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## **The ecosystem service benefits of green-roof as a part of smart ecosystem-based management: A case study in Dublin, Ireland**

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The concept of Ecosystem-Based Management (EBM) as part of Nature-Based Solutions (NBS) have frequently been adopted in different strategic planning as a cross-sectoral mechanism to manage environmental problems. The EBM combines all relevant approaches, methods, tools, and software that collectively provide key scientific and socioeconomic evidence and eventually address environmental issues more sustainably. The specific application of EBM in different environmental problems, including flooding, have been proven effective in many cases. This ensures the superiority of EBM approaches for designing collaborative programs for solving environmental problems. The EBM offers a variety of sustainable interventions such as reducing impervious surface through porous paving, green parking lots, brownfield restoration, and deployment of green-roofs, which collectively attenuates water runoff and peak discharge, and offers protection against extreme precipitation events by enhancing water infiltration. In addition to the targeted benefits and cost-effectiveness of EBM, the supply of potential ecosystem service co-benefits that usually comes with EBM can contribute substantially to generating environmental benefits and adds community well-being. In order to analyse the superior effects of green-roof as a part of a smart-EBM framework, which has been deployed in CHQ building in Dublin, Ireland, a conceptual upscaling scenario framework has been formulated for measuring the city scale impact of green-roofs in providing multiple-valued ecosystem services. The biophysical and economic benefits of smart green-roof EBM will be estimated using varied ecosystem service modelling and standard cost-benefit analysis. The proposed smart green-roof framework is expected to have a more significant impact in minimising the flooding problems in Dublin city and expected to provide multiple regulating, supporting provisioning, and cultural benefits that can collectively surpass the deployment cost of green-roofs in the long run.