

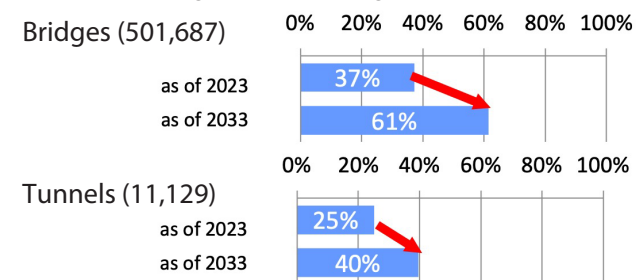
# Major shift to preventive maintenance

## - Transfer safe and secure roads to 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 pass on reliable infrastructure to future generations. In order to quickly shift to preventive maintenance that reduces life cycle costs and achieves efficient and sustainable maintenance management, we will accelerate measures for facilities in need of repair as identified by periodic inspections and promote the active use of new technologies.

### Increasingly serious aging of infrastructure

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



Infrastructure facilities more than 50 years old

\*(I) indicates numbers of bridges and tunnels, excluding those where year of construction is unknown



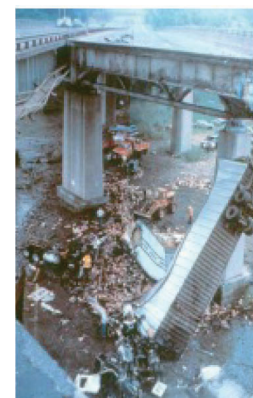
Judgment category IV (urgent measures should be taken)

### America in Ruins

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



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



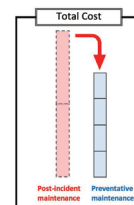
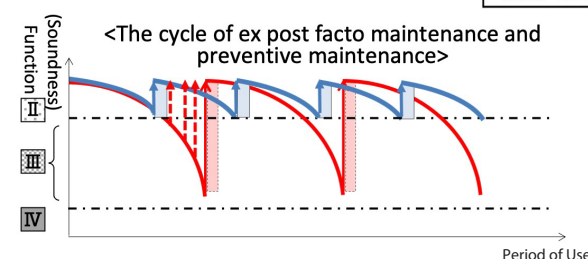
Collapse of the Maianas Bridge (1983)



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

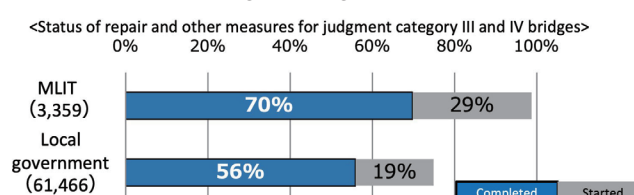
### Medium- to long-term cost reduction through preventive maintenance

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).



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

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



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

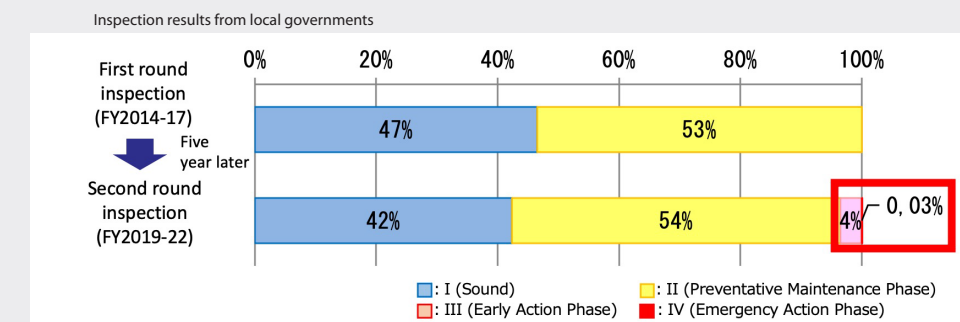
### Financial and technical assistance to local areas

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

#### Background / data

[FY2023 annual road maintenance report]

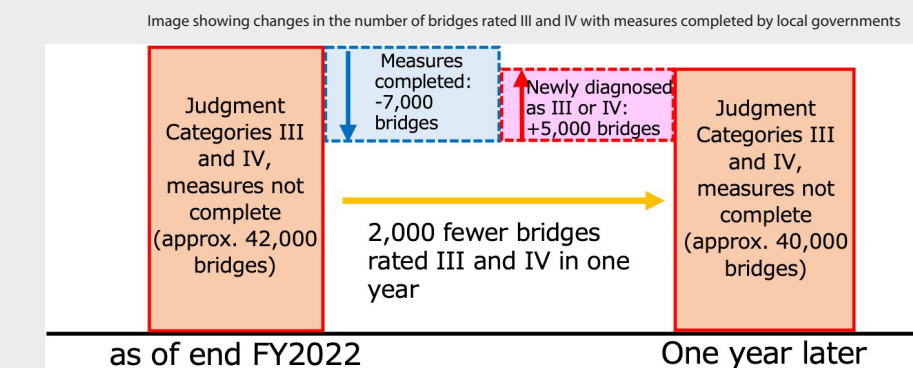
- Proportion of bridges rated from I/II in the first round to III/IV in the second round of inspections five years later: 4%.



