

## New Stage in Water Field

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*Key words: Flood disaster, disaster prevention / mitigation, maintenance, river environment, continuity*

### 1. Introduction

In recent years, Japan has often suffered serious disasters, including the Tsunami by the March 2011 Great East Japan Earthquake, Typhoon No. 12, which hit the Kii Peninsula in August 2011, the Northern Kyushu heavy rain in July 2012, and the Hiroshima Heavy Rain in August 2014.

The Ministry of Land, Infrastructure and Transport (MLIT), facing up squarely to such disasters, released "Disaster prevention / mitigation for addressing a new stage" in January 2015, considering the situation that "the way of rainfall is clearly changing as known from such extreme rainfall as anticipated to occur according to progress in global warming" as "a new stage."

Not only the flood disaster field but various water-related fields are facing a new stage, and we herein discuss a new stage in the three fields of flood disaster, maintenance, and river environment.

### 2. New stage of flood disaster field

As basic concept of the climate change adaptation measures in the flood disaster field, the following three concepts were reported: 1) Prevent occurrence of disasters with facilities against external force with relatively high frequency of occurrence, 2) Minimize damage to the extent possible against external force that exceeds the capacity of facilities using all possible measures, and 3) "Protect the life" and "avoid destructive damage" against external force that considerably exceeds the capacity of facilities with focus on non-structural measures.<sup>1)</sup>

Since the Great East Japan Earthquake, the focus of research activities in the River Department has shifted from disaster prevention to disaster reduction, so its activities have also entered a new stage. For example, in disaster reduction focused on evacuation or crisis management, information, such as prior risk information or real time condition plays an important role. Therefore, we are developing technologies for delivering condition information (rainfall, a water level, inundation) to the persons in need in order to support voluntary evacuation in case of torrential downpour or to avoid disaster refuge in large area or destructive damage, and for realizing a low risk society by showing inundation risk intelligibly to society under the conditions of climate

change.

Further, these studies require literacy of people and society who provide technologies and information. Therefore, the River Department, as the issue of intergenerational time scale, is developing new fields, such as research on evaluation of risk communication or natural features effective for disaster reduction as natural / social infrastructure.

### 3. New stage of maintenance field

Considering the year of 2013 as the "first year of maintenance policy," the MLIT has been strengthening the maintenance policy. Although maintenance has entered a new stage, it is important to further continue it.

In the water field as well, it is increasingly important to ensure safety consistently by maintaining existing facilities appropriately with limited financial and human resources.<sup>2)</sup> In response, the River Law was revised in 2013 and it has become required accordingly to inspect levees and other facilities with eyes at the frequency of at least once every year.

Main targets of river management, i.e. channels and levees, are highly non-uniform, and have therefore been managed based on experiences by accumulating findings obtained from the records on the deformation and damage, disaster relief work, and maintenance and repair and making decisions based on accumulated findings. Accordingly, it is important to transfer management skills accumulated by senior engineers to junior engineers to ensure the quality of inspection.

As the targets of research in this field, there are technologies for supporting inspection using database, reducing re-deposition of sediment on river channels or reducing repeated overgrowth of trees, and diagnosing the condition of levees in case of flood.

In order to ensure safety consistently, it is required to continue to turn the PDCA cycle of maintenance and database must also be a part of PDCA cycle of maintenance. In other words, it is significant to establish a system under which database is daily utilized on the site. To that end, it is necessary in technical development to develop technology in cooperation with the site and follow up the technology as research activity so that it may be incorporated into the PDCA cycle of maintenance.

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#### 4. New stage of river environment field

The River Law was revised in fiscal 1997 when the initial budget of expenditure for public works reached a peak and "Development and maintenance of river environment" was defined as the purpose of the Law in addition to flood control and water utilization. Main themes of research in this field at that time were technologies for avoiding or mitigating the effect of works on the environment and for restoration of river environment that deteriorated due to works.

In fiscal 2013, it was reported concerning the future of river environment management to develop activities by considering maintenance / renewal as an important opportunity to improve the management and landscape of rivers and to establish specific goals for environmental management.<sup>2)</sup> Accordingly, technologies to be pursued in research and development need to enter a new stage, i.e. from technologies for maintenance / renewal to technologies for management to achieve goals.

In order to set up a goal, it is necessary to ensure social agreement to the level and resource for achieving the goal (budget, technology, information). For data, accumulation is proceeding through National Census on River Environments and other various surveys, and establishment of a system is required for using accumulated data for environmental management. Further, for development of environmental management technology, it is essential to turn the PDCA cycle through trial execution in close connection of theory and practice and to accurate and share findings. In setting up a goal, it is necessary to establish a goal at a reasonable level considering limitation of resources, not establish one at a high level without step by step approach, and to build consensus among the persons involved.

Technologies related to this field include those for setting up environmental goal using accumulated environmental information and those for restoring nature. Particularly, to launch a goal higher than maintenance / restoration, consensus building among the persons involved is required. To that end, as prerequisite for consensus building, value of the environment, i.e. so-called ecosystem service, should be presented to the persons involved, which requires another approach that is different from conventional way of research.

#### 5. Conclusion

We discussed three fields of flood disaster, maintenance, and river environment as a new stage in the water field. The key word common to these three fields is "continuity."

To "protect the life" and "avoid destructive damage" in water disasters means to continue to sustain the life and society. Moreover, since the occurrence frequency of a

catastrophic disaster is very low, we must continue to prepare against it for a long period of time. For maintenance, it is essential to continue to accumulate data obtained, while ensuring the quality of inspection and diagnosis, and to continue activities. Further, since natural environment is the transgenerational property, we should have the awareness of improving river management even a little for succession to next generation.

Importance of continuity has been increasing in each field. Insufficient consideration of continuity would be regarded as one of the causes of the past failures. Technology developed only for a single purpose would be unavailable soon. In order to assure continuity, it is necessary to design the whole system including how the developed technology is used. The River Department intends to continue research so as to be able to provide design proposal for whole system as well as development of technology for a single purpose. To this end, we would have more opportunities to need communications with the site and appreciate your cooperation on such occasions. Also, please feel free to contact us if you have any problem.

1) River Subcommittee, Panel on Infrastructure Development (2015): "Interim Report on Climate Change Adaptation Measures in Flood Disaster Field --- Aiming for a society that shares disaster risk information and sense of crisis to work for disaster reduction"

2) River Subcommittee, Panel on Infrastructure Development (2013): "River Management for Ensuring Safety Continuously"