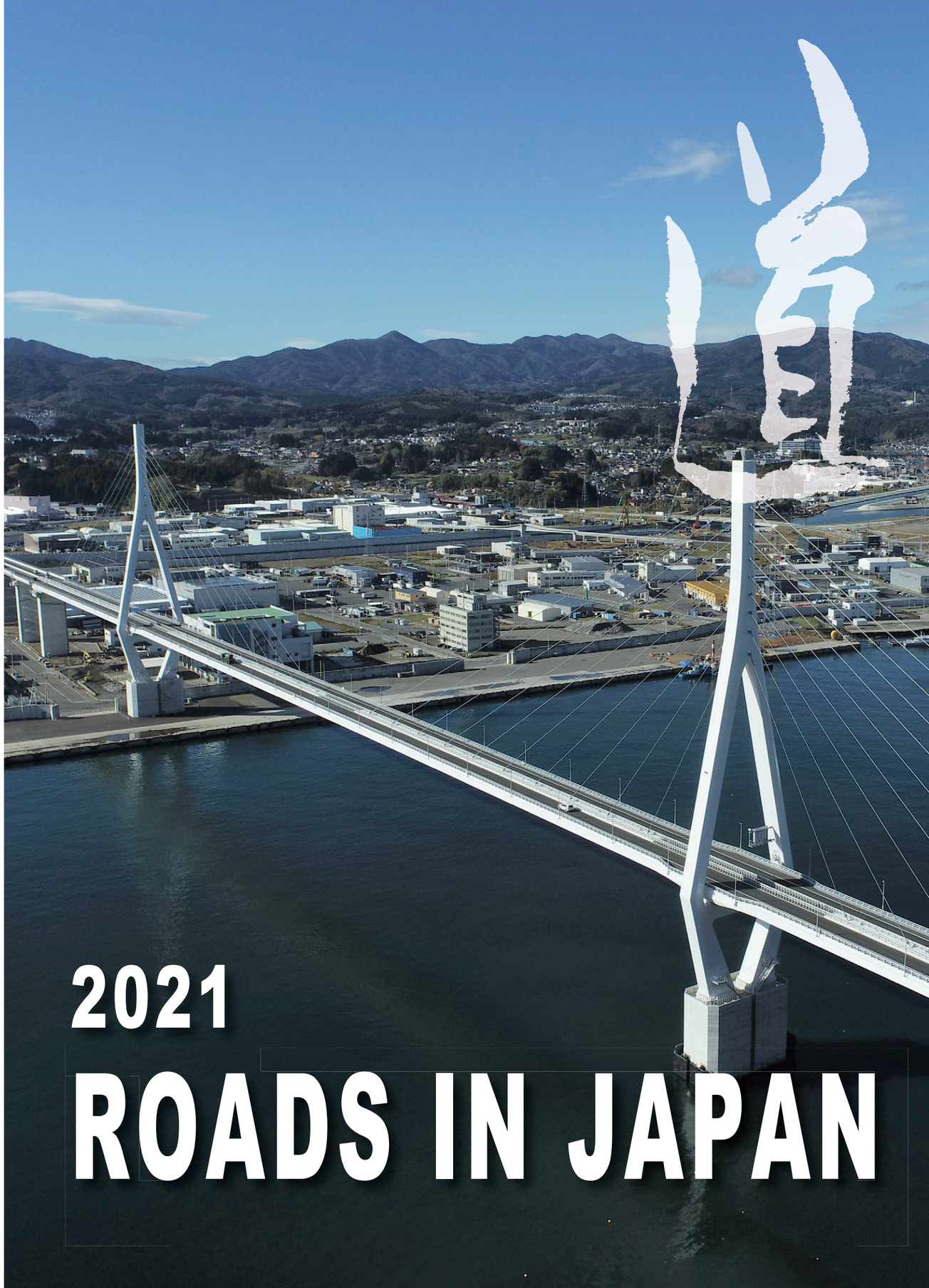

2021
ROADS IN JAPAN

Road Bureau
Ministry of Land, Infrastructure, Transport and Tourism

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

2021

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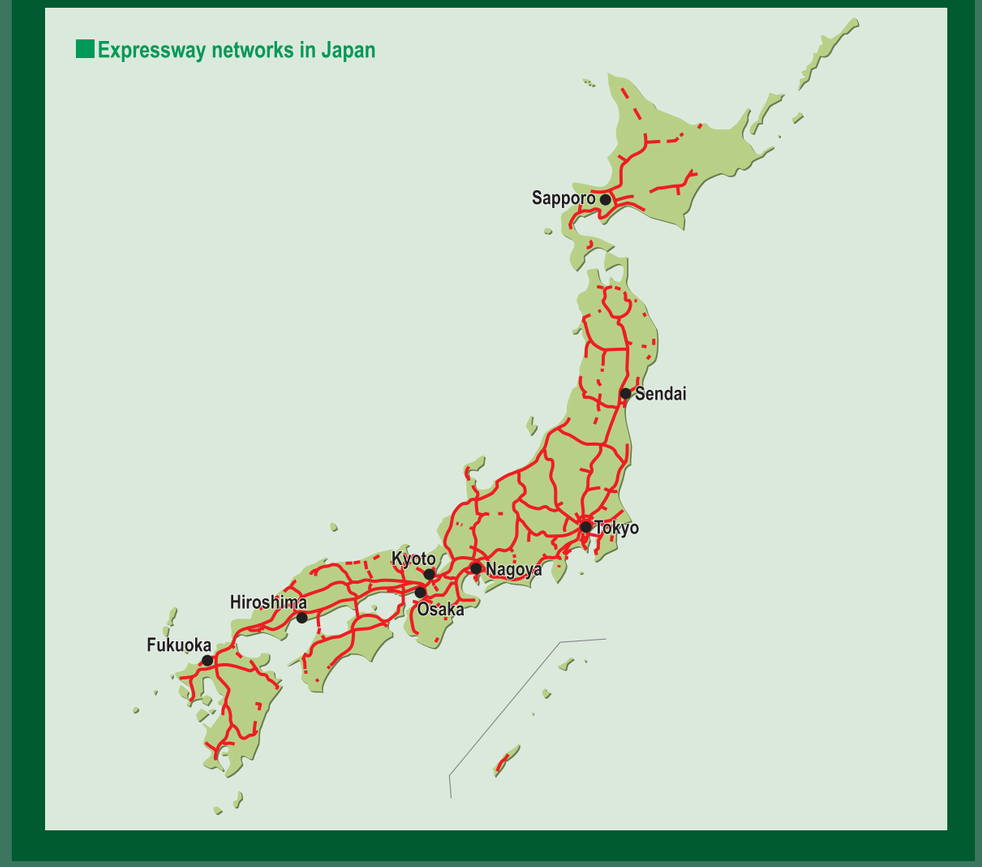
Cover photo：Kesennuma Bay Crossing Bridge
This is the only bridge that crosses the sea in the Sanriku Coastal Highway, which was constructed as a leading project for the reconstruction of the areas affected by the Great East Japan Earthquake. Of the 1,344m length of the bridge, the 680m cable-stayed 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



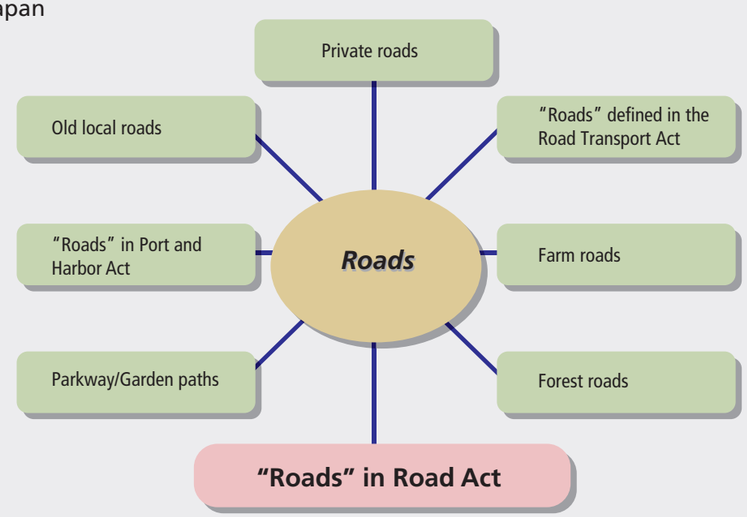
Types of Road

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 No 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

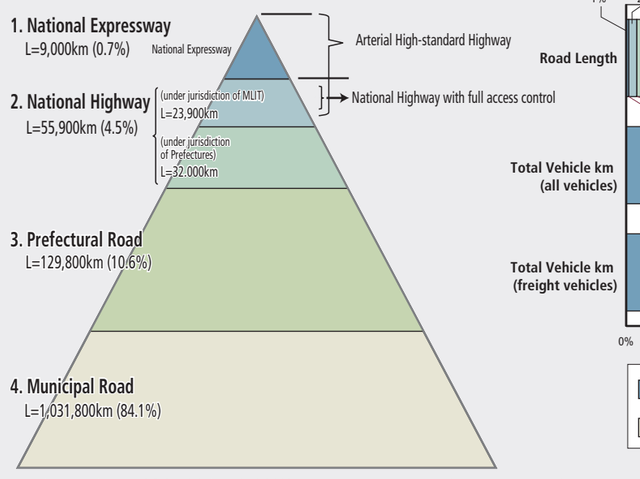
Road Type		Road Administrator	Cost is carried by	Cost Sharing	
				Development/improvement	Maintenance/repair
National Expressway	Toll	Minister*1 〔Article 6 of the National Expressway Act〕	Expressway Companies (NEXCOs)	Development, improvement and repair activities are carried out using a loan. The debt 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.

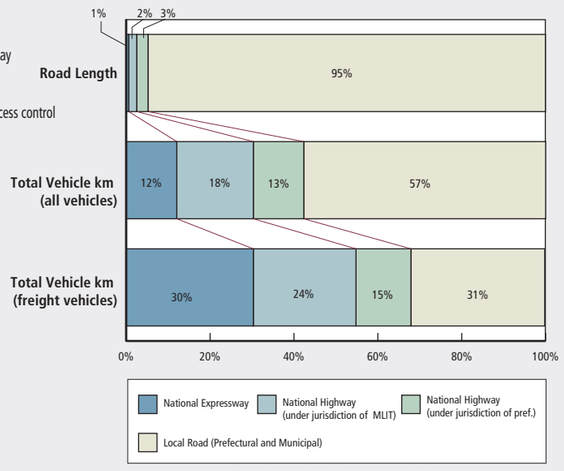
■Road classification and percentage of road length



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]

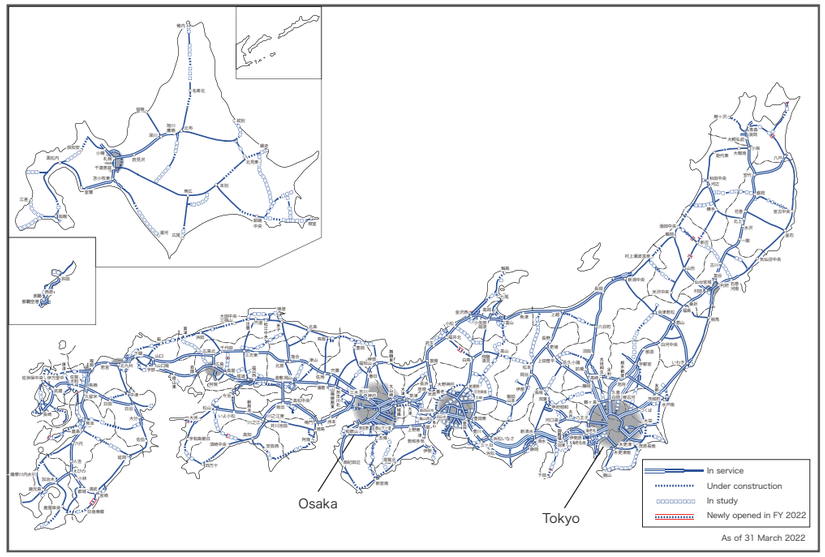
Proposed route	**Decision by Minister of Land, Infrastructure, Transport and Tourism**
Legally determined in the National Development Arterial Express Construction Act [11,520 km]	Master Plan [2,480 km]
Basic Plan	**Basic Plan**
Decided by the Minister of Land, Infrastructure, Transport and Tourism after 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.

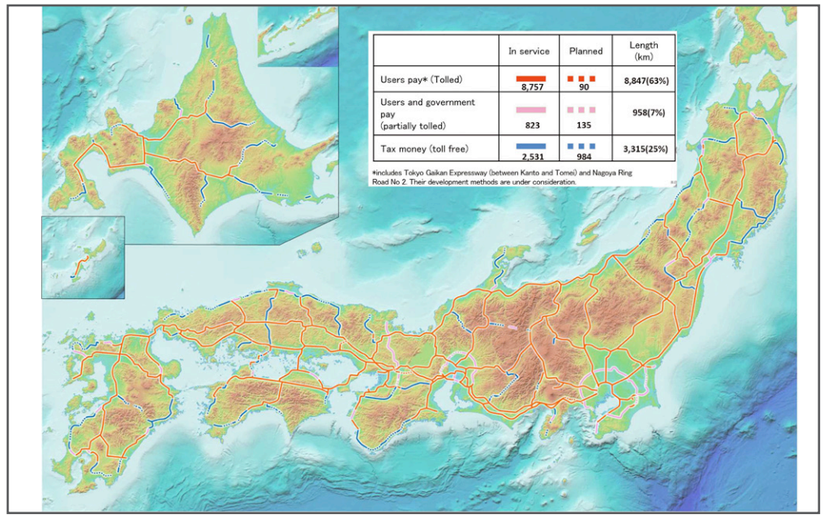
Arterial high-standard highway network



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.

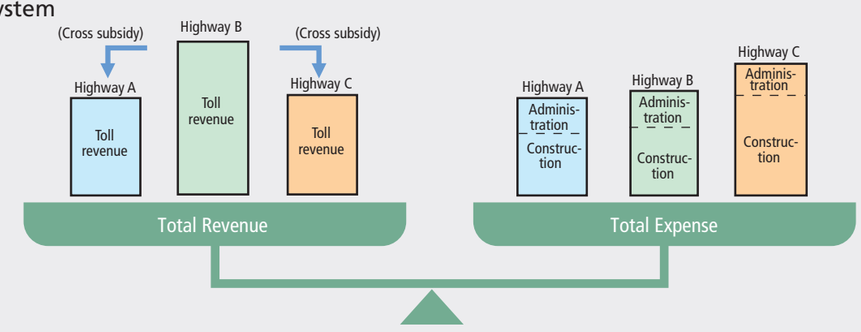
Pool system

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.

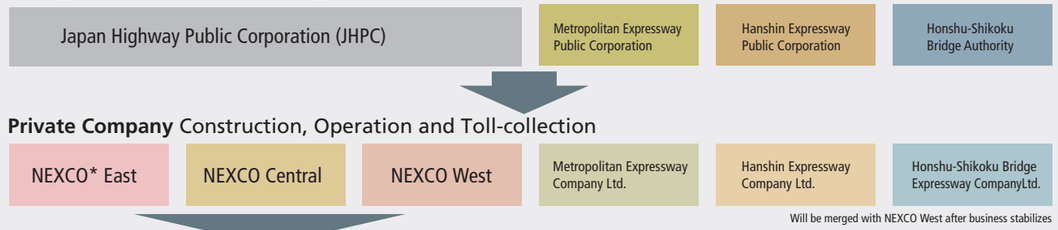
Pool system



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

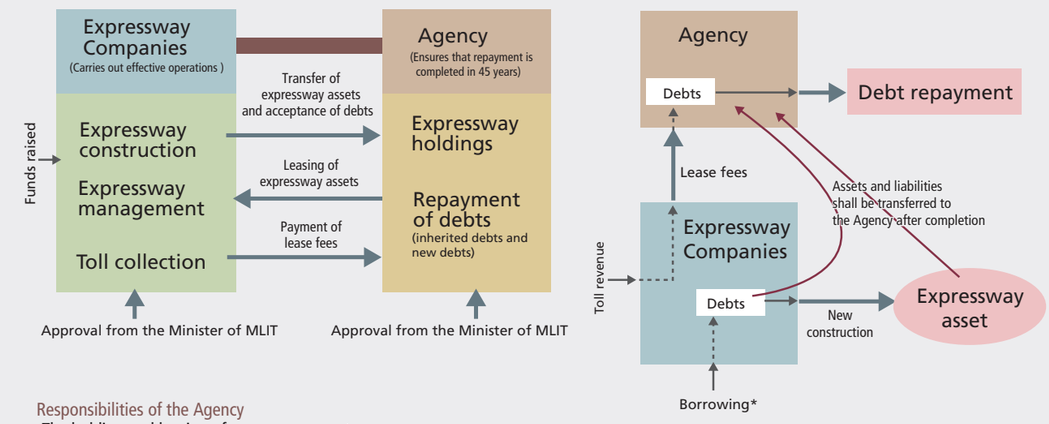


Privatization was based on the following acts
-Expressway Company Law
-Japan Expressway Holding and Debt Repayment Agency Law
-Law Regarding the Development of Highway-Related Laws in Connection with the Privatization of the Japan Highway Public Corporation
-Act for Enforcement of Acts Related to Privatization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

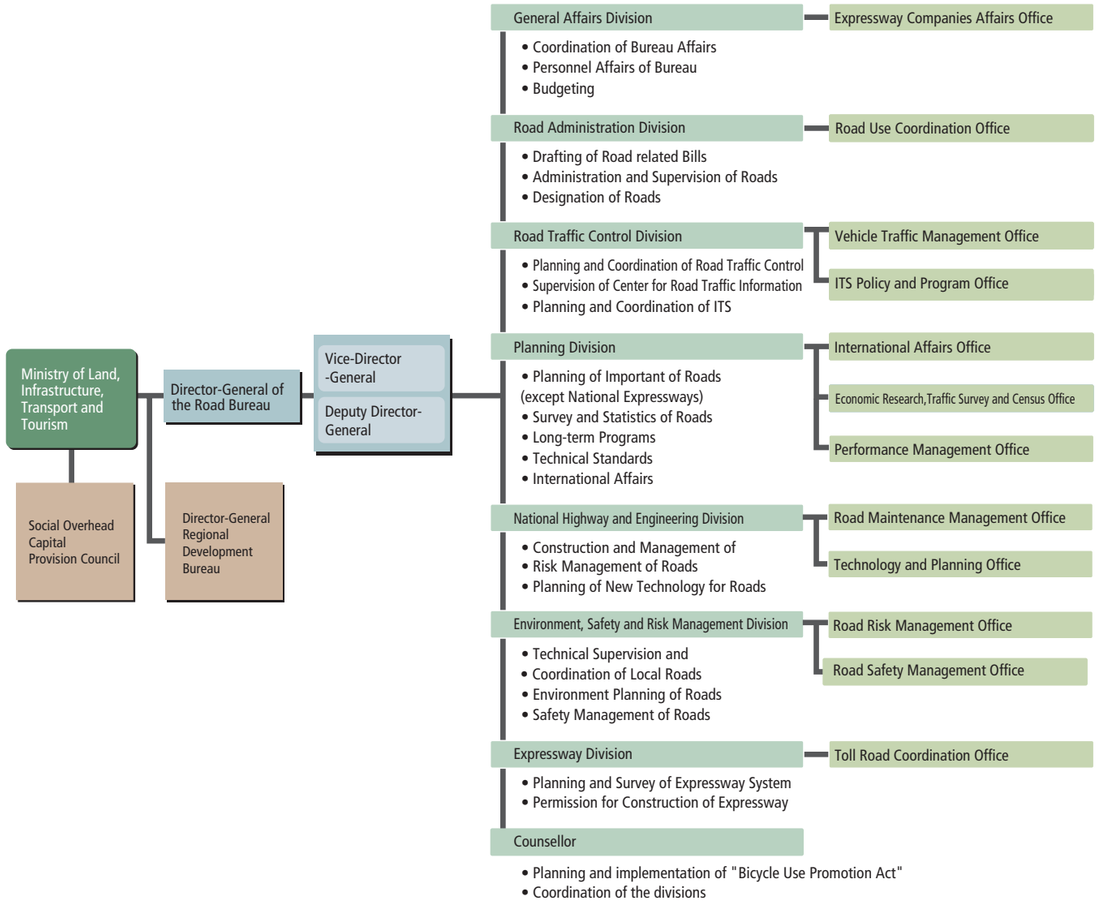
Civil Aviation Bureau
- Director-General
- Senior Deputy Director-General
- General Affairs Division
- Aviation Network Department
  - Director-General
  - Planning Division
  - International Air Transport Division
  - Aviation Industries Division
  - Airport Planning Division
  - Airport Engineering 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

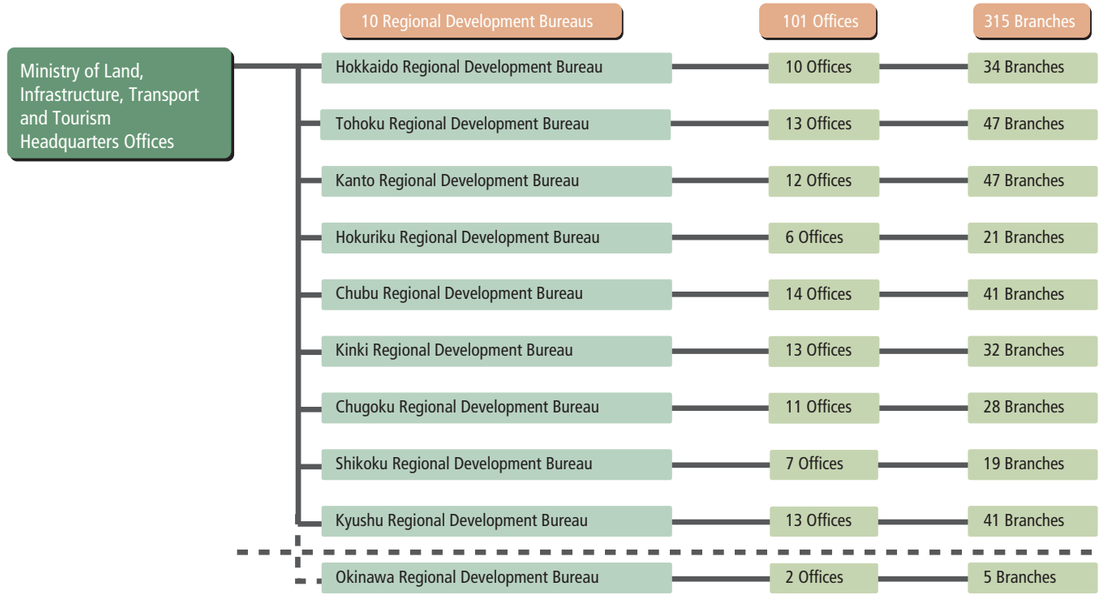
Director-General for International Affairs

