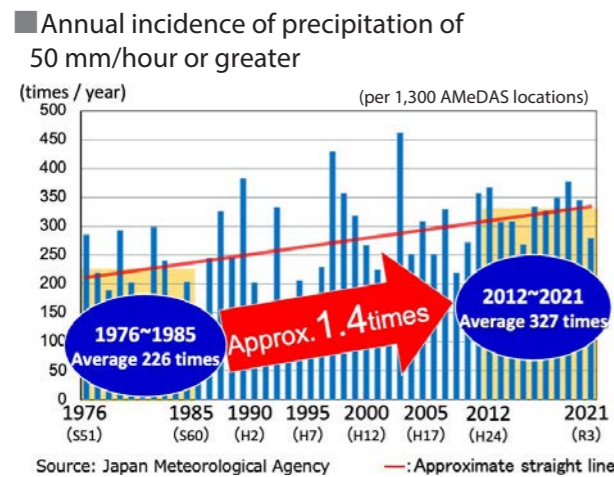


# Disaster prevention and mitigation, national resilience

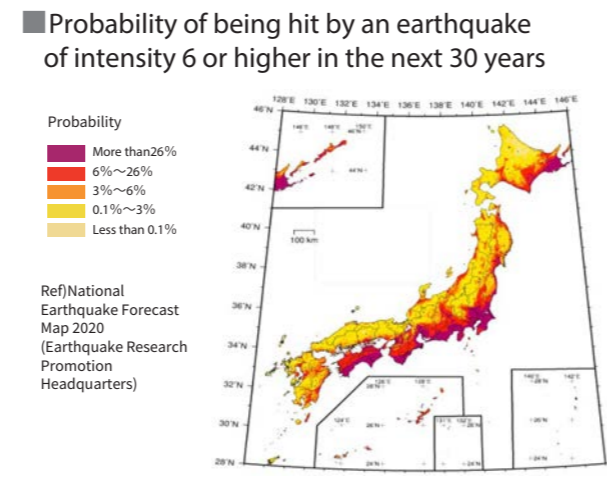
## - Protecting people's lives and livelihoods from disasters -

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

### Increasingly severe and frequent weather disasters



### Major earthquakes that can occur at any time



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

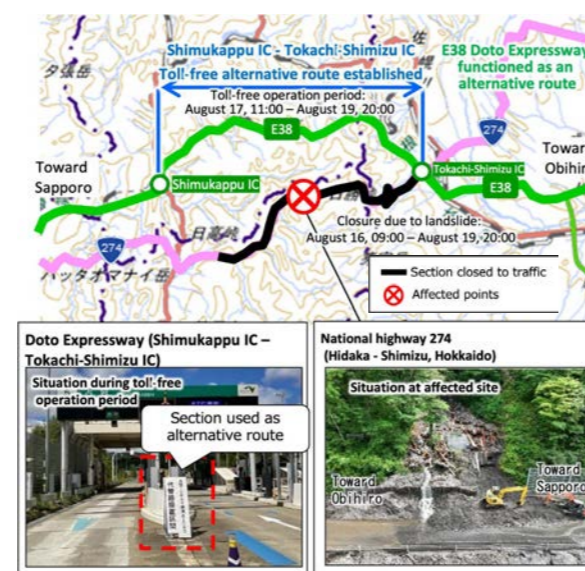
#### Early reopening of four-lane sections to traffic

