Road Bridges in Japan: Characteristics, Background and Legal System

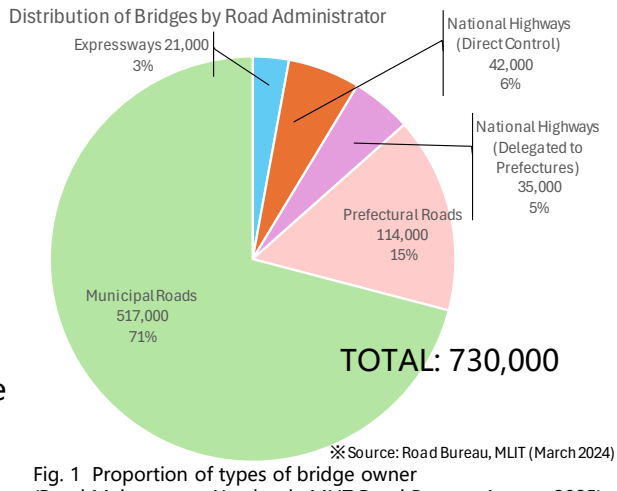
Caractéristiques, contexte et système juridique des ponts routiers au Japon

Present state of road bridges in Japan

✓ There are **about 730,000 road bridges** in Japan.
✓ **Over 70% are managed by municipalities.**
✓ Progressive aging and deterioration (over 50 years old: **39%** → **63**% in 10 years)

Geographical and climate conditions and deterioration

✓ Long coastlines
→ Vulnerable to salt damage
✓ North regions:
Heavy snow regions → Frost damage
Deicing agents (calcium chloride) accelerate corrosion.



※Source: Road Bureau, MLIT (March 2024)

Fig. 1 Proportion of types of bridge owner
(Road Maintenance Yearbook, MLIT Road Bureau, August 2025)

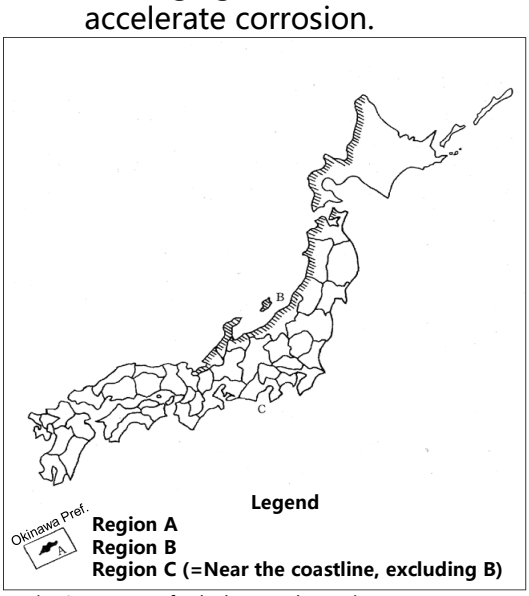


Fig. 2 Degree of salt damage by region
(Specifications for Highway Bridges III), Oct. 2025, Japan Road Association)

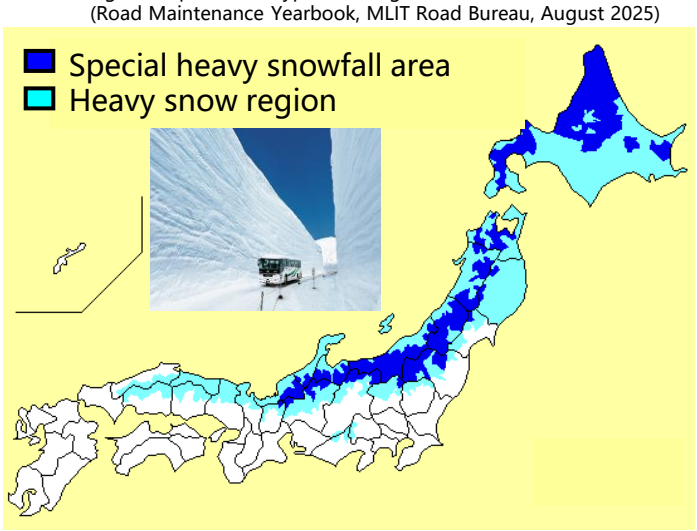


Fig. 3 Designated heavy snow regions and special heavy snowfall regions
(http://www.sekkankyo.org/zenkoku.htm)

Background summary

• Environmental conditions in Japan are harsh for bridges.
→ Legislative Institutional framework for inspections and diagnosis are essential.

Legal inspection system in Japan (close visual inspection every five years)

Overview of legal inspections

✓ Close visual inspections every five years mandated since 2014
✓ Rating: I to IV (nationally standardized assessment categories)
✓ Records: Nationally standardized MLIT format

Table 1 Classification of structural soundness diagnoses (notification)

Category		Condition
I	Sound	Condition in which the structure is fully functional
II	Preventive maintenance stage	Although structural functionality is not impaired, preventive measures should be taken from the standpoint of preventive maintenance.
III	Early corrective action stage	Structural functionality may be impaired, and early corrective actions should be taken.
IV	Urgent corrective action stage	Structural functionality is impaired or is highly likely to be impaired, and urgent correction action should be taken.

