WAT-24 ORAL PRESENTATION · WATER TRACK · URBAN WATER & RESILIENT INFRASTRUCTURE

Enhancing Urban Stormwater Resilience through Surface Low Impact Development (LID) Measures: A Hydrological Assessment in Sri Lanka

M. E. Sutharsan[1*] and M. Shafique[1]

[1]*Brunel University of London, United Kingdom*

**Corresponding author: edsutharsan@yahoo.com*

DOI: https://doi.org/10.31705/ICEWSE.2026.76

Abstract

Rapid urbanisation increases stormwater runoff. This study focuses on comparing four surface-based LID techniques, namely, bioretention cell, permeable pavement, rain garden, and vegetated swale, based on two hydrological performance measures, namely, infiltration efficiency and surface-runoff efficiency. The evaluation was carried out on a 2.5-acre mixed-land-use catchment in Vavuniya, Sri Lanka, that discharges into a lake. A model using the EPA Storm Water Management Model (SWMM) was created for 16 sub-catchments, 12 conduits, 12 junctions, and one outfall. The four surface LID measures were assessed relative to the baseline scenario, which represented the catchment without any LID measures. Rainfall was recorded over six hours, with a maximum intensity of 12 mm/h, and was categorised as a moderate rainfall event according to World Meteorological Organization criteria. The increase in infiltration for each LID measure was as follows: bioretention cell, 25%; permeable pavement, 33%; rain garden, 18%; and vegetated swale, 23%. Surface runoff was reduced by the following percentages for each LID measure: bioretention cell, 23%; permeable pavement, 23%; rain garden, 24%; and vegetated swale, 19%. Permeable pavement achieved the highest infiltration efficiency, while the rain garden achieved the highest surface-runoff efficiency. Although the differences in surface-runoff efficiency were small, the results suggest that the four measures have different hydrological efficiencies. The results show that permeable pavement could be selected over other surface LID measures where the priorities are infiltration and surface-runoff control. These results show that surface LID measures may be chosen purposefully to ensure resilience in urban planning and stormwater management. Consequently, urban planning should include a mix of surface LID measures, rather than just one, depending on the specific land use, available space, and dominant drainage objective in each case.

Keywords: *EPA SWMM; infiltration efficiency; Sri Lanka; surface green infrastructure; surface-runoff efficiency; urban stormwater management*