Study of Projects to Raise Efficiency of Measures Taken to Mitigate Inundation

Year of Research	2011・2012	Implementation of anti-inundation measures

(Purpose)

As shown in **Fig. 1**, inundation caused by rainfalls of a scale beyond levels projected in drainage plans has been occurring with increasing frequency in recent years. In particular, 60-minute rainfalls remain within the level projected in the plans, but localized heavy rainfalls are increasing in Area (2) where 10-minute rainfalls exceed plan levels. Comprehensive research and study is required to improve the effectiveness of measures being taken to mitigate inundation in large cities. In 2011, a study was conducted on advanced technologies along with case studies of measures against inundation. Also, the use of a virtual model designed to enhance the accuracy of the model was investigated. In 2012, case studies, in which run-off analysis was implemented, were conducted in three sub-areas, and investigations were conducted of approaches to efficient pump operation control, improving analysis accuracy, and efficient promotion of projects to mitigate inundation.

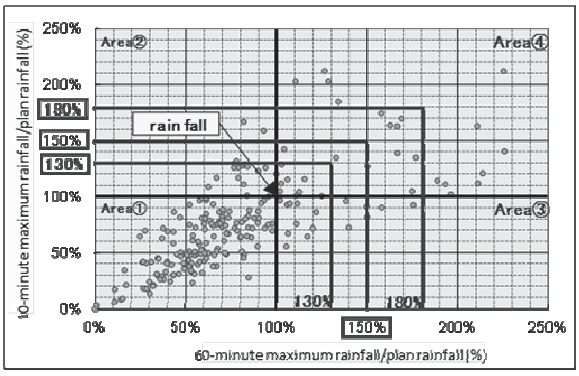

Fig.1. Actual rainfall causing inundation in Tokyo and government ordinance cities

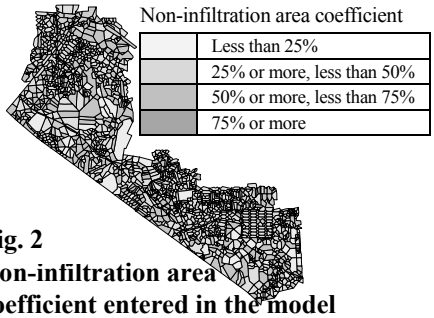

Fig. 2
Non-infiltration area coefficient entered in the model

(Results)

(1) Understanding of the effects of pump operation control according to the outside water levels, and study of utilization of the GIS data

Using the existing runoff analysis model for Sub-area C, the effects of using pump operation control according to outside water levels was grasped. Though no differences could be found between rainfall areas, remarkable effects could be confirmed in pump operation depending on the wave form of long-term and two-peak rainfall. By utilizing GIS data (DM, land-use information) and by reflecting the non-infiltration area coefficient (**Fig. 2**), it was confirmed that improvement of analysis accuracy could be expected.

(2) Study of improving efficiency of measures taken to mitigate inundation

Using Sub-area A, where both trunk and branch lines have been developed, and Sub-area B, where a branch line has not been developed, an analysis was conducted to determine how the difference in the level of development will affect dealing with rainfalls beyond plan levels. Also, a study was conducted of future development policies expected to raise efficiency. The results are shown in Table 1. As the table indicates, it is highly possible that storage will be effective at 130% of the undeveloped sub-area in Area (2) and storage or flow as combined with stormwater infiltration facilities should be effective regardless of the excess ratio in other sub-areas. It is estimated that the flow + pumping station would be more advantageous than storage as the excess ratio increases in undeveloped sub-areas of Areas (3) and (4). To ensure efficient progress of the project to implement measures to mitigate inundation, Table 1 is expected to be utilized when assuming cases for consideration in the draft measures.

Table 1. Table of selection of candidate measures

(Cost comparison between the case using storage pipe and other alternative cases)

Measures against inundation	For the area ② where the route with the short concentration time with high possibility of occurrence of damage						For areas ③ and ④ that are considered equal in development efficiency					
	Developed (Sub-area A)			Not developed (Sub-area B)			Developed (Sub-area A)			Not developed (Sub-area B)		
	Plan rainfall			Plan rainfall			Plan rainfall			Plan rainfall		
	130%	150%	180%	130%	150%	180%	130%	150%	180%	130%	150%	180%
Storage pipe	○	○	○	○	○	○	○	○	○	○	○	○
Storage + stormwater infiltration system	△	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
Flow pipe	△	△	△	◎	◎	◎	◎	◎	◎	◎	◎	◎
Flow + stormwater infiltration system	△	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
Flow + pumping station	△	△	△	△	△	△	△	△	◎	△	◎	◎
Flow + Pumping station + stormwater infiltration system	△	◎	◎	△	△	△	△	△	◎	△	◎	◎

Legend: ○ : Storage, ◎: Measures, for which larger cost reduction than the case of storage is expected

△ : Measures for which the cost may be higher than the case of storage.

*For the pump drainage district, the flow facility and the flow + stormwater infiltration facility are excluded from the scope of study.

*Where discharge restrictions are set for the receiving rivers, the flow may not be allowed.

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