[Transition to preventative maintenance]

- At the current budget level, complete transition to preventative maintenance will take about 20 years (based on end FY2022 criteria).

(Note:) it is expected to take approximately 10 years under jurisdiction of MLIT



### Financial support for local government

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

- Promote the shift to preventive maintenance by providing systematic and intensive financial support for facilities that require early repair and other measures.
- Priority support will be given to projects that use new technologies (Ref.1) and to the projects of local governments that have established short-term numerical targets for consolidation or removal of bridges (Ref.2) as well as the use of new technologies and their cost reduction effects in their Long Life Repair Plans.

Ref.1: Program to promote new technologies

Ref.2: Support for consolidation, removal, and reductions of functionality

Ref.3: Directly managed diagnoses (FY2014-2022): 17 locations; repair and maintenance (FY2015-2022): 16 locations

### Technical support for local government

Technical support provided by the government, including repair services and training on repair. (Ref.3)

- 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

## Improve efficiency and sophistication of periodic inspections, and introduce new technologies and materials

To improve the efficiency and sophistication of maintenance management, we promptly prepare and actively utilize the catalogs and technical standards that are necessary for the introduction of new technologies, as well as encourage the acquisition of qualifications for inspection technicians.

### Background / data

- In order to promote the use of new technologies, create and publish a performance catalog of inspection support technologies (Ref.1).
- Some of the technologies listed in the catalog are to be used in principle for direct inspection of bridges and tunnels from FY2022, and pavements from FY2023 (detailed in special specifications).
- Since 2023, qualifications (Ref. 2) have been required for engineers in charge of inspecting bridges on national highways under jurisdiction of MLIT.

## Improvement of efficiency, sophistication, and quality of periodic inspections

In addition to bridges, tunnels, and pavements, promote more efficient and sophisticated periodic inspections by utilizing the performance catalog of inspection support technologies for construction works, created in November 2023.

Review periodic inspection procedures for bridges, tunnels, and utilize new technology to improve efficiency in the third round of inspections starting in FY 2024.

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

## Promoting the introduction of new technologies

Promote technological research and development conducted by start-up companies to improve efficiency and sophistication of maintenance and management (also utilizing SIP(Ref. 3) and SBIR(Ref. 4)).

Promptly establish technical standards necessary for the introduction of new technologies.

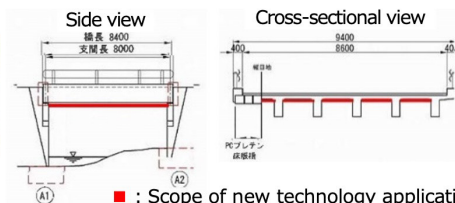
### Examples of new technology applications

Bridge name: Omosawa Bridge  
(National Route 20)  
(Fujimi-machi, Suwa-gun,  
Nagano Prefecture)  
Bridge length: 8.4 m  
Bridge type: Girder bridge (T-girder)  
Target parts and materials  
: Below main truss, bridge deck  
Type of deformation to be covered  
: Cracks and fissures, Rebar exposure

Conventional inspections  
(Inspection by ladder)



Overall view of  
the bridge



■ : Scope of new technology application  
(under main truss, bridge deck)

Inspection utilizing new technology  
(Creation of damage diagrams by equipment)



- No risk of falling from heights, as personnel can work at ground level
- Number of personnel required was reduced by approx. 70%. (3 people -> 1 person)
- Number of inspection days was reduced by approx. 50% (1 day -> 0.5 day)
- Inspection costs were reduced by approx. 30%. (about 160,000 yen -> about 110,000 yen)

Inspection status

Inspection camera

Inspection camera

### Performance catalog of inspection support technologies (246 technologies as of November 2023)



## Improving efficiency of maintenance and aging management measures

Support the consolidation, functional reduction, and removal of aging bridges and other structures to reduce maintenance costs, and promote comprehensive private sector outsourcing to improve the efficiency of local governments' maintenance and management and to provide good public services.

