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.

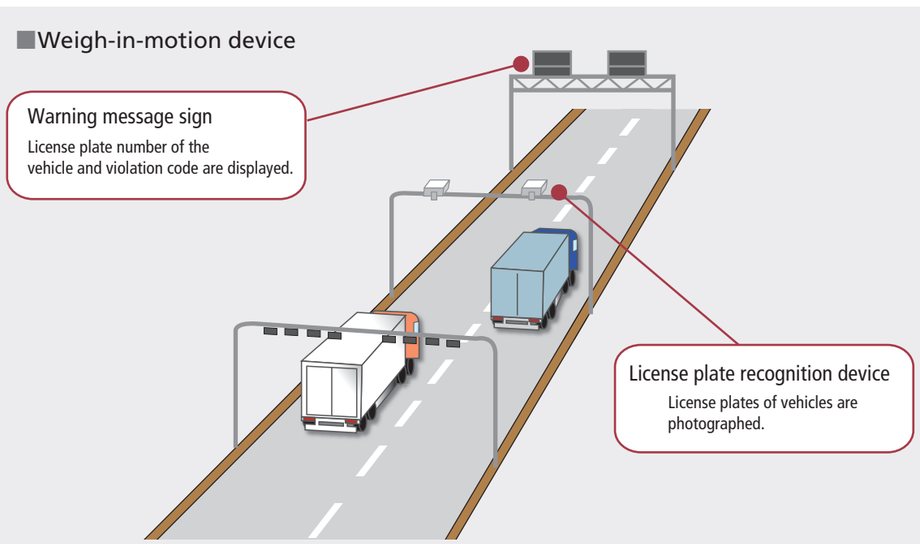
2. Weigh-in-motion (WIM)
A WIM device automatically measures a vehicle's gross weight. If the vehicle is over the weight limits, the WIM system then determines if the overweight vehicle has a permit by accessing the database. Based on the results, repeated violators will be given an instructive warning.

■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)

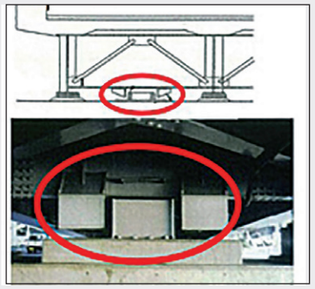
Measures against Earthquakes

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

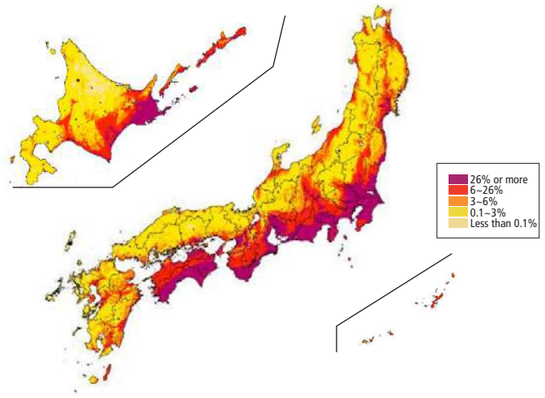
Bridge collapse prevention measures
+
Reinforcement/replacement of supports

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)

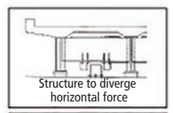
Example of earthquake preparedness

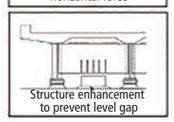
Implement bridge collapse prevention measures that add an ability of immediate recovery of functions.

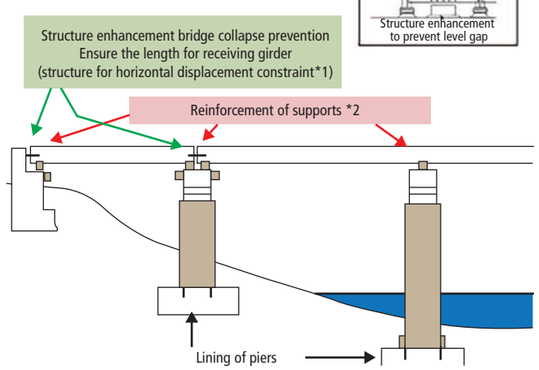
Bridge collapse prevention measures towards immediate recovery of functions (Level 2 in the Seismic resistance performance)

[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

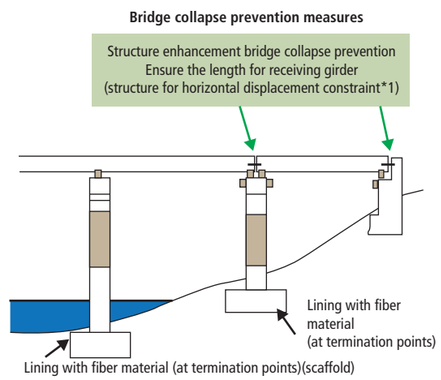






Bridge collapse prevention measures (Level 3 in the Seismic resistance performance)

