

Title: How nature-based solutions can enhance urban resilience to flooding and climate change and provide other co-benefits: A systematic review and taxonomy

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Abstract: Planning clean, livable, and resilient cities is challenging. This becomes even more complex when considering the rapid population growth and urban development. The development of nature-based solutions (NbS) is acknowledged as a viable strategy to address this issue. It has multiple human and environmental health benefits under both normal and extreme climatic scenarios. This study aimed to examine how different conditions and factors are linked to the development of NbS for urban climate change adaptation, with a specific focus on stormwater and flooding management. Through a systematic literature review, this study proposes a taxonomy of NbS to better understand the processes and hierarchies involved in developing NbS. The analysis covered multiple factors related to geographical focus and scale, sector, climatic conditions, adaptation and mitigation measures, ecosystem services, and co-benefits. These factors were linked to ten classified NbS approaches and 29 specific NbS interventions. An analysis of 582 empirical studies showed that Sustainable Urban Drainage Systems (SUDS) are the most dominant approaches of NbS for adaptation, followed by Low-Impact Development (LID), Green Infrastructure (GI), Sponge City (SC), and Blue-Green Infrastructure (BGI). Among the different interventions, green roofs play a significant role in providing multifunctional ecosystem services and adaptation benefits such as stormwater and climate regulation. Policymakers and developers aiming to expand the implementation of NbS can consider the taxonomy proposed in this study to choose the right types of NbS and obtain maximum co-benefits.

Keywords: Nature-based solutions (NbS), Urban climate change adaptation, Stormwater management, Flooding management, Sustainable, Urban Drainage Systems (SUDS), Low-Impact Development (LID)

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