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A transdisciplinary approach to hydro-meteorological risk reduction in an informal semi-urban neighbourhood in El Salvador

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Abstract

Informal neighbourhoods face complex social, economic and environmental challenges, of which many are related to uncoordinated land and water management. Mitigation measures are mostly implemented by individual residents, but due to landscape connectivity, these measures often cause downslope impacts. Reduced vegetation and surface sealing combined with the lack of a sewage system lead to high surface water runoff, which results in increasing pluvial flooding, erosion, and landslides. Moreover, the effects of climate change increase hazard intensities and therefore, hydro-meteorological risks.

This study presents a transdisciplinary land and water management approach based on interviews, field surveys and numerical modelling to identify appropriate Nature-based Solutions (NbS) for informal semi-urban neighbourhoods to reduce hydro-meteorological risks.

Interviews and transect walks served to delineate the study area and identify challenges and relevant stakeholders. Participatory mapping utilised local knowledge to identify surface runoff paths and problem sites and served as a basis to discuss, design, and locate potential NbS. Proposed solutions include low-cost, self-implementable NbS and urban planning measures which require the involvement of other actors.

The use of the coupled hydrological-hydrodynamic model HEC-RAS serves to describe the surface water runoff conditions in selected precipitation events by utilising Rain-on-Grid modelling, and to quantify the potential effects of suggested NbS. The idea is to validate the model through flooding depths of historical precipitation events, which were determined during the participatory mapping workshop.

The results are expected to demonstrate the ability of this conceptual approach to utilise local knowledge to design implementable and effective NbS to reduce hydro-meteorological risks. Furthermore, this study will show how local knowledge and participatory mapping can be used to validate pluvial flooding models. The quantification of the effects of proposed NbS can support the implementation of suggested measures.

Keywords: Hydro-meteorological risk, hydrological-hydrodynamic modelling, informal neighbourhood, nature-based solutions, participation, transdisciplinary research, urban runoff