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

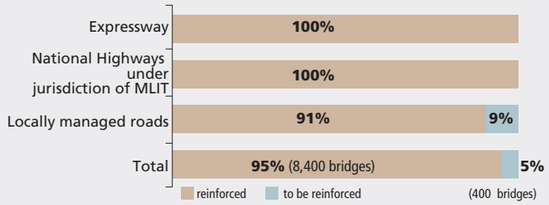


Note *1: only for curved and skew bridges
*2: Reinforcement of support (replacement of support and structure to diverge horizontal force and/or prevent difference in level)

A seismic retrofitting of overpass

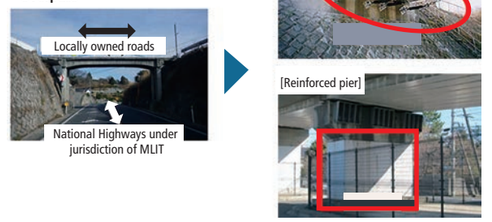
-Overpasses over expressways and national highways under jurisdiction of MLIT are given priority on the collapse prevention measures in the next 5 years (400 bridges are owned by local governments as of November 2016).

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.

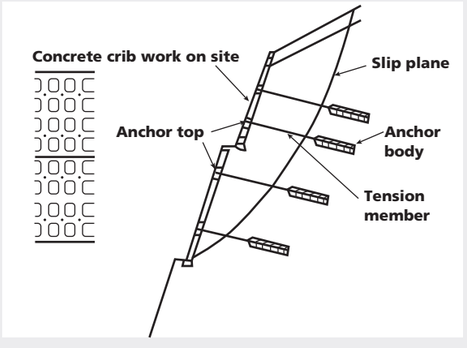
Rock falling protection fence

Pocket-type rock falling protection net

Wire rope work

Concrete crib work

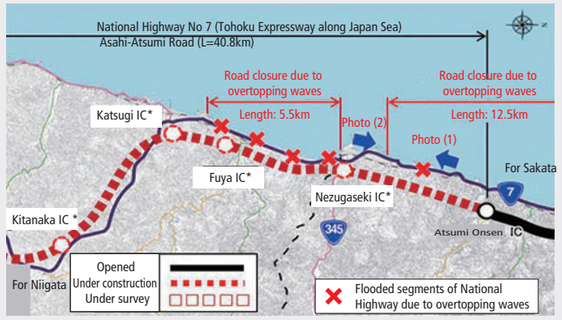
Crib work + anchoring



Illustrative description of anchoring

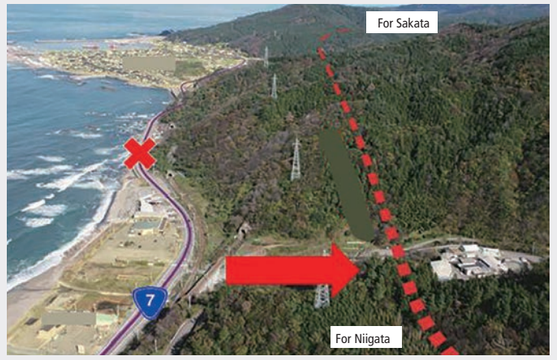
Enhancement of road network for redundancy

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)

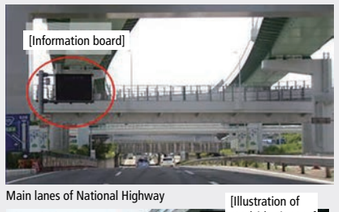
High-standard Arterial Highway is developed to ensure alternative route in the event of disaster (example of Asahi-Atsumi Road)

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.

