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

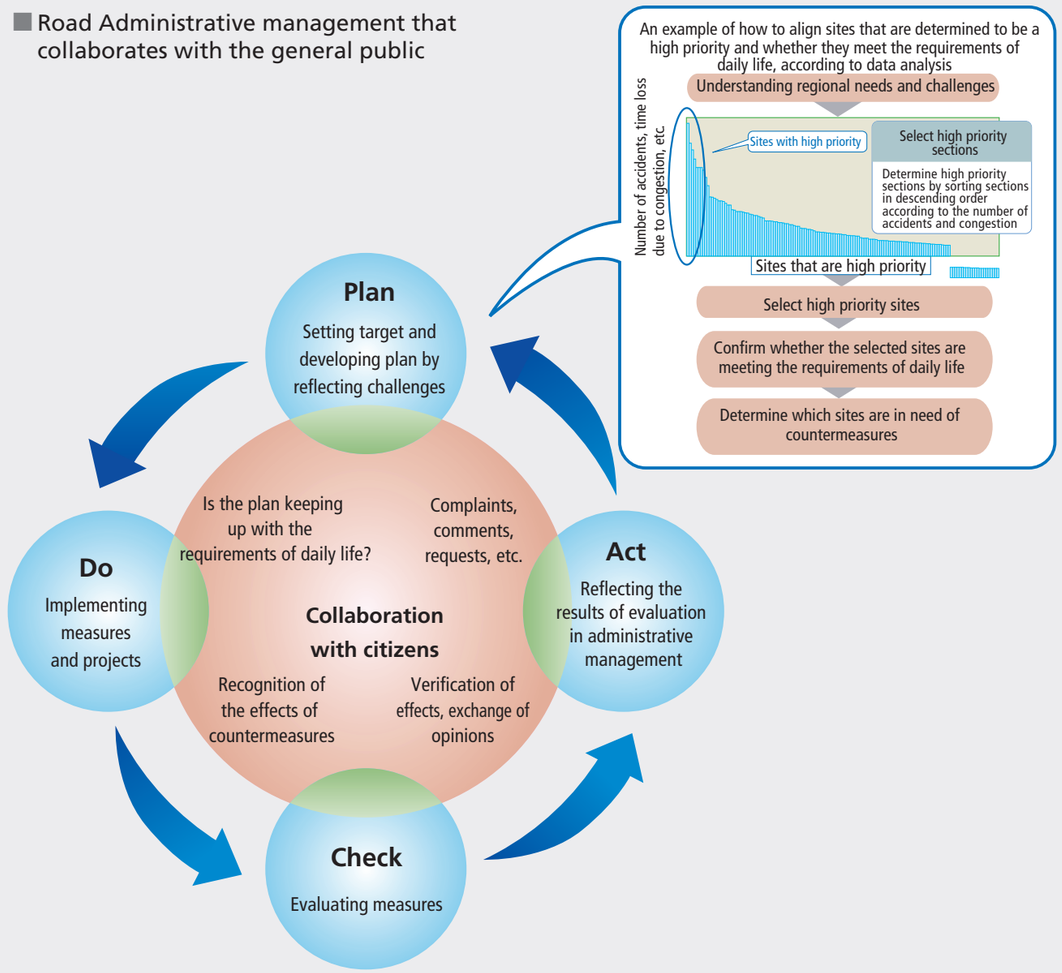
Together with regional public corporations, NPOs and other citizens' groups, the Japanese government is currently putting its efforts toward enhancing administrative management for roads. In order to achieve more effective, efficient and transparent road administration, Japan has promoted result-oriented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

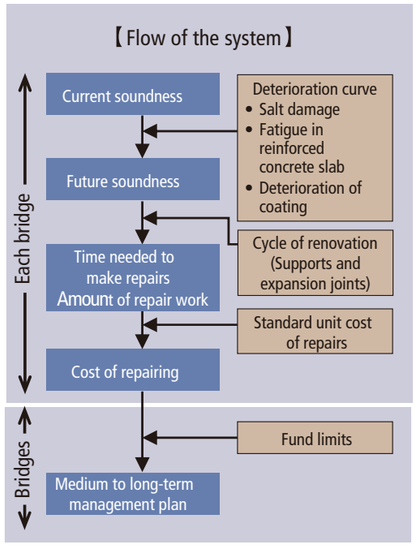
Asset Management

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.

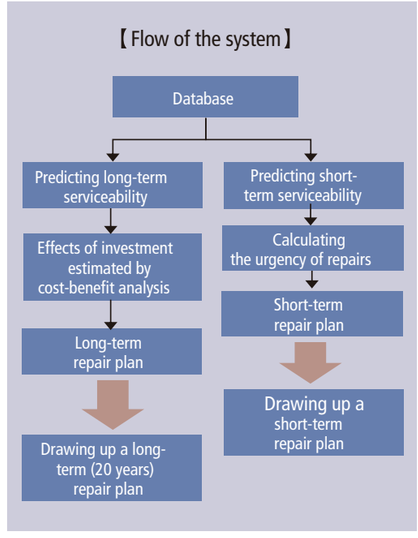
Development of road asset management

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

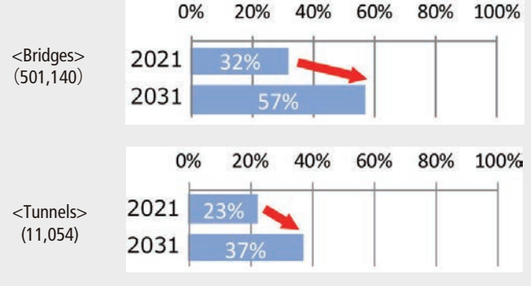


■ Overview of Pavement Management System



■ 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)