Risk-KAN Working Group: *Vulnerability dynamics in (multi-)hazard-risk research*

Working Group Leads

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Rationale

Vulnerability is a central component of risk, shaping the extent to which individuals or other elements at risk are affected by natural hazards. It can be linked to single or multiple hazards, and is driven by a myriad of interacting factors, including shifting social, economic, and environmental conditions. Additionally, disadvantaged social groups such as ethnic minorities, persons with disabilities, and women often carry a disproportional burden from natural hazards. As a result, assessing and addressing vulnerability have become increasingly complex tasks. It demands not only a holistic characterisation of the system under investigation but also an in-depth understanding of the root causes of vulnerability and their spatial and temporal dynamics. This integration of holism and depth has, nonetheless, proved overwhelming, with most studies accepting trade-offs, especially in the context of repeated disaster exposure, where recovery between events is not always possible.

Rising to this challenge, recent studies have sought to deepen our understanding of the temporal and spatial vulnerability dynamics, including those resulting from compound and consecutive hazards, as well as complex socio-economic and political drivers. They have advanced in integrating evidence, data, and methods, for example, by implementing multi-scale methods and capturing the local context of vulnerability. There is also great promise in systematic framings of vulnerability, the combination of qualitative and quantitative perspectives, interdisciplinary approaches, and promoting the transferability of datasets and methods across disciplines, contexts, and scales (e.g., applying Earth observation to vulnerability estimation).

To support these efforts and fill the remaining gaps, this working group proposes highlighting the dynamic nature of vulnerability across all phases of disaster management and climate adaptation, thereby advancing its integration across disciplines in the climate and natural hazards fields. Specifically, we seek to foster an exchange of cross-sectoral and multi-scalar approaches, foment the transferability of data and methods, the production and validation of systematic data on vulnerability factors, and inter- and transdisciplinary learning through

scientific exchange. We also recognise a need to support the operationalisation of vulnerability science in the form of capacity building on different scales and equitable knowledge exchange across contexts, ensuring strong leadership and perspectives from the Global South, which is currently still underrepresented in global research.

Aims

- To identify common and divergent points in vulnerability definitions to enhance the robustness of vulnerability understanding and cross-study comparison. This will support a more nuanced, context-specific characterisation of vulnerability drivers, dynamics, measurement approaches, and outcomes.
- To promote the development of conceptual and operational frameworks capable of tracking vulnerability dynamics in hazard-specific, as well as hazard-agnostic contexts.
- To collect and promote best practices in data, methods, and evidence transferability and interoperability, including approaches in standardisation, generalisation, downscaling, and multimodal data harmonisation.
- To facilitate inter- and multidisciplinary exchange among academics, practitioners, and decision-makers, particularly in the sectors of Disaster Risk Reduction (DRR), Disaster Risk Management (DRM), Humanitarian Assistance, Development, Climate Adaptation, and Climate Science.
- To improve the common understanding and strengthen capacity building on different scales.

Planned Activities

- Organise regular online seminars (~4 times a year) to share research insights and foster discussions.
- Participate and organise relevant thematic events and workshops (e.g., a recurring Splinter Meeting at EGU).
- Organize dedicated scientific sessions at conferences (e.g., EGU under NH9, NH10, or ITS) and contribute to relevant policy dialogues.
- Contribute to debate in the field through journal articles, policy briefs, and blog posts.