

Evaluation of the Mid- and Long-term Impact of Flood Damage (Study period: FY2017 to FY2019)

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1. Spread of the impact of flood damage

It is known that the impact of flood damage will not end at the stricken area but spread spatially through breakdown of infrastructures, supply chains, etc. ("ripple effect"). It is also considered that the impacts of flood damage are exerted in a medium-to-long-term on the stricken area ("mid- and long-term impact") by causing physical / social changes to the area. For example, in the Tokachi District, Hokkaido, which suffered enormous damage mainly by Typhoons Nos. 7, 9, 10, 11 in 2016, the soil of farmland was eroded away by flood in a large scale and there is a concern about fall of productivity even after completion of farmland recovery. Thus, the impact of flood damage in some cases does not end immediately after disaster but continues in the community for a medium-to-long-term.

2. Issues in evaluation of mid- and long-term impact

In order to evaluate impact of flood damage and consider disaster prevention / mitigation measures properly, it is necessary to evaluate the ripple effect and mid- and long-term impact of the damage. In such evaluation, however, it is often difficult to eliminate the factors other than the flood damage in the spreading process of impact, and evaluation is therefore difficult since the ambiguity of causal relationship between the consequence and the flood damage and the uncertainty of spreading process are both high. In development of evaluation methods, some progress is seen, e.g. publication of "Guide to Flood Damage Index Analysis (Trial version)" in 2013 (Water and Disaster Management Bureau, MLIT). However, there are not so many findings, particularly about mid- and long-term impact, and it is also necessary to review what kinds of impact should be evaluated based on further research and study.

3. Selection of impacts to be evaluated and estimation of spreading process on a trial basis

NILIM surveyed impacts of damage for extreme-scale flood disasters in the past that are considered to have a mid- and long-term impact on the stricken area, and tried estimation of the spreading process of impact. In the survey, we also considered the presence/absence of counter disaster plans, such as disaster restoration support plans, and of organizations considered to contribute to the resilience of local communities, such as agricultural cooperative association. In the current

year's survey, through interviews of local governments, enterprises, financial institutions, etc., specific mid- and long-term impact and spreading process thereof were clarified, including a case where a food production company which temporarily stopped operation due to flood damage is still unable to recover income even after recovery of productivity due mainly to the loss of customers.

4. Impact of flood damage on local decline

Evaluation of the extent of macroscopic decline in the stricken area as a result of the mid- and long-term impact caused by flood damage is also considered an important research issue.

In the areas stricken by flood, declines, such as population outflow, have been observed. However, evaluation of damage impact is difficult since it is unclear to what extent flood damage influenced local declines. NILIM has been developing an analytical method for evaluating the extent of the impact of flood damage on local area by estimating the time variation of indexes, such as population when not suffering flood damage and comparing with actual results, using the multiple correlation analysis that considers as comprehensively as possible the factors considered to have effect on the time variation in population, such as distance from the train station or presence/absence of nearby highways for each grid. In the current fiscal year, we tried probationary application of this method in case study areas (Figure below) and found, as an example, that zonings and Floor Area Ratio should be considered as explanatory variables in order to raise the interpretability of objective function. In next fiscal year, we intend to develop a method for producing more interpretable objective functions, etc. while utilizing the findings described in 3 above.

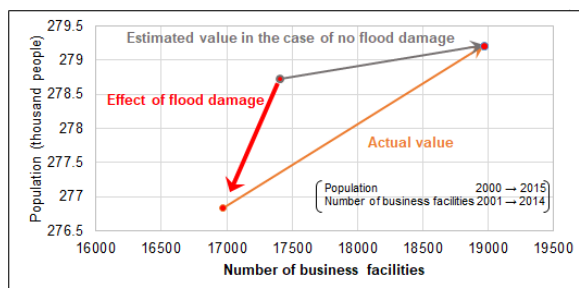


Figure: Image of evaluating the impact of flood damage on local decline