Organization Chart of Road Bureau



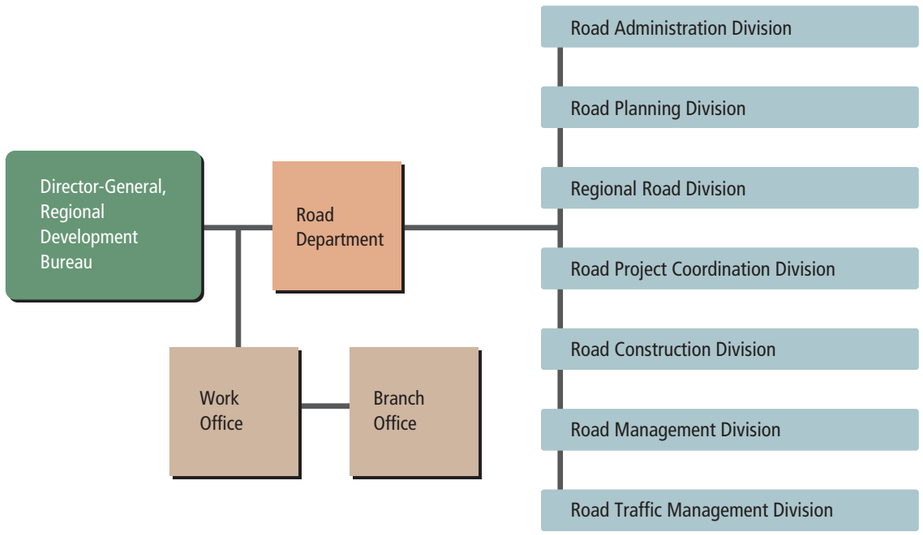
As of April 1, 2018

Regional Development Bureaus



As of April 1,2021

Organization Chart of a Regional Development Bureau



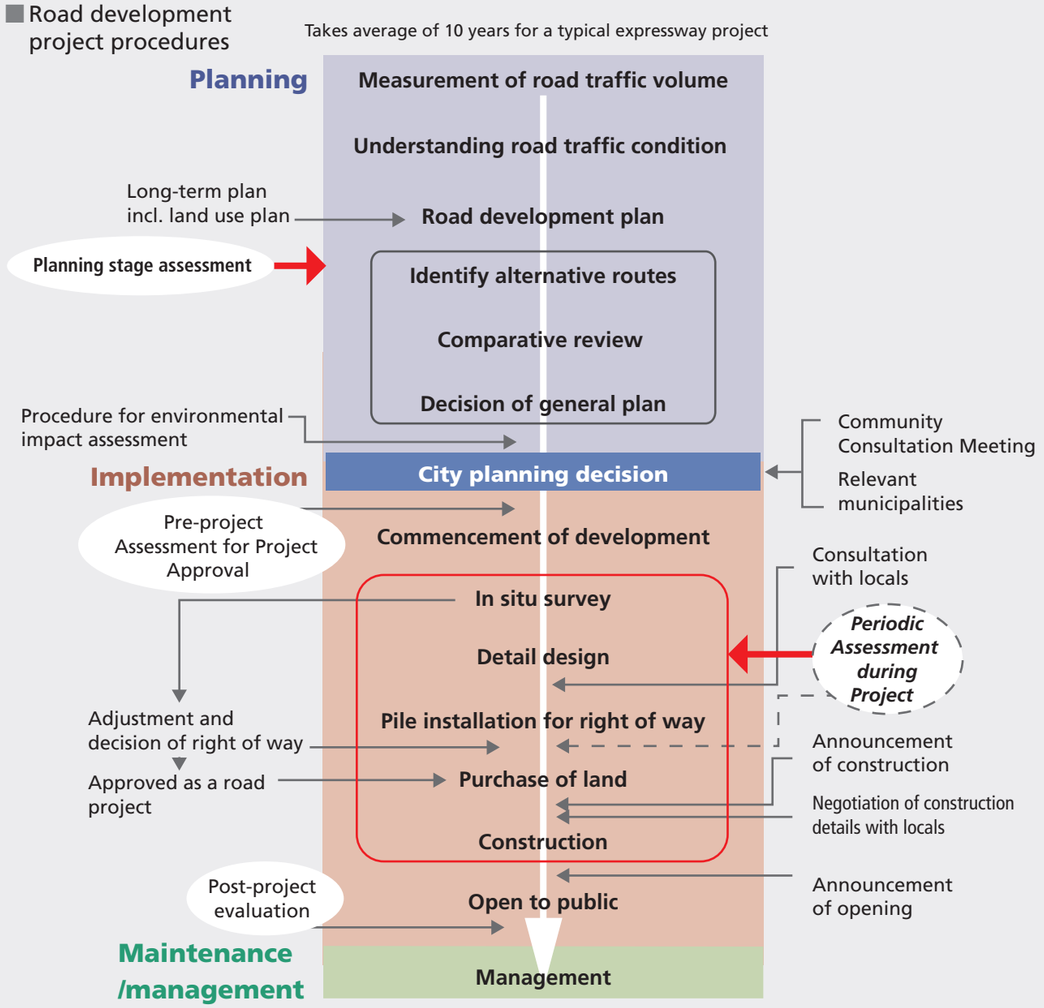
Planning and Implementation of Projects

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.

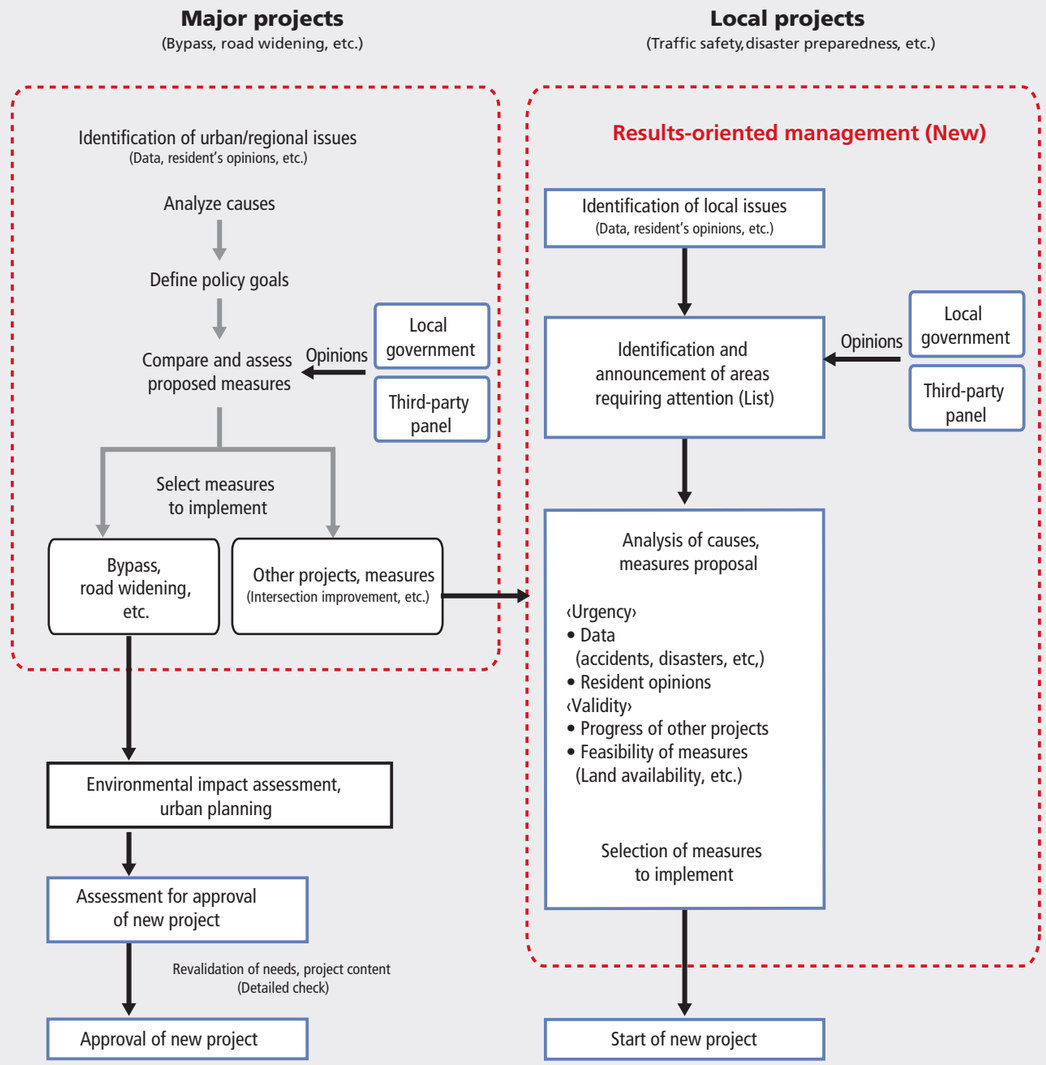
■ Road development project procedures



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.

↓

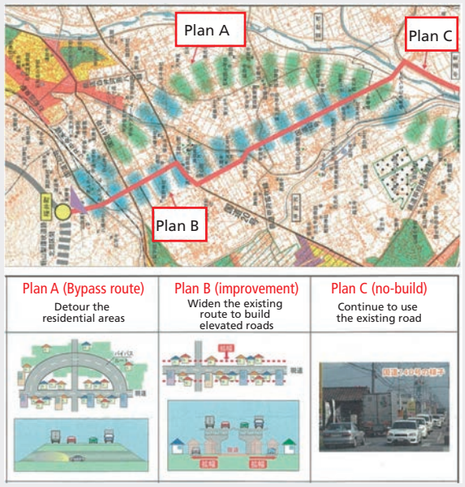
Comparative review
Make a comparison with other routes with respect to nature, structure, care for control-points* and economy before deciding the optimal route.

↓

(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.

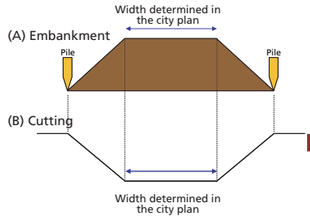
(2)

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

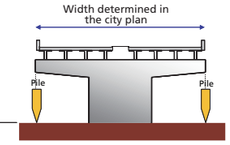
Negotiation of compensation is conducted.

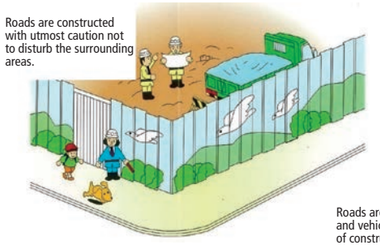
【Pile installation】

(1) Structures at grade

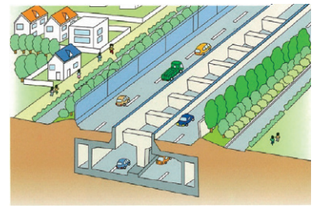


(2) Elevated structures





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.

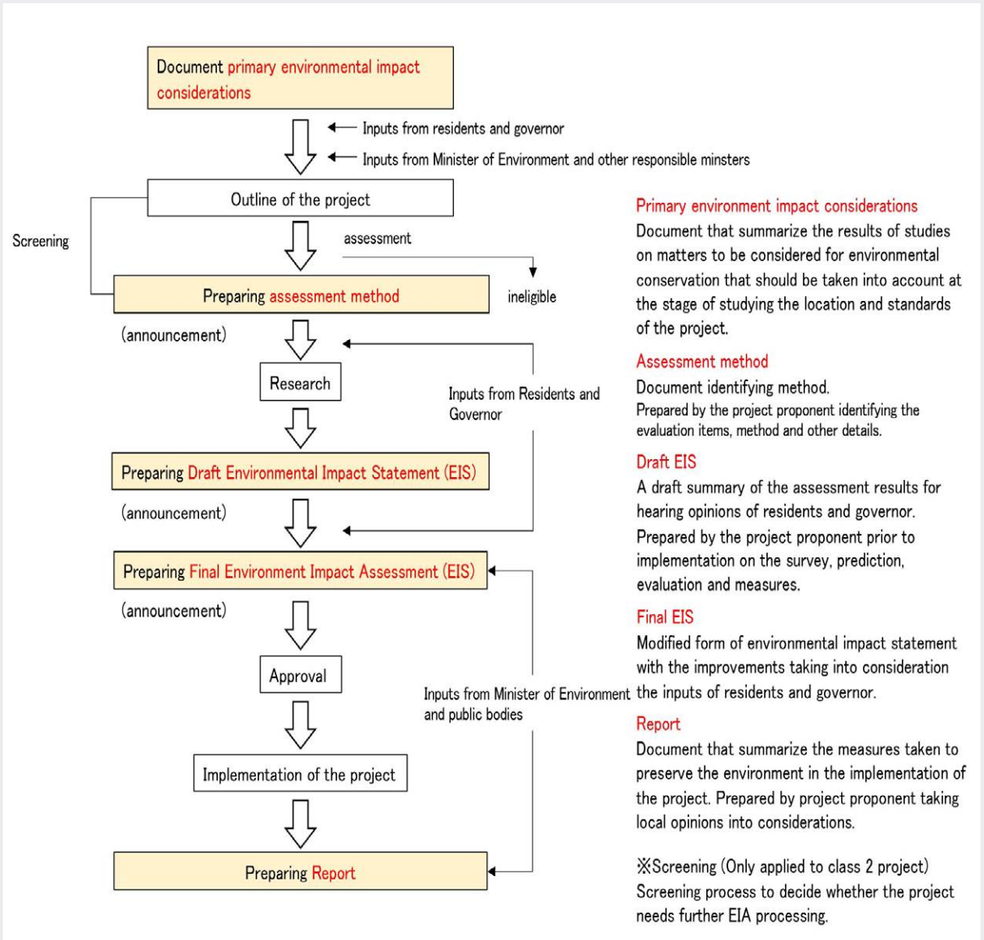
■Road projects that have to be assessed

	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.

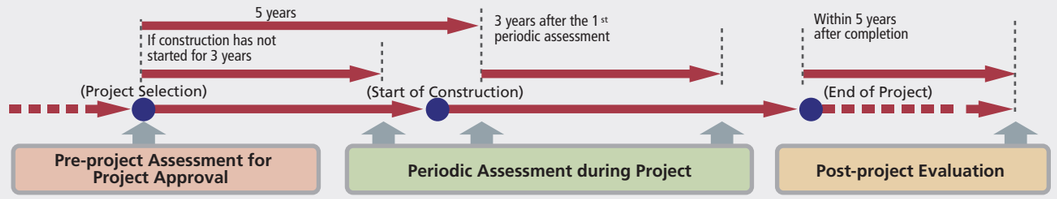
※Screening (Only applied to class 2 project)
Screening process to decide whether the project needs further EIA processing.

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)



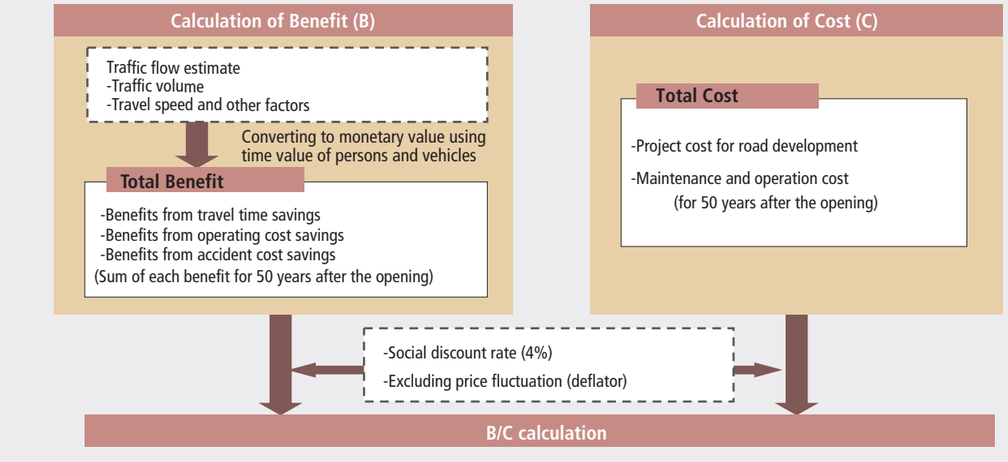
1) Pre-project assessment for project approval Project assessment including a cost-benefit analysis is conducted when approving a new project. **This procedure was introduced in FY 1998.**	Total : 1,067projects (FY2020 : 45projects)
2) Periodic assessment during project When a project has not started 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

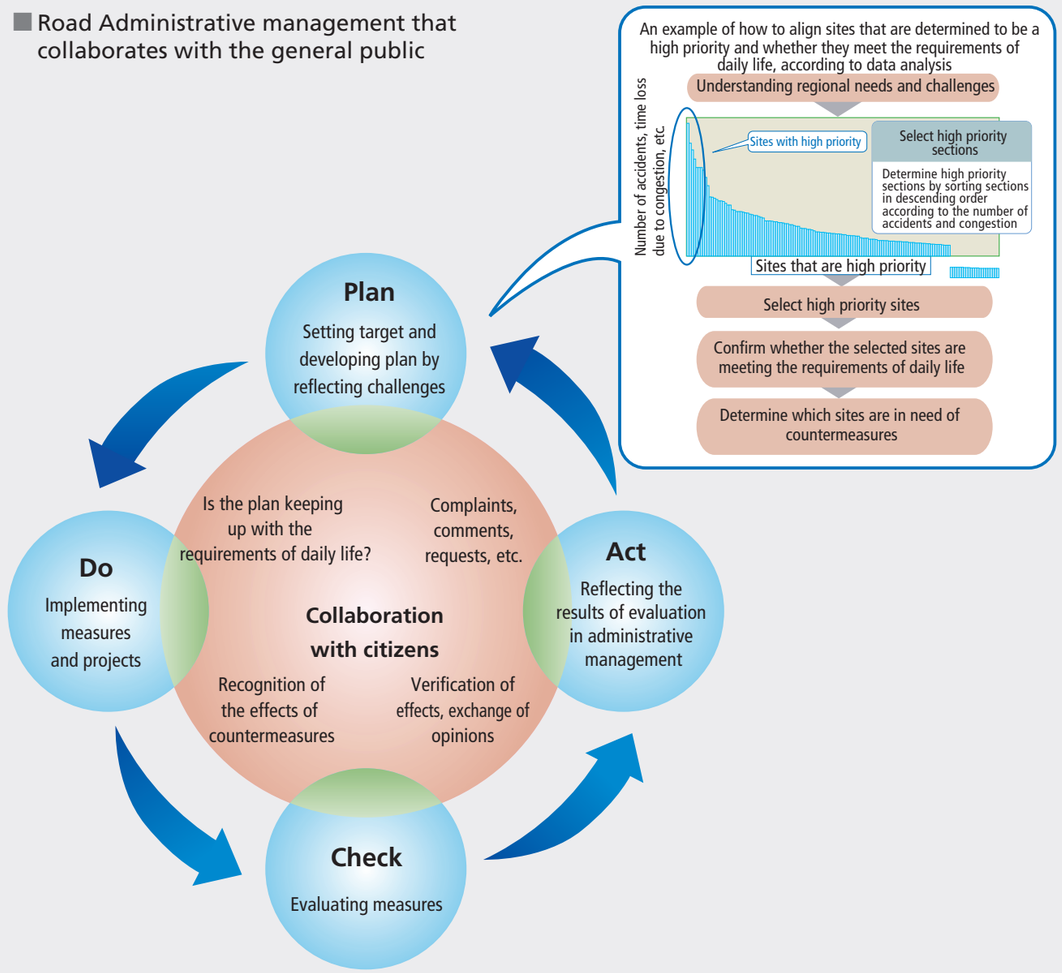
Together with regional public corporations, NPOs and other citizens' groups, the Japanese government is currently putting its efforts toward enhancing administrative management for roads. In order to achieve more effective, efficient and transparent road administration, Japan has promoted result-oriented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

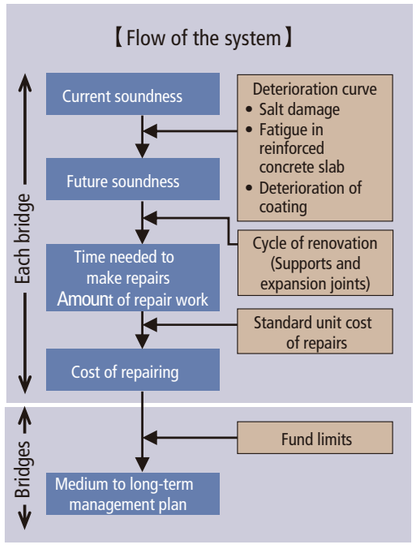
Asset Management

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.

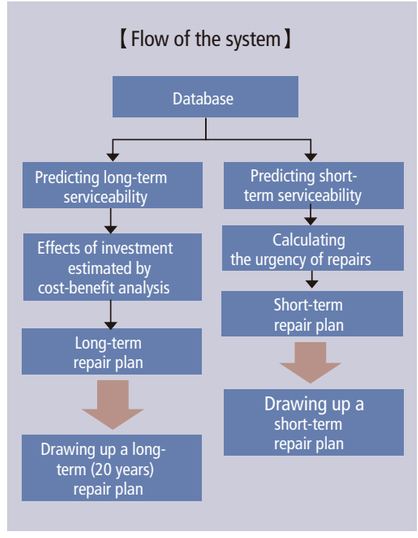
Development of road asset management

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

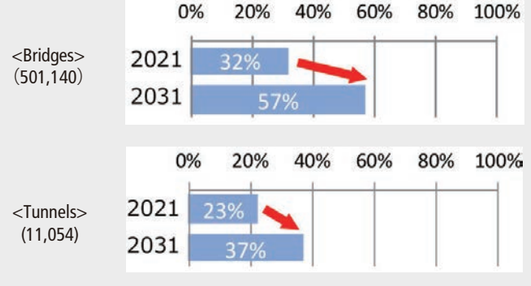


■ Overview of Pavement Management System



■ Percentage of bridges olderthan 50 years

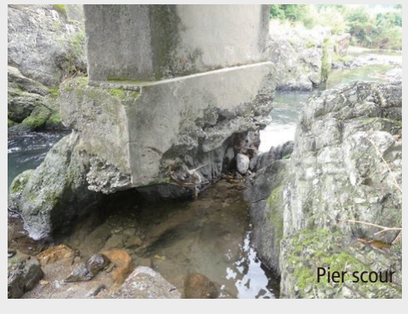
The percentage of infrastructure facilities that are more than 50 years old is increasing at an accelerating rate.



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.

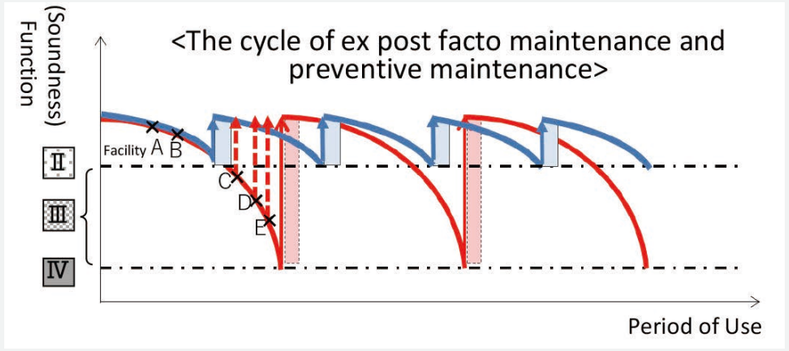
Judgment category IV (urgent measures should be taken)

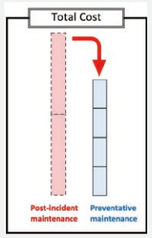


Efficient management of road assets

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

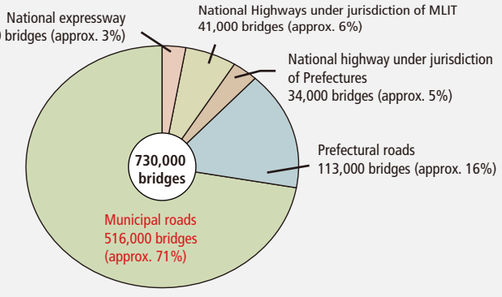
December 2, 2012:
Sasago Tunnel Ceiling Collapse

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

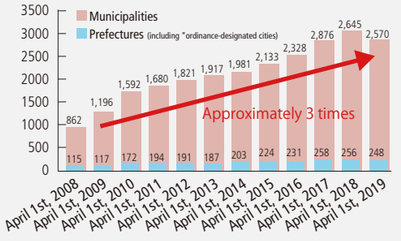
Current maintenance activities for aging roads activities

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

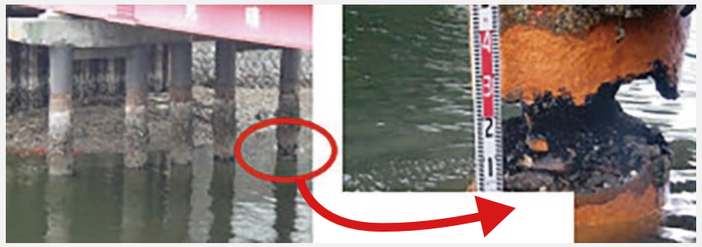


Increasing number of traffic restrictions on local roads



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

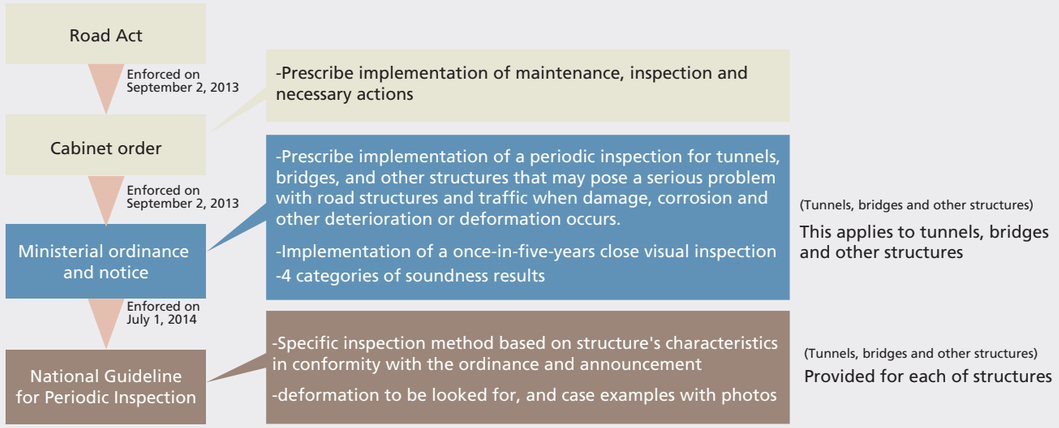


37-year old Miharashi Bridge (on Shinyamashita 8th municipal road) was found damaged.

