

# Building a strategic management cycle for road structures

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## 1. Introduction

The Fundamental Plan for National Resilience that was determined by the Cabinet Decision in July 2023 has shown 4 fundamental goals and 5 basic policies. Among them, pillars that have intricate relationships with the technological policies in the road structure sector have also been launched, such as the strengthening of lifelines and the securing of substitutability as well as the improvement of capabilities to address disasters by the utilization of new technologies such as digital.

Among them, as one of the measures to increase the resilience of lifelines such as roads, it is shown that reduction of the life cycle cost will be pursued by full-fledged conversion to maintenance of the preventive maintenance type, and at the same time that infrastructure management will be implemented efficiently and strategically by grasping the infrastructure in multiple sectors as a group from the viewpoints of wide areas.

Based on this trend, this paper presents a plan for the strategic management of road structures as dealt with by the Road Structures Department. Also, since FY 2023 will be the final fiscal year in the second round of regular inspection of bridges and tunnels, we have organized the problems we will confront in the third round. We have also examined the review of regular inspection procedures (technical advice). Our efforts

in this respect are outlined below.

## 2. Management cycle for road structures

The Road Structures Department conducts research on technological measures that enable the management cycle to be run strategically. Roads play a role of linear functions through the mutual configuration of road structures. This is not limited solely to point-like technological measures such as the maintenance cycle of individual road structures or disaster prevention inspection, etc.

The figure below shows an image of such cycle in its entirety. It aims at the improvement of technical standards that enable the design, inspection, and repair of each structure to be implemented based on the performance required for roads. It also aims at building a mechanism that will lead to efficient management by utilizing the data that will be obtained in the processes of this cycle.

## 3. Organizing problems in preparation for the 3rd round of regular inspection

In 2014, legally defined regular inspections were started, and in 2019 when the first round ended, the first review of the regular inspection procedures was implemented. At the time, it was shown that, when it is determined that sound diagnosis is equivalent to the diagnosis achieved by close visual inspection, other methods may also be considered equally viable where

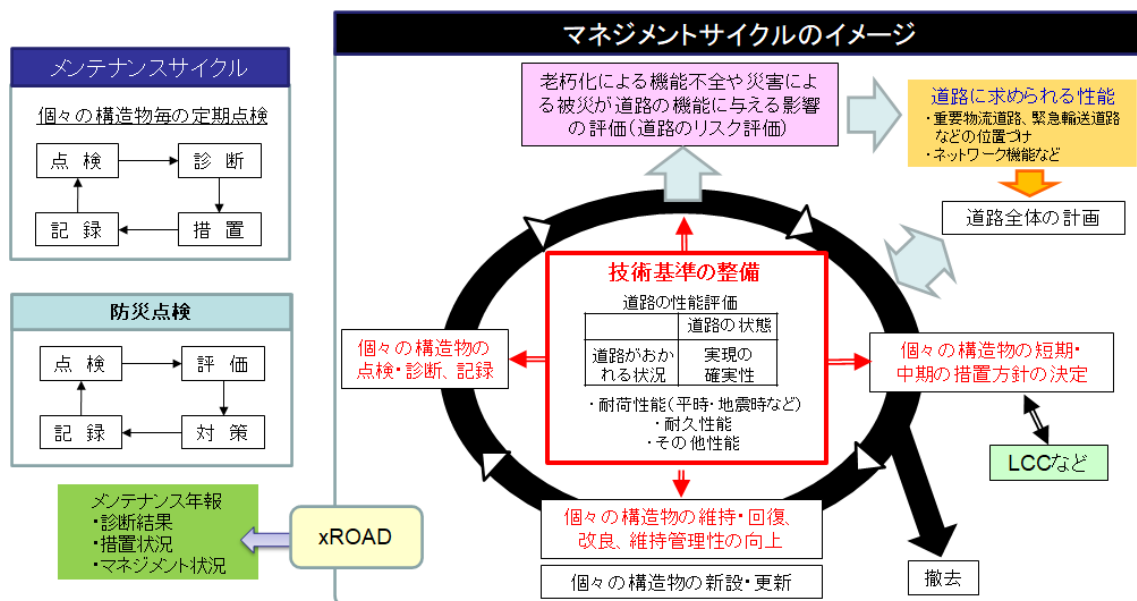


Figure: Image of the management cycle for road structures

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close visual inspection is basically used. Now that the second regular inspection has ended, by taking a bird's-eye view of the results of such analysis, problems have been generally classified into 3 distinct categories.