In order to achieve preventive maintenance to extend the service life of pavements, analyze and utilize data obtained through the road data platform and thereby efficiently promote pavement management and other activities.

## Support for consolidation, removal, and reductions of functionality

### Background / data

- About 80% of municipalities have considered consolidation or removal (as of the end of FY2022)

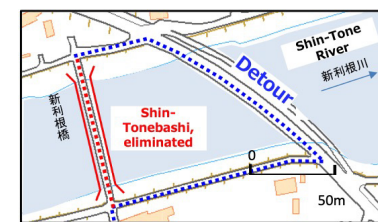
Support for consolidation(Ref. 1) , functional reduction, and removal(Ref. 2) of replaceable aging bridges and other structures through the creation of case studies and the Road Maintenance Project Subsidy Program(Ref. 3).

- Proportion of local governments that considered consolidating or removing facilities or reducing their functions (2019 -> 2025): 14% -> 100%

## Promotion of comprehensive private sector outsourcing

Promote efforts by local governments to comprehensively outsource the management of road maintenance and repair to the private sector.

### Example of cost reduction associated with consolidation and removal of road bridges (Shin-Tone Bridge: Inashiki City, Ibaraki Prefecture)



This initiative reduced bridge inspection costs by 0.2 million yen/year.

## Next generation pavement management

### Background / data

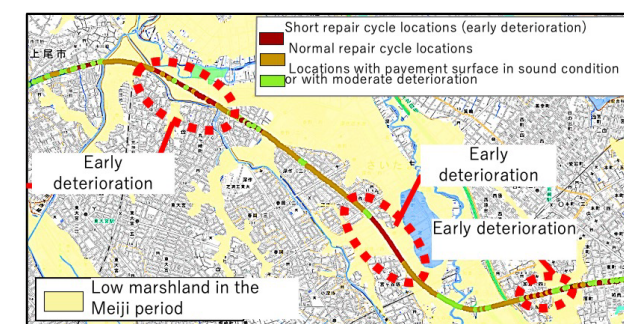
- Damage to the roadbed causes premature deterioration of the surface layer, resulting in a large increase in LCC.
- Repair completion rate of pavements requiring repair such as roadbed replacement is 14% for the roads under jurisdiction of MLIT (as of the end of FY2022).

Inspection support technology performance in pavement inspection of national highways under jurisdiction of MLIT  
Efficient inspections using AI or ICT through the general rule of catalog(Ref. 4) utilization.

Promote preventive maintenance through visualization of pavement condition, and repair history.

Promote revision of technical standards to achieve preventive maintenance.

### Example of relationship between prematurely deteriorated areas and land formation



National Route 16 between Omiya and Iwatsuki

Data analysis is possible by superimposing information on the location of pavement inspection results with information on land formation

Early deterioration was found in past low marshland locations

Ref. 1: Performance values for each technology are organized and published in catalog format for each standard item <https://www.mlit.go.jp/road/sisaku/inspection-support/>

Ref. 2: Qualifications required of management engineers in their work (e.g., professional engineer, doctoral degree, JSCE certified engineer), private qualifications registered as "Ministry of Land, Infrastructure, Transport and Tourism Registered Qualifications," certificates of training in road bridge maintenance technology.

Ref. 3: Strategic innovation creation program, which is an industry-academia-government collaboration on cross-disciplinary research and development, in collaboration with government ministries and agencies.

Ref. 4: Small Business Innovation Research Program, supporting research and development by startups and the commercialization of their results.

Ref. 1: Only when repairing structures at the consolidation site or reconstructing roads to divert to the consolidation site.

Ref. 2: Only when road reconstruction is simultaneously implemented, when flood control effects are expected from removal, or when short-term numerical targets for removal and its cost reduction effects are specified in the service life extension and repair plan.