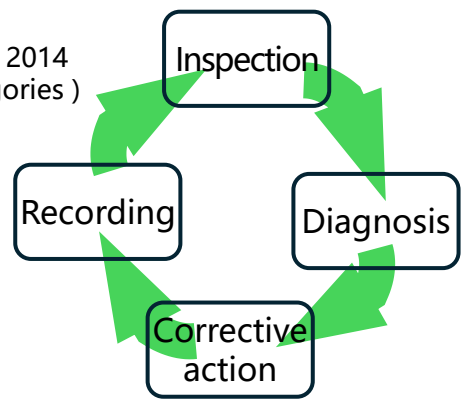


Fig. 4 Institutional framework for effective infrastructure management

Japan Bridge Engineering Center
https://www.jbec.or.jp/en/

JBEC Japan Bridge Engineering Center

Qualification System and Inspection and Diagnosis Practices (Role of JBEC)

Système de certification et pratiques d'inspection et de diagnostic (rôle du JBEC)

Resilience

MLIT qualification registration system (since 2014)

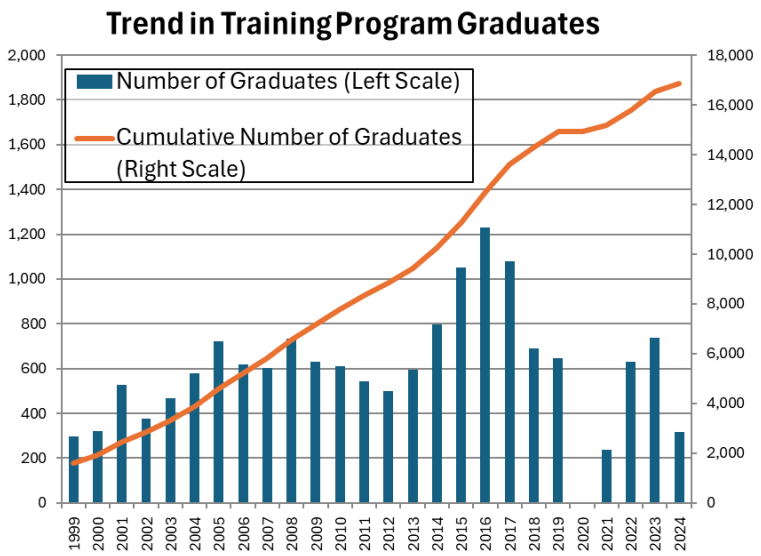
✓ Review and registration of private qualification by national government
✓ 402 qualifications
(maintenance 299, bridge maintenance 129)

Bridge inspector qualification system by JBEC

✓ Training → Examination → Work experience → Registration (Fig. 1)
✓ Inspectors 9,380/Assistant Inspectors 1,449 (Fig. 2)

Fig. 1 Qualification registration process

Fig. 2 Numbers of participants and graduates of bridge inspectors training course (as of March 2025)



Inspection record (determination and recording of bridge conditions)

1. Basic information and comprehensive evaluation
2. Element-by-element evaluation
3. Prevention of third-party damages/injuries
4. Photographs, damage diagram, data records

These measures keep soundness and resilience of bridges nationwide.

Photo 1 Field training

Diagnosis (engineering judgment and forecast)

✓ Evaluation of structural soundness and durability
✓ External influences (earthquakes, floods, frost damage, salt damage)
✓ Forecasting future deterioration (for five years)
✓ Repair/reinforcement planning → with an emphasis on preventive maintenance

Table 1 Concept of bridge soundness assessment (elements × external influences) Concept of structural soundness assessment

Element	Increase in live load	Earthquake	Heavy rain/flood
Superstructure	Fatigue/deflection	Deformation	Corrosion/leakage
Superstructure/ substructure connection	Bearing abnormality	Collapse risk	Bearing deterioration
Substructure	Increase in footing reaction	Seismic stability	Scour
Fail safe structure	–	Restraining function	–
Overall bridge category	I - IV		

Japan Bridge Engineering Center
https://www.jbec.or.jp/en/

JBEC Japan Bridge Engineering Center

Trends in Structural Soundness of Bridges and FAQ

Tendances de l'intégrité des ponts et FAQ

Present state of assessment and corrective actions

✓ III and IV require repairs or reinforcement.
✓ IV involves traffic restriction.
✓ Nationwide, III and IV is declining, but the rate of change is gradual.