The 1st category is one that shows an unevenness in the quality of regular inspections. This may have been caused by relative differences in the examination process of diagnosis and in the quantity or quality of information was obtained for diagnosis, depending on the manager of structures.

The 2nd category is one that shows the record of the diagnosis process that is the basis for the diagnosis was insufficient. This becomes a great obstacle in the promotion of the management of road structures based on data that will be taken into account by the road administrator.

The 3rd category is one that shows the problem of a burden of inspection. It also has reveals a deficiency of the lack of engineers. There is also the problem that records and data until the present have not been fully utilized effectively. The clarification of records that should be kept is necessary.

These problems all have aspects that are interrelated. It is considered to be important that, in the management cycle shown in the figure, diagnosis based on performance will be implemented in the inspection, thereby enabling the road administrator to evaluate the effects of malfunction due to aging degradation and damage caused by a disaster on the functions of roads. At the same time improvements will be made so that the basis for diagnosis is recorded reasonably.

#### **4. To ensure regular inspection quality and increase efficiency**

In the current regular inspection, the condition is grasped based on close visual inspection. Then a diagnosis of soundness is classified into 4 categories as required by laws and regulations, and the results are recorded. On the other hand, on the basis of the problems described above, in order to increase the reliability of ensuring quality of the regular inspection, not only the category on classification of soundness, but the basis of such diagnosis should also be kept on record. Namely, in the diagnosis of soundness, it is important that a person having knowledge and skills estimates how the current situation of road structures are, and how their condition will be in relation to the situations assumed by the time of next inspection, and keeps such estimation as a record.

For example, in the case of a road bridge, assumed situations include factors such as the situation where a live load acts, the situation where an earthquake occurs, what effects of torrential rains might have, and the like. In relation to these assumed situations, it is important that the state of the bridge as a whole and the state of each of the structures constituting the bridge (superstructure, substructure, and each structure

when classifying the bridge into the units of connections from the top to the bottom parts) will be evaluated, and specific findings related to the estimation of performance will be recorded. After that, if a decline in the performance is estimated, the road administrator will determine short-term or mid-term measures and policies. However, if the repair method is examined based on the concept of performance recovery, a repair method other than simply returning the shape to its original one may also be considered in the broader picture. It is also considered possible that such an examination will lead to reasonable repair based on the shape and state of the structure. Note that, from the viewpoint of increasing efficiency of regular inspections, there is also the need to systematize the inspection items and how records should be kept. Also, from the viewpoint of enabling the results of inspection to be utilized in asset management and risk evaluation, it is considered that data recording such as the estimation of performance should be standardized and codified, thereby organizing the environment in order to enable efficient quantitative analysis. The records that should be kept will be clarified, and no records beyond what is necessary will be required, thereby ensuring that the efficiency of inspections.

#### **5. Conclusion**

In the Road Structures Department, we would like to continually proceed with necessary research so that the management cycle of the performance required for roads will function appropriately. In so doing we will continue to make efforts to implement the research in the practical business of the plan, design, as well as maintenance and management of roads.

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☞ **For detailed information, refer to the following:**

- 1) FY 2023 NILIM Lecture Meeting, Making PDI infrastructure more resilient  
<https://www.nilim.go.jp/lab/bbg/koen2023.html>
- 2) Council for Social Infrastructure Development, Road Subcommittee, Road Technology Subcommittee, 20th Road Technology Subcommittee, Jan. 2024  
[https://www.mlit.go.jp/policy/shingikai/road01\\_sg\\_000673.html](https://www.mlit.go.jp/policy/shingikai/road01_sg_000673.html)