Reducing surface water flooding through green infrastructure

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Many minds, one mission

About the research

Surface water flooding, caused by extreme rainfall, is of growing concern due to the increasing densification of urban environments, climate change and changes in land use. These factors, combined with the limited capacity of conventional drainage infrastructure in some urban areas, are likely to elevate the frequency of flooding events and as such, the potential for costly economic threats.

Green infrastructure (GI) can be defined as a set of practices that implement either natural vegetative systems and/or green technologies. GI is not only able to minimise urban flood risk, but such practices can provide a variety of ecological, social and economic benefits.

In order to support the development of GI approaches in urban areas, this study sought to investigate the effectiveness of green roofs and permeable pavements at reducing surface water flooding in an area of Bristol.

These two GI approaches were selected as they do not require additional space for implementation and as such, are a favourable GI approach in urban areas where available land is sparse and of high economic value.

Policy implications

- Local authorities should encourage the incorporation of GI into development plans through planning policy.
- Strong incentives are required to encourage the retrofit of the existing built environment with GI, particularly where the responsibility of uptake rests with individual homeowners
- To ensure that GI approaches harness the maximum possible benefit to an area, it is essential that during the design and implementation process, there is a strong multi-stakeholder collaboration and engagement
- To encourage maximum uptake, it is vital that the benefits of GI are clearly quantified and translated.

Key findings

- Both the singular and combined application of green roofs and permeable pavements across the study domain contributes to a reduction to both the depth and extent of surface water flooding, highlighting the effectiveness of such measures at improving the resilience of urban environments to flooding events.
- A range of multifunctional benefits can be delivered from the installation of GI that would not be attained with conventional drainage alone, strengthening the argument to implement GI measures. These benefits include, but are not limited to enhancing biodiversity, improving air quality, sequestering carbon, mitigating from the urban heat island effect and enhancing the character of a locality.
- Under conditions where there has been significant rainfall and, as a result, a saturated ground surface, the effectiveness of GI at reducing surface water flooding is reduced. Therefore, GI should be considered as an integrated solution with conventional drainage infrastructure.
- The installation of GI in the urban environment is limited by factors that include traffic volume on roads for permeable pavements and for green roofs, roof slope and the structural capacity of buildings. Therefore, their installation may only be feasible on select buildings suitable for retrofit or limited to new developments.

Further information

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