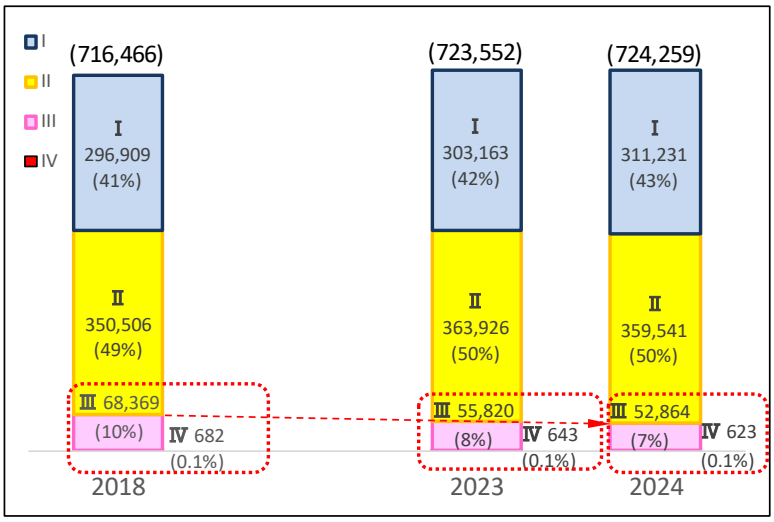


Fig. 1 Numbers of bridges inspected in the past (FY2014 to FY2024) and the proportion of soundness categories
(Road Maintenance Yearbook, MLIT Road Bureau, August 2025)

FAQ:

Q1. Why are there many bridges in Japan?
A. Japan is a notably mountainous country that requires many bridges.

Photo 1 Examples of damage due to geographical and climatic conditions


ARCH (Corrosion)


SLAB (Two-Way Cracks and Efflorescence)


BEARING (Corrosion)


PIER (Cracks and Efflorescence)

Q2. What measures are being taken to cope with labor shortages?
A. Use of inspection support technology.

Q3. Who determines the bridge soundness categories I to IV?
A. Road administrators, as mandated by law.

Q4. How is the reliability of inspection results ensured?
A. Inspections are conducted by qualified inspectors who have specialized knowledge and skills. Bridge conditions are evaluated by close visual inspection or equivalent means to minimize misjudgment as well as by use of legally- standardized evaluation forms. This ensures objectivity and reliability of inspection results.

Q5. Is close visual inspection alone sufficient to obtain complete information?
A. AI image analysis and use of UAVs are used as needed.

Q6. Are numerical evaluation and diagnosis software used?
A. Some road administrators use methods such as field use of tablet data recording and AI-assisted damage detection. Periodic inspections do not involve detailed evaluation such as using structural analysis.

Japan Bridge Engineering Center
https://www.jbec.or.jp/en/

JBEC Japan Bridge Engineering Center

Inspection Support Technology Performance Catalog (Bridges)

Catalogue des performances techniques d'aide à l'inspection (ponts)

Organizations responsible for promoting the deployment of new technologies

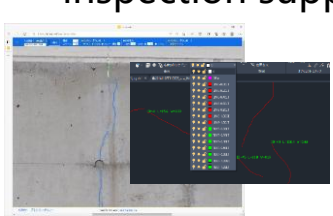
For promoting the introduction of new technologies, the Road Bureau of MLIT selects third-party institutions (deployment promotion organizations) for tasks—such as technological validation necessary for assuring new technologies—to be carried out in cooperation with the national government.
JBEC has been designated by MLIT as an institution to promote the deployment of "bridge inspection support technologies." Specifically, JBEC is assisting in formulating inspection support technology performance catalogs.

Inspection support technology performance catalogs

Performance catalog are documents that can be used as a reference for entities who want to use inspection support technologies. The catalogs They are useful in comparing and reviewing different equipment and devices.

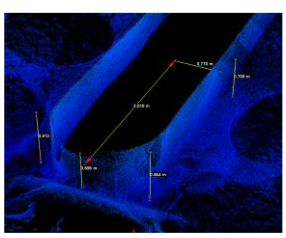
Catalog classification	Description	Number of entries (April 2025)
Image measurement technologies	Technologies by imaging or measurement bridge elements, techniques for processing image data and preparing documents	61
Non-destructive inspection technologies	Technologies for sensing and measuring defects of structures by non-destructive inspection	31
Measuring/monitoring technologies	Technologies for structural sensing or monitoring	53
Total		**145**

Example of applications of inspection support technologies

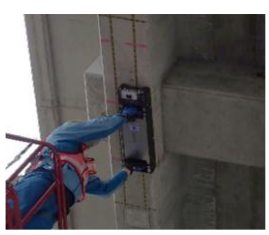


Automatic crack detection and mapping

Imaging using a cable robot



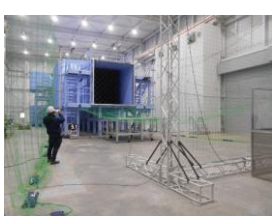
Substructure/river bed profiling using sonar



Steel rupture detection using magnetism

Validation of performance

Testing using a test bridge (Fukushima Robot Test Field)



Wind tunnel test (Fukushima Robot Test Field)

Testing using a specimen (National Institute for Land and Infrastructure Management)

Japan Bridge Engineering Center
https://www.jbec.or.jp/en/

JBEC Japan Bridge Engineering Center