Development of a Method to Evaluate Flood Damage/Countermeasure Effect Toward the Reduction of Urban Flood Risks

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1. Necessity of the Information on Flood Disaster Risk which local people can realize

While the importance of local development reflecting the risk of a flood disaster is a priority, the necessity to reflect the diversity of city in the evaluation of flood damage risks and countermeasure effects is increasing. Therefore, we initiated the research on a method for upgrading the information on flood disaster risks, which is easy for local residents and business operators to realize and is useful when taking measures and conducting examinations, by converting into damage risk information based on diversified styles of living in urban areas and locations of business operators.

2. Flood Hazard Evaluation for Both Inside and Outside Water

Generally, since many inside water inundation hazard maps are created based on past flood records and sewage work project levels

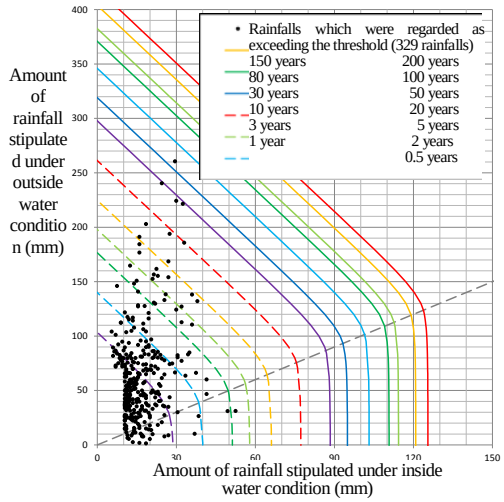

Figure A co-occurrence probability distribution chart consisting of the annual maximum two-day rainfall (vertical axis) and the maximum amount of rainfall per hour during two days (horizontal axis)

but do not respond to various occurrence probability levels, there are limits to the examination of countermeasures considering the effect. On the other hand, outside water inundation hazard maps may make it difficult for local residents to realize the risks because they are created based on small occurrence probabilities, such as annual probability of exceedance of over 100 years. Therefore, we conducted case examinations on the method for evaluating flood damage hazards seamlessly from inside water inundation of high occurrence frequency to outside water inundation, which occurs less frequently but creates a significant hazard. In this method, a co-occurrence probability distribution chart consisting of the annual maximum two-day rainfall that causes inside water inundation and the maximum amount of rainfall per hour during two days that causes inside water inundation is created (Figure), and the flood depth distribution in various places obtained by an inundation analysis based on a combination of various types of rainfall is overlaid on this figure in order to evaluate the probability of flood damage for both inside and outside water. This is expected to enable seamless evaluation of flood probability in each area, as well as a more quantitative evaluation of flood damage risks and countermeasure effects.

3. Conversion of Flood Hazard into Flood Damage Risk based on Building Model and Evaluation of Countermeasure Effects

In recent years, GIS data on detailed building properties, such as application of building, category of business facility, and number of stories, has been available. Therefore, we established 13 building models in which buildings, such as houses and business facilities, including offices and shops, as well as the layouts of equipment and goods (that is, the vertical distribution of the total amount of properties damaged according to flood depth), and then overlaid them on the flood hazard maps after placing such building models in the intended area based on the above GIS information. We have been developing a technology that evaluates the effects of reducing flood damage risks, as well as property damage risks, when countermeasures against floods, such as leveling and installation of water stops, are taken together with the probabilities. This enables showing that the damage and countermeasure effects differ depending on the building application distributions and flood characteristics of the intended area. For details, please refer to "Evaluation of flood damage/countermeasure effects of cities based on building models."

4. Research System in Cooperation with Local Development

This research was conducted utilizing the system of the Climate Change Adaptation Research Group in which the departments related to river development, sewage improvement, and local development, such as River Department (River, Water Cycle, and Flood Disaster Prevention Divisions), Urban Planning Department (Urban Planning and Urban Disaster Mitigation Divisions), and Water Quality Control Department (Wastewater System Division) work in collaboration.