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Urban Water Neutrality at City Scale: CityPlan Evaluation and Design Module

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November 26, 2022

Abstract

Climate emergency and exponential population growth threaten urban water security in cities worldwide. In the UK, London aims to build more than half a million households over the next 10 years to cope with a growing demand for housing. These new urban developments will significantly increase the consumer water demand, urban flood risk, and river water pollution levels; therefore, a sustainable approach to development is urgently required. Urban Water Neutrality (WN) has emerged as a concept to frame these concerns about rising water stresses in cities. We adapt the definition of WN as a design process aimed to first minimise the impact of every new development and then offset any remaining stresses with interventions external to the development, so the current overall impact levels are not increased after the project completion. Despite several studies related to WN, little evidence is available on how urban water neutrality might be achieved to tackle predicted pressures at city scale. In this work, we present a novel urban design and evaluation module called CityPlan. It integrates spatial data with an integrated urban water management model, enabling urban design at systems level and delivering a new index that assesses possible future scenarios. Urban form properties and urban water security indicators are improved with design options that deliver different scores of the Water Neutrality Index (WNI). The results from the WNI indicate the potential of a particular urban design scenario to achieve water neutrality and how multiple interventions should be combined at city scale. In London, CityPlan's results suggest that it will be necessary to retrofit almost the same number of existing homes with WN design options outside the planned development areas to completely offset the forthcoming water stresses. CityPlan provides a clear vision of how water neutrality can be achieved for urban water systems and is a powerful tool for urban planners and other stakeholders to effectively promote new policies and drive sustainable development. Moreover, it provides a framework to contextualise water neutrality and its key role in urban water security.

AGU FALL MEETING 2021

ABSTRACT SUBMISSION

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