

Assessing the contribution of nature-based Solutions to urban resilience. A comprehensive assessment framework with focus on stormwater management and control

Summary

Nature-Based Solutions (NBS) are crucial to achieve the goals of the Paris Agreement on Climate Change and of the United Nation Agenda 2030 for sustainable development. In the last decade, a growing research attention to the NBS umbrella concept has emerged with the aim of contributing to urban resilience while also addressing the climate change challenges. NBS are defined as living solutions inspired by, continuously supported by and using nature, which are designed to address several societal challenges in a resource efficient perspective and to provide simultaneously economic and environmental benefits. Currently, cities are encouraged to understand and measure the NBS contribution to identify adequate strategies and prioritize investments with resilience as a focus. In this sense, the present thesis aims to promote and enhance the NBS implementation in cities, focused on solutions for stormwater management and control, through the analysis of their contribution to urban resilience, demonstrating their potential to meet environmental, social and economic challenges and to adapt across diverse urban scales and contexts. Thus, a Resilience Assessment Framework (RAF) to assess the NBS contribution to urban resilience and a guidance for the RAF application in cities were developed, including the RAF validation by stakeholders from seven cities, from the national and international context, which participated voluntarily in this phase.

A comprehensive and multidimensional RAF driven by the definition of objectives, criteria and metrics was developed, according to the proposed structure in the ISO 24500 standards for water supply and wastewater system management. For an oriented assessment of the criteria, qualitative and quantitative metrics were defined, considering data from different sources and complexity. Reference values were identified and metrics' classifications were proposed, by associating each answer to a resilience development level, to assess the NBS contribution to urban resilience on a normalized scale. To support the RAF application to cities with different resilience maturity, several analysis degrees and pre defined metrics were proposed in the guidance for the RAF application. In this sense, a complementary profile was also developed to support the assessment at the city and NBS levels and to assist in the selection of the analysis degree more suitable for a city. To conclude, the application of the RAF essential analysis degree to the seven participating cities, with different challenges regarding urban resilience and NBS, was detailed and the complete RAF application to the Porto's urban area, through an assemble assessment at the city and NBS levels. was carried out.

Keywords

Guidance for the RAF application, Nature-Based Solutions (NBS), resilience assessment framework, stormwater management and control, urban resilience.



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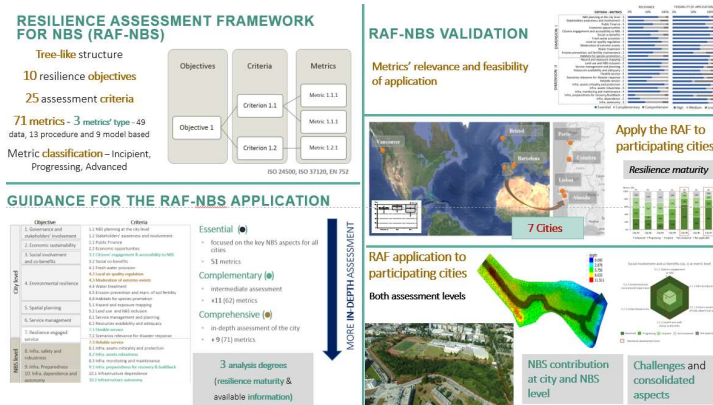
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Main PhD objectives and steps for assessing the contribution of NBS to urban resilience at the city and the NBS level.