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Does urban flood resilience compete with sustainable urban planning as a whole?

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Sustainable urban planning aims at designing the urban fabric so that it meets the needs of an expanding urban population, while synergistically addressing a number of environmental objectives such as transport, energy and resource efficiency. Urban densification is a key concept in sustainable urban planning, as it contributes to reduce pressure on environmentally sensitive lands and it makes several services more efficient, including water and energy supply. Similarly, at a local level, intervening spaces in-between buildings should be minimized to enhance heating efficiency. In this communication, we will report on two recent studies focusing on urban flood resilience. Both of them suggest that flood-resilient urban design tends to conflict with the two aforementioned aspects of sustainable urban development.

The first study was conducted at the regional level, covering the whole Walloon Region in Belgium (17,000 km^2). First, an original agent-based model was used to generate multiple urbanization scenarios with contrasting assumptions on spatial planning policies: urban expansion (sprawl) vs. urban densification, various degrees of ban on new developments in flood-prone areas … Next, flood damage modelling was performed along over 1,300 km of river. The results show that the urban densification scenarios lead to systematically higher flood risk estimates, since they promote new developments in the vicinity of existing urban areas mainly located in the lower parts of the river valleys.

In a second study, conducted at the district level, we investigated how inundation severity is affected by the arrangement of buildings in floodplains . A set of 2,000 building layouts were synthetized using procedural modelling (Bruwier et al., 2018). Each building layout is characterized by a set of parameters such as the typical street widths, building size … Next, the flow characteristics (water depth, flow velocity) were computed for each building layout considering the same flooding scenario. An original porosity-based model was set up for this purpose (Bruwier et al., 2017). The findings of the study reveal that increasing the separation space in-between buildings tends to improve flood-resilience at the district level, thanks to an increased flow conveyance across the urban area.

At first sight, the conclusions inferred from the two studies focusing on flood-resilience only (higher future flood risk due to urban densification, benefit of keeping intervening space in-between buildings) seem to diverge from general good-practice in sustainable urban planning. We intend to use this provocative statement to foster discussion with the audience on issues such as: “How can more integrated approaches mitigate such apparent contradictions?”, “How to best modulate sustainable urban planning principles to accommodate urban flood resilience?”

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