



## **Integrating social justice concerns into evidence-based governance of nature-based solutions for urban resilience: insights from field research in Glasgow and Taipei**

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This paper exemplifies a framework for systematically evaluating social justice dimensions within evidence-based decision-making processes for nature-based solutions in cities. There is increasing awareness that social justice – that is, reaching outcomes which are fair across society - needs to be an integral component to resilient cities, and that nature-based solutions may disproportionately benefit affluent or empowered communities. Yet it is also arguably true that effective deployment of nature-based solutions requires consideration of technical and scientific processes at a city-wide scale, and hence that equitable reduction of climate risk via nature-based solutions may be more complex than simply targeting discrete interventions towards more vulnerable areas.

The purpose of this paper is therefore to illustrate challenges and opportunities in supporting geoscientists and urban policy-makers, who produce and rely on spatial environmental data as an evidence base for decisions, to consider social justice dimensions in urban governance for nature-based solutions. The aim is to reach outcomes that are both socially equitable and scientifically appropriate. We assess these issues through empirical stakeholder interview- and policy-analysis data collected for the current status of nature-based solutions development in Glasgow (Scotland) and Taipei (Taiwan), giving one European and one Asian case study and one oceanic and one subtropical city. For each, we assess (a) data availability and competences for understanding spatial distribution of benefits from nature-based solutions relative to vulnerable populations; (b) processes for making decisions about nature-based solutions, and opportunities for participation and learning within these; and (c) how well different groups and knowledge systems are recognised within decision-making forums for nature-based solutions.

Our results indicate that finding ways to connect nature-based solutions – particularly their role in reducing climate risk – to overarching social issues such as health and wellbeing may build political traction for deployment. Attaining this, however, requires rigorous and appropriate data – such as flood disadvantage work undertaken in Glasgow integrating physical exposure with socio-economic data – and strong city-level leadership to balance competing pressures and identify areas where nature-based solutions benefits are needed the most. Moreover, whilst governance of nature-based solutions ought to be guided by data and techno-scientific evidence from the city-wide level, community engagement initiatives can help to ensure nature-based solutions are appropriate to communities' resilience-building requirements, perceived as legitimate, and not viewed as being imposed from on high and/or unwanted. Whilst not explicitly geared towards nature-based solutions, initiatives such as disaster resistant community in Taiwan, Taipei Open Green and Taipei's wider turn towards citizen participation can provide a pathway to more inclusive governance processes. Lastly, we reflect on the challenge in both cities of recognising techno-scientific expertise and data (e.g. land use and heat exposure, flooding risk, and vulnerability within different societies) alongside citizen and practitioner knowledge.

Finally, from Glasgow and Taipei we offer insights on the role geoscientists can play in the complex governance of nature-based solutions. This includes early engagement with policy-makers to understand knowledge gaps and data requirements, and collaboration with knowledge-brokers to identify where and how they can inform urban governance with appropriate evidence.