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)).

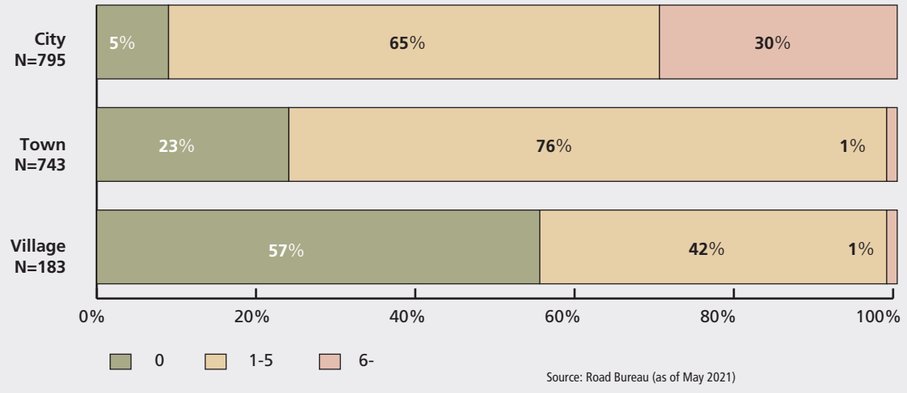
Legal system of the inspections



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:

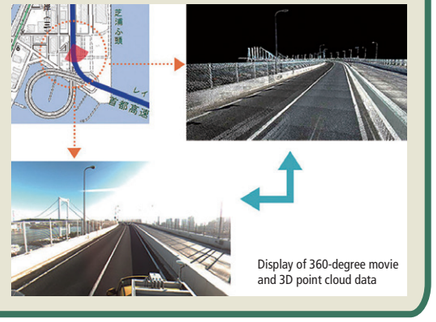
I. Basic features for GIS and 3D point cloud data

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

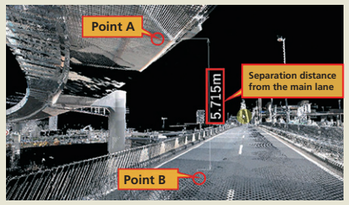
InfraDoctor displays 3D point cloud data and 360-degree movie in synchronization. Easy switching between these data enables to quickly understand the situation on site.



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.

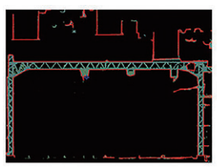
III. Further sophisticated management and advanced features

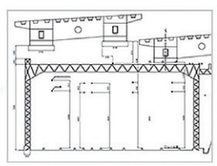
Further sophisticated infrastructure management through expanded features using GIS and 3D point cloud data

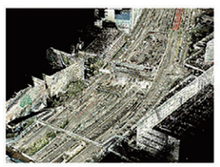
InfraDoctor provides various features, including drawing, deformation detection on pavement and walls, creation of traffic control plan drawing and 3D simulation, streamlining maintenance work through a good use of GIS and 3D point cloud data.

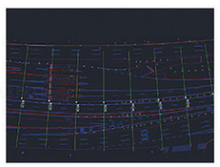
2D CAD drawing feature

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

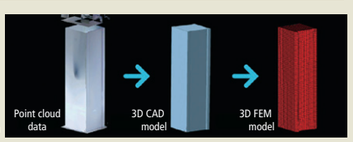

2D CAD drawing (cross section)


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.

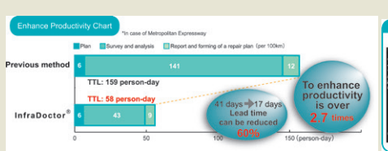


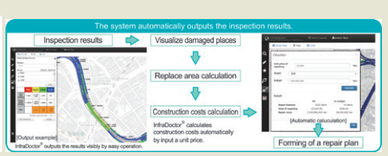
Creation of an FEM model from 3D point cloud data

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.





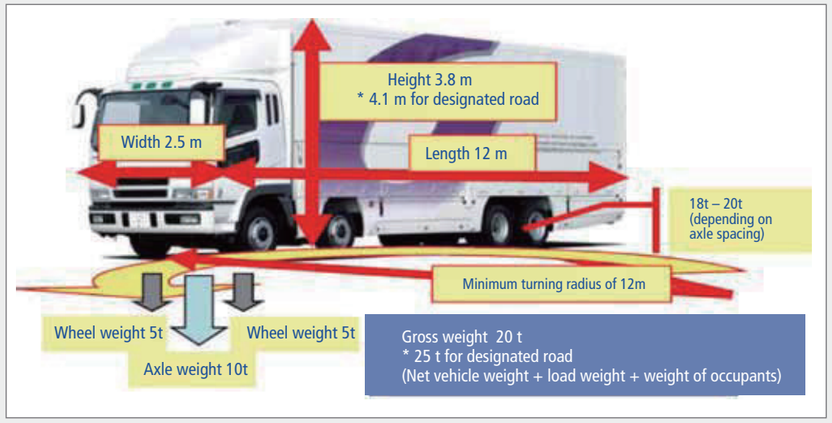
Road-related systems in Japan

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

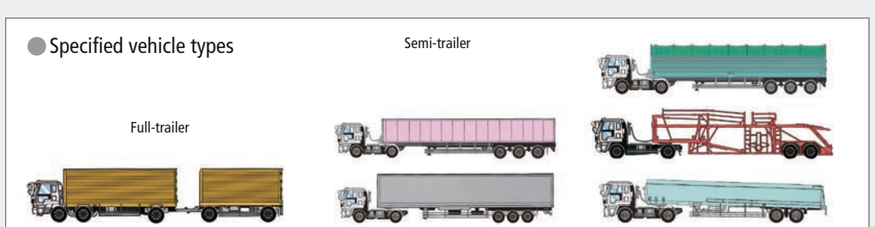
On expressways

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.

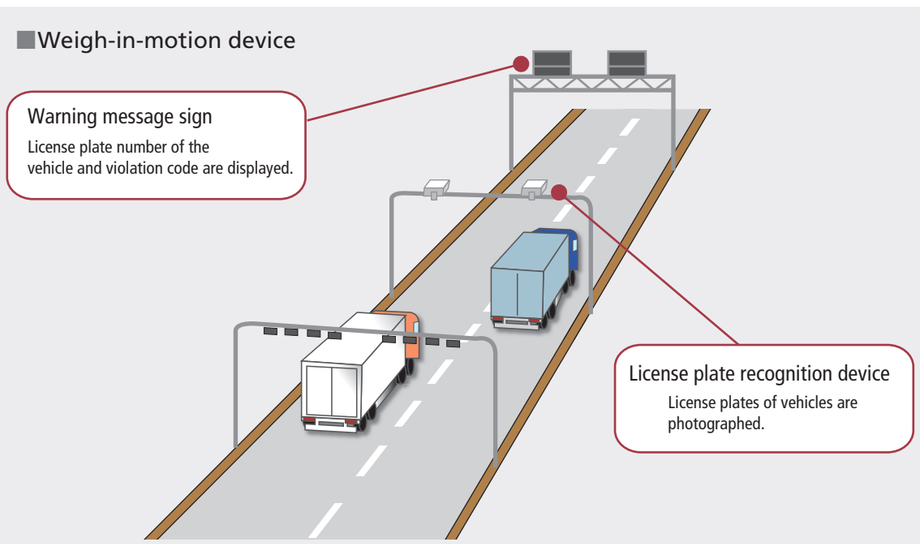
2. Weigh-in-motion (WIM)
A WIM device automatically measures a vehicle's gross weight. If the vehicle is over the weight limits, the WIM system then determines if the overweight vehicle has a permit by accessing the database. Based on the results, repeated violators will be given an instructive warning.

■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)

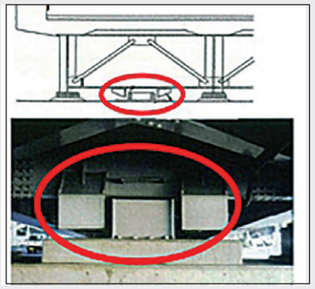
Measures against Earthquakes

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

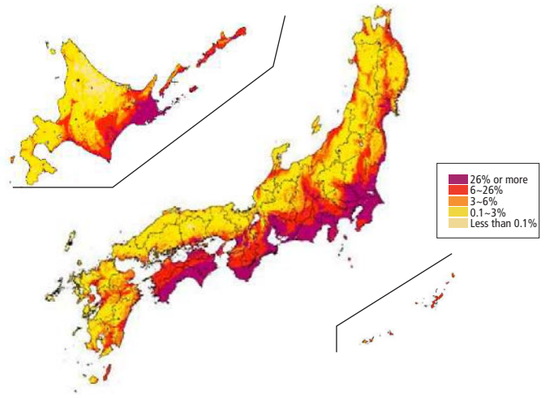
Bridge collapse prevention measures
+
Reinforcement/replacement of supports

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)

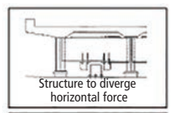
Example of earthquake preparedness

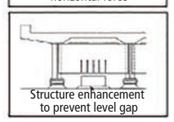
Implement bridge collapse prevention measures that add an ability of immediate recovery of functions.

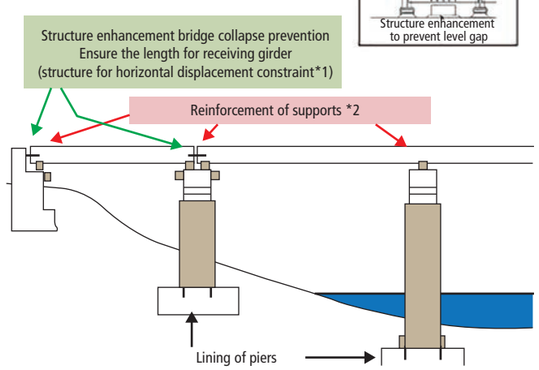
Bridge collapse prevention measures towards immediate recovery of functions (Level 2 in the Seismic resistance performance)

[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

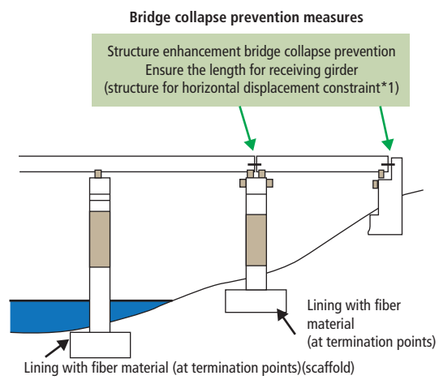






Bridge collapse prevention measures (Level 3 in the Seismic resistance performance)

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

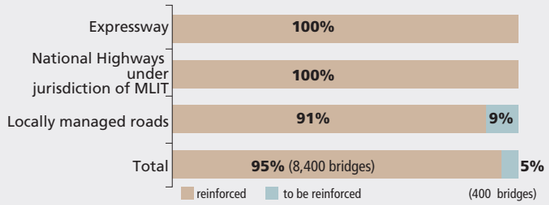


Note *1: only for curved and skew bridges
*2: Reinforcement of support (replacement of support and structure to diverge horizontal force and/or prevent difference in level)

A seismic retrofitting of overpass

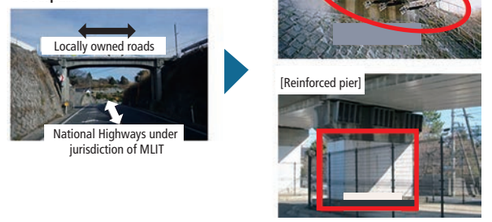
-Overpasses over expressways and national highways under jurisdiction of MLIT are given priority on the collapse prevention measures in the next 5 years (400 bridges are owned by local governments as of November 2016).

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.

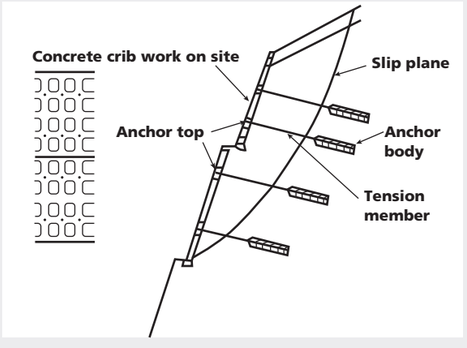
Rock falling protection fence

Pocket-type rock falling protection net

Wire rope work

Concrete crib work

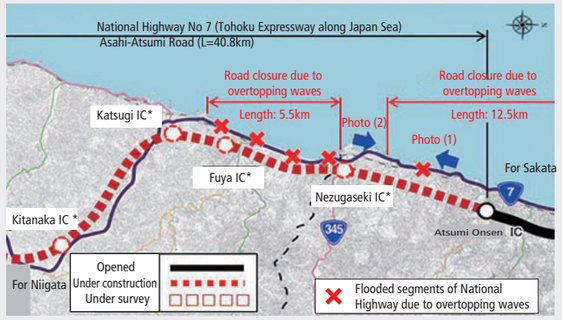
Crib work + anchoring



Illustrative description of anchoring

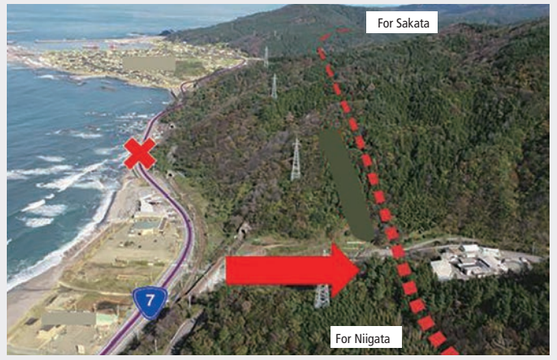
Enhancement of road network for redundancy

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)

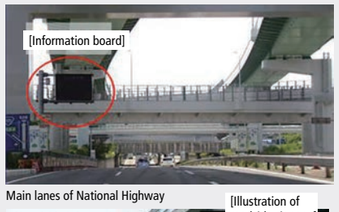
High-standard Arterial Highway is developed to ensure alternative route in the event of disaster (example of Asahi-Atsumi Road)

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.

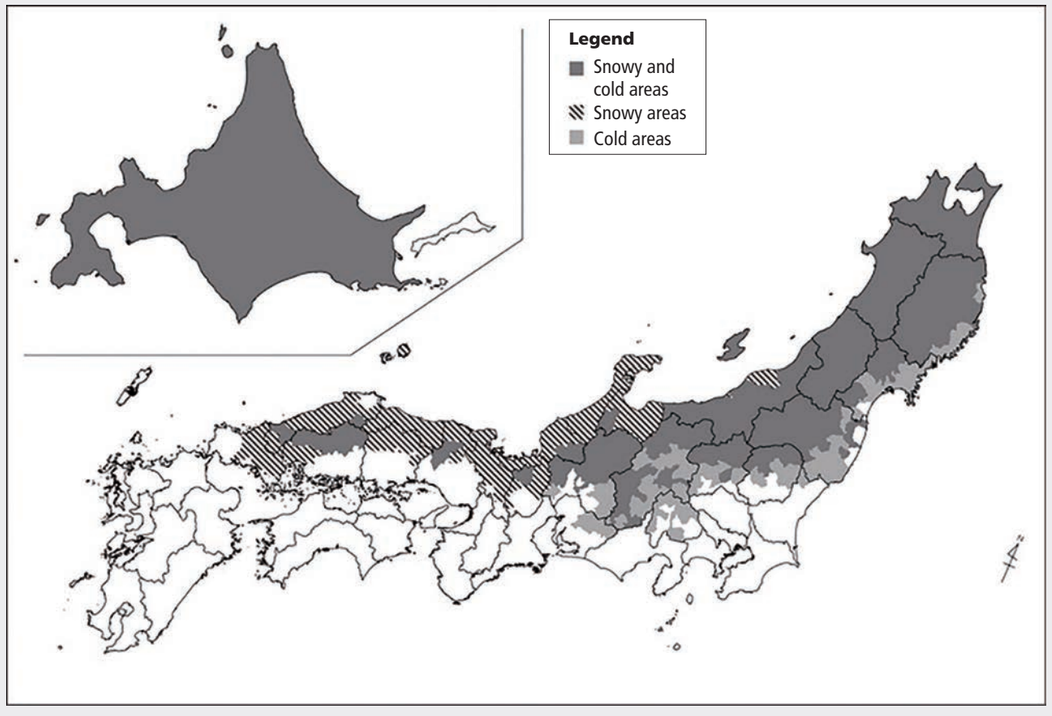


Figure: Snowy and Cold Areas

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)]

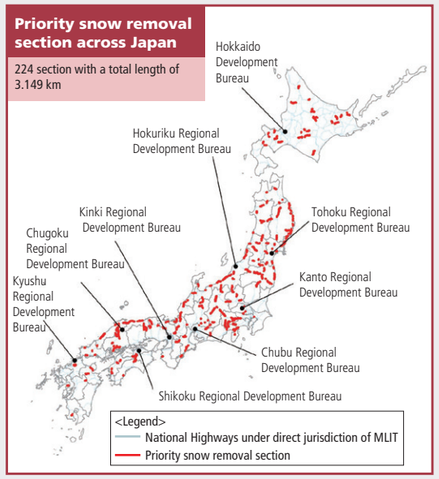
- national highways under jurisdiction of MLIT：175 sections, 980 km (total 4%)

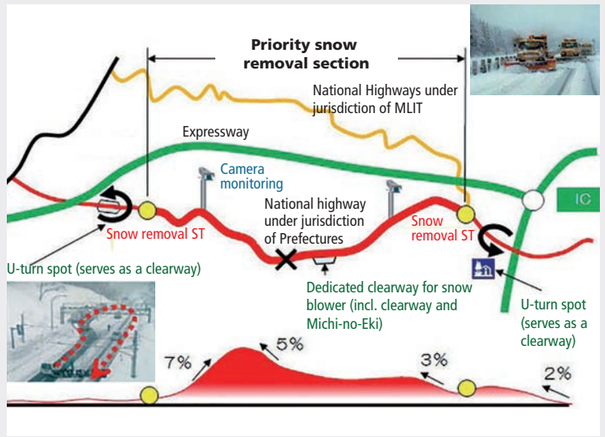
(As of April 1, 2014)

・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

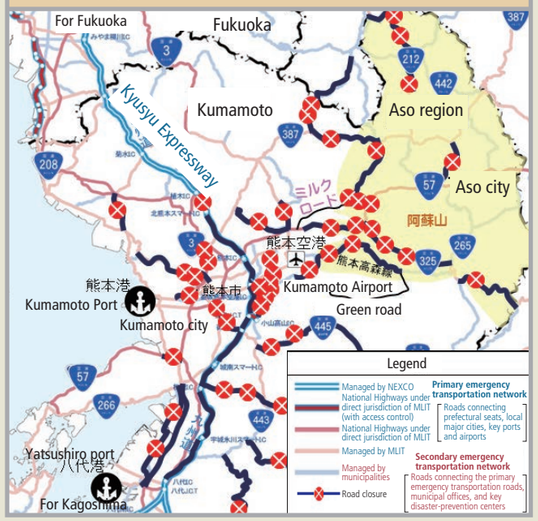
For the arterial network,

-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

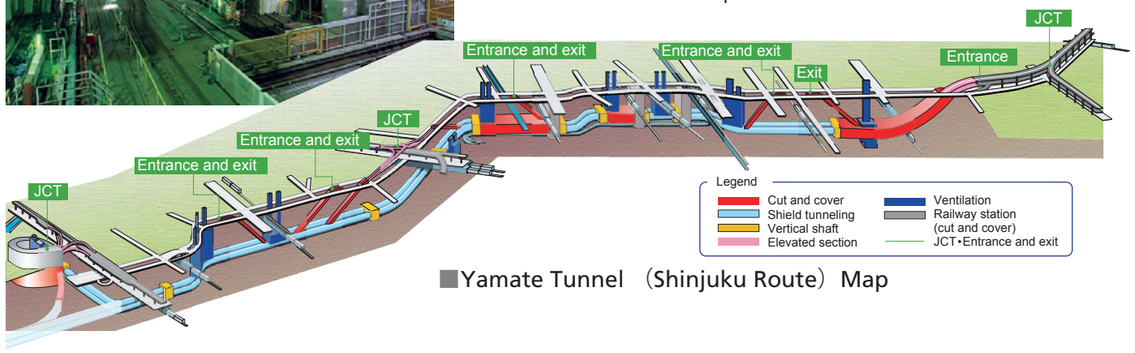
The long, thin chain of islands that compose Japan has a spine of steep mountains running north to south down the island chain. The elevations reach 2,000m to 3,000m above sea level and about 70% of the land is mountainous. Therefore, roads must be constructed on the narrow strips of land between steep 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)

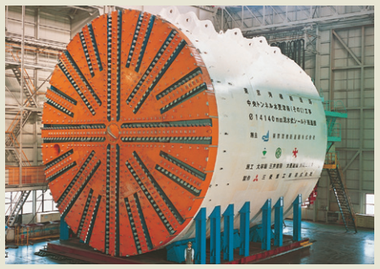
Yamate tunnel connects Shinagawa, Shibuya, Shinjuku and Ikebukuro, which are major sub-centers of Tokyo.
The tunnels is 18.2km long and is the longest Expressway tunnel in the world. The tunnel were completed in 2015.



■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).

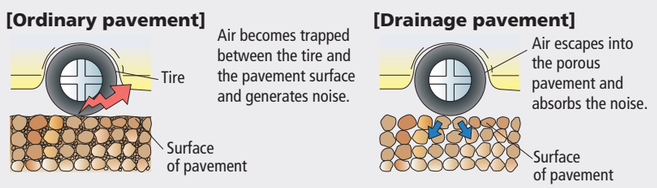
A model experiment using a 1/6-scale model of buckling restraint braces.

Pavement

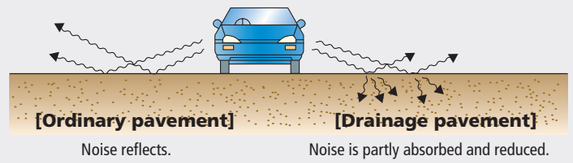
In 1955, the percentage of paved national highways in Japan was less than 14% of the total road network. The percentage increased sharply thereafter as motorization rapidly progressed, reaching 57% in 1965, 79% in 1975, and over 90% today. Various paving technologies have been researched and developed 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.

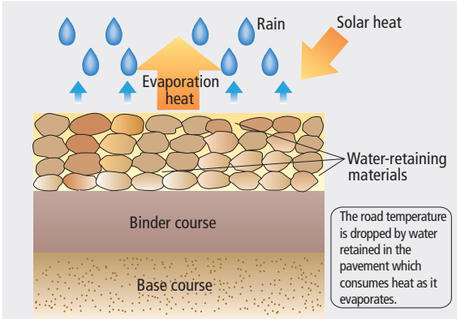


Reduction in the noise level by changing the pavement to one that absorbs rather than reflects vehicle noise on the road surface.



