

Research Trends and Results

Upgrading Inspection and Management Methods for River Management Facilities

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1. Background

Of the 10,216 river management facilities (dams, water gates, sluices, sluice pipes, etc.) in the rivers administered by the country, as many as 3,765 facilities were constructed more than 40 years ago. The number of such old facilities is expected to continue to increase and deterioration is anticipated to accelerate in many of them.

The river administrators are monitoring the condition of river management facilities by conventionally conducting "inspections" (1 or 2 times a year), in-depth visual observations on foot, and "patrols" (comprehensive visual inspections 1 or 2 times a week, mainly from a car). They have maintained the functions of river management facilities and ensured flood control safety by detecting deformations as a sign of early damage and repairing facilities as required.

In the future, the number of deformations that will be detected is expected to increase in accordance with the increase in deteriorating river management facilities. Accordingly, efforts and time required for maintenance will also increase and, under the present maintenance system, functional maintenance of river management facilities may become difficult. Therefore, it is necessary to review the present inspection and patrol methods in the interest of upgrading the maintenance of river management facilities.

2. Technical perspectives

Conventionally, river administrators have conducted maintenance by monitoring the condition of facilities but only sporadically applied new technologies in order to rationalize their maintenance methods. They have not steadily studied enough to make continuous improvements based on actual condition using accumulated data on deformations and repairs.

In view of such circumstances, the MLIT started building a river maintenance database to record the places, types, scales, etc. of deformations found through inspections and patrols. With this database, the data that was previously managed separately by each river administrator will be collected and placed under integrated control. Taking this opportunity, maintenance of river management facilities should be streamlined by analyzing and evaluating this vast amount

of data and incorporating results into site inspections and patrols.

For example, one possibility is to construct a PCDA cycle to streamline maintenance by first identifying locations susceptible to deformation from the deformation history and characteristics of river management facilities. Then, by strengthening the inspection and patrol and grasping the type and scale of deformation that is likely to degrade the flood control safety of river levees and so forth, it should be easier to determine whether repair is required or not.

3. State of study for upgrade

As part of the study for upgrading the maintenance of river management facilities, we are collecting data obtained from the inspection and patrol of river levees in five rivers to analyze and evaluate the status of those studies. As a result, so-far unknown characteristics of inspections and patrols have begun to become clear. For example, the number of deformations found by one administrator in one day is about 150 times those found in a patrol, although there are variations according to river.

Moreover, we have just begun to quantitatively evaluate as well the decrease in flood control safety of levees caused by deformation. It was found from this evaluation that once a crack occurs in a river levee, the safety factor for sliding decreases about 10 to 20% as compared with a case of no deformation, although it depends on the location of the crack and the nature of the soil of the levee.

Note that, to identify locations susceptible to deformation from the deformation history and characteristics of river management facilities, we are using a statistical processing method that has remarkably advanced in recent years, but we are still working on it.

We will continue to study and would like to upgrade maintenance by searching for desirable methods of inspections and patrols, in order to prepare against the accelerating deterioration of river management facilities.