Ref. 3: Road maintenance project subsidy program

Ref. 4: Performance catalog of inspection support technologies



## Large-scale renewal of Expressways

Planned systematic large-scale renewal of expressways managed by expressway companies

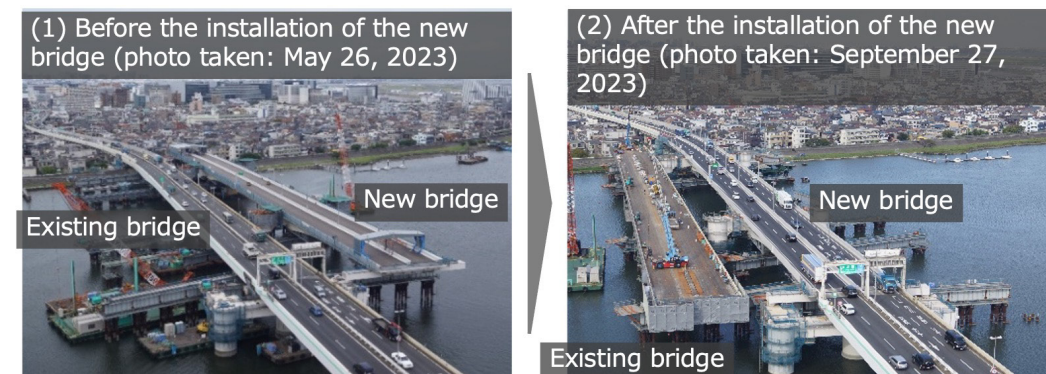
### Expressway Renewal

#### Background / data

- Status of road closures for specific renewals (FY2022, total of 6 Expressway companies)
- All-day road closures (main lanes): 19 locations for a total of 723 days
- Two-way traffic restrictions: 61 locations for a total of 3,432 days

Systematically promote renewal projects while minimizing the social impact of traffic restrictions, by devising construction methods, utilizing new technologies, and thoroughly publicizing the project in advance through media tours and other means.

#### ■ Example: Metropolitan Expressway Daishi Bridge (bridge replacement project)



Construction of a new bridge with a length of approximately 300m by moving it to the location of the existing bridge.

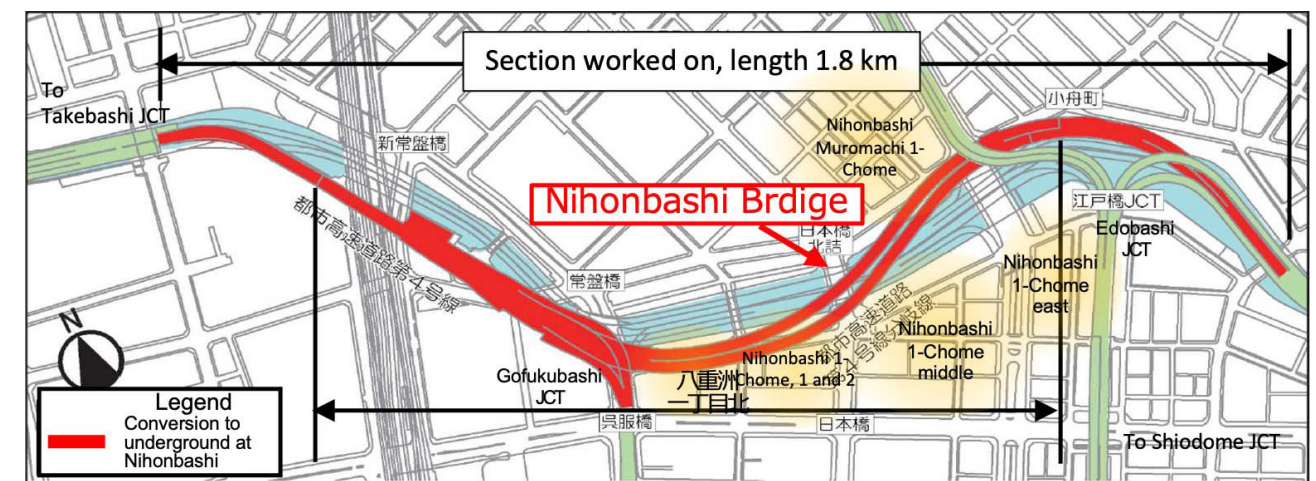
From the closure of the existing route to the opening of the new route in two weeks (May 27 – June 10).

Continue to steadily implement other renewal projects in line with the revised law(Ref. 1) enacted in May.

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

In addition to aging countermeasures, the Nihonbashi section undergrounding project(Ref. 2) will improve the functionality of the road by widening the shoulders, and will be linked to private redevelopment projects such as the revitalization of the waterfront space around the Nihonbashi River and the development of business centers.

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



\* Based on current information on redevelopment plans

Ref. 1: The Act Partially Amending the Act on Special Measures concerning Road Construction and Improvement and Japan Expressway Holding and Debt Repayment Agency Act (Act No. 43 of 2023)  
Ref. 2: The city plan was renewed in October 2019, the business license was granted in March 2020, and the construction work was started in November 2020, underground route to be opened in FY2035, overpass to be removed in FY2040