

Plan for flood prevention facilities in Hiroshima (Part2)

Whole term

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(Purpose)

The recent advance in the extent of urbanization has raised the probability of flood occurrence at Senda drainage area in Hiroshima. Accordingly, Hiroshima city is planning to install large-scale stormwater pipes (additional pipes). The plan states that new pipes should be installed with the same density as the existing ones. However, the plan suffers from drawbacks, such as, long construction period and associated huge cost of the project. The implementation of the project thus requires formulation of a stepwise development plan which involves phased installation of additional pipes based on their relative priority ascertained by means of cost-effectiveness analyses. Usually the method applied for assessment of damage cost caused by flooding of river is utilized to estimate the effect of flood mitigation by means of stormwater control within sewerage system. Flooding pattern of river is, however, different from that of the sewerage system and therefore much prudent consideration is necessary to adopt the method of calculation applicable to the former for use in case of the latter. Accordingly this investigation, taking the aforementioned issue into consideration, was conducted throughout FY1995 and FY1996.

Here, the results of the investigations conducted in FY1996 as well as the result of estimating the effect of installing facilities on stormwater control by the 'Hedonic pricing' method were reported.

(Results)

The results of the investigations conducted in FY1996 are outlined below.

1. Cases considered

For the cost-effectiveness analysis different maximum rainfall intensities and orders of development were considered. Five cases of return period, namely, 5, 10, 30, 50, and 100 years were taken into account for maximum rainfall intensity. Also four stepwise development plans were considered by dividing pipe networks into four parts and changing order of development.

2. Flood analysis

In order to describe the flooding phenomena precisely, an analytical model composed of stormwater drainage model, hydraulic analysis of pipes and flood analysis model was used.

3. Calculation of monetary value of damage caused by flood

The cost of damage was calculated based mainly on 'the guideline for economic study of flood control' proposed by the Ministry of Construction. However, the direct damage and the indirect damage values were also calculated separately giving proper consideration to urban flooding pattern.

4. Assessment of cost-effectiveness

Cost-effectiveness analysis was conducted for the following two cases,

Following the 'Guideline for economic study of flood control', cost-effectiveness was evaluated by using year-averaged cost and effectiveness values, which are independent from project period.

Cost-effectiveness was also evaluated by taking into account the period of the project.

5. Evaluation of the stepwise development plan

Based on the above cost-effectiveness analyses, additional investigations were carried out for determining priority of installing facilities.

6. Hedonic pricing method

The adopted cost-effectiveness analysis methods are popular for their simplicity and ease of manipulation. However, estimation of indirect damage using these methods is difficult and also these methods are susceptible to omission and repeated counting of damage items.

Therefore, benefit of installation of facilities was estimated by the Hedonic pricing method, which is one of the econometric models, in the lights of fluctuation of land values due to stormwater control.

7. Issues for future

Issues to be considered for application of these cost-effectiveness analyses to other areas in the future were summarized.

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Keywords

flood, cost-effectiveness, flood analysis, gradual development plan, Hedonic pricing method