**Lifecycle cost-benefit evaluation and optimization of Low Impact Development (LID) practices at small watershed scale**

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Abstract

The low impact development (LID) practices are identified as environmental friendly alternatives to the conventional stormwater drainage systems (CSDS). The commonly used LID practices (e.g. green roof, bioretention, porous pavement) can provide multifunctional benefit, e.g. urban heat island effect reduction, groundwater recharge, etc. Therefore, to elaborate a suitable LID design, it is essential to evaluate the flood control performance, environmental impact and economic feasibility of various LID practices. In this study, a comprehensive modelling system that investigates the hydrologic, environmental and economical aspect is developed. The EPA SWMM model, the WERF BMP and LID whole life cycle cost modelling tools, the CNT green values national stormwater calculator and the WERF SELECT model are used and coupled together to evaluate the lifecycle benefit of various LID practices. The optimal LID designs are then can be selected. A case study in the City of New York is presented, and the result shows that the bioretention is the most cost-effective LID practice, and adding CSDS to can further improve the effectiveness. The model can be further coupled to various optimization and decision making model.