

Promoting river projects that ensure safety and security

YAMAMOTO Akira,

Director of the River Department

(Key words) Climate change, flood control, risk assessment, adaptation measures

1. Change surrounding river administration

Extremely sharp changes of direction are facing flood control projects intended to ensure the safety and security of the people of Japan. One is abnormal weather occurring frequently throughout Japan and elsewhere around the world in recent years. Weather phenomena, which can be described as the source of flood disasters, are frequently taking abnormal form, resulting in expressions we use to describe them often including “the highest (or lowest) ever observed”.

The severe impact on the world’s grain markets of the serious damage to grain production in Australia in recent years inflicted by its severe droughts and unprecedented giant floods is still fresh in our memories. It is impossible to state positively that the causes of these abnormal weather phenomena is climate change. But we can conclude that some occur when climate changes, and that we must now begin considering how to respond to these changes.

The second change in the environment surrounding flood control projects is the arrival of the era when our priority has abruptly shifted to management. Generally, regarding the provision of public capital, in the beginning, Japan responded to a shortage of needed facilities by providing (constructing) more, increasing the quantity of facilities being managed, a process resulting in a shift of emphasis from provision to management. It has long been pointed out that an era dominated by facility management would eventually arrive, but spurred by financial restrictions, this process is abruptly accelerating. This is not a simple shift of emphasis from provision to management; we must not only manage existing facilities without errors, but must shift to appropriate management by advancing our methods in order to maximize our utilization of our facilities, requiring proposals for technical support measures for appropriate and efficient management.

In the midst of this recent change of both the climate and facility needs, a major challenge facing flood control projects which must be resolved is to decide the best measures to adapt to climate change. Another major challenge is the efficiency of river management. This report introduces some of the research which the River Department has undertaken in response to these two challenges.

2. Measures to adapt to climate change

Half of Japan’s population and about three-quarters of its assets are concentrated on alluvial plains accounting for only about 10% of its national land. And the three large metropolitan regions, which serve as Japan’s administrative and economic centers, are located beside three large bays (Tokyo Bay, Ise Bay, and Osaka Bay) on low “zero-meter” zones facing the sea. Japan’s national land is also susceptible to floods, debris flows, and storm surge disasters at a location exposed to the threat of typhoons passing or crossing its land, and on the eastern end of the monsoon region of Asia, a zone of heavy rainfall unmatched by any other part of the world.

In an effort to overcome such national land conditions, Japan has worked strenuously to implement flood control measures by, for example, constructing uninterrupted lines of levees and building dams and other flood regulation structures, achieving a big improvement in the level of safety from floods. But the state of provision of flood control structures remains at a low level, at only about 60% of the present target levels. Already vulnerable to natural disasters in this way, finding ways to respond to this rise in external forces occurring in response to climate change is a major challenge facing future national land management.

Studies to develop measures to adapt to climate change are now guided by the following considerations.

(1) Evaluation of risk accompanying climate change.

The effects on society and the economy of flood disasters occurring under the impact of climate change are evaluated as disaster risk. Evaluating flood risk is important in the sense that it not only shows present vulnerabilities, but also permits the clarification of effectiveness of introducing adaptation measures.

(2) Proposed measures to minimize inundation damage

We study comprehensive measures combining facility provision—the excavation of river courses to increase rivers’ flow capacity and the construction of retention facilities to supplement present inadequacy of flood control planning—with “drainage basin measures” (for example, setting flood control safety

levels according to land use, doubled levees, and other inundation prevention measures).

And to minimize the harm to residents, we conduct basic studies of non-structural measures outside river areas, the improvement of evacuation guidance systems or land use guidance, among them.

At the same time, we study the increase in rainfall plus ways to increase the precision of climate models. Recent analysis has obtained the results of calculating the relationship: increasing torrential rain → increasing flood flow rates → increasing river improvement works, but even if the torrential rain increases only 10% over present levels, the flow rate will rise 20%, and the quantity of works necessary to handle this increase in the flow rate, will rise 80%. Unable to define the extent of hypothesized climate change, we have to study adaptation measures resigned to the fact that they must be extremely extensive.

3. Performing more efficient maintenance

Ensuring the safety and security of the peoples' lives is an important policy target, and in order to deal with river damage such as the breaching of levees etc., we must continuously implement appropriate river management adapted to changes in the state of rivers such as runoff etc. and to changes in river management facilities which have been constructed. But there are limits to maintenance which river managers can perform with their limited budgets, manpower, and systems, so performing effective and efficient maintenance is an urgent challenge.

A predominant feature of river management is that levees, which are the major facilities managed, are extremely long linear structures which, when breached at even one point, result in the loss of the flood control functions of the entire patrol section. A characteristic of the soil used to build levees is, that as result of the frequent reconstruction and repair of the levees in the past, its quality is inconsistent, and it is also difficult to fully clarify the erosion resistance capability of the vegetation on the surface of the levees. Under these circumstances, the NILIM is currently undertaking the following research.

- Research to improve inspection and maintenance technologies to maintain the safety of levees

This is intended to propose the minimum necessary level of management by clarifying the quantitative relationship of deterioration of its functions such as change of the looseness of levees or of erosion resistance according to the level of levee vegetation maintenance.

- Improving maintenance technologies

This will allow managers to perform maintenance more efficiently and at less cost and will advance technologies used to analyze photographic and video data concerning levees by using the most advanced technologies such as IT technologies and non-destructive inspection technologies, and to

evaluate these technologies.

- This will systematize data and analysis results related to patrols and inspections, maintenance and repair, and evaluation of rivers, to build a database of, and to evaluate the results, thereby contributing to appropriate maintenance in the future.

4. Aiming at river management which can ensure safety and security

It is essential that Japan, which is vulnerable to flood disasters, look back at its history to clearly evaluate risk posed by the impact of climate change and to propose appropriate and effective responses in order to recover from the many natural disasters which have been caused by violent wind and rain etc. and to prevent future disasters. And at the same time, Japan also has the duty of sharing its advanced technologies with countries around the world. At any rate, we have little time left to implement measures to adapt to the impacts of climate change, so we are determined to quickly undertake research needed to do so.