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



#### Securing transportation functions through a redundant network

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



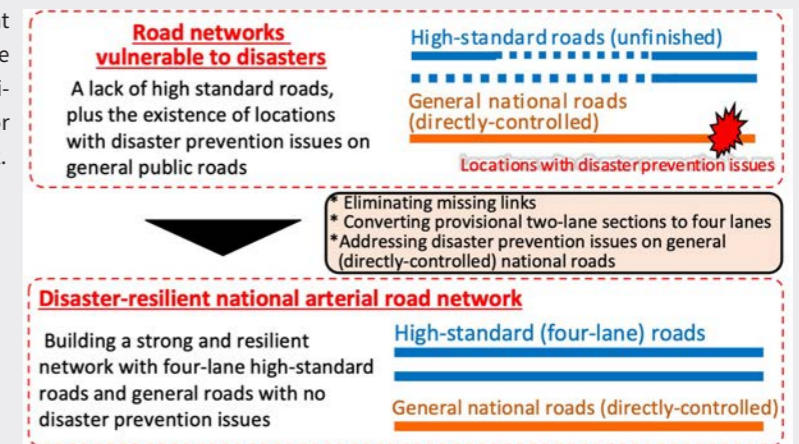
## Radical and comprehensive disaster prevention and mitigation measures to be put in place in advance

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

### Expressway Renewal

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

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

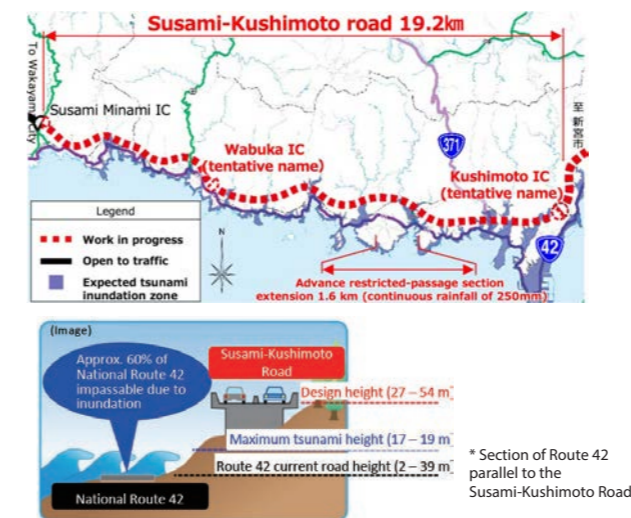


\* Rate of improvement of missing links on high-standard roads (2019 -> 2025): 0% -> approx. 30%  
 \* Percentage of 4-lane conversion projects in priority improvement sections (Ref.3,4) of high-standard toll roads started (2019 -> 2025): approx. 13% -> approx. 47%

### Eliminating missing links

(National Highway 42 Susami-Kushimoto Road)

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

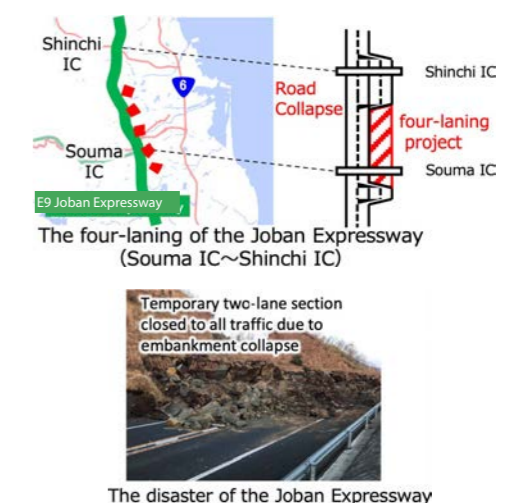


Ref.1: December 11, 2020 cabinet resolution  
 Ref.2: April 27, 2021 decision  
 Ref.3: Approximately 880 km section as defined in the Basic Plan for Safety and Security on Expressways (decided September 10, 2019)  
 Ref.4: As of March 31, 2022, approximately 1,400 km had not yet been converted to four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

### Conversion of provisional 2-lane sections to 4-lane

(Joban Expressway)

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



## Radical and comprehensive advance disaster prevention and mitigation measures

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

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

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

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

### Boosting earthquake resilience of road bridges

Promote seismic retrofitting of bridges on emergency transportation roads

(Measures to ensure that even in a major earthquake, only minor damage is sustained, and that functionality can be restored quickly)

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

### Landslide prevention measures for road slopes and embankments

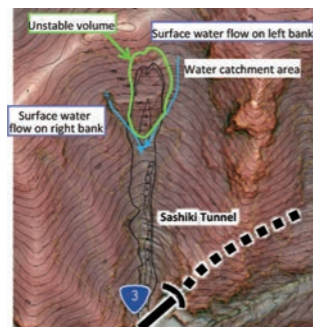
Promote countermeasures on slopes and embankments against newly-identified disaster risks through advanced inspection methods, etc.