Water-retaining pavement

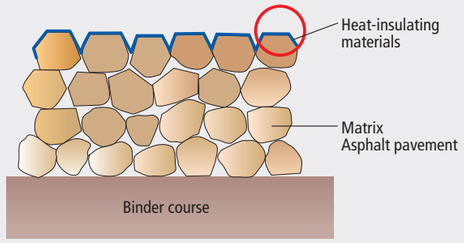
The pavement retains water and thus lowers the road temperature through water evaporation. Diverse techniques, from which rain water and underground water slowly evaporate, have been proposed. For example, injecting water-retaining materials like polymers into the voids of asphalt mixtures is one such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



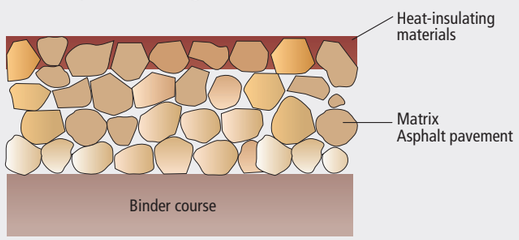
Heat-insulating pavement

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.

■Example of application



■Example of filling



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 land 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 logistics - 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 road infrastructure, and the enhancement of modal connections 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 -
In order to achieve the transformation to a sustainable and smart road system, we will accelerate labor-saving and efficiency improvements in road management and administrative procedures through the introduction of new and digital technologies.

6 Realization of a Green Society - Contribution to 2050 carbon neutrality -
Aiming to achieve carbon neutrality by 2050, we will contribute to the realization of a green society by reducing CO_2 emissions from road use (automobile CO_2 emissions), road development and maintenance, and increasing the amount of CO_2 absorbed through road greening.

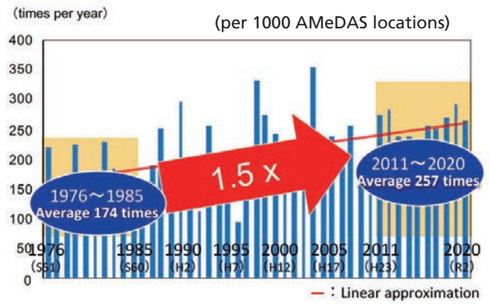
Disaster prevention and mitigation, national resilience policy

- 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.

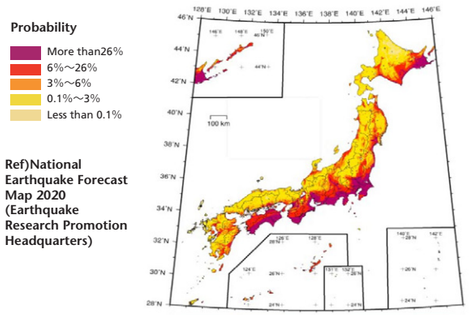
Increasingly severe and frequent weather disasters

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



Major earthquakes that can occur at any time

■Probability of experiencing an earthquake of intensity 6 or greater in the next 30 years



Disaster-Resilient Road Network Proves Effective (Case Study of heavy rain in 2021)

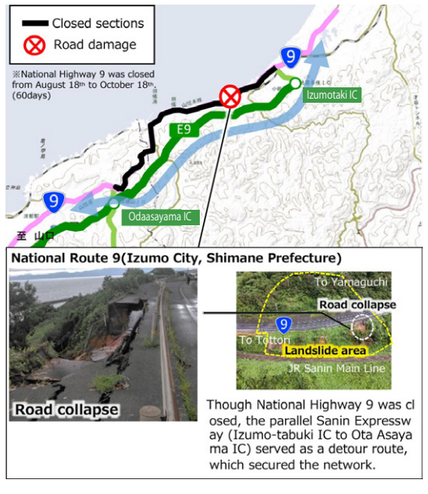
■Early reopening of four-lane sections to traffic

The Chuo Expressway (Okaya JCT to Ihoku IC) was closed to traffic due to a mudslide, but since it was a four-lane section, the undamaged lanes were used and traffic was opened as soon as possible.

The upstream line, which was unaffected by the disaster, was opened to two-way traffic.
Emergency vehicles were able to pass in about 19 hours.
The road was opened to general traffic in about five and a half days.

■Securing transportation functions through a redundant network

National Highway 9 (Izumo City, Shimane Prefecture) was closed due to a landslide, but the Sanin Expressway, which forms a redundant network, was used to secure traffic functions.



Though National Highway 9 was closed, the parallel Sanin Expressway (Izumo-tabuki IC to Ota Asayama IC) served as a detour route, which secured the network.

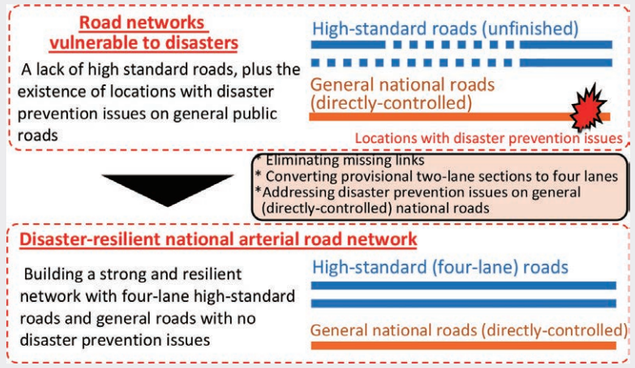
Comprehensive advance disaster prevention and mitigation measures

Based on the "Five-Year Road Program for Disaster Prevention, Mitigation and National Resilience" formulated in April 2021, 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.

Background / data

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 in the "Five-Year Acceleration Measures"[1], each regional infrastructure bureau formulates a "Five-Year Road Program for Disaster Prevention, Mitigation and National Resilience"[2] showing the expected progress of specific projects in each prefecture over the five-year period.

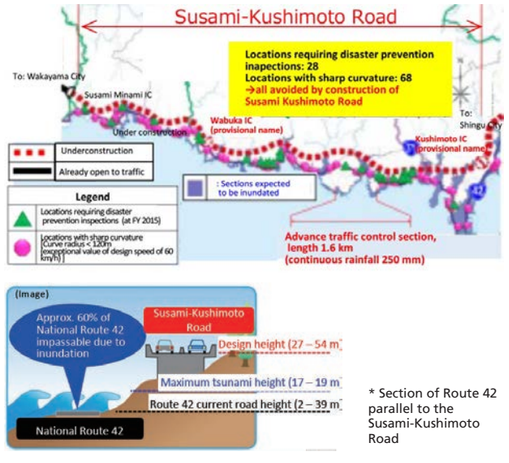


* Rate of improvement of missing links on high-standard roads (2019 -> 2025): 0% -> approx. 30%
* Start rate of four-lane conversion projects on high-standard (toll) roads in priority development sections (2019 -> 2025): approx. 13% -> approx. 47%

Eliminating missing links

(national highway 42 Susami-Kushimoto Road)

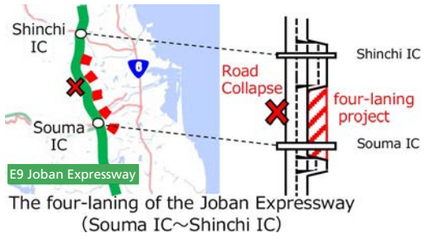
A tsunami resulting from a Nankai Trough earthquake is expected to inundate* about 60% of the sections of Route 42. The construction of the Susami-Kushimoto Road eliminates a missing link and secure routes for emergency transportation to avoid tsunami-inundated areas



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

Converting temporary 2-lane sections to 4-lane (Joban Expressway)

In February 2021, an earthquake off the coast of Fukushima Prefecture caused a slope collapse on a provisional two-lane section of the Joban Expressway, which led to a total closure of the road. The four-laning of the Joban Expressway is expected to secure traffic functions by utilizing the undamaged lanes in the event of a disaster.



The four-laning of the Joban Expressway (Souma IC～Shinchi IC)

The twc-lane was closed due to a slope collapse.

The disaster of the Joban Expressway

[1] Five-Year Acceleration Measures for Disaster Prevention and Mitigation and National Resilience Cabinet decision, Dec 11, 2020
[2] Five-Year Road Program for Disaster Prevention, Mitigation and National Resilience（27 April 2021）

Comprehensive advance disaster prevention and mitigation measures

In order to build a resilient road network, disaster prevention and mitigation measures will be promoted in response to increasingly severe recent disasters and disaster risks that have been newly identified through advances in inspection methods.

Background / data

* The average annual incidence of precipitation of 50 mm/hour or greater has increased by about 1.5 times [1].
* In heavy rains in July, 2020, 10 bridges along the Kuma River in Kumamoto Prefecture were washed away, with roads adjacent to the river also washed away and suffering major landslides, causing long-term road closures.

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

In response to risks of disasters leading to long-term road closures 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

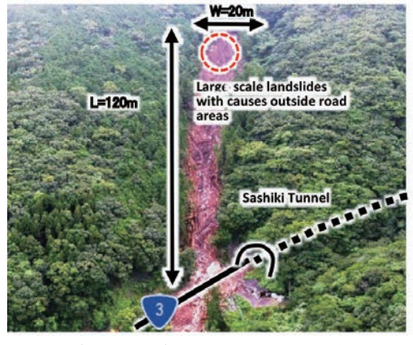
■Image of countermeasures

Road loss countermeasures

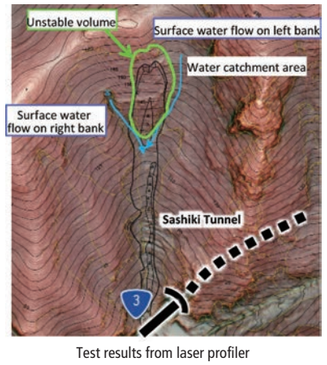
Landslide prevention measures for road slopes and embankments

Promote slope and embankment countermeasures in response to recent disasters, and disaster risks newly identified through advanced inspection methods such as laser profiler surveys.

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



Large-scale landslide from the top of the slope national highway 3, torrential rain of July 2020



Test results from laser profiler

Boosting earthquake resilience of road bridges

Promote earthquake-resistant reinforcement of bridges on emergency transportation roads (implement measures to ensure that even in the event of a major earthquake, only minor damage will be sustained, and bridge function will be recoverable quickly).

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

[1] Comparison between 1976-1985 and 2011-2020 averages of annual incidence of precipitation of 50 mm/hour or greater per 1000 AMeDAS locations

Comprehensive advance disaster prevention and mitigation measures

In order to protect people's lives and livelihoods from disasters, we will promote efforts to convert roads into "disaster mode" as soon as possible after a disaster occurs so that we can support evacuation, lifesaving and emergency services, and recovery activities.

Use of elevated sections of roads as inundation evacuation measures against tsunamis and floods.

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%.

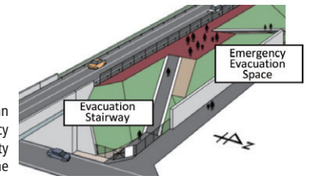


Image of an emergency evacuation facility in a road zone

Example of an evacuation stairway and evacuation trainings

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

Background / data

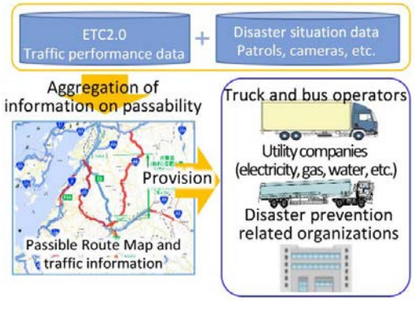
* In the aftermath of major disasters such as the 2016 Kumamoto earthquakes and the 2018 Hokkaido Eastern Iburi earthquake, Roadside rest area (Michi-no-Eki) functioned as bases for recovery and reconstruction activities.

Strengthen disaster prevention functions by designating Disaster Prevention Roadside rest areas[Ref. 2] and parking lots of those stations as bases for wide-area disaster emergency measures as “Disaster Prevention Base Parking Lots”.[Ref.3]

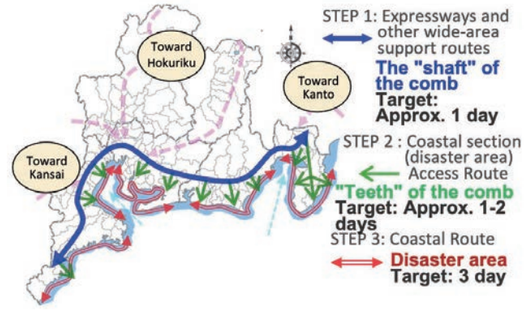
* BCP formulation rate at Roadside rest area (Michi-no-Eki) positioned in the regional disaster prevention plan: (2019 -> 2025): 3% -> 100%

Disaster response routes and Information

* 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 preparation for an imminent large-scale earthquake, formulate and review Disaster response routes plan and conduct training programs.



Provision of a passible route map



Example of road recovery plan> Chubu version “Operation Teeth of the Comb”

Ref. 1: Expressway and national highway under jurisdiction of MLIT
Ref. 2: Rest Area that will serve as disaster prevention centers over a wide-area are selected as “Disaster Prevention Roadside rest areas”
Ref. 3: Parking lots at Roadside rest areas and other facilities that serve as bases for wide-area disaster response measures

Comprehensive advance disaster prevention and mitigation measures

In the event of a disaster, such as heavy rains, haevay snowfalls or earthquakes, we will take measures to minimize the impact on socioeconomic activities, while giving top priority to people's lives and livelihoods .

Improvement of disaster preparedness in cooperation with other organizations during heavy rains and snowstorms.

Background / data

・The average annual frequency of precipitation of 50 mm or more per hour has increased by about 1.5 times.[Ref1]
・In recent years, heavy snowfall has occurred locally, including in areas where there has been little snow in the past.(In the past 10 years, 30% of all observation points in Japan have set new records for snow depth.)
・Heavy snowfall in 2020 caused large-scale vehicle blockage on the Kanetsu Expressway and other roads.

In order to minimize the impact of road closures, when abnormal weather conditions such as heavy rain and snow are forecast, we repeatedly announce road closure forecasts and make emergency announcements in cooperation with the Japan Meteorological Agency, calling on people to refrain from going outside.

Reinforcement of measures to secure road traffic during heavy snowfall, in light of the large vehicle blockage caused by heavy snowfall in 2020.[Ref2]

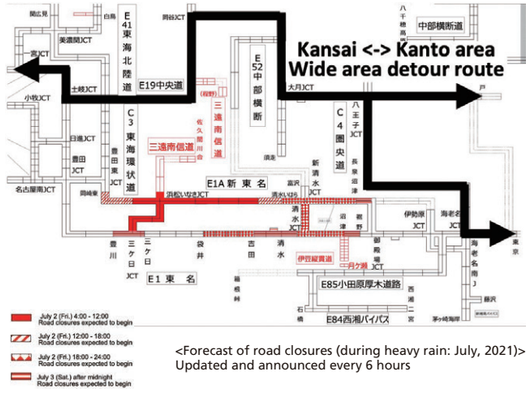
Principal measures to be undertaken

* Create a timeline and conduct trainings to respond to short-term, concentrated snowfall, including systematic and preventive road closures without hesitation.)
* To prepare for the unavoidable occurrence of vehicle blockage, a support plan to protect passengers was developed, and training was conducted.
* Increase the amount of snow removal equipment, install more cameras, and improve snow removal and melting facilities.
* Upgrade snow removal equipment and introduce automatic detection of traffic obstacles using AI

In preparation for rapid recovery in the event of a large-scale electric outage due to a disaster, an information system will be established in advance with the Ministry of Economy, Trade and Industry (METI) and electric power companies, and priority routes will be coordinated.

■Announcement of road closure forecasts and calls for wide area detours

<Forecast of road closures (during heavy rain: July, 2021)>
Clearly indicate wide area detour



<Forecast of road closures (during heavy rain: July, 2021)>
Updated and announced every 6 hours

■Measures to secure road traffic during heavy snow

Large-scale vehicle blockage on the Kanetsu Expressway (December 2020)

Passenger protection seminars against large-scale vehicle blockage on the Kanetsu Expressway [Ref. 3] (January 28, 2021)

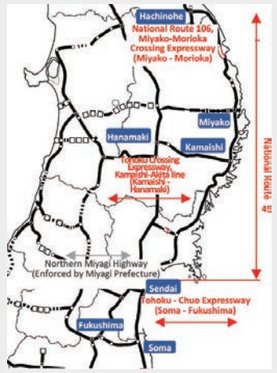
Ref.1:The frequency of annual precipitation amount of 50 mm or more per hour per 1,000 AMeDAS points, comparing 1976-1985 and 2011-2020 averages.
Ref.2: Interim report on measures to secure road traffic during heavy snowfall (revised in March 2021)
Ref.3: Regional Development Bureau, District Transport Bureau, municipal government, police, fire department, and NEXCO jointly conducted trainings to distribute supplies on site. <Photo shows the status of the training at the local headquarters.>

Recovery and restoration from large-scale natural disasters

We will promote disaster recovery projects for roads and other facilities in order to achieve the earliest possible recovery and restoration of disaster-stricken areas that were 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.
・Before the earthquake, we used National Highway 45 and the three roads that had already been opened.
・Soma - Fukushima: From approx. 80 min. to approx. 50 min.

Recovery from the Kumamoto Earthquake

*Restoration of National Highway 57, Highway 325, and prefectural roads damaged by the Kumamoto Earthquake in 2016 will be completed by March 2021.
*In the same time as the opening of the New Aso Bridge, a viewing platform was completed.
*The number of visitors to nearby tourist facilities more than the level before the earthquake.
*Michino-Eki"Asobo No Sato Kugino"

Pre-earthquake: 28,400 people/month
->After opening：30,500 people/month

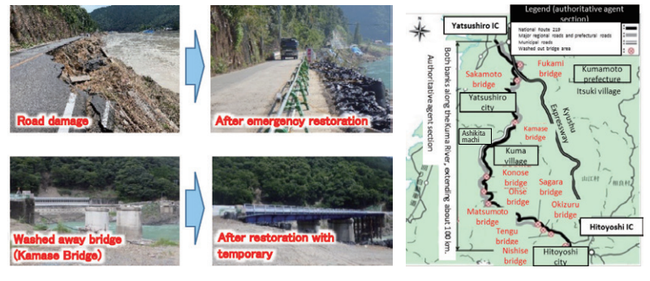
Promote disaster recovery projects on the behalf of local governments, such as the Kawashima Bridge in Gifu Prefecture and National Highway 279 in Aomori Prefecture, which were damaged by heavy rain in 2021.

Promote disaster recovery projects on the behalf of local governments for National Highway 219 and prefectural roads, including 10 bridges along the Kuma River in Kumamoto prefecture

■Kawashima Bridge (Gifu Prefecture)

■National Roue 279
(Aomori Prefecture)

■Floods in the region of Kyusyu in July 2020
(National Highway 219, Kumamoto Prefectural Road)



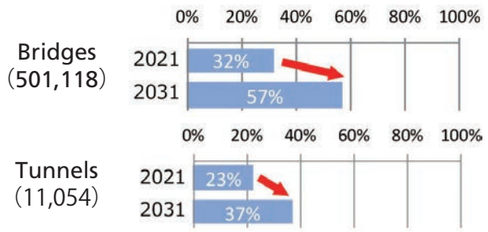
Preventive maintenance measures to aging road

- 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.



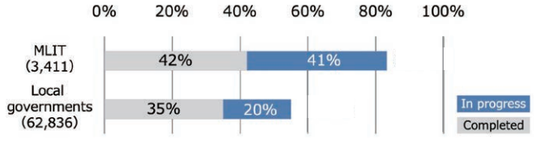
Facilities that are more than 50 years old

* ( ) 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)

Implementation status of repairs and other measures for bridges with judgment categories III and IV

As of 2020, 42% of bridges repaired by the MLIT and 35% of bridges repaired by local governments in the first round of inspections in the five years since 2014 are in a condition that requires early or urgent action (judgment category III or IV).



* The target is facilities that were diagnosed as Category III or IV among facilities that underwent the first round of inspections from FY2014 to FY2018. (This does not include facilities that were newly diagnosed as Category III or IV after the second period of inspections.)

America in Ruins

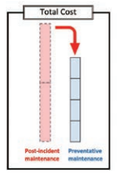
In the 1980s, the U.S. was unable to cope with the aging of road structures that were built in large numbers in the 1930s, and accidents involving damage to bridges and elevated roads resulted in massive traffic detours, which had a major impact on various aspects of the economy and people's lives.

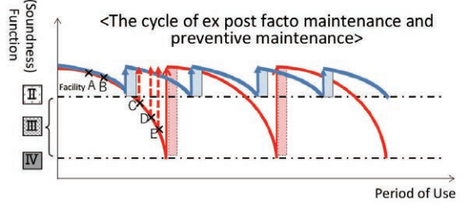
The Brooklyn Bridge's sidewalk closed down after a cable cutting accident.
(Taken from "Highways and Automobiles, November, 1981.

Collapse of the Maianas Bridge (1983)

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).



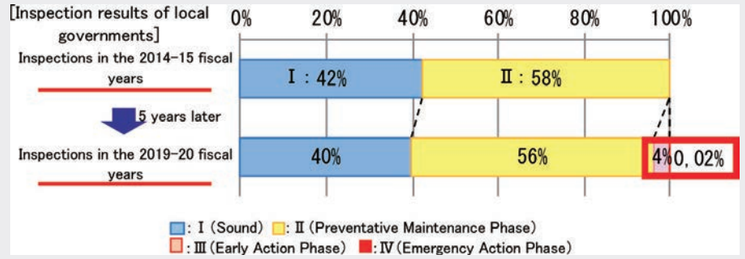


Realization of sustainable road management

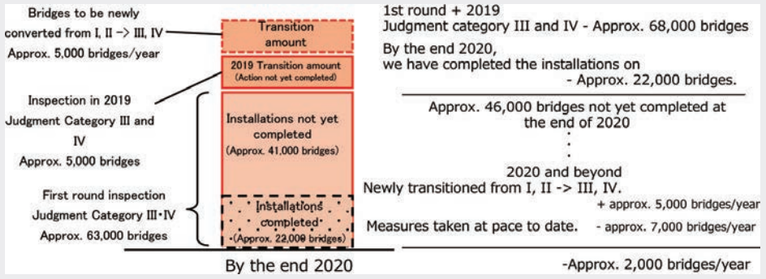
For facilities managed by local governments, we provide systematic and intensive financial support to the measures based on "Long-Life Repair Plans" by utilizing subsidy system for road maintenance projects, and technical support such as direct diagnosis and repair services on their behalf.

Background / data

・The rate of repair measures for bridges on roads managed by local governments that require urgent or early maintenance is about 51%(FY2020).
・The percentage of bridges that transitioned from the first round of inspections (2014-15) to the second round of inspections (2019-20) to a state that requires early or urgent action is 4%.



・About 7,000 bridges are repaired annually by local governments, and about 5,000 bridges are expected to need new repairs in the future.



At the current budget level, complete transition to preventive maintenance will take about 20 years.

Financial and technical 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
・In order to promote the use of new technologies, the subsidy system for road maintenance projects will require the consideration of the use of new technologies, and will give priority to projects that use new technologies and local governments that specify numerical targets [Ref. 1] for cost reduction in their long-life repair plans
・Support for the bundling, functional reduction and removal of aging bridges in order to reduce medium- to long-term maintenance and management costs

Technical support for local communities

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

・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 (2014-2020): 16 areas, repair and maintenance (2015-2020): 14 areas

Realization of sustainable road management

In addition to normal repairs, we will provide support for the consolidation, removal, and reduction of functionality of aging road facilities that can be replaced.
In addition to the intensive repair of pavements where vulnerability of the roadbed has been confirmed through periodic inspections, the use of concrete pavement in the right places will be promoted.

Support for consolidation, removal, and reductions of functionality

Background / data

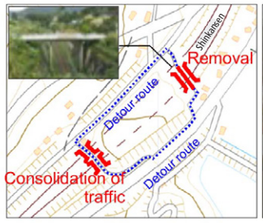
- Only 20% of municipalities have considered consolidation, removal. (as the end of FY2020)
- In 2021, 96 bridges managed by local governments were scheduled to be consolidated or removed.

