Collaborative planning of nature-based solutions for climate resilience at landscape scale: exploring the potential of geodesign

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Rural European landscapes are increasingly faced with the interlinked and cascading hazards of flooding and drought, exacerbated by both unsustainable land use practices and climate change. Sponge measures are particularly promising for addressing such multi-hazard risk from a participatory and social-ecological perspective. Sponge measures are nature-based solutions (NbS) that preserve, restore, enhance or create ecosystems to increase landscape and soil water retention while providing co-benefits for people and nature through biodiversity and ecosystem services. As NbS, they interact in complex ways with the socio-ecological systems (e.g. watershed boundaries) in which they are implemented. Thus, participatory processes are needed to ensure a systemic and interdisciplinary understanding of impacts while capturing diverse stakeholder values and interests. NbS design and planning often lacks 1) a shared understanding of the spatially-explicit impacts of NbS on the social-ecological system among stakeholders; 2) consideration of a broad spectrum of impacts as (co-)benefits and trade-offs; and 3) consideration of scales beyond the immediate measure and within diverging future scenarios.

As a promising approach to address these shortcomings, we propose the use of geodesign - an iterative framework for multidisciplinary, stakeholder-driven, and context-sensitive spatial decisions based on the integration of stakeholder inputs, geospatial data, and technology to generate real-time feedbacks and inform smart decision-making. This process also can support participation through fostering shared understandings and reconciling stakeholder conflicts. Despite promising applications in urban and landscape planning, knowledge is lacking on how and with what impacts geodesign can be applied to facilitate the planning of sponge measures at landscape scale. The aim of our research is to assess the utility of geodesign in the context of adaptive sponge measures by combining a systematic literature review with practical application of geodesign in two European catchments faced with increasing risk of hydrometeorological extremes. The review will quantify the adoption and past effectiveness of geodesign practices in similar landscape planning contexts. Based on these insights, a geodesign approach will be developed and implemented within the EU SpongeScapes project (spongescapes.eu) in selected case studies to generate future scenarios to increase landscape resilience against climate change. We present the research plan, including initial hypotheses and preliminary findings as
conducted within the context of ongoing PhD research. With the increasing implementation of NbS in Europe in response to unfolding climate change and its consequences, our research will provide insights into the potential benefits and limitations of geodesign to improve their co-design, support policy creation, and inform decision-making.