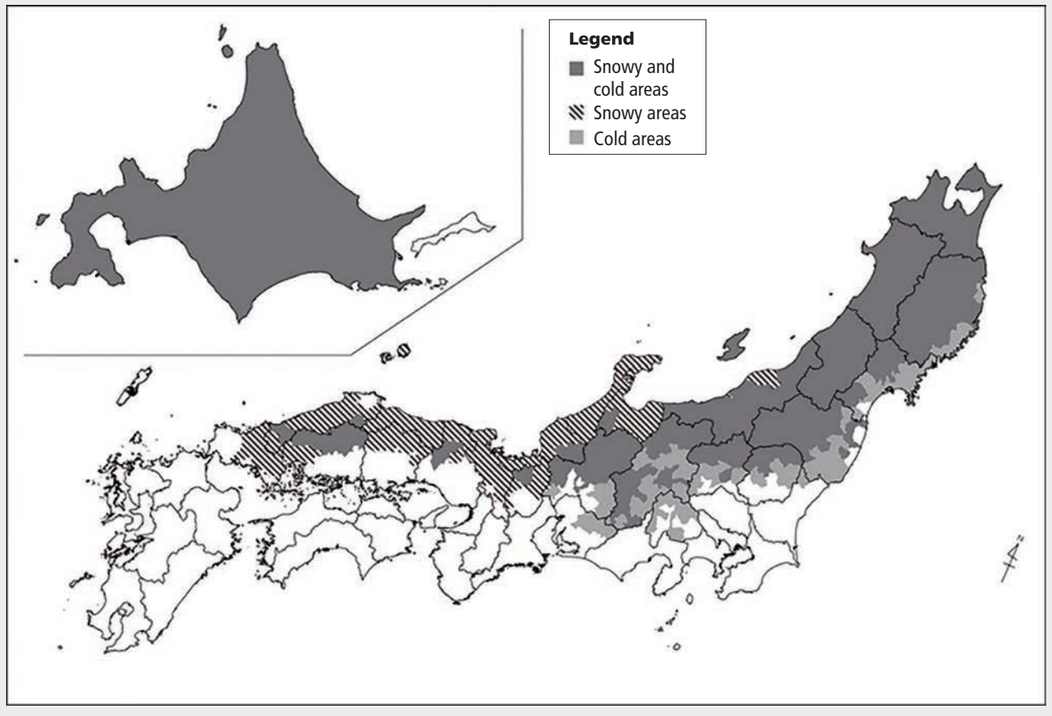


Figure: Snowy and Cold Areas

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)]

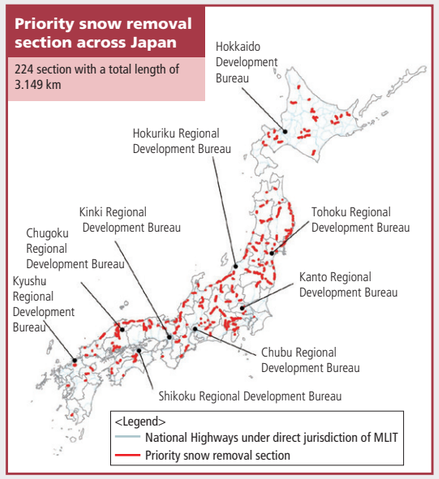
- national highways under jurisdiction of MLIT：175 sections, 980 km (total 4%)

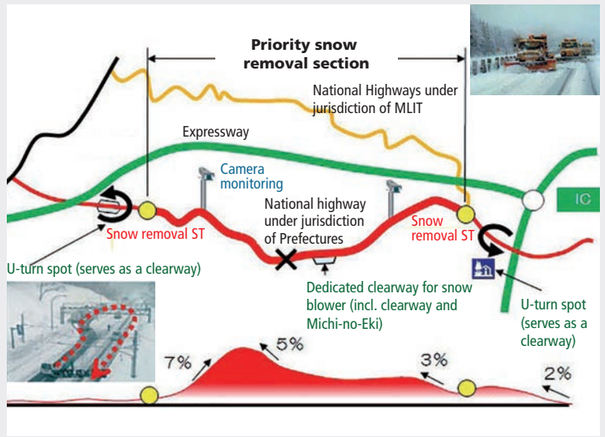
(As of April 1, 2014)

・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

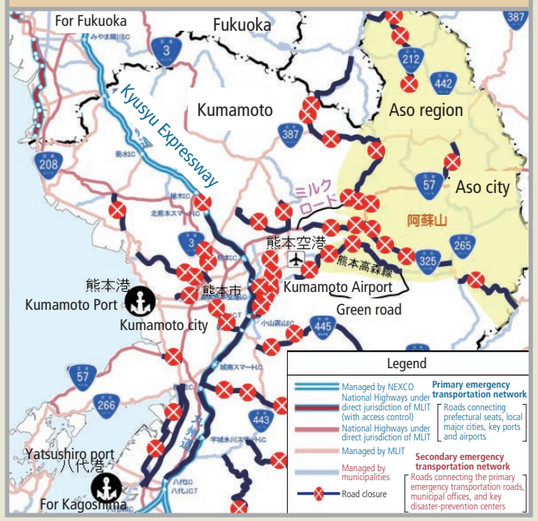
For the arterial network,

-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.