Support measures for the removal of old road facilities that can be replaced through the road maintenance project subsidy system.

Support Contents
- Removal due to consolidation [Ref. 1]
- Removal to ensure the safety of pedestrians, passing vehicles. [Ref. 2]
- Removal of bridges with high flood control effect [Ref. 3]

- 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

Measures to prevent aging of pavement

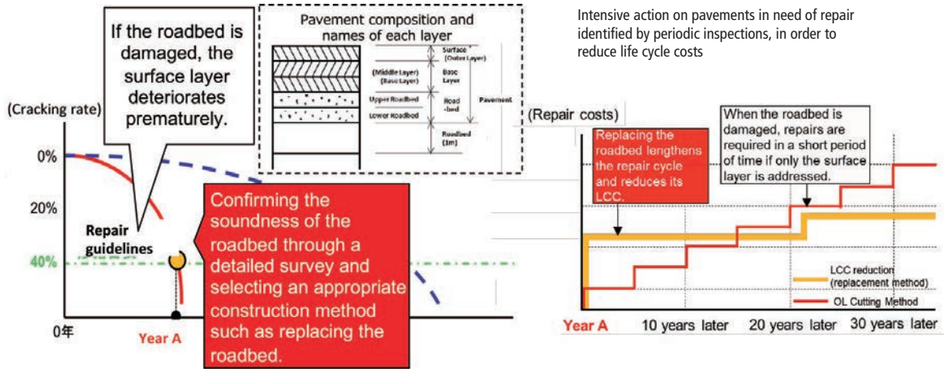
Background / data

- Pavements in need of repair are about 5,900 km for national highways under jurisdiction of MLIT and about 8,900 km for local roads, of which about 15% have already started repair work (as of the end of FY2020).

Reduce lifecycle costs by intensively repairing pavements where vulnerability of the roadbed has been confirmed through periodic inspections and by utilizing concrete pavement in the right places.

Rate of pavement repair on roads important for disaster prevention for pavements with damaged roadbed or lower layer (approx. 2,700km as of FY 2019).

■Image of life cycle cost reduction



Intensive action on pavements in need of repair identified by periodic inspections, in order to reduce life cycle costs

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.
Ref. 3：Only in the case where short-term numerical targets for removal and cost reduction effects are specified in a Long-Life Repair Plan.

Realization of sustainable road management

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

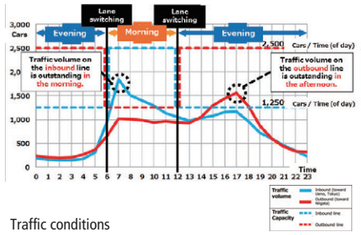
Background / data

- Status of road closures related to specific renewals (2020, six companies in total):
All-day road closures (main line): 4 locations, total of 39 days
Two-way traffic restrictions: 35 locations for a total of 2,606 days

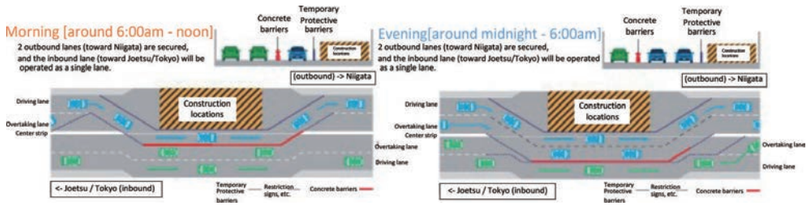
Promote renewal projects in a systematic manner while minimizing the social impact of traffic restrictions by promoting the use of new technologies.

Reduce congestion caused by the construction restrictions by the use of the road zipper system and the operation of the lanes according to the congestion periods as the peak traffic periods for morning and evening commuting traffic differ between the upstream and downstream.

■Example：Hokuriku Expressway (Nakanoshima Mitsuke IC - Sanjo Tsubame IC)
Sakae Bridge and Kaigui River Bridge Floor Slab Replacement



Traffic conditions

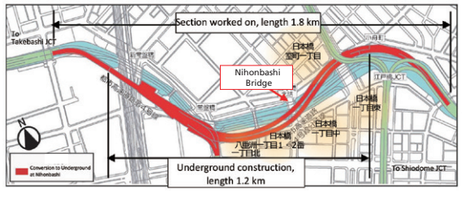


Traffic jam countermeasures: Lane operation by time of dayusing the Road Zipper System.

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 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 to move the Nihonbashi area of the Metropolitan Expressway to underground



■Image of the Nihonbashi area before and after underground construction

* Based on current information regarding redevelopment 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

Realization of sustainable road management

Improve the efficiency and sophistication of periodic inspections by proactively utilizing new technologies and organizing optimal inspection methods for each part and component.
Promptly develop technical standards necessary for the introduction of new technologies in order to save labor and reduce costs in maintenance and management.

Background / data

・To promote the use of technologies that complement, substitute, or enhance close visual inspection, a list of the performance of inspection support technologies was prepared to serve as a reference [Ref. 1] for making decisions when using such technologies.

Improvement of efficiency and sophistication of periodic inspections

Expand the inspection support technology performance catalog [Ref. 1] and organize optimal inspection methods for each part and component to Improve the efficiency and sophistication of periodic inspections.

・Number of technologies published in the performance catalog of inspection support technologies:
(2020 -> 2025): 80 -> 240 technologies
・ Percentage of local governments that used new technologies in bridge and tunnel inspections out of local governments that considered using new technologies in bridge and tunnel inspection:.
(2019 -> 2025) Bridges: 39% -> 50%, Tunnel : 31% -> 50%

Introduction of new technology and new materials

Promptly develop necessary technical standards for the introduction of new technologies and materials

Focused support for the use of new technologies and materials in the road maintenance project subsidy system.

Improvement of efficiency and sophistication of periodic inspections

■Expand the technologies listed in the performance catalog of inspection support technologies

Performance catalog of inspection support technologies
(as of October 2021 with 131 technologies)

Image Measurement

Using drones to identify deformations

Non-destructive testing

Using radar to identify damage to tunnel lining

Measuring and Monitoring

Monitoring of bridge cable tension using sensors

■Conduct inspections using a combination of technologies best suited to the purpose.

Small bridges (such as ditch bridges)

・Narrow down the inspection items according to damage and structural characteristics.
・Improve efficiency with simple, inexpensive technology

Large bridges (cable-stayed bridges, etc.)

・Improve the efficiency of inspections by combining various new technologies depending on the part, material, etc.

Introduction of new technology and new materials
(example of tunnel lining technology)

■Study on the introduction of lining technology to reduce the occurrence of peeling.

[Review Process]

Review of verification methods → Technical announcement → Formulation of test methods, etc. → Review of proposed revisions to technical standards, etc. → On-site implementation

Reduced traffic restrictions due to implementation of emergency measures

Ref. 1: The performance values of each technology are organized and listed in a list format using standard items. URL ; https://www.mlit.go.jp/road/sisaku/inspection-support/

Development of road 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 connect by developing transportation hubs, counter-congestion, and support logistics.

Express services between cities

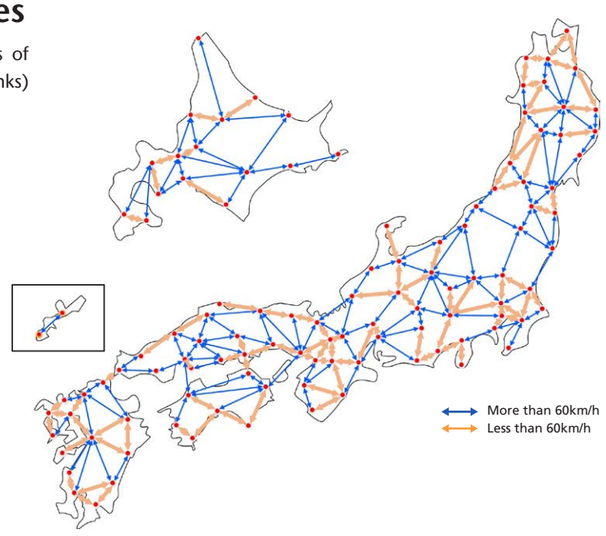
Japan is still lagging behind other countries in terms of inter-city speed, with about 40% intercity(90/208 links) still less than 60 km/h.

■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 (2020 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



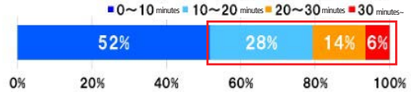
Accessibility to airports and harbors

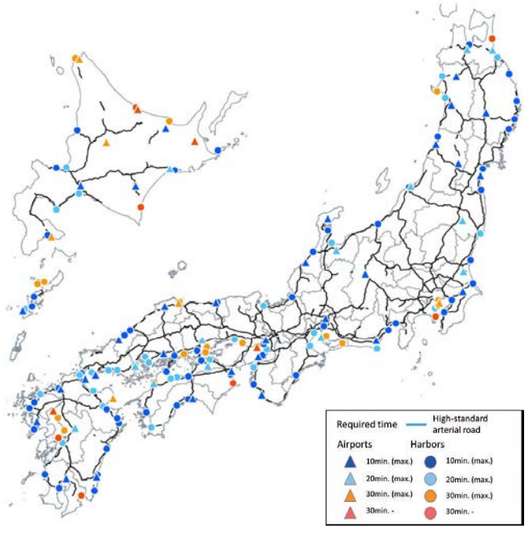
Airports and seaports are bases for the wide-area movement of people and logistics, but about 60% of them still require 10 minutes or more from high standard arterial roads (82/170).

■Access to major airports and harbors

* Main bases include base airports, jet airports, international strategic ports, and important ports.
* The time required wes calculated from the ETC2.0 data for 12 hours in the daytime on weekdays in 2019.

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

In order to improve productivity and revitalize the region through the facilitation and revitalization of human flow and logistics, the road network will be surveyed and improved to strengthen its functions based on the "New wide-area road transport plan" formulated in each region.

Background / data

・The pandemic of COVID 19 has brought to light the risk of concentration in Tokyo, and it is necessary to promote the creation of dispersed national land use through new regional development.[Ref. 1]
・With a declining population, low birthrate, and aging society, the shortage of truck drivers, who are essential workers, is becoming apparent, and there is an urgent need to improve the productivity of logistics.
・ The number of oversize and overweight vehicle permits for international marine container vehicles (40ft tall) increased by approximately 50% over the past five years (from approx. 310,000 units in 2008 to approx. 460,000 units in 2020).

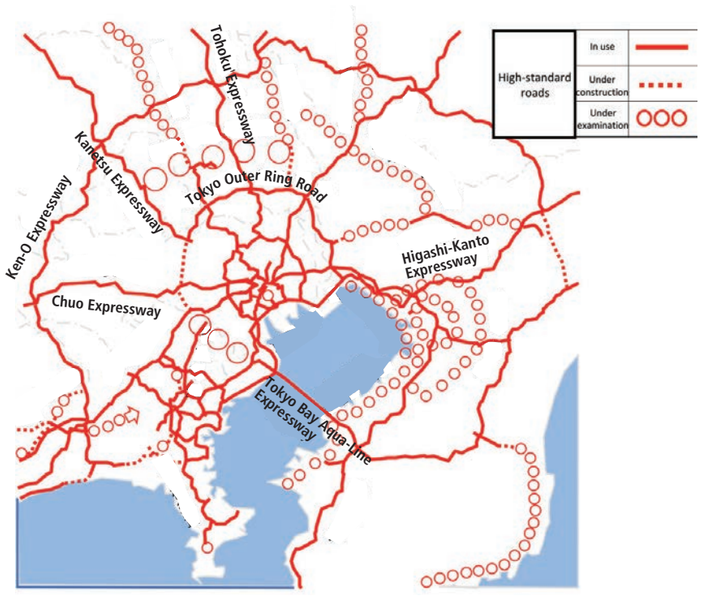
From the high-standard roads that are positioned for the "New wide-area road transportation plan", planning was formulated based on current transportation issues and the future vision of the region. [Ref. 2]
・Promote functional enhancement by systematical survey and improvement of the road network.
・Additional designation as an "Important Logistics Road" [Ref. 3] will be made, and priority investments will be made with the help of individual subsidy programs.

・ 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%

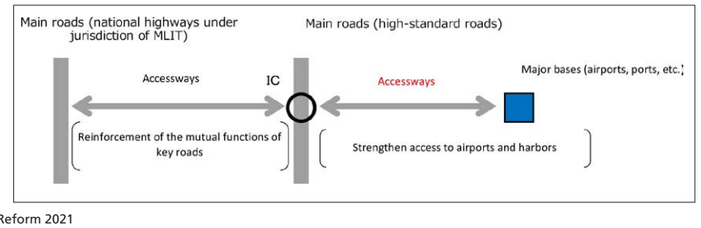
The number of sections where international marine container vehicles (40ft tall) do not require a special traffic permit has been gradually expanded in the sections of the Important Logistics Roads currently in service.

In order to cope with the increase in the size of trucks in the future, performance indicators for important logistics roads will be established, and based on the data, obstacles to traffic will be effectively and efficiently eliminated.

■High-standard roads in the Tokyo metropolitan area



■Image of Important Logistics Road



Ref. 1: Basic Policy for Economic and Fiscal Management and Reform 2021
Ref. 2: Versions for prefectures, ordinance-designated cities, and blocks (formulated by regional development bureaus) have been formulated by July, 2021. The plan consists of a wide area road network plan, a transportation and disaster prevention base plan, and an ICT transportation management plan.
Ref. 3: Approximately 35,600 km of roads in service have been designated (as of April 1, 2021).

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.
To promote use of the Smart IC system (hereinafter referred to as Private Sector IC), which directly connects expressways and private facilities on the initiative and at the expense of the private sector.

Background / data

・ The number of expressway interchanges in Japan is 1,519.*

*The number of IC's managed by expressway companies is included (including those under construction, excluding smart IC's). as of December 2021

・ 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.
(US: approx. 5km, Germany: approx. 7km, UK: approx. 4km)

・ Access to major airports and seaports from high standard arterial road interchanges is 10 minutes or more in about half of cases.

・As of December 2021, 145 smart IC's are open and 52 are in operation nationwide..

・As Private Sector IC trhe Awaji-Kita Smart IC (Kobe-awaji-Naruto Expressway) opened in March, 2020, and the Taki-Vison Smart IC (Ise Expressway) opened in April 2021.

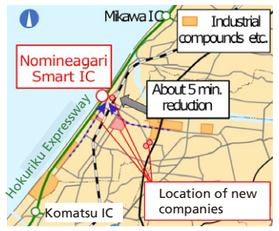
In order to promote more efficient logistics, regional revitalization, improved convenience, and enhanced disaster prevention functions, the need for Smart IC's will be examined in the region, and the development of Smart IC's will be promoted in locations where a consensus has been reached .

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

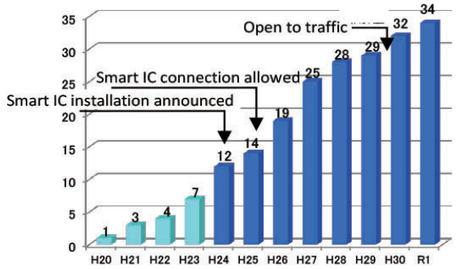
Promote the development of private-sector direct-connected Smart IC systems through the use of a system that provides interest-free loans to private-sector developers to cover part of the IC development costs, and through the exemption of registration and license taxes when private-sector developers acquire land.

Effect of Smart IC development (Nomineagari Smart IC)

・Smart Interchanges will improve accessibility to expressways and surrounding businesses.
・Companies are locating in the vicinity, creating approximately 2,000 new jobs.



Location map of Nomineagari Smart IC



Increase in the number of companies located in Nomi city

Construction of an Private Sector (Awaji Kita Smart IC)

Higashiura Highway Oasis

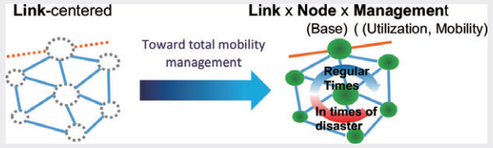
Strengthening the functions of transportation and disaster prevention centers

- 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 era of link-centeredness to the era of link x node x management



・Number of representative stations (all as of July 2021)
Roadside rest area (Michi-no-Eki): 1,193 stations (Disaster Prevention Roadside rest area (Michi-no-Eki): 39 stations, Priority Roadside rest area (Michi-no-Eki): 103 stations)
Bus terminals (Busta): 1 in service, 6 in operation
SA/PA: 883 (3 NEXCO companies, Metropolitan Expressway, Hanshin Expressway, Honshu Expressway)

Research and develop transportation and disaster prevention bases positioned in the new wide-area road transportation plan, and promote strengthening the functions of bases such as Busta and Roadside rest area (Michi-no-Eki), especially by strengthening connections between transportation modes (modal connect) and providing rest facilities.

Conduct a survey on public involvement in relay transportation bases and cargo handling spaces, based on trends in the logistics industry.

Promote the designation of specified vehicle stopping facilities [Ref. 1], "Disaster Prevention Base Parking Lots" [Ref. 2] as specified in the revised Road Act.

Functions and locations on the road network

Transportation hub for public transportation

Development of travel space for public transportation such as BRT, and connection and transfer points (mobility hubs)

BRT Oya-Kaigan Station, Miyagi Prefecture Kesennuma line maintained at Oya-Kaigan Roadside rest area BRT Otani Kaigan Station (Miyagi Prefecture)

Development of logistics relay bases

Promote the development of transportation bases that contribute to the practical application and spread of relay transportation.

A logistics relay base (Connect Area Hamamatsu) has been constructed adjacent to Shin-Tomei Hamamatsu SA.

Ref. 1: Under the revised Road Act of 2020, dedicated terminals for buses, taxis, trucks (specified vehicle stopping facilities) are positioned as road appendages.
Ref. 2: The system was established under the revised Road Act of 2021.

Strengthening the functions of transportation and disaster prevention centers

- Promotion of the Busta Project

By developing a centralized public transportation terminal (Busta) that strengthens the modal connection between various modes of transportation, the functions of the transportation hub will be strengthened, facilitating the flow of people and goods, promoting the use of public transportation, creating regional liveliness, and securing transportation functions in times of disaster.

Background / data

Basta Shinjuku consolidates express bus and cab stops(Opened in 2016).
In May 2020, with the enactment of the revised Road Act, dedicated terminals for buses, cabs, and trucks (specified vehicle stopping facilities) were defined as road facilities, and provisions related to the concession system were established.
The MLIT established guidelines for road administrators to use as reference when formulating plans for strengthening the functions of transportation hubs.(April 2021)

Business development in Japan

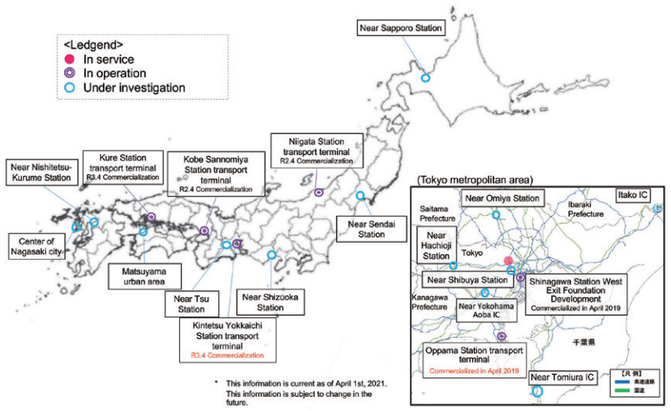
In addition to Busta Shinjuku, operations are expanded in six areas nationwide, including Shinagawa West Exit and Sannomiya in Kobe, and the Busta Project is being promoted in each area.

Deepening of efforts of the Busta Project

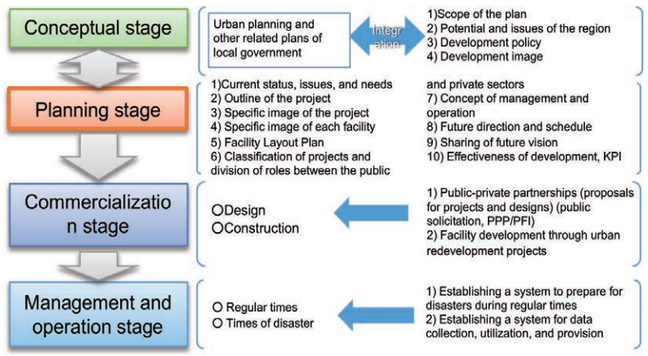
To ensure the necessary functions of a transportation hub in the event of a disaster, a guide for creating a business continuity plan (BCP) has been formulated.

Studying methods for qualitative and quantitative evaluation of the effects of enhancing the functions of transportation hubs.

■Major areas of study and progress in the Busta Project



■Four stages for consideration in the guidelines



Ref. 1: Planning guidelines for strengthening the functions of transportation bases (Road Bureau, MLIT)

Development of ICT transportation management

In addition to aiming to establish a system for constant observation of traffic conditions by utilizing big data such as ETC2.0, we will promote data-based software countermeasures for traffic congestion caused by daily recurring traffic jams, disasters, events, large-scale renewa in cooperation with related parties.

ICT Transportation Management Plan

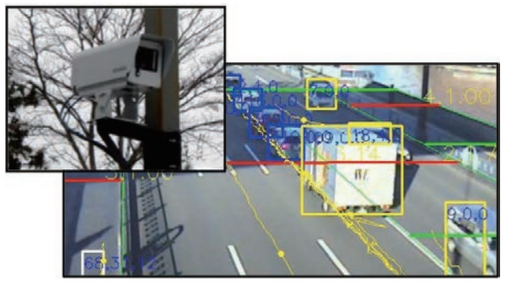
Background / data

・In the national survey on road and street traffic conditions conducted in 2021, manual observation will be abolished in principle for national highways under jurisdiction of MLIT. (Ratio of manual observation in the 2015 survey: approx. 35%)

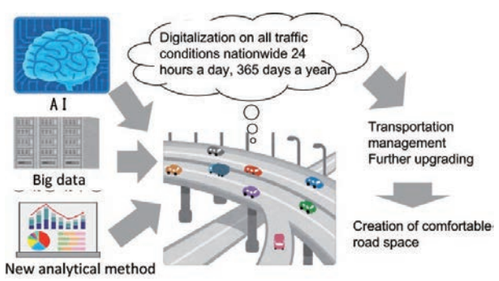
By establishing a method for observation using new technolo gies such as AI and a method for estimation using existing big data, we will establish a system for constant observation of traffic conditions in five years time.

Utilizing the forum of the Regional Road Economy Strategy Study Group [Ref. 1], we will promote initiatives for the advancement of ICT traffic management, including the combination of ETC2.0 and other big data analysis methods, and the study of effective information dissemination.

■Traffic volume observation using AI image analysis



■Continuous observation system (image)



Various traffic jam software measures using ICT

Background / data

・The time lost in traffic congestion on expressways, the Tokyo Metropolitan Expressway, the Hanshin Expressway, and major national highways under jurisdiction of MLIT in 2020 was only about 9% less than in 2019, before the COVID-19 pandemic. Countermeasures against traffic congestion are still necessary

Based on the analysis results of the relationship between changes in traffic conditions and the occurrence of traffic congestion during the COVID-19 pandemic, we will promote traffic demand management (TDM) initiatives in cooperation with the private sector with the goal of eliminating traffic congestion at 100 locations.

We will support effective, efficient measures to be taken promptly after a disaster, such as traffic management against disaster[Ref. 2] in the regional disaster prevention plan and sharing examples of past efforts.

Publicize information on traffic congestion to reduce the social impact of renewal work.

Ref. 1: A research group to promote research on strategies for revitalizing regional economies through the effective use of road space, and social experiments and implementations to realize these strategies, by receiving policy proposals that make use of regional roads from academic experts. (Regional study groups are established in each regional development bureau based on the characteristics and features of the region.)
Ref. 2: Implemented through the Disaster Traffic Management Study Group, which consists of MLIT, police, local governments, expressway companies, academic experts, and related organizations.
Examples: Hiroshima, Kure, Higashi-Hiroshima (2018 Japan floods), Kansai International Airport Bridge (Typhoon No. 21 in 2018), Hitoyoshi City, Kumamoto Prefecture (2020 Kyushu floods).

