

Research Trends and Results

Efficient Inundation Countermeasures According to Regional Characteristics

OGAWA Fumiaki , Head; HASHIMOTO Tsubasa , Researcher
Wastewater System Division, Water Quality Control Department

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1. Introduction

In recent years, many regions of Japan have been hit frequently by heavy rain with an hourly precipitation of 50 mm or more, or by concentrated heavy rain in a short period of time such as 10 minutes. As the frequency of heavy rains is increasing, concern is also increasing over the decline in stormwater penetration due to the progress of urbanization, as well as the increase in inundation damage potential due to the development of underground space use. Cities need to advance urban stormwater management measures efficiently and effectively within their limited financial resources. In order to support inundation countermeasures according to regional characteristics, NILIM has organized various characteristics, including inundation damage and the development of storm sewers, according to the size of cities.

2. Damage by inner water inundation and development of storm sewers

An “inner water inundation” is a state wherein heavy stormwater that falls on an urban area or farmland cannot be drained into drainage facilities (sewerage, etc.) or public waters, and inundates buildings, land, and roads. From the inundation statistics ¹⁾ of 2001 to 2009, we identified damage data for cases where no less than 50 structures were inundated by inner water inundations above or below the floor level (“inner water inundation damage”). We then organized the numbers of such cases according to the population of the municipalities in which they occurred. In addition, using the storm sewer development area (FY2010) survey conducted by the MLIT, we calculated the ratio of developed area to the total area where storm sewers are planned (“ratio of storm sewer development”). The results of the calculation are indicated in the figure. In small-and-medium-size cities (population of less than 300,000), the ratio of storm sewer development is smaller than that in big cities (population of not less than 300,000), but the number of cases of inner water inundation damage is small. In big cities where a decline in stormwater storage penetration is marked due to the progress of urbanization, area-wide development of storm sewers—including branch lines—is required. In small-and-medium-size cities where a certain level of stormwater storage penetration is expected, the development of branch lines is not necessarily required, therefore the selection and concentration of target areas should be ensured. As a result of analyzing the development of storm sewers from FY2008-2010, for which a detailed explanation is omitted, it was found that big cities are promoting area-wide development of main and branch lines, while

small-and-medium-size cities are promoting development focused on main lines. The characteristics of storm sewer development in big cities and small-and-medium-size cities are summarized in the table below.

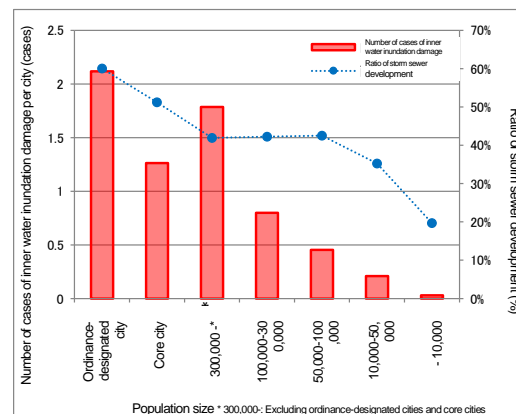


Figure: Number of Cases of Inner Water Inundation Damage and Ratio of Storm Sewer Development by Population Size

Table: Characteristics of Storm Sewer Development by Population Size

	Big city (Population of not less than 300,000)	Small-and-medium-size city (Population of less than 300,000)
Townscape	Many urbanized areas are formed in area.	Town is formed around the terminal station (heavily built-up areas are limited).
Trend of development	Development of main / branch lines in area	Concentrated on main lines (More selective / concentrated development than big cities)
Inner water inundation damage	Much	Little
Ratio of storm sewer development	High (51.1%)	Low (34.9%)
Necessity for structural measure development	Development including branch lines is necessary.	It is necessary to examine necessity for branch line development while advancing monitoring and non-structural measures (selection and concentration).

3. Inundation countermeasures in cooperation with other (non-sewerage) projects

In order to promote efficient inundation countermeasures in cooperation with non-sewerage projects, we are collecting and organizing examples of cases of such cooperation, including: effective use of stormwater reservoirs for inundation control in rivers; improvement of stormwater storage penetration using parks, schools, space under elevated roads, and farmland; support systems for development of stormwater storage penetration facilities in development activities; and others. In relation to this cooperation policy, we are going to evaluate their implementation methods and direct solutions alongside regional characteristics such as municipality population, urban area, suburban area, etc.

[Reference]

1) Inundation Statistics, 2001-2009, MLIT