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Effectiveness of green roofs in reduction of rainfall-fed runoff: A case study in Dublin, Ireland

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Increase in extreme rainfall and storm events due to climate change and decrease in water retention in soil due to urbanization has increased the risk of flooding in cities globally. Since majority of the cities are mostly developed, expanding the conventional urban drainage system to account for the excess runoff produced by the rainfall event has limited scope. The challenge is to develop sustainable urban drainage systems (SUDS) to reduce runoff and create a flood control system in major cities. One of the SUDS that are becoming popular is the use of nature-based solutions (NBSs). A set of conventional NBSs to mitigate flood risk include bioswales, bio-retention, tree pits, infiltration trenches. However, even though their performance in flood control is found to be effective, they require considerable land area for deployment, which might be difficult to obtain in cities. For this purpose, green roofs have becoming popular as an alternative NBS in flood control, as it does not require any additional land area for deployment. This study investigates the effectiveness of a green roof in reduction of runoff via real-world case study. A green roof deployed in the CHQ building located at the city centre in Dublin, Ireland has been considered for the study. The green roof has a total size of 70 sq. m. Performance of the green roof in runoff reduction was measured based on rainfall and water retention data collected at four modular units, each having 1 sq. meter area, located at the centre of the roof with an IoT weight scale. The data has been collected for 1 week at 3-minute interval, and the reduction in runoff with and without the presence of the green roof has been estimated. The performance of the green roofs in runoff reduction was found to vary between 20-40% depending on the intensity of storm events.