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

#### Disaster case studies



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



Examples of advanced inspection methods Laser profiler inspection results

#### Mitigation case studies

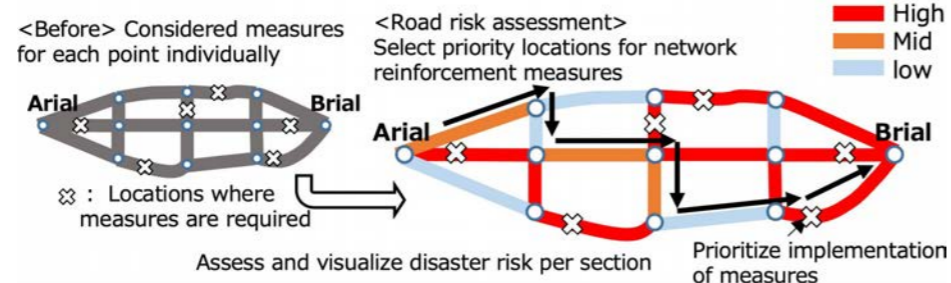


Fukuchiyama city, Kyoto

### Implementation of road risk assessment Ref.1

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

#### Use-case image



Ref.1 Deployment of road data platform "xROAD" etc.

## Radical and comprehensive disaster prevention and mitigation measures

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

### The use of elevated sections of roads as inundation evacuations.

#### Background / data

• About 1,800 km of road sections nationwide are higher than the submersion depth of tsunamis and floods. [Ref. 1]

\* In the aftermath of the Great East Japan Earthquake, roads were used as emergency evacuation sites, demonstrating their secondary disaster prevention function. [Ref. 2]

\* when constructing roads, consider the risk of inundation by tsunamis and other disasters

\*In order to support local governments in their efforts to secure emergency evacuation sites, evacuation facilities will be constructed in elevated sections.

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

#### Evacuation facility image

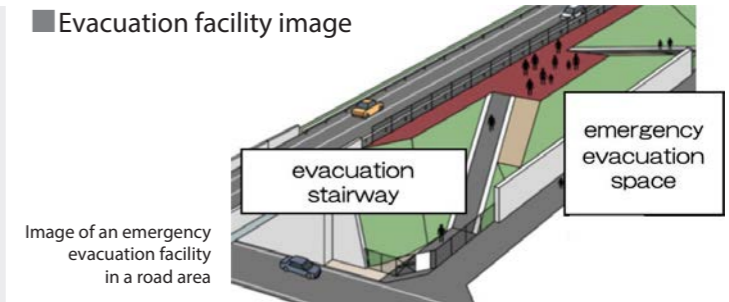


Image of an emergency evacuation facility in a road area

#### Case study



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

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

#### Background / data

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

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

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

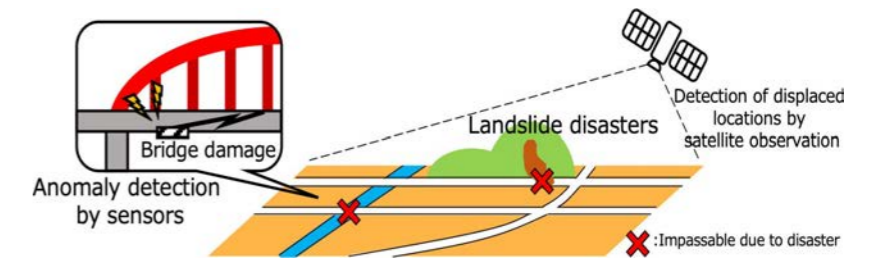
### Information provision, road opening, and damage ascertainment in times of disaster

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

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

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

#### Image of damage ascertainment methods



Ref. 1: Expressway and national highway under jurisdiction of MLIT

Ref.2 : Designate roadside rest areas that serve as wide-area disaster prevention centers as "Disaster Prevention Michi-no-Eki "

