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ASSESSMENT OF THE MODELLING PERFORMANCE OF THE ENVIRONMENTAL PROTECTION AGENCY STORM WATER MANAGEMENT MODEL FOR A VEGETATIVE SWALE

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Abstract

Urbanization and global climate change cause an increase in severe flood events with highly destructive effects on living areas. Various engineering solutions have been proposed to mitigate these adverse effects, which can be integrated into traditional infrastructure systems. Low Impact Development (LID) is one of these methods that are widely used and are both eco-friendly and low-cost methods. The most common types of LIDs are vegetative swales, bioretentions, green roofs, rain barrels, and rain gardens. Accurate modelling of LIDs has gained great importance to determine the optimum design criteria. The Environmental Protection Agency Storm Water Management Model (EPA SWMM) is one of the few software, which can model many types of LIDs. In this study, the modelling performance of the EPA SWMM for vegetative swale was investigated by using the data obtained from controlled laboratory experiments. For this purpose, the Rainfall-Watershed-Swale (RWS) experimental system was employed to determine the performance of vegetative swale. The RWS is a large-scale experimental system comprising a sprinkler system, a watershed area, and a swale module. To evaluate the effectiveness of the model, the Coefficient of Determination (R^2), the Root Mean Square Error (RMSE), the Root Mean Square Error to the Standard Deviation Ratio (RSR), the Percent Bias (PBIAS), and the Nash-Sutcliffe Efficiency Coefficient (NSE) were calculated. Results show that the EPA SWMM outputs are acceptable, and therefore, EPA SWMM is a reliable model that can be used in the modelling of a vegetative swale. However, there is room for improvement, particularly the storage capacity of vegetative swale needs to be integrated into the EPA SWMM modelling to obtain more accurate results.

Key words: best management practices, EPA SWMM, hydrological modelling, low impact development, Rainfall-Watershed-Swale (RWS) system, vegetative swale

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