Efficient and effective traffic jam countermeasures

In order to maximize the functioning of the road network, big data such as ETC2.0 will be utilized to visualize traffic congestion and to efficiently and effectively implement detailed measures according to the causes of congestion and traffic characteristics.

Background / data

・Annual congestion loss per person is approx. 40 hours, which is equivalent to approx. 40% of the time spent driving/riding (approx. 100 hours).
・Tokyo and Osaka are the most congested cities in the developed world (G7). [Ref. 1]
・Approximately 9,000 major traffic congestion areas were identified by the traffic congestion countermeasures councils across the country. (as of November, 2020).

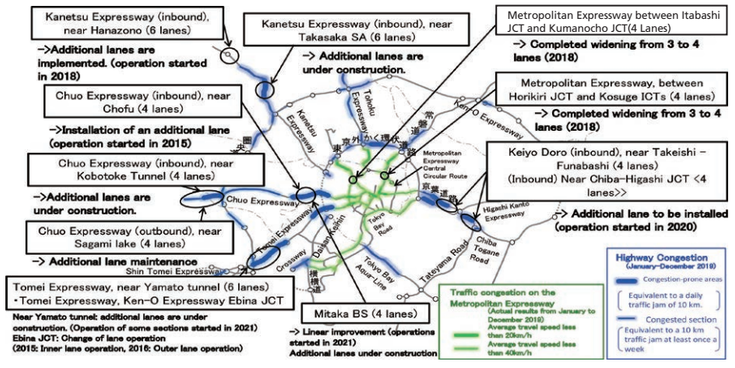
Continue to promote the development of the arterial road network in order to drastically improve areas where traffic congestion is severe.

Flexibly implement pinpointing measures using ETC2.0 and other big data in order to achieve early effects of measures against traffic congestion and functional enhancement of expressways (12 locations in the project)

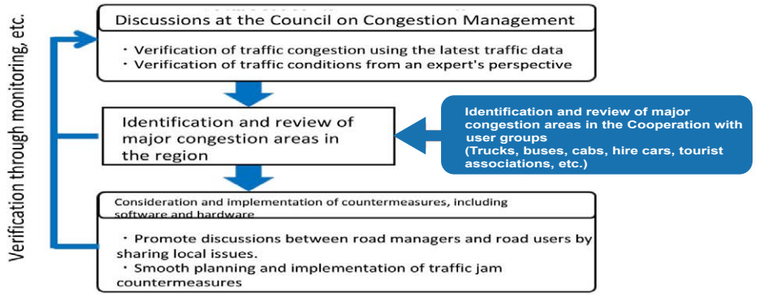
Strengthen cooperation between the Congestion Management Council [Ref. 2] and user groups of trucks, buses and promote nationwide efforts to identify congested areas from the viewpoint of users and implement quick-response measures.

In order to ensure smooth traffic on important logistics roads, continue to require road traffic assessments [Ref. 3] to be conducted for facility sites along the roads, and promote monitoring through the Congestion Management Council and other organizations after the sites are located.

■Major traffic concentration points and countermeasures on expressways in the Tokyo metropolitan area



■Traffic jam countermeasure flow



Ref. 1: Source TOMTOM Traffic Index 2019 Ranking 2nd in Tokyo and 10th in Osaka among G7 (Japan, Canada, France, Germany, Italy, UK and US) cities
Ref. 2: Road administrators, police, local governments, user groups in each prefecture, identify major traffic congestion areas in the region, and establish a council for traffic congestion countermeasures to study and implement countermeasures, both in software and hardware.
Ref. 3: By predicting the impact on traffic in the vicinity prior to location and implementing appropriate measures in advance, the facility can be located without interfering with existing road traffic, and additional measures can be considered if traffic conditions deteriorate after the facility is positioned.

Introduction of tolling 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.

Background / data

Three wise principles of fees
(1) A fair fee 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

Introduction of new expressway tolls in the Tokyo metropolitan area in April 2016
・(Result) Traffic will be diverted from passing through the city center to the outer ring road, and the use of the Ken-O Expressway will be promoted.
Introduction of new expressway tolls in the Kinki region in June, 2017
・(Result) The introduction of the fixed toll rate regardless of route will increase the share of traffic on the Moriguchi Line and alleviate congestion on the Higashi-Osaka Line, which was causing excessive traffic concentration.
Introduction of new expressway tolls in the Chukyo region in May, 2021
・(Policy) Organize and unify the toll system inside the Tokai Kanjo Expressway into a new toll system based on distance.
Revision of expressway tolls in the Tokyo metropolitan area (planned) for April, 2022

Continuation of measures to expand large-lot and multi-frequency discounts

We will continue the expansion of the large/multi-frequent discount for motor carriers using ETC2.0.
(Implemented until the end of March 2023 based on the supplementary budget for the fiscal year ended March 31, 2021.)

Main initiatives based on the interim report of the Committee on National Arterial Road

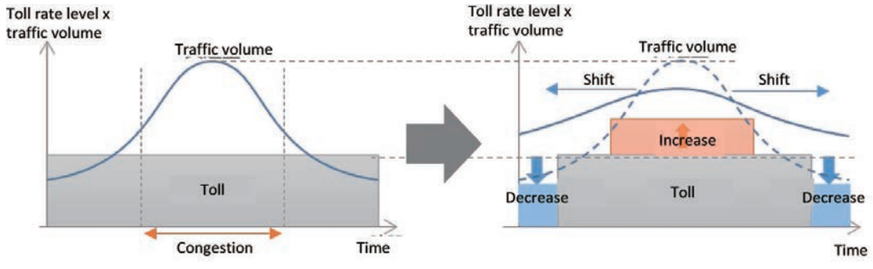
In order to ensure that renewal projects and evolution/improvement efforts (Ref. 2) are carried out, specific consideration will be given to extending the fee collection period based on user fees.

Consideration will be given to reviewing nationwide rate discounts in order to resolve the main current issues.

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

To eliminate chronic traffic congestion on expressways in major metropolitan areas, we will promote the introduction of distance-based tolling, in which the toll is proportional to the distance traveled.

■Image of fees based on congestion



Ref. 1: Official announcement on August 4th, 2021
Ref. 2: Example measures: Converting tentative two-lane sections to four lanes, reinforcing earthquake resistance, providing space for automated driving, installing EV chargers and hydrogen STs.

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.

Addressing the shortage of parking spaces at rest facilities

Background / data

・On expressways, which are the backbone of logistics, the shortage of parking space for large vehicles due to long hours of parking, especially late at night, is becoming a problem.

・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 at the rest facility, there will be an introduction of dual-use spaces that can be used by both standard and large vehicles, and a parking lot reservation system.

Conducting a demonstration experiment of a parking lot reservation system for medium-sized vehicles and larger to ensure reliable rest opportunities.

Number of parking spaces expanded by the three NEXCO companies		
Maintenance in 2019 (Target: 43 locations)	Maintenance in 2020 (Target: 49 locations)	Scheduled for maintenance in 2021
Increase by approx. 1,350 cars	Increase by approx. 550 cars	Increase by approx. 600 cars

Image for dual use spaces

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

Location: the Toyohashi PA (outbound) on the Tomei Expressway.
(Started as a free experiment in April 2019. From May, 2021, a partial toll will be charged during late-night hours.)

Oversized car space-parking situation

Promote the use of double-trailer truck to save manpower in trucking

Background / data

・Introduced at Kitakami Etsuriko IC on Tohoku Expressway to Dazaifu IC on Kyushu Expressway

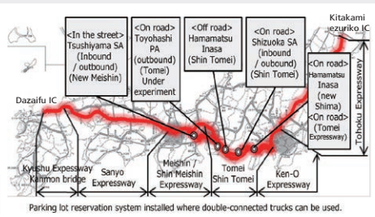
・9 operating companies, 130 licensed units (As of September 2021)

・197 double-trailer truck parking mass (on the road, September, 2021)

Expansion of routes for double-trailer truck as needed.

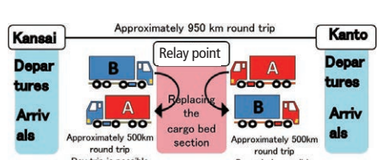
Development of parking spaces for double-trailer truck at SA/PA and trial introduction of parking reservation system

double-trailer truck



Efforts to promote the use of relay transportation

Promote the development of stations that contribute to the practical application and spread of transit transportation.



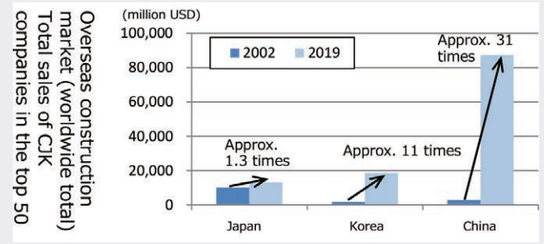
Export infrastructure systems in the road sector

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 support for project acquisition

Cooperation Agreement in the Field of Tunnels (Philippines)
Taking the opportunity of the groundbreaking of the first full-scale road tunnel in the Philippines (Davao Bypass), further strengthening of cooperation through sharing of O&M technologies of Japanese expressway companies, holding of workshops.

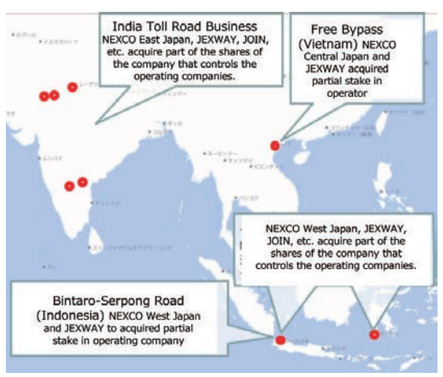
Groundbreaking in the Philippines

Examples of Overseas Development by Expressway Companies

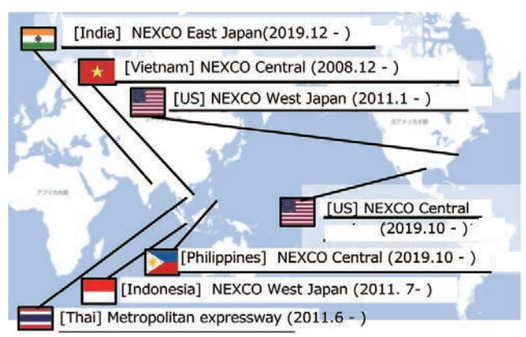
Non-Destructive Inspection of Structures (US) NEXCO West Japan established NEXCO-West USA, Inc. to enter the bridge inspection business in the U.S.A. and to investigate advanced technologies. They received orders for non-destructive point infrared camera inspection of concrete slabs using an infrared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

Inspection of concrete slabs using an infrared camera

■Major participation road PPP projects



■Overseas offices of expressway companies



In addition to the above, group companies Central Japan Exis and Hanshin Expressway Giken have established subsidiaries in Taiwan and China, respectively

Ref. 1: Decided by the Keikyo Infrastructure Strategy Council in December 2020 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 (2003,2020) 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

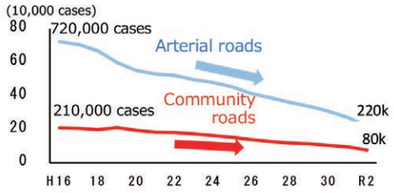
Creating safety, security and activity in road space - Creating regions and towns -

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 community road is small,many accidents still occur.

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



* Community roads: roadway width of less than 5.5m
Arterial roads: roadway width of 5.5m or more
Compiled based on the annual report on traffic accident statistics

Elementary school pupils walking on a narrow curb

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

■Universally designed walking space

Minato Ward, Tokyo

■Universally designed walking space

national highway 246: Aoyama area

Diversification of needs for road space

Promote the utilization of spaces where diverse local needs can be addressed, such as open cafes on sidewalks.

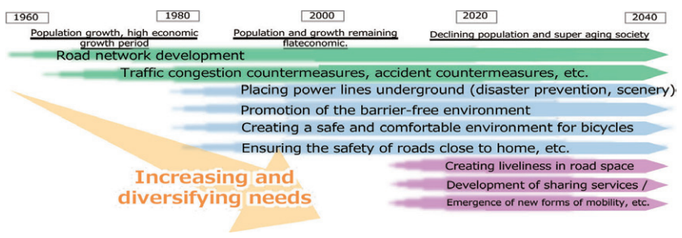
■Open cafe on the sidewalk

Open Cafe on the sidewalk
(Nihon Main Street: Yokohama City)

■Social experiment on new mobility sharing on public roads

Route 1: Chiyoda Ward

Road policies diversify in response to the needs of the world



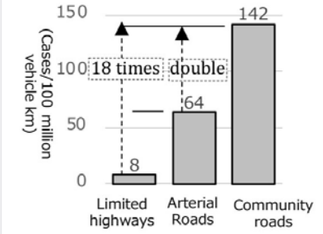
Development of a safe and secure road space

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 2020 was 2,839, the lowest since the end of World War II for the fourth year in a row.
・The number of traffic fatalities per 100,000 people while riding in a car is the lowest in the G7 countries, but the second highest among pedestrians and cyclists .
・Casualty rates on daily roads are much higher than on limited highways and arterial roads.
・As a result of the Joint Inspection of School Routes [Ref. 2]" conducted in response to the accident that occurred on a school route in Yachimata City, Chiba Prefecture in June, 2021,
the number of locations where road managers need to take countermeasures is about 37,000 (as of October 31, 2021).

Rate of accidents resulting in death or injury by road type (2015)[Ref. 1]



* Figures are rounded to the nearest unit.

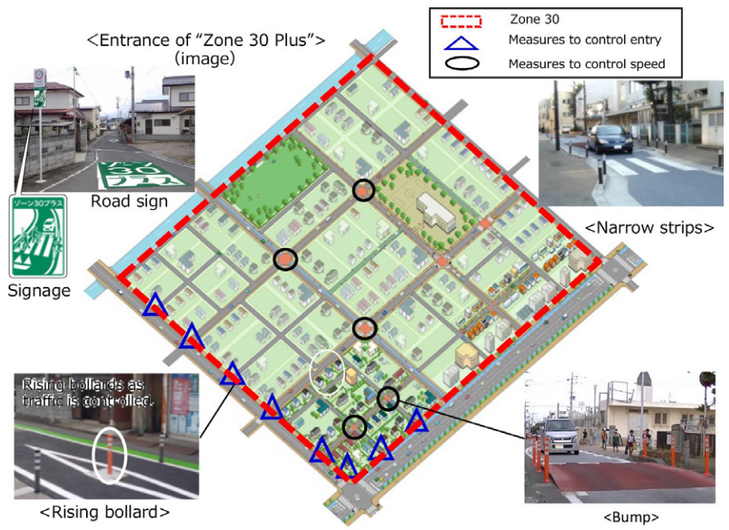
Promote intensive measures for accident risk areas (accident-prone areas, potentially dangerous areas etc.) on arterial roads.

Promote the conversion of automobile traffic to limited highways and arterial roads, and differentiate the functions of these roads from those of community roads.

Based on the Joint Inspection of School Routes, promote effective measures by combining the installation of sidewalks and protective fences with soft measures taken by related organizations through the Traffic Safety Measures Subsidy System (emergency measures for school routes).

We will promote "Zone 30 Plus" , a newly coordinated policy to ensure traffic safety for pedestrians and others through an appropriate combination of Zone 30 maintenance by the police (30km/h zone regulation) and physical devices such as speed bumps installed by road administrators.

■Image of "Zone 30 Plus"



・Improvement rate of sidewalks on school routes (2019 to 2025): 53% -> 57%.
・Reduction rate of fatal and injurious accidents at dangerous locations 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 and maintenance of humps and narrow strips: about 30% reduction compared to 2019

Ref. 1: Limited highway (national expressways, automobile-only national highways, urban expressways, and other automobile-only roads), arterial roads (general national highways, major regional roads, and prefectural roads (excluding overlaps with automobile-only roads)), and community roads (other roads (including roads other than those under the Road Act))
Ref. 2: "Guidelines for Conducting Joint Inspections of School Routes" (dated July 9th, 2021, Ministry of Education, Culture, Sports, Science and Technology, Ministry of Land, Infrastructure, Transport and Tourism, and the National Police Agency)

Promotion of railroad crossing countermeasures

In accordance with the revised Act on Promotion of Railway Crossings [Ref. 1], , crossings with problems will be designated in an expeditious manner, and measures such as the construction of multi-level crossings and sidewalks along railroad crossing roads will be implemented, while building up a PDCA cycle to conduct consistent follow-ups.
We will promote efforts to ensure the implementation of measures such as prioritizing the opening of crossings so that they are not blocked for long periods of time in the event of disasters.

Background / data

・Crossing accidents occurred approximately every two days, and one person died every five days. (FY 2020)
・There are more than 500 railroad crossings across Japan that are closed at nearly all times. (FY 2020)
・In October 2021, 1,336 crossings were identified and announced as crossings which require urgent consideration of countermeasures (chart crossings).
・In accordance with the Act on Promotion of Railway Crossings
 ・In April, 2021, the first batch of 93 railroad crossings was designated for improvement.
 ・In June, 2021, the first round of designations was made for 181 railroad crossings to be managed in the event of disasters.

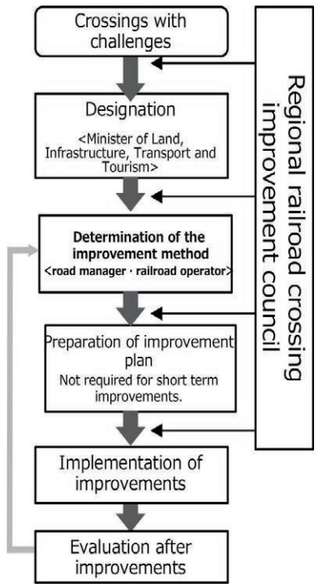
Systematic and intensive support for railroad crossing countermeasures, including multilevel crossings and installation of railroad crossing sidewalks, through the use of the railroad crossing improvement planning project assistance scheme

In June, 2022, a management method will be formulated for the railroad crossings designated as level crossing roads where the method of disaster management should be specified, including a communication system with the police, fire department, and other relevant organizations, priority opening procedures, and periodic trainings

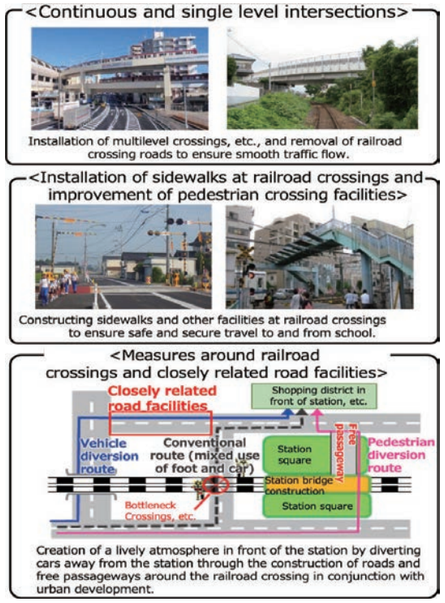
Steadily follow up on railroad crossing countermeasures using the PDCA cycle, and promote "visualization" of the implementation status by the "Railroad Crossing Road Safety Passage Chart.

・Number of 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

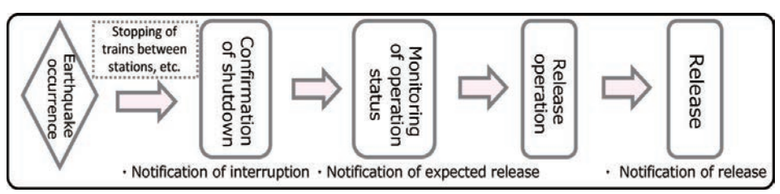
■Implementation scheme of improvements



■Examples of improvement methods



■The process of opening a railroad crossing that has been closed for an extended period of time in the event of disasters



Ref. 1: Act for Partial Amendment of the Act for Promotion of Railway Crossing Road Improvement.

Improving the safety and reliability of expressways

With regard to measures to prevent head-on collisions, we will promote countermeasures such that installation of wire ropes will mostly be completed on earthwork sections and small and medium bridges by the end of FY 2022, while new technologies will be introduced on a trial basis to public roads starting in FY 2021 for long-span bridge and/or tunnel sections.
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 2021, approx. 1,243 km of wire ropes have been installed.
(Approx. 78% of the total 1,600 km of earthwork sections and small and medium bridges have been installed)
・As of November 2021, out of 3,589 contact cases, there were 14 accidents in which the driver ran into oncoming traffic [Ref. 2] , of which there were no fatalities.

Outline of wire rope installation in FY 2022 for earthwork sections and small and medium bridges

For long-span bridge and tunnel sections, trial installation of two of the technologies selected from the publicly solicited technologies that meet the criteria for breakthrough prevention performance will begin at six locations nationwide.

Selected 2 technologies for long-span bridge and tunnel sections

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

Background / data

[Wrong-way driving]
・The average number of incidents of wrong-way driving on expressways has been approximately190 per year for the past four years.
・Approximately 52% of all accidents involving wrong-way driving on the main line result in death or injury.
[Wrong-Way Entry]
・3,662 incidents involving pedestrians, bicycles, mopeds entering expressways by mistake occur annually. Of which, 57% mopeds, 28% pedestrians, and 15% bicycles.
・The number of incidents is on the rise. In recent years, the number of mopeds in particular has been on the rise.

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)

Ref. 1: Expressway (toll) (2013 - 2020)
Ref. 2: Include incidents where vehicle rides on the ends of wire ropes

Utilization of space to meet various needs

In order to respond to various needs for roads, including the need for local dynamism, we will promote the improvement and revitalization of regional attractions by dividing the functions of each road in the region and flexibly using different roads according to location and time of day.

Background / data

・While there are roads where automobile traffic is decreasing due to the development of the arterial road network, the needs for roads are becoming more diverse, such as “liveliness”, “safety”, and “support for new mobility”, and the need to review the role of roads is increasing.
・In order to reduce the risk of COVID-19 infections and to create a lively community, the standards for road occupancy permits for roadside restaurants and other establishments were relaxed (special exception for road occupancy due to the COVID-19) (Until the end of FY2021).
◇ Number of applications: approx. 170 autonomies
◇ Number of permits nationwide: approx. 420 *As of July 2021
・A system of Improving Pedestrian Convenience Road System(Hokomichi)[Ref. 1] was established as a system for building lively, dynamic roads. 49 routes were designated nationwide (as of December, 2021).

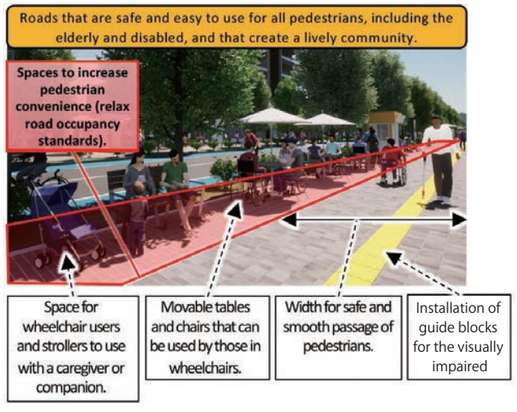
Promote Hokomichi system to create a lively community. (Transfer to Hokomichi if local governments wish to continue with the covid-19 occupancy exception)

Designing new standards and systems based on the Guidelines for the Development of Road Spaces to Meet Diverse Needs[Ref.2], to promote the reconstruction and re-use of roads in each region.

［Key points in the guideline］
Describes the concept of the division of functions and flexible use of roads, useful individual measures, points for consideration, and points to note.

To further improve road maintenance and management, we are promoting the development of the Road Cooperation Group System [Ref.3] and cooperation with Hokomichi System.

