



## Identifying archetypes of climate vulnerability: A mixed-methods approach for heat and flood related risk in Austria

**Julia Beier**<sup>1</sup>, Eva Preinfalk<sup>1,2</sup>, and Susanne Hanger-Kopp<sup>1,3</sup>

<sup>1</sup>Population and Just Societies, International Institute for Applied Systems Analysis, Laxenburg, Austria

<sup>2</sup>Wegener Center for Climate and Global Change, University of Graz Austria, Graz, Austria

<sup>