

Flood control measures linked to town development, local residents, and businesses

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1. Introduction

An important action to respond to the increasing risks of flooding caused by climate change is to implement flood control measures linked to town development, in addition to conventional flood control using flood management facilities. Cities contain various types of residences and various business activities. The authors consider that the awareness among residents and businesses will increase, and the implementation of flood control measures will be accelerated as risks of expected hazards to human lives, and assets are evaluated based on the characteristics of houses, business establishments, and cities that consist of houses and businesses, and when possible flood damage and the effects of flood control measures are presented.

This paper introduces investigations concerning examples of flood control measures linked to town development and the details and results of investigations concerning changes in actions and awareness toward flood control by presenting the information of overall flood risks to houses and businesses.

2. Example of flood control measures linked to town development

Western Europe has been under a relatively stable climate. Because of the concern over increasing precipitation caused by climate change, however, flood control measures linked to town development are being implemented, such as the reduction (retention) of rainwater outflow using urban spaces and the development of flood control facilities combined with urban functions (photo 1), and the development of flood control facilities using multiple town development methods (photo 2).

Similar activities in Japan are organized as follows: [1] regulations on the use of buildings and lands (designation of high-risk areas under the Building Standards Act: photo 3); [2] planned guiding (e.g. consideration of flood risks in the process of establishing land optimization plans); and [3] cooperation in development projects (activities conducted in cooperation among the government and private sector in urban redevelopment: figure 1). This paper summarizes these activities by gathering and analyzing relevant references and conducting interviews and on-site inspections and by organizing and examining the outlines of research, concept of risk reduction (water control safety target to satisfy), consensus building process, allocation of roles to the government and private sector, and factors for success.



Photo 1: Development of a park (upper section) and stores (lower section) that function as a levee in Rotterdam, the Netherlands



Photo 2: Flood control facility development in the BID city development method in Sheffield, England



Photo 3: Raising of the foundation of buildings in high-risk areas in the city of Sapporo

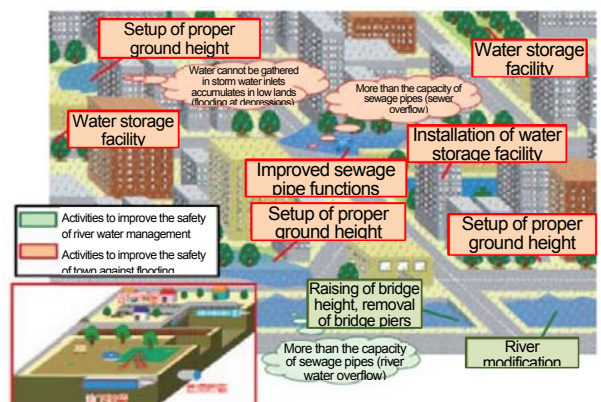


Figure 1: Image of flood control method conducted in cooperation between the public and private sectors (Source: City of Yokohama, Excite Yokohama 22 December 2009)

Many of these activities have been successfully implemented with the background of actual flooding, which triggered such activities. In addition, the cooperative relationship and the allocation of roles among the public and private sectors are often clearly defined. Local flood management departments and relevant sectors have high expectations for implementing flood control measures linked to town development. Meanwhile, the authors found challenges, such as the proper identification of actual risks and cost effectiveness, reevaluation based on changing situations, and proper hazard evaluations that were the foundation of all activities.

3. Presentation of general flood risk information to residents and businesses and awareness toward flood control actions

The presentation of general flood risk information (the information of the depth of flooding at individual locations based on the frequency of the recurrence and interpretation as to the damage to the assets of individual houses and businesses and effects of measures) is necessary to accelerate the implementation of measures to prevent flood damage to building-level properties. The authors are examining ways to present risk information in an easy to understand manner and facilitate reactions with the expected depth of flooding by recurrence frequencies, which is estimated in another study.¹

The authors investigated 12 houses and businesses located in large cities in the delta areas in the lower reach of large rivers. The authors then presented the following based on the flood damage risk evaluation method² using a model building developed up to the previous fiscal year:

[1] investigation of the vertical distribution of main assets within a building; [2] presentation of risk information combined with the outcome of calculating flood depth (limited to flooding inside levees) at a given location based on different recurrence frequencies; and [3] presentation of simple proposals based on actual conditions, such as asset distributions within buildings and their effects (monetary amount of damage reduced as an annual average). Then, the authors conducted interviews concerning the ease of understanding information, its reliability, and changes in awareness toward engaging in flood control measures (figure 2).

