

A Multi-criteria Decision Analysis System for Prioritizing Sites and Types of Low Impact Development Practices

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This study developed a multi-criteria decision analysis framework to prioritize sites and types of low impact development (LID) practices. This framework was systemized as a web-based system coupled with the Storm Water Management Model (SWMM) from the Environmental Protection Agency (EPA). Using the technique for order of preference by similarity to ideal solution (TOPSIS), which is a type of multi-criteria decision-making (MCDM) method, multiple types and sites of designated LID practices are prioritized. This system is named the Water Management Prioritization Module (WMPM) and is an improved version of the Water Management Analysis Module (WMAM) that automatically generates and simulates multiple scenarios of LID design and planning parameters for a single LID type. WMPM can simultaneously determine the priority of multiple LID types and sites. In this study, an infiltration trench and permeable pavement were considered for multiple sub-catchments in South Korea to demonstrate the WMPM procedures. The TOPSIS method was manually incorporated to select the vulnerable target sub-catchments and to prioritize the LID planning scenarios for multiple types and sites considering socio-economic, hydrologic and physical-geometric factors. In this application, the Delphi method and entropy theory were used to determine the subjective and objective weights, respectively. Comparing the ranks derived by this system, two sub-catchments, S16 and S4, out of 18 were considered to be the most suitable places for installing an infiltration trench and porous pavement to reduce the peak and total flow, respectively, considering both socio-economic factors and hydrological effectiveness. WMPM can help policy-makers to objectively develop urban water plans for sustainable development.

Keywords: Low Impact Development, Multi-Criteria Decision Analysis, SWMM, TOPSIS, Water Management Prioritization Module (WMPM)