

Research Trends and Results

Preparations Due to Climate Change for Flood Risks Exceeding the Capacity of Flood-Control Infrastructure

- Disaster Reduction Management for Preventing Destructive Damage Caused by Floods Beyond the Design Level of Infrastructure

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Key words: Excessive flood, climate change adaptation measures, disaster reduction management

1. Flood risks exceeding the design / improvement level of flood-control infrastructure

There is concern over the increased scale and frequency of intense rainfall that may cause a large-scale flood disaster due to global warming. This is stated as "there is no room for doubt" in the fifth report of the U.N. Intergovernmental Panel on Climate Change (IPCC). We have already understood the existence of such risk through recent illustrating events such as flooding along the Yabe River because of heavy rain in Northern Kyushu in July 2012 and flooding in the Shingu River System caused by heavy rain when Typhoon No. 12 hit the Kii Peninsula in September 2013.

2. Proposal of framework for disaster reduction management to control the occurrence of damage in case of excessive flood

In order to minimize the damage in the whole basin even under excessive flooding where a disaster cannot be avoided, the National Institute for Land and Infrastructure Management ("NILIM") has proposed, as a future direction, a framework for "disaster reduction management" that identifies changes in a flood damage characteristic curve of each river basin caused by the combined effects of various infrastructure improvements (structural measures) and non-structural measures (Fig. 1:

4 types of conditions are assumed), and controls the occurrence of damage according to various scales of excessive flooding.¹⁾ In other words, in order to avoid the occurrence of immediate destructive damage in excess of the design level of structural measures and minimize the increase in damage in the whole basin as much as possible (although the prevention of all damage in local sites is impossible), the framework aims to control the occurrence of damage by appropriately combining non-structural measures including evacuation, land-use management, etc., while utilizing the toughness and other features of structural measures to the utmost. In this framework, it is essential to fully understand the effect, limit, and uncertainty of structural and non-structural measures to be combined and to study how to expand the menu of such measures. NILIM has developed a flood risk assessment method for the whole basin in consideration of the uncertainty of bank response in case of a flood exceeding river-channel flow capacity.¹⁾ The combination of this method with the above-mentioned framework enables detailed analyses, e.g. selection from a variety of measures based on the evaluated flood risk for the whole basin and how the risk changes in consideration of the balance between upstream and downstream. Case studies are already ongoing in some river basins. For other research achievements, refer to the literature.^{1,2)}

3. Reflection of the proposal in the report of the Council for Social Infrastructure

The framework discussed above was used in discussions of the Subcommittee for Flood Control Measures Adapted to Climate Changes in the River Subcommittee of the MLIT Council for Social Infrastructure, and served as an important factor that supported the concept of its interim report. NILIM also intends to offer the maximum technical support for planning measures for adaptation to excessive flooding in each river basin.

[Reference] 1) Technical Note of NILIM, No.749, 2013.
<http://www.nilim.go.jp/lab/bcg/siryounn/tnn0749.htm>

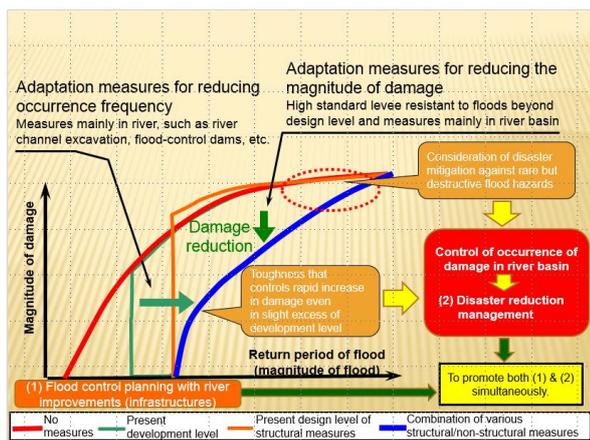


Figure 1: Disaster Reduction Management to Cope with Excessive Flooding

2) Civil Engineering Journal, Vol. 56, No. 12, Special Issue:
5-Year Researches in Climate Change Adaptation Research
Group, 2014.