

## GREENER – GREEN roofs and walls hydraulic performance: Evaluation of the contribution towards Resilient cities

### Summary

Nature-based solutions (NbS) are being increasingly explored to assist in minimizing the impacts of the built environment, improve the quality of life in urban communities, and enhance the resilience of cities to face future challenges. Green roofs and walls are some of the most explored NbS in both academic studies and practical implementation. The array of potential benefits of these solutions ranges from the building scale, for point-isolated installations, to the city scale, for a generalized spatial implementation. At the building scale, some of the benefits include enhanced thermal performance, higher sound insulation, or better performance of photovoltaic panels, when installed in combination with green roofs. A city-wide scale policy for green roofs and walls installation also entails benefits in terms of heat island effect, noise and air pollution reduction, increased biodiversity, and better stormwater management. Some of these benefits are directly related to the climate and, therefore, dependent on climate changes.

Green roofs and walls have been studied by various researchers in diverse climate conditions, including in Portugal and Norway by members of the team, both in experimental, prototype, and real installations and under forced and natural rainfall events. However, few studies measured simultaneously all parameters related to the hydraulic performance of green roofs (rainfall intensity and amount, soil water content, evapotranspiration, and runoff). Furthermore, most studies resort to different measurement

techniques, some of them providing total values (e.g., water meters or scales for measuring the runoff) and other point values (e.g., humidity meters for measuring the soil water content), with varying degrees of accuracy.

Within this context, the main goal of the GREENER project is to expand the knowledge regarding the hydraulic performance of green roofs and walls under climate changes scenarios, providing more information on retention, detention, and evapotranspiration under present and future climate conditions for extreme and frequent rainfall events. This will be done through an experimental campaign resorting to simulated rainfall events. In addition to measuring simultaneously all parameters related to the hydraulic performance of the green roofs, the GREENER project proposes an innovative approach to measure them. The idea consists in assembling the green-roof tray on a high-resolution scale, while controlling the rainfall inflow and weighting the outflow runoff. Under these conditions, the proposed measurement approach will enable monitoring continuously and with an identical degree of accuracy all water fluxes. The validation of the proposed experimental approach will provide a simple, low cost and accurate method to study the hydraulic performance of green roofs in any weather context. The data obtained will be used to develop parametric models to assist in forecasting the impact of green roofs on the performance of stormwater management systems.



### Project Reference

FBR\_OC2\_80

### Leading Institution

IST – Instituto Superior Técnico  
(Portugal)

### Partners

NTNU – Norwegian University of  
Science and Technology  
(Norway)

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### CERIS Research Team

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EEA Grants

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### CERIS

14 977.15€

### Project Website

[gigroup.tecnico.ulisboa.pt/PHP/about.php?ProjectId=GREENER](http://gigroup.tecnico.ulisboa.pt/PHP/about.php?ProjectId=GREENER)