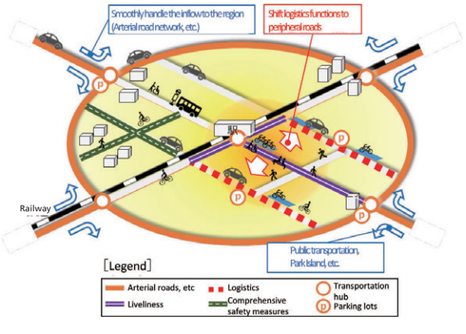
■Image of Hokomichi



■Example of transition from COVID-19 occupancy exception to Hokomichi

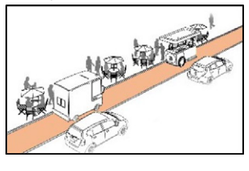
Kobe City, Hyogo Prefecture

■The division of functions on each road

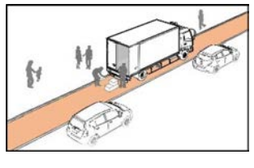


■flexible use of roads

Morning to night
（8:00～20:00）
→ space for rest and relaxation



Midnight - morning
（20:00～8:00）
→Used as a cargo handling space



Ref. 1: Based on the implementation of the amended Road Act in November 2020
Ref. 2: Expected to be established in FY 2021
Ref. 3: 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.

Background / data

・Extension of bicycle traffic space separated from pedestrians: approx. 2,930 km (as of the end of FY 2019)
・Established the "Certified Bicycle Commuting Company" Declaration Project system in April, 2020.
The number of companies certified as “Declared company” was 47, of which two companies were certified as "Excellent company” (as November, 2021).
・One in four Tokyo bicycle commuters started biking after the COVID-19 pandemic. [Ref. 1]
・Status of obligation to obtain bicycle liability insurance.
Mandatory: 23 prefectures, Effort obligation: 11 prefectures (as of October, 2021)

Creating a safe and comfortable bicycle user environment

Promote the formulation of local Bicycle Use Promotion Plan [Ref. 2] that include plans for bicycle networks.

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

Promote the systematic development of bicycle traffic spaces with appropriate separation of pedestrians, cyclists and vehicles

Bicycle Path

Arrow / Pictogram

Bicycle Lane

Promoting the introduction of bicycle commuting

Publicize the "Guide to Promoting Bicycle Commuting" and the "Certified Bicycle Commuting Company" Declaration Project. system.

・Bicycle share for commuting (2015→ 202):
15.2% ⇒ 18.2%

Promotion of cycle tourism

On the National Cycle Route promote the improvement in the riding environment and the development of an environment for cycling, a welcoming environment in cooperation with commercial facilities including convenience stores, and public transportation, the creation of attractions along the route, and the dissemination of information.

Establishment of receiving environment in coordination with local stores

・The number of model routes aiming to develop an advanced bicycle user environment (2019→2025):56 routes ⇒ 100 routes

Promote the purchase of bicycle liability insurance etc.

Support for the enactment of ordinances by prefectures and provision of information to promote the purchase of bicycle liability insurance.

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

Ref. 1: From a survey conducted by a u Insurance Company, Ltd. in July 2020
Ref. 2: According to the Bicycle Utilization Promotion Act, prefectures and municipalities are required to make efforts to establish local Bicycle Use Promotion Plans.

Creating an environment for sharing service and new forms of mobility

In light of the change in usage patterns from ownership to sharing, we will promote the use of sharing of bicycles and light vehicles by strengthening cooperation with railroads, buses and other transportation modes.
In light of the emergence of personal mobility devices and other forms of mobility as well as the growing need for their use, we will promote the reconstruction and utilization of roads that will help in improving the convenience of new mobility services.

Promoting the use of sharing

Background / data

•The number of cities with full-scale introduction of shared bicycles increased from 77 (as of March 31st, 2016) to 164 (as of March 31st, 2020) in five years. [Ref. 1]
•Establishment of a special tax exemption on fixed asset for the installation of shared bicycle ports for projects described in the municipal bicycle utilization promotion plan. [Ref. 2]
•The number of car-sharing users (members) in Japan increased by approx. 200,000 from approx. 2.05 million (in 2000) to approx. 2.25 million (in 2021). [Ref. 3]

Promotion of the spread of shared bicycles

Provide know-how to local governments by utilizing guidelines that contribute to the efficiency of business operations, securing locations for cycle ports, and improving convenience.

Promotion of car sharing

Verified the safety of the structure and operation of the social experiment program that uses road space as a car-sharing station by expanding the range of vehicle types to include mini vehicles, and formulated guidelines for nationwide deployment.

National Highway 15 Shinbashi Station

The development of a new environment for the use of mobility

Background / data

Many new forms of mobility have emerged in recent years and traffic rules and regulations are under review by the relevant ministries.

Electric kickboard

Ultra-small mobility

Automated delivery robots

Photo courtesy of the Advisory Committee on Otemachi, Marunouchi, and Yurakucho Area Development , Luup Inc. and MP Inc.

Conducting social experiments on the reconstruction and utilization of roads, including parking spaces, and verify the necessary facilities and functions.

Social Experiment of Parking spaces for new mobility services

Locations for sharing services on roadside and pavement, small logistics, drones.

multi-functional next-generation mobility port on sidewalks

Ref. 1: According to MLIT and the Urban Affairs Bureau
Ref. 2: During the exception period of 2 years (April 1st, 2021. to March 31st, 2023)
Ref. 3: According to the Foundation for Promoting Personal Mobility and Ecological Transportation Ref. 4: Schedule to be determined in FY2021
Ref. 5: We will set up and operate car-sharing stations on roads where there is a high level of convenience in transferring from public transport (near Otemachi Station on Highway 1 and near Shinbashi Station on Highway 15) , to examine vehicle usage and the effects of increased convenience.

Support for the spread and promotion of autonomous driving

In addition to providing priority support for the efforts of local governments that aim to develop communities and regions using autonomous driving, we will promote joint research with private companies and other organizations for the realization of autonomous driving on expressways.

Background / data

A regional unmanned automated transport service on public roads in more than 40 locations by 2025 and in more than 100 locations nationwide by 2030.
Social implementation of automated driving services based at Roadside rest area (Michi-no-Eki).
• Full-scale implementation in
November, 2019 “Kamikoani” (Akita Prefecture)
April, 2021 “Oku-Eigenji Mountain Stream Village” (Shiga Prefecture)
July, 2021 full-scale introduction at the “Yamakawa Branch Office in Miyama City” (Fukuoka Prefecture)
October. 2021 at “Akagi Plateau” （Shimane Prefecture）

Focused support for the development of driving environments based on urban development plans that utilize automated driving, and technical support for the formulation of plans for driving spaces.

In order to further promote the spread of automated driving services, examine the ideal driving space in urban areas where pedestrians and bicycles are mixed.

Self-driving bus operation in Sakaimachi, Ibaraki Prefecture (Increase the number of bus stops and waiting areas to eliminate the delay of following vehicles)

Verification of support measures at complex intersections (image) (Maintenance of demarcation lines to be detected by in-vehicle sensors)

Improvement of the road environment necessary for automated vehicles

Background / data

• Level 4 automated driving on highways by 2025.

To achieve safe and smooth automated driving on expressways promote joint research through public-private partnerships on the management guidelines for demarcation lines and methods for providing anticipatory information.

■IImage of Joint Research

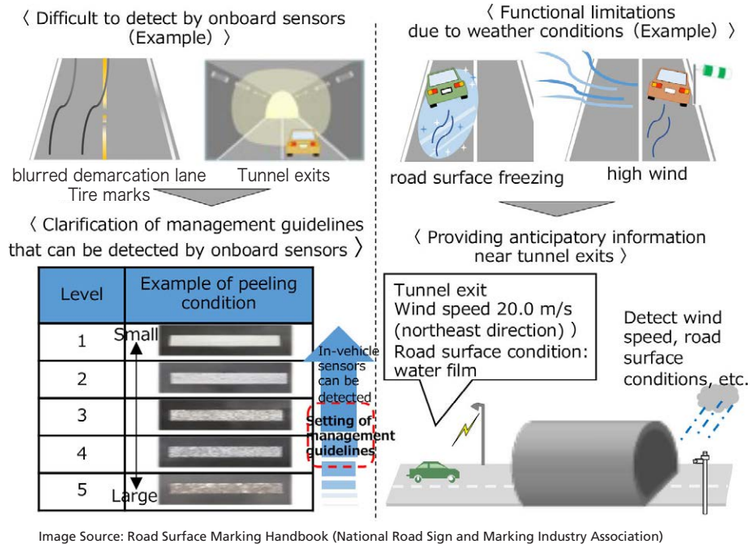


Image Source: Road Surface Marking Handbook (National Road Sign and Marking Industry Association)

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 can move around smoothly and safely.
Promote the development of child-rearing support facilities at expressway service areas and Roadside rest area (Michi-no-Eki) 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 Roadside rest area (Michi-no-Eki)

Rate of maintenance (July, 2021)	Baby corner available 24 hours a day.	Covered priority parking spaces for pregnant women
Roadside Rest Areas developed by the Government (284 facilities)	46% (130facilities)	71% (202 facilities)
Service areas (220 facilities*) *Currently, service areas with commercial facilities	100% (220 facilities)	100% (220 facilities)

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

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

Promote the development of road space with consideration for universal design that is easy to use by all people, including the elderly and disabled.

・In addition to barrier-free road standards formulate and publicize guidelines that specifically show how road space should be based on universal design and advanced cases.

・Consider measures to deal with the issues identified during the formulation of the guidelines (e.g., desirable specifications differ depending on the characteristics of the disability, it is difficult to set clear barrier-free standards.), based on interviews with the parties concerned.

Promote the development of child-rearing support facilities at expressway service areas and Roadside rest area (Michi-no-Eki) nationwide

Image of barrier-free system

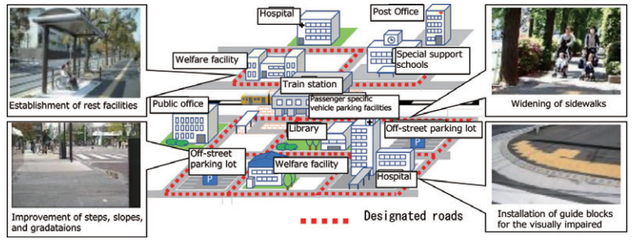


Image of a child-rearing support facility

Baby corner available 24 hours a day.

Covered priority parking spaces for pregnant women

Development of road space with consideration for universal design

Inspection by 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.

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.

Acceleration of utility poles removal

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), Tokyo 23 wards: 48%, Osaka City: 46% (2019) *Cable extension base

・Approx. 2,000 utility poles collapsed and were broken, mainly in Chiba Prefecture due to the storm caused by Typhoon No. 15 in September, 2019.
・The number of poles installed increased at a rate of about 70,000 per year from FY 2008 to FY 2018.
・Basic Policies of the Removal of Utility Poles Promotion Plan
  ・Not to increase the number of new utility poles (reduce the number of poles, especially on emergency transport routes)
  ・Thorough promotion of cost reduction (average cost reduction of about 20%)
  ・Further accelerate the project (target to halve the project period (from 7 to 4 years on average))

4,000 km without utility poles, including 2,400 km of emergency transport routes in urban areas where there is a risk of road blockage due to collapsed utility poles, which will be launched as part of the 5-year acceleration plan

To reduce the number of newly established poles,

・Collaboration of related parties to investigate and analyze the factors behind the increase in the number of new utility poles, and compile measures to reduce them.

・Begin operating a notification and recommendation system for the installation of utility poles in roadside areas to prevent blockage of emergency transportation roads.

・When implementing road projects and urban development projects, in principle, no utility poles will be installed unless it is technically difficult to avoid their use.

・Expand the prohibition occupancy of new utility poles on emergency transportation routes and roads with extremely congested traffic, and begin early restrictions on existing poles.

Promote further cost reduction thorough cost comparison at the time of design and introduction of new technologies and construction methods.

Introduce a comprehensive ordering system in cooperation with relevant ministries and agencies to facilitate simultaneous construction and coordination, and promote speedy project implementation.

Promote the removal of utility poles by reducing property tax on underground cables.

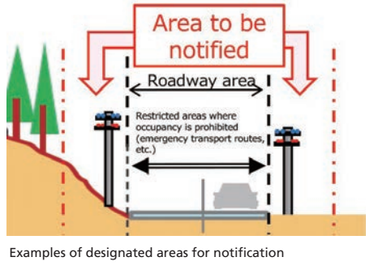
Road blockage due to collapsed utility poles

Tateyama City, Chiba Prefecture, Japan

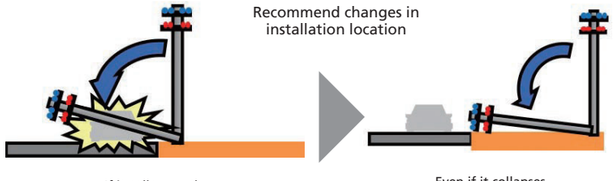
Road where traffic is extremely congested

Example of the roads subject to occupancy restrictions

Image of the operation of the notification and recommendation system



Examples of designated areas for notification



Ref. 1: the Removal of Utility Poles Promotion Plan decided by the cabinet on 25th, March, 2021

Third stage of "Michi-no-Eki (Roadside rest area)"

As a part of the third stage of "Roadside rest area (Michi-no-Eki)" initiative[Ref. 1], which started in 2020, we will promote full-scale efforts to make them disaster prevention, post-COVID-19, and regional centers.

Background / data

・Since the establishment of the system in 1993, 1,193 stations have been built nationwide (as of December 2021).
・In November 2019, the Review Council on new "Roadside rest area (Michi-no-Eki)" handed over its proposal, "To the Third Stage of 'Roadside rest area (Michi-no-Eki)'" to the Minister.
・In May, 2020, the national Roadside rest area liaison association (General Incorporated Associations) and others submitted an urgent proposal to the Minister, "The Evolution of Roadside rest area (Michi-no-Eki) in Japan with a View to the 'New Normal'".
・39 stations were selected for the first time as "Disaster Prevention Roadside rest areas" (June 2021)

Efforts to create a disaster prevention center

Roadside rest area (Michi-no-Eki) that are positioned as wide-area disaster prevention centers in the regional disaster prevention plans of prefectures are selected as "Disaster Prevention Roadside rest area (Michi-no-Eki)" and priority support is provided.

■Image of "Disaster Prevention Roadside rest area"

Responding to the New Normal

Priority support for renovation of facilities to accommodate new lifestyles in post-Covid, including improvement of sanitation.

Strengthen cooperation to more effectively implement regional revitalization efforts based at Roadside rest area (Michi-no-Eki), and promote horizontal development of initiatives such as cashless payment and mail-order/EC support.

Efforts to make it a regional center

Contribute to the resolution of regional issues by promoting projects that match issues (needs) faced by individual Roadside rest area (Michi-no-Eki) with the technologies and products (seeds) of private companies that have the potential to solve them.

■Image of the Matching Project

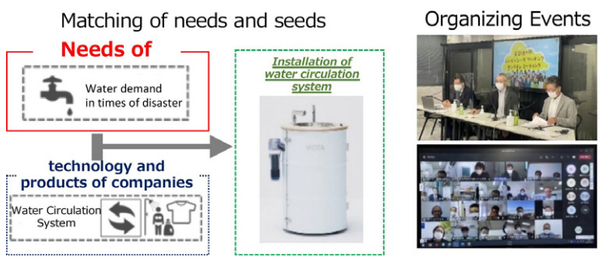


Image Credit : Michi-no-Eki Association

Ref. 1: The first stage (1993-) promoted "a place to provide services for passing road users".
The second stage (2013-), promoted initiatives based on the concept that " themselves are destinations".
The third stage (2020-2025), we will promote "bases for accelerating regional development and tourism".

Promotion of Tourism

We support the creation of tourism regions that contribute to regional development, such as the development of new tourism content for the region, countermeasures against traffic congestion in tourist areas, and environmental improvements in anticipation of a recovery in inbound demand.

Background / data

・31.88 million foreign visitors to Japan in 2019 (3.8 times the number in 2012)[Ref. 1]
・Many foreign visitors to Japan are dissatisfied with the lack of multilingual displays. [Ref. 2]
・Increase in the percentage of domestic travel by private car after the pandemic [Ref. 3]
(54% (July-September, 2019) -> 71% (July-September, 2021))

Development of new tourism content for the region

We will improve the riding environment along the national cycle route, create a welcoming environment, and promote the creation of attractions along the route and the dissemination of information.

Promote sightseeing tours and PR activities that unite the Japan Scenic Byway and Roadside Rest Area (Michi-no-Eki).

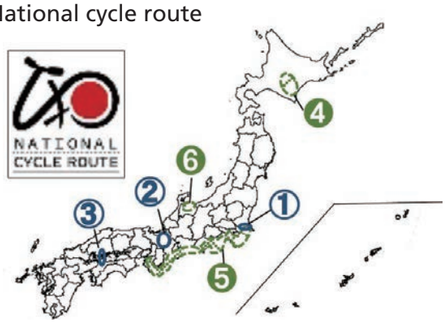
Measures to prevent traffic congestion in tourist areas

Promote comprehensive parking management and other comprehensive measures to combat traffic congestion, based on initiatives for the Tokyo 2020 Olympic and Paralympic Games.

Environmental improvement in anticipation of recovery in inbound demand

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

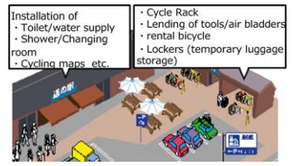
■National cycle route



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

■Improve the host environment and make it attractive



Michi-no-Eki as Cycling Bases

An example of collaboration between the Japan Scenic Byway and Michi-no-Eki

■Comprehensive measures against traffic congestion

Measure for the Tokyo 2020 Olympic Games

■Support for wide-area sightseeing tours

Signage for World Heritage Sites (Hagi City, Yamaguchi Prefecture)

Pictogram of the heritage, The Sites of Japan's Meiji Industrial Revolution registered as a World Heritage Site

Ref. 1: According to the Japan National Tourism Organization, FY 2019
Ref. 2: According to the Japan Tourism Agency, FY 2019
Ref. 3: Prepared by the Road Bureau based on the "Survey on Travel and Tourism Consumption Trends" by the Japan Tourism Agency.

Road system DX
- The realization of xROAD

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

Policy and examples of initiatives for DX road system

[Policy] Making full use of IT

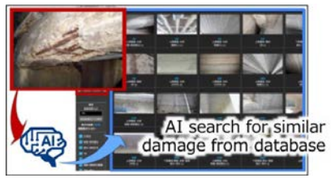
① Early detection and treatment of various events that hinder road use
② Thorough automation and unmanned construction and maintenance operation
③ Procedures and payments will be online, cashless and touchless.
④ Collecting, storing, and fully utilizing big data on roads to contribute to society

■Provision of high-level road infrastructure services

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

■establishment of xRoad and its utilization in various fields

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



■Digitizing and 'smartifying' administrative procedures

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

■Improvement of convenience of expressways

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

The future of the road system

■End of FY2021

Resolve issues that need immediate attention

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

■End of FY2022

Automation of road management tasks

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

Upgrading procedures for road use

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

Building a data platform

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

■End of FY2025

Dedicated ETC, etc.

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

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

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

Background / data

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

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

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

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

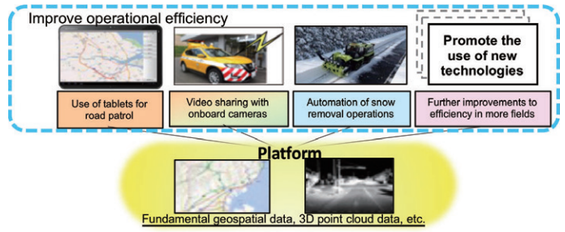
Measures to strengthen the road management system using IT

Accelerating the sophistication of road management, including the realization of early detection and early treatment of road defects through automatic traffic hazard detection systems

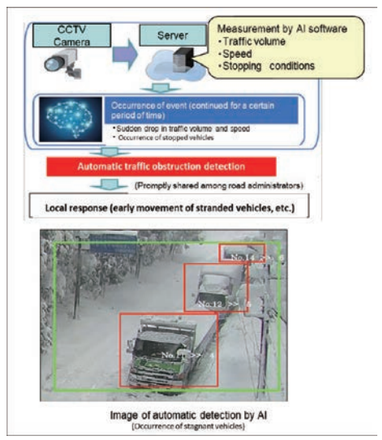
Installation rate of CCTV cameras on emergency transport routes where constant observation is required（2019→2025）：0% => Approx. 50%

Pomote the automation of snow removal work that requires advanced skills, and start deploying automatically controlled snow removal machines at National Highway Offices by FY2022.

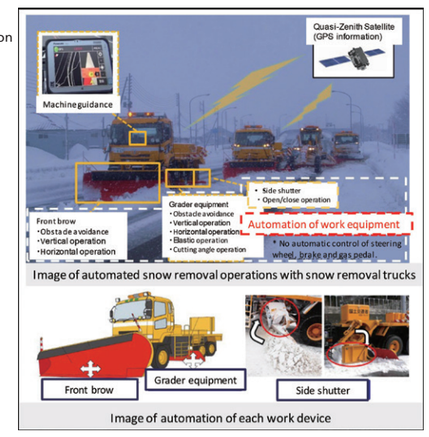
Improving the sophistication and efficiency of construction, inspection, and maintenance management using ICT and AI technologies



Examples of use at Regional Development Bureaus



Automatic traffic obstruction detection system



Automation of snow removal operations

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

To improve the productivity of road users administrative procedures related to road space can be streamlined and processed immediately.
A new traffic system for oversize or overweight vehicles (immediate processing) will be put into practical use in April, 2022. We will also promote digitalization and smart procedures for road occupancy permits and for permitting stoppage at oversize or overweight vehicle stopping facilities.

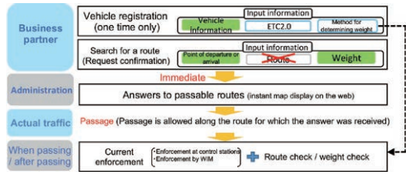
Expediting procedures for the passage of oversize or overweight vehicles

Background / data

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

Promote the expansion of the use of the new system for special-purpose vehicles, which provides instant online answers to passable routes, by promoting the digitalization of information on target roads.
Strengthen control of violating vehicles by using automatic weight measuring devices and ETC 2.0, as well as by strengthening cooperation with related organizations.

New system through promotion of digitalization



Improving the sophistication and efficiency of road occupancy permit procedures

Background / data

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

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

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

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

Background / data

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

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

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

Improving the convenience of expressways

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

Background / data

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

Promotion of ETC exclusive use

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

・In consideration of the ETC usage rate, traffic volume, and substitutability with neighboring IC's, the project will start on a trial basis at metropolitan some toll gates at the end of FY2021[Ref. 2], and gradually expand based on the operational status.
・Improvement of the ETC usage environment and countermeasures for non-ETC vehicles through subsidies for in-vehicle equipment (scheduled to start on January, 2022) and lowering of the minimum deposit for ETC personal cards [Ref. 3] (from 20,000 yen to 3,000 yen).