A quick summary of the findings of the investigation up to this point was that many subjects of the investigation gave good evaluations when the information of risks, measures, and effects for specific conditions of individual buildings was presented in an easy to understand way. In particular, businesses on the lower floors (many of them on the ground level) exhibited increased motivation toward implementing simple measures to respond to frequently occurring floods with low flood depths. The presentation of such flood risk information seems effective in encouraging people to engage in measures

to control damage from floods inside levees. The study also found challenges, including comments, such as that the presented values did not match how people actually felt, inability to understand expressions of expected values, and details of the effects of proposals to prevent flooding were unclear, as well as that most of the subjects of the investigation were reluctant to implement measures to control damage from floods that were expected to occur at low frequency.

4. Summary

Throughout this study, the authors found that the presentation of the information of general flood risks in an easy to understand manner would encourage residents and businesses to engage in measures to control flood damage in the process of promoting effective measures to protect their assets from damage. Such information was also effective in activities linked to district-level town development.

The findings of this research titled the “Development of Measures to Strategically Reduce Disaster Risks in Cities under Climate Change” (to be completed in FY 2017), including contents introduced in this paper, are going to be summarized and published in a future NILIM reference.

Relevant information

- 1) “Risk information and the proposal of a method to examine it for specific purposes of measures to reduce flood damage” NILIM Report 2018, 93p
- 2) “Evaluation of urban flood damage using model buildings/evaluation of effects of measures” NILIM Report 2017, p. 99

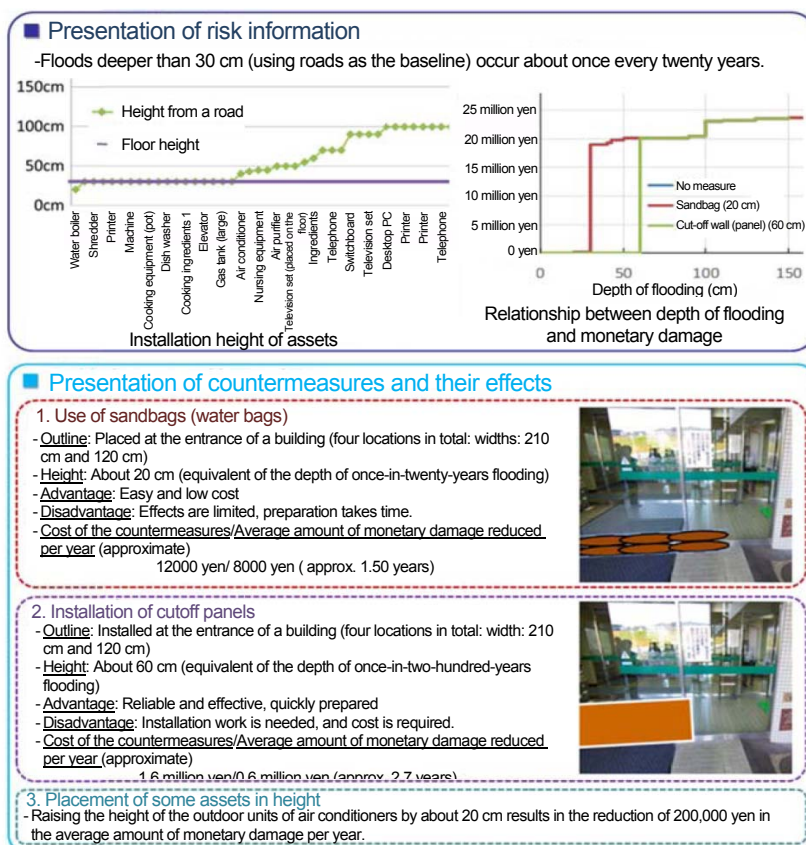


Figure 2: Flooding risks for residents and businesses and the presentation of countermeasures and their effects (example)