Effects of Green Infrastructure for Resilient Cities at the Catchment Scale in Urban Area

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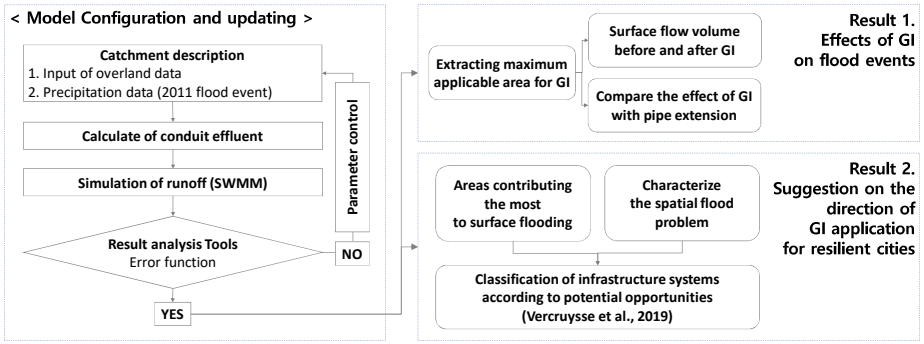
Abstract

This study set up catchment-scale sites located at the boundary where rainwater is treated in an urban area and evaluated the impacts of GI(Green Infrastructure) using the SWMM(Storm Water Management Model) based on actual flood events during the wet season.

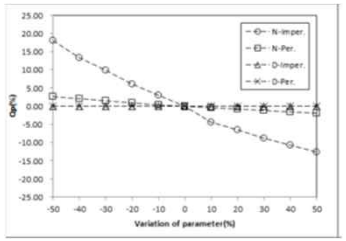
The first result showed that GI could reduce the runoff volume, peak flow, and inundation volume compared with conventional development. This study also used and demonstrated the implications of sensitivity testing and model updating to increase the correlation between the real system and the modeled site. In second result, considering the intervention between the areas that contribute the most to surface flooding and potential flood hazard highest, we explored the areas where the GI application was most appropriate in the future.

Process and method of study

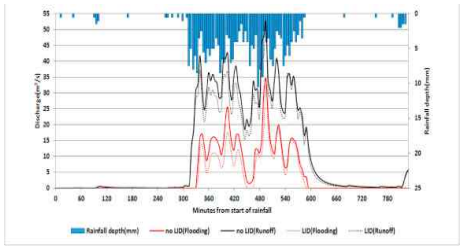


Result 1. Effects of GI on flood events

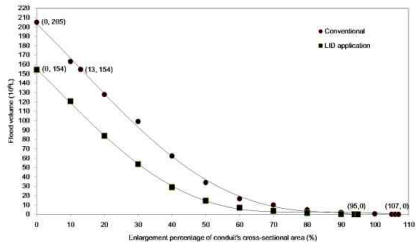
- **(Parameter sensitivity test and model updating)** Manning's N value of pervious surface which is the most sensitive parameter was adjusted for site within the respective range to approximate the inundated area based on the inundation trace map
- **(Effect of GI)** GI did not affect the occurrence of flooding, but the flood reduction effect was 2–5 times higher than that of runoff. The results showed that the same effect could be obtained by enlarging the conduit cross-sectional area of the whole site by 11–13%



< Sensitivity test of input variables for internal inflow >

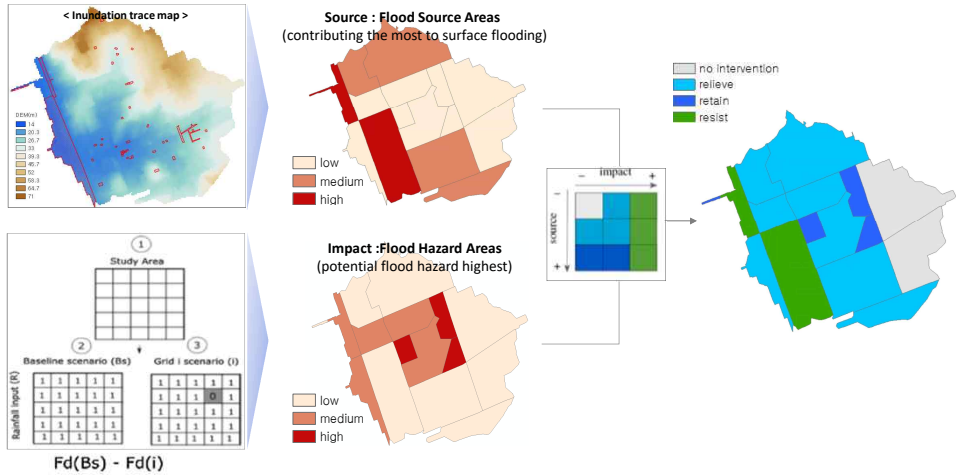


< Hydrograph results before and after GI >



< Flood volume modeling results by enlargement percentage of conduit's cross-sectional area >

Result 2. Direction of GI application for resilient cities



- **(Source)** Runoff contributions of each sub-catchment is analyzed by repeatedly executing a precipitation-omitting model
- **(Impact)** The potential hazard of each sub-catchment is analyzed relatively by using inundation trace map

► The source and impact areas of the flood were distinguished. And given the interoperability between them, it is possible to determine which point GI application would be the most effective compared to current land use. This part is handled by the method of Vercruysset al.(2019)

< The area of opportunity in rainwater harvesting on the current land cover map >

Summary and future research

- **(GI application direction for resilient city)** Based on result 2, information on which areas are currently being utilized and which areas should be improved can be provided for future urban regeneration planning
- **(Pont of improvement)** It Requires a high resolution grid unit evaluation and potential hazard data to replace flooding events

Acknowledgements

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