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

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

The spread of touchless payment by ETC

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

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

■Examples of the expansion of ETC technology into various fields

Regional public road corporations

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

Drive-Thru

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

Parking lot

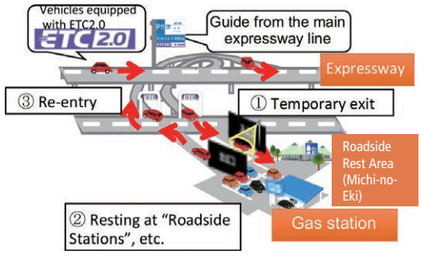
Conducted demonstration tests at private parking lots from July, 2017 (6 locations in Tokyo, Osaka, Nagoya and Shizuoka)

Expansion of rest services using ETC2.0

■Smart fees that allow for temporary exits

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

[Future]
Consideration of expanding the number of target locations from the perspective of securing rest opportunities for logistics companies (large vehicles) and revitalizing the region



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

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

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

Background / data

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

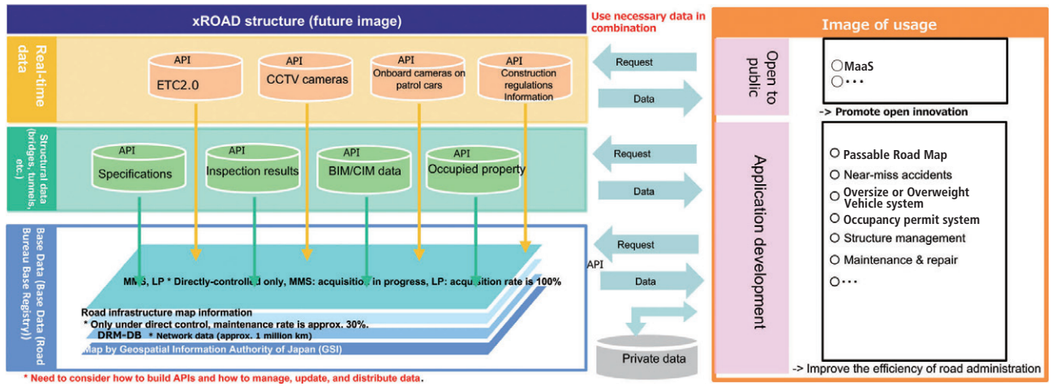
・Using Mobile Mapping System (MMS) technologies, collect 3D mapping data from national highways under jurisdiction of MLIT for over 9000 km (as at November 2021)

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

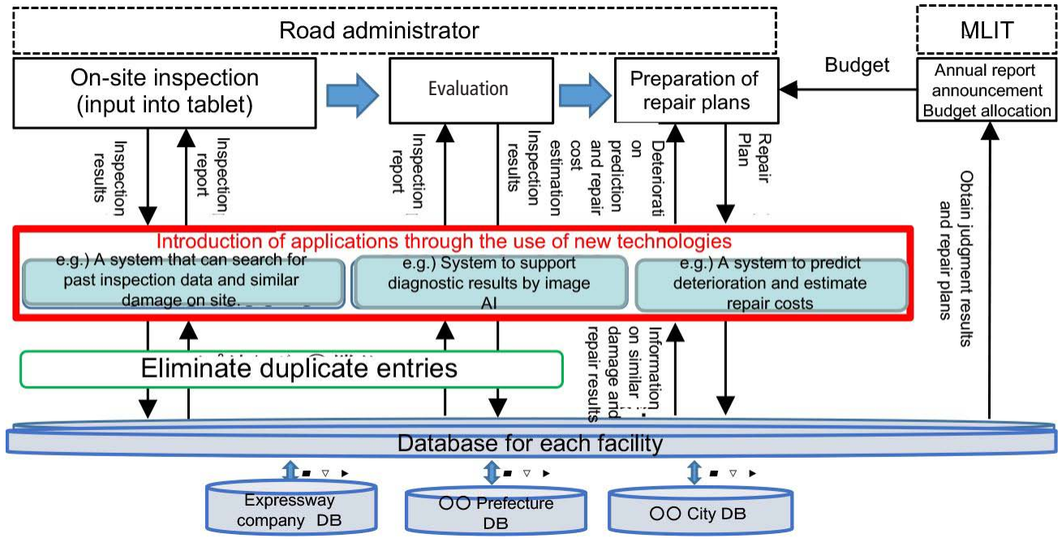
Promote the use of MMS to acquire 3D point cloud data of roads (intersection shapes, location information of geographic features such as demarcation lines, etc).

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

■xROAD structure (future image)



■Image of the development of applications using the database



Realization of a Green Society

- Contribution to 2050 carbon neutrality -

As natural disasters due to climate change have been increasingly serious and more frequent, taking measures against global warming is a pressing issue. In order to achieve carbon neutrality by 2050, we will contribute to the realization of a green society by reducing CO2 emissions from road use (CO2 emissions from automobiles), road maintenance and management, and increasing the amount of CO2 absorbed through road greening. We will contribute to the achievement of a green society.

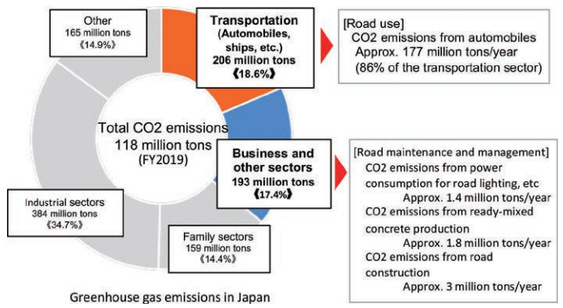
Targets for carbon neutrality in 2050

Long-term strategy as a growth strategy based on the Paris Agreement (approved by the Cabinet on October 22, 2021)
The goal is to reduce greenhouse gas emissions to zero as a whole by 2050, i.e., to achieve "carbon neutrality by 2050.

Global Warming Prevention Plan
(approved by the Cabinet on October 22, 2021)
In FY2030, we aim to reduce greenhouse gas emissions by 46% from FY2013 levels. We will continue to take on the challenge of achieving an even higher goal of 50%.

2019 CO2 emissions by sector

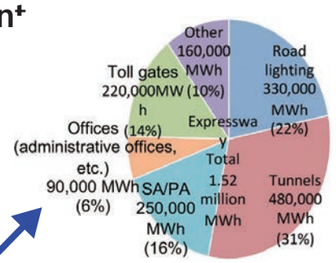
In the road sector, a total of approximately 180 million tons of CO2 was emitted in the “transportation” and “other business” sectors (approx. 16% of the total).



Greenhouse gas emissions in Japan

Power consumption in road management

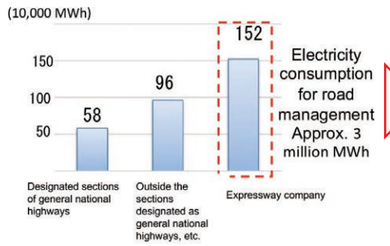
Annual electricity consumption for road management is approx. 3 million MWh
The amount of renewable energy generated on roads is only approx. 13,000 MWh (remaining at approx. 0.4% of the above electricity consumption).
On expressways, road lighting and tunnels account for more than 50% of electricity consumption.



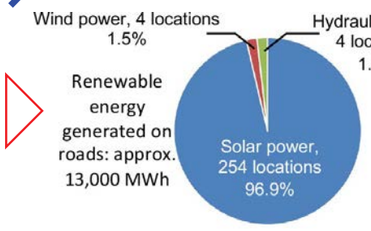
Breakdown of electricity consumption on expressways (FY2013)

Annual power generation: Approx. 13,000 MWh

Electricity consumption on roads (FY2013)



Electricity consumption for road management Approx. 3 million MWh



Renewable energy generation on roads Total percentage (FY2020)

* Electricity consumption and power generation are estimates.

Direction of contribution to carbon neutrality

<Reduction in emissions>
[Road Use] Reduce consumption of fossil fuels used for automobiles.
[Road maintenance and management] While reducing the consumption of fossil fuel-derived energy used for road maintenance and management, switch to renewable energy sources for electricity used in road infrastructure.
<Improved absorption>
[Road greening] Promoting CO2 absorption through road greening (Approx 400,000t in FY2019)

Reducing CO2 emissions from vehicles on roads

In order to reduce CO2 emissions from vehicles using the roads, we will promote the development of an environment for the widespread use of next-generation vehicles, as well as energy conservation through the mitigation of traffic congestion and further streamlining of logistics, thereby promoting low-carbon road transportation.

Background / data

- Status of EV charging facilities
  Roadside Rest Area (Michi-no-Eki) ：877（74% of total）※July, 2021
  SA・PA：383（43% of total）※March, 2021
- Yokohama City Conducts Nation's First Social Experiment to Install EV Charging Facilities on Public Roads
  ※June, 2021～March 2022(planned)
- Number of EV charging facility information signs installed ※As of January, 2021
  Directly controlled national highway ：84points, Highways：279points

Enhancing the environment for the spread of next-generation vehicles

Based on the results of the social experiment, we will promote studies for the installation of EV recharging facilities on public roads, and support research and development of non-contact power transfer technology for the electric road systems.

Cooperate with businesses to provide locations for EV charging facilities and hydrogen stations in SA/PA and Road-side Rest Area (Michi-no-Eki).

Promote the development of EV charging facility information signs

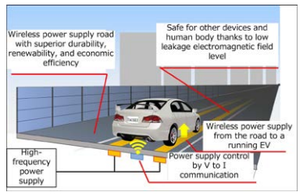
Provide incentives for using expressways when acquiring next-generation vehicles[Ref.1] to encourage traffic shift to expressways and spread of next-generation vehicles.

Ongoing efforts to reduce carbon footprint of road transportation

Promote measures for road traffic flow by improving road networks and mitigating traffic congestion, improve logistics efficiency by using double-trailer truck, promote the use of bicycles, and promote the use of public transportation by strengthening the functions of transportation hubs.

Environmental improvement for spread of next-generation vehicles

■Support for research and development of wireless power transfer technology



■Installation of EV chargers on public roads (Yokohama City)

■Hydrogen stations (image)

■EV charging facility information signs

Ongoing efforts to reduce the carbon footprint of road transportation

Congestion prevention

Promote the use of bicycles

Ref. 1: Electric vehicle refers to BEV, FCV, PHV, HV.

Energy conservation and greening of road infrastructure

While curbing the energy used for road maintenance and management, we will promote the energy conservation and greening of road infrastructure by converting the electricity used for road infrastructure to renewable energy and improving CO2 absorption through road greening.

Background / data

- The rate of LED road lighting on directly-controlled national highways is approximately 30% (as of FY2021 March).
- Introduction of solar power generation facilities
  SA・PA　89 facilities（Approx. 10% of total）※March,2021
  road side rest area　211 facilities（Approx. 20% of total）※July, 2020
- The effect of absorbing carbon dioxide by road greening is approximately 400,000 tons.

Reduction of energy consumption, use of renewable energy

Promote the use of LED lighting to reduce energy consumption in road management.

To realize further energy saving and upgrading of road infrastructure,
- Promote the development of new road lighting technologies
- Promote technological development for the implementation of solar power generation pavement in cooperation with related parties

Model introduction of solar power generation facilities in order to develop guidelines for the installation of solar power generation facilities utilizing road space.

Promotion of road greening

Promote greening of roads to serve as CO2 absorption points, and green infrastructure to reduce drainage into sewers and rivers by storing and infiltrating rainwater.

Reduction of energy consumption, use of renewable energy

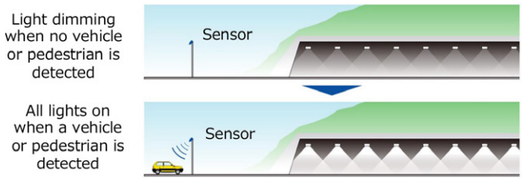


Image of lighting upgrading using sensing technology

LED lighting


Use of solar power generation on roads

Promotion of road greening


Example of road greening


"「Ame Niwa"[Ref. 1]」 at Shijo Horikawa intersection

Ref. 1: A space with a structure for storing and soaking in 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.

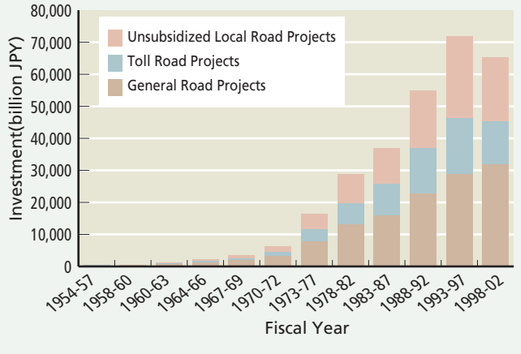
Since the public works budget, under the general revenue scheme, was insufficient in meeting the ever-increasing road traffic demand, two new financing systems were introduced: the toll road system and the tax revenue system with earmarks for roads. These systems allowed for a significant number of road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

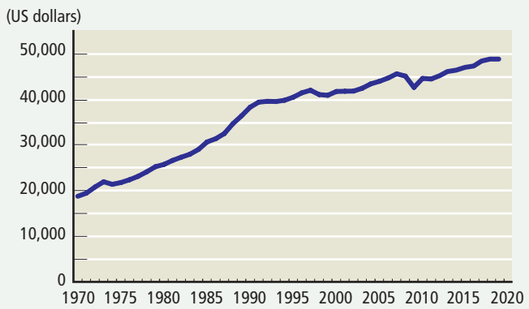


Note:
1) Reserve fund (150 billion) is included.
2) Reserve fund (100 billion) is included.
3) Reserve fund (500 billion) is included.
4) Reserve fund (700 billion) is included.
5) Adjustment cost (1,300 billion) is included.
6) Adjustment cost (1,300 billion) is included.
7) Adjustment cost (1,400 billion) 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.

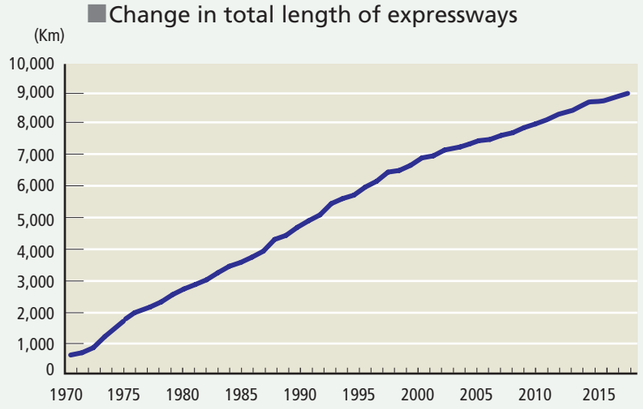
2)Preparing for Natural Disasters

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.

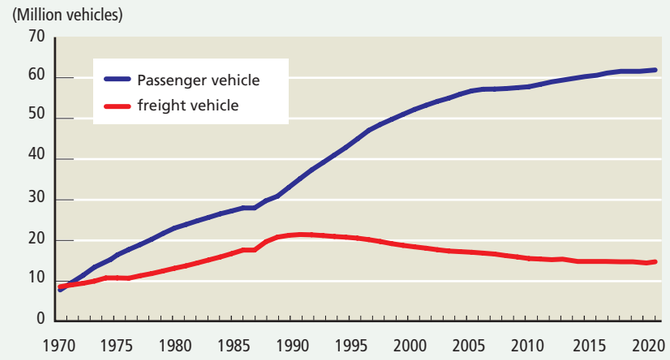
3)Improvement of Road Service Provisions using Intelligent Transport Systems (ITS)

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

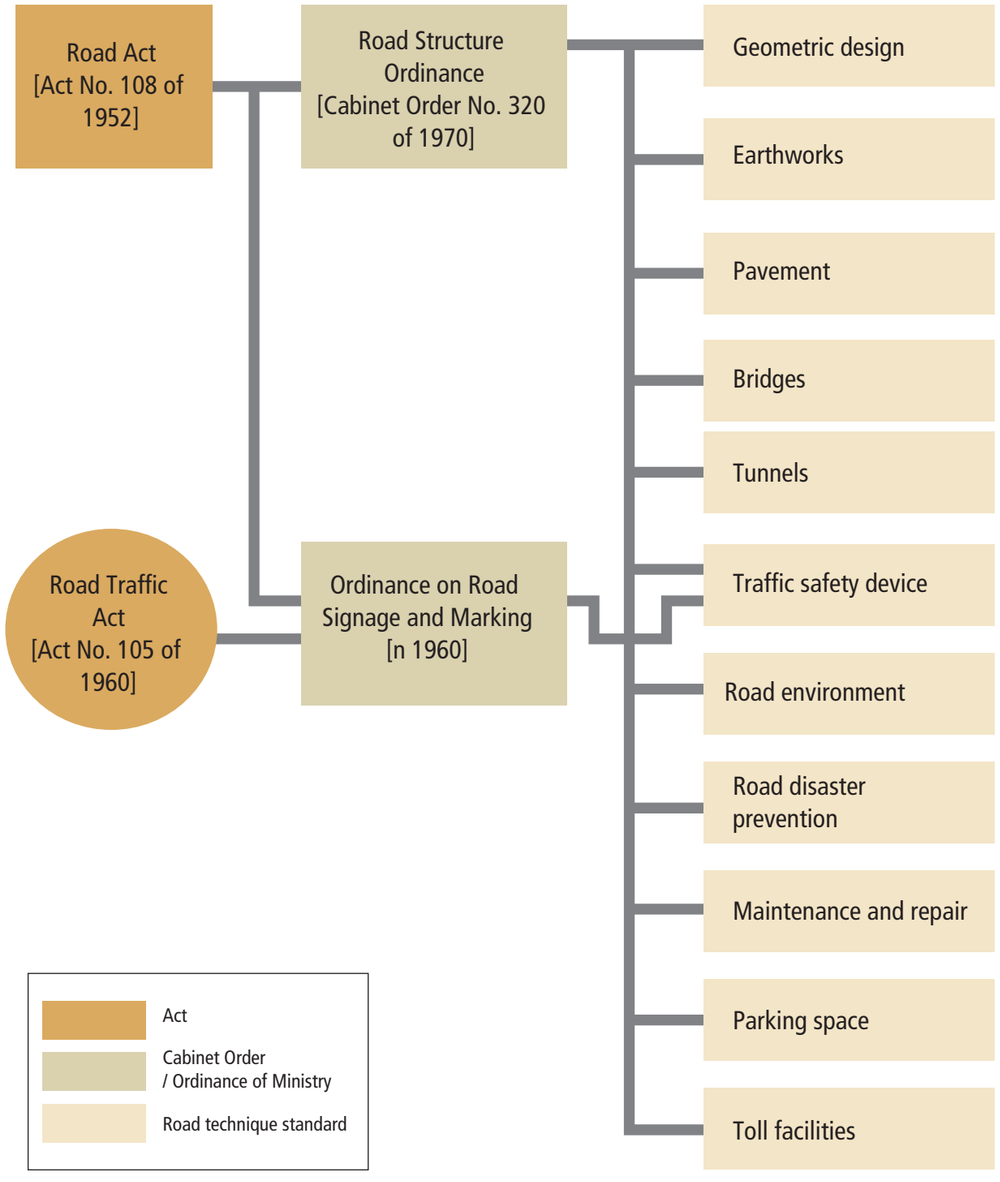


Technical Standards

(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)

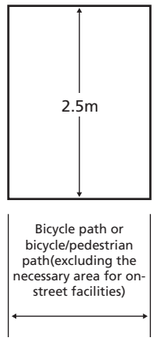
Article 38

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

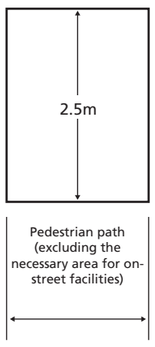
1. Bicycle path width shall be not less than 3m, while bicycle/pedestrian path width shall be no less than 4m. However, where topographical conditions or any other reasons do not permit such provisions, bicycle path width can be reduced to 2.5m.
2. Lateral clearances wider than 0.5m shall be provided 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

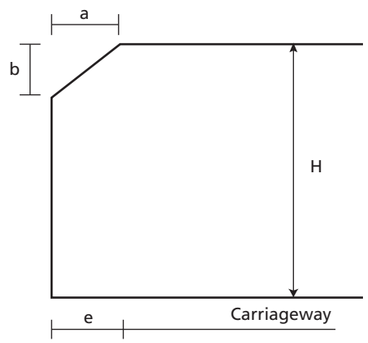
1. Pedestrian path width shall be not less than 2m in consideration of pedestrian traffic conditions and areas where the track is located, except where topographical conditions or other reasons do not permit such provisions, in which case the width can be reduced to 1m.
2. Where on-street facilities 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.

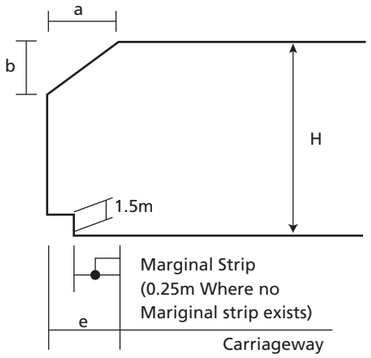


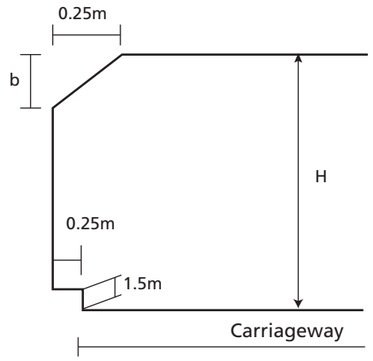
(General technical standards for structure of prefectural and municipal roads)

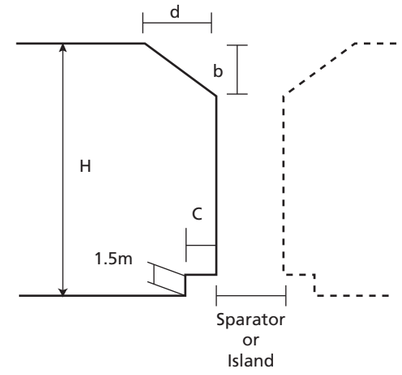
Article 41

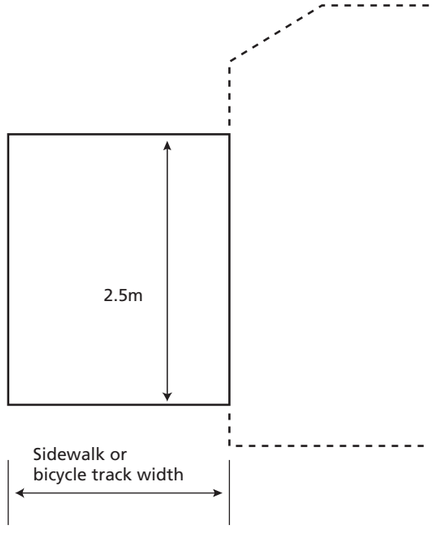
1. The provisions of Article 4, 12, 35.2, 35.3, 35.4 (limited to the matters listed in Article 30.1.12), 39.4, and 40.3 shall apply mutatis mutandis to general technical standards for the structure of prefectural or municipal roads when these roads are newly constructed or reconstructed. In this case, "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".

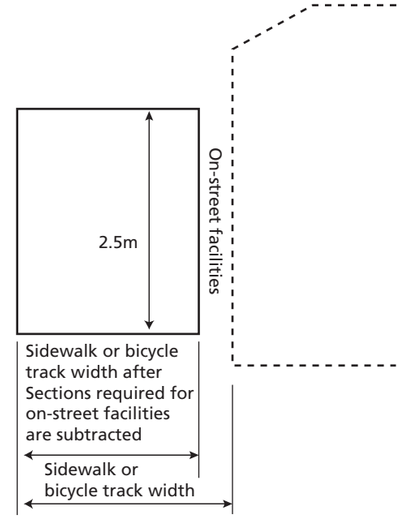












2040 Vision for Roads in Japan

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

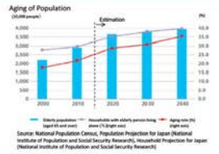
5. From "Road to be Affected" to "Road to Relief"

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

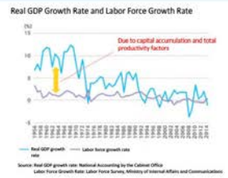
◆ "Sustainable Society" and "Policy Directions" aimed for by road administrations

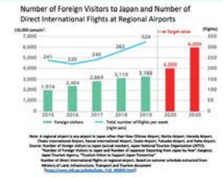
<Backgrounds & Issues >

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.

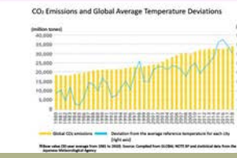


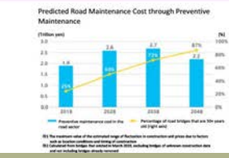
Economic growth is essential to enhance the sustainability of society. Economic vitality must be generated by attracting people and goods from abroad to the domestic market, as well as by having Japan actively promote the flow of people and goods overseas. A vibrant society where people and goods are 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

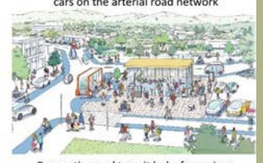
- Rising bollards restricting access to community roads
- Roads where pedestrians and cars coexist

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

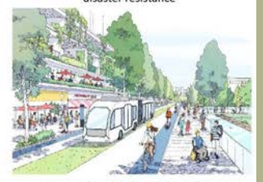
- Expressways in disaster mode
- Making Michi-no-Eki stations and SA/PAs disaster prevention centers

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

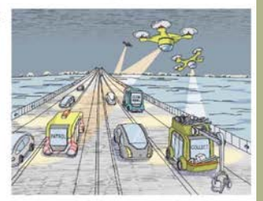


A low-carbon transportation system centered on BRT (Bus Rapid Transit) and bicycles, etc.

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