Addressing Flood Damage Reduction under the Global Climate Change Using Imagination and Organizing Technique to the Fullest Extent

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1. Measures considering the global climate change are no-regret measures

When developing flood damage reduction measures to prepare for an increase in the scale and frequency of heavy rains that may be caused by global climate change, it is essential not only to prevent the occurrence of flood disasters but also to minimize damage to the extent possible. Systematic development of flood damage reduction measures requires avoidance of several potential pitfalls.

First, take steps to avoid over- or under-estimation of future flood possibilities. These estimates are based on the results of climate change simulations; both carelessness and optimism can skew the estimates.

Furthermore, when evaluating the effect of measures to compare multiple alternatives for countermeasures, attention should be paid to avoiding "insufficient consideration," e.g., failure to identify positive effects expected to mitigate disaster, and "insufficient caution," e.g., failure to identify serious risk without recognizing negative effects.

For example, imagine that we look back upon the aforementioned study of measures at a certain point of time in the future. We may regret it if we commit any of the aforementioned mistakes. We should use such imagination constantly and examine measures so that we can make the best efforts.

2. Organize and grasp various cases that could occur

As an effective approach to examine flood damage reduction measures, we are studying a flood risk analysis method that utilizes the relationship between the magnitude of flood damage and the scale of the flood, as shown in figure. In calculating the direct damage in the whole basin, as indicated on the vertical axis, the position and the number of points at which levee breach could occur is set based on the relationship between the flood water level and the height of the levee. The number of breach points is not limited to one, as all possible combinations of levee breach points are listed. The figure shows the maximum, minimum, and average values of damage in all these potential cases. In calculating the damage, the scale of flooding was set to range from a flood that just exceeds the present discharge capacity up to a large-scale flood with the annual probability of occurrence of 1/500.

When the results of such calculation are organized, as shown in the figure, it is possible to grasp the increasing tendency to damage according to the increase in flood scale (drastic increase in damage, reaching a limit, etc.). It is also possible to grasp the positive and negative effects of countermeasures from the changes in maximum, minimum, and average values.

3. Suggest proper measures depending on the flood damage change tendency

The figure also shows an example of an assumptive calculation for raising the levee height in the upstream, not considering the basic theory of flood control, i.e., raising the levee from the downstream. The negative effect is clearly visible, i.e., it brings mostly a decrease in the minimum value, brings an equivalent or an increase in the average value, and brings an increase in the maximum value.

Other indexes, such as death toll, could be examined on the vertical axis. It is also important to examine the increase or decrease in damage in each local area, as well as the whole basin. We are compiling a systematic approach to examine these “no-regrets measures.”

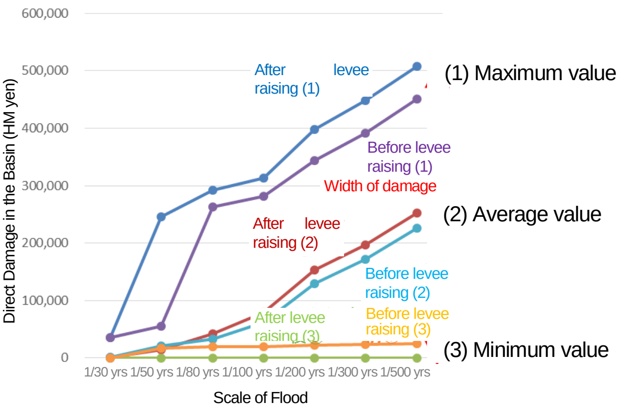

Figure: Example of Flood Risk Calculation

[Reference]

Climate Change Adaptation Research Group: Interim Report on Climate Change Adaptation Studies, Technical Note of NILIM, No.749, 2013.