Ref.3 : Parking lots at Michi-no-Eki, etc. that serve as bases for emergency response measures in the event of a wide-area disaster

## Radical and comprehensive disaster prevention and mitigation measures

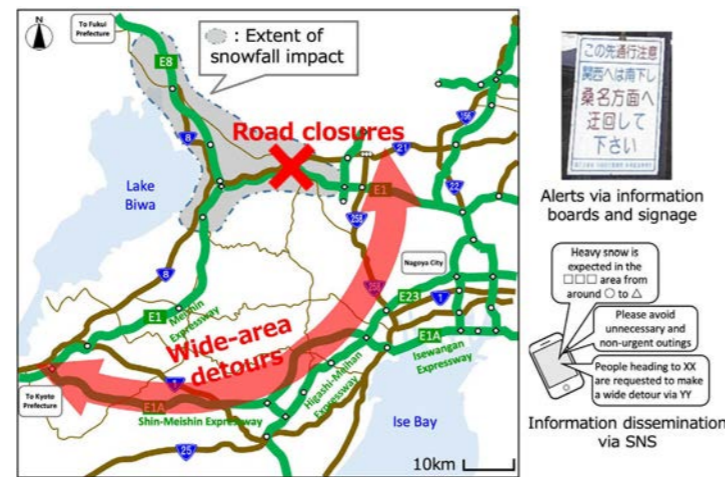
In the event of a disaster, while placing the highest priority on human lives, we will implement measures such as road closures so as to minimize the impact on socioeconomic activities.

### Disaster preparedness and cooperation

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

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

#### Examples of calls for behavioral change



### Winter road traffic security Ref.1

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

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



### Spot measures at snow risk locations

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



### Support for municipalities

Assist municipalities to strengthen their snow removal systems



Lending of small snowplows and other vehicles free of charge



Sending snow removal machine

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

## Recovery and restoration from large-scale natural disasters

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

### Background / data

Recovery from the Great East Japan Earthquake



- Reconstruction road and Reconstruction support road (550km) for the Great East Japan Earthquake in 2011 fully opened on December 18, 2021.
- Sections started after an earthquake will be open in about 8 years on average.
  - opened in 6 years at the earliest
- The opening of the entire line has greatly reduced travel time between cities.

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

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

### Disaster recovery projects on behalf of local governments

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

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

### Rapid reopening to traffic secured by emergency-assembly bridges

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

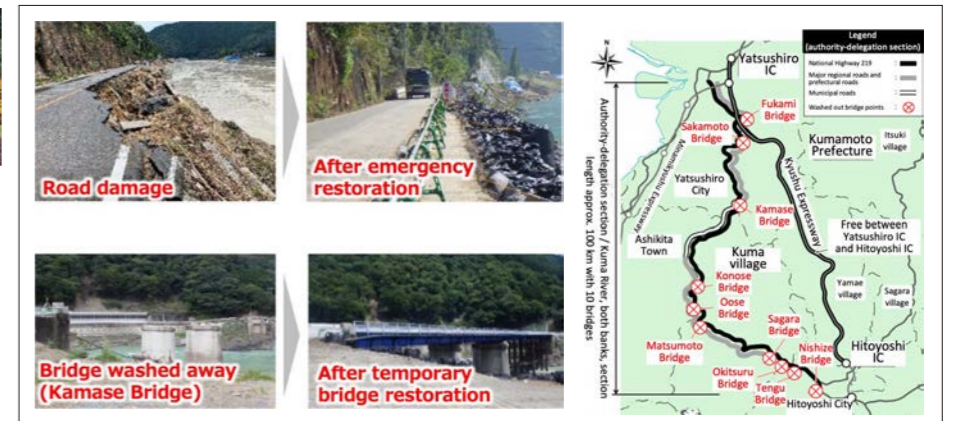
### Examples of authority delegation



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



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



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

### Examples of emergency-assembly bridge deployment



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