

Analysis of Urban Flood Damage Using SWMM5 and FLUMEN Model of Sadang Area in Korea

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Abstract

Frequent urban floods affect the human safety and economic properties due to a lack of the capacity of drainage system and the increased frequency of torrential rainfall. The drainage system has played an important role in flooding control, so it is necessary to establish the effective countermeasures considering the connection between drainage system and surface flow. To consider the connection, we selected SWMM5 model for analyzing transportation capacity of drainage system and FLUMEN model for calculating inundation depth and time variation of inundation area. First, Thiessen method is used to delineate the sub-catchments effectively base on drainage network data in SWMM5. Then, the output data of SWMM5, hydrograph of each manhole, were used to simulate FLUMEN to obtain inundation depth and time variation of inundation area.

The proposed method is applied to Sadang area for the event occurred in 27th of July, 2011. A total of 11 manholes, we could check the overflow from the manholes during that event as a result of the SWMM5 simulation. After that, FLUMEN was utilized to simulate overland flow using the overflow discharge to calculate inundation depth and area on ground surface. The simulated results showed reasonable agreements with observed data. Through the simulations, we confirmed that the main reason of the inundation was the insufficient transportation capacities of drainage system. Therefore cooperation of both models can be used for not only estimating inundation damages in urban areas but also for providing the theoretical supports of the urban network reconstruction. As a future works, it is recommended to decide optimized pipe diameters for efficient urban inundation simulations.

Keywords : Urban inundation, Drainage systems, SWMM5, FLUMEN

Acknowledgement

This research was supported by a grant (14AWMP-b079364-01) from Water Management Research Program funded by Ministry of Land, Infrastructure, and Transport of Korean Government.

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