Research Survey for Stormwater Runoff Control Measures in Kobe City

Year of Research	2007	

(Purpose)

Localized heavy rain has occurred now and then in recent years. With increasing urbanization, the infiltration area is decreasing. Because of these factors, the road surface becomes inundated even during a short period of rain, and the incidence of urban flood damage is increasing. Measures that have been taken to date target rapid stormwater drainage mainly by means of the installation of retention pipes and pump stations. However, pipe and culvert installation is the conventional peak runoff measure, but it can be extremely uneconomical and takes a fairly long time to complete in many cases. To cope with the increase in peak runoff, therefore, it is not rational to rely on stormwater drainage alone. It is important to promote retention and infiltration aimed at urban development to control stormwater runoff throughout the entire area.

This research survey dealt with retention and infiltration facilities and evaluated their quantitative runoff reduction effects, and their positioning within the sewerage operation was made clear. At the same time, the study aimed to reduce inundation damage and develop a plan for stormwater runoff control measures based on cooperation with other projects (roads, parks, etc.). The study was conducted following the workflow in Figure 1.

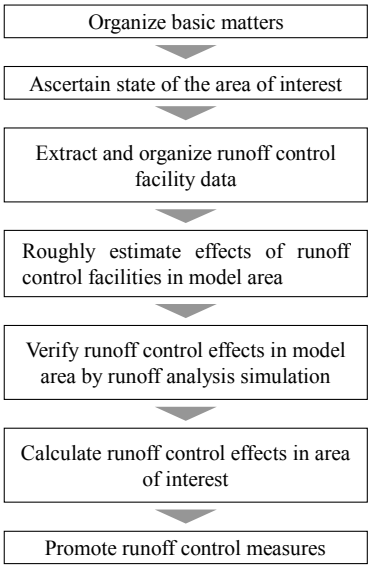

Figure 1 Workflow

(Results)

This research survey deals with the installation of runoff control facilities and as such, it covers public facilities (public institutions, schools, welfare facilities, cultural facilities, public parks, roads) and private facilities (dwellings). The coverage of the study was taken to be the entire area of the city. The model area is shown in Figure 2.

(1) Summary of effects roughly estimated from simulation results

① By promoting cooperation among the retention and infiltration project and other projects, we can expect some reduction in the amount of overflow for the past maximum rainfall (75.8 mm per hour). However, even if a runoff control facility is installed in every facility (public facilities and dwellings) dealt with this time, the results indicate that it will not be possible to fully cope with the past maximum rainfall in many administrative regions.

② Even if the installation level of the runoff control facility was raised, it would not be possible to effectively reduce the amount of overflow in some areas. This is because, when the results of the model area were expanded over the entire city area, an effective facility deployment plan was not taken into account based on the drainage capacity evaluation of existing pipes and culverts, pump stations, and the like.

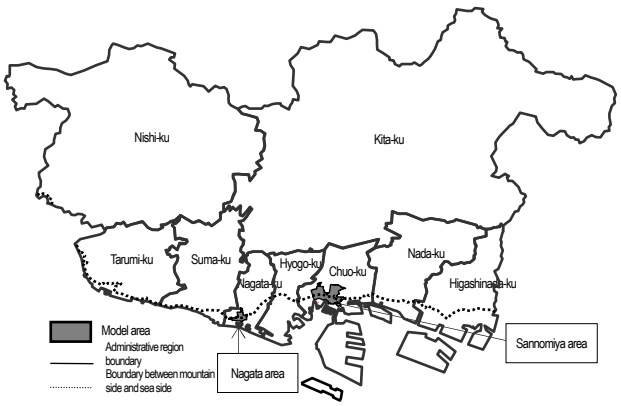

Figure 2 Model area map

(2) Summary of effects roughly estimated from the number of installable retention or infiltration facilities based on statistical documentary data

① The retention and infiltration effects were calculated over the entire city area. The results show that, in all administrative regions except for Nada-ku and Chuo-ku, it would almost be possible to cope with the past maximum rainfall by installing a runoff control facility in every public facility dealt with this time.

② In Nada-ku, the results show that it would be possible to cope with the past maximum rainfall by installing a runoff control facility in every public facility and installing permeable inlets in every dwelling (about 1.5 units per house). In Chuo-ku, however, the results show that these measures will not work even if approximately the same number of permeable inlets were installed in every dwelling. This is because there are comparatively fewer public facilities and dwellings per hector in Chuo-ku than there are in other administrative regions.

(3) Comparison of differences in roughly estimated effects arising from the use of different effect estimation methods

Method (2) tends to estimate greater effects than method (1) does. This is related to the fact that method (2) anticipates an ideal peak cut effect from the retention or infiltration facility.

(Future plan)

The above results demonstrate that it is necessary to organize technical standards for retention and infiltration facilities and to organize their positioning in the stormwater drainage plan. After that, a study must be conducted to establish an effective placement of retention and infiltration facilities while seeking to cooperate with other projects.

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Key words	Runoff control, Past maximum rainfall, Cooperation with other projects