	6) 53000
FY1988-92	22,637.6	41.1	14,238.7	25.9	18,164.3	33.0	55,040.6
j/J (%)	9.1	-	101.7	-	130.7	-	103.9
11th Plan	28,800.0	37.9	20,600.0	27.1	25,200.0	33.2	7) 76000
FY1993-97	28,627.4	39.9	17,703.6	24.7	25,476.2	35.5	71,807.2
k/K (%)	99.4	-	85.9	-	101.1	-	94.5
12th Plan	29,200.0	37.4	17,000.0	21.8	26,800.0	34.4	8) 78000
FY1998-02	31,729.0	48.6	13,431.2	20.6	20,155.4	30.9	65,315.6
l/L (%)	108.7	-	79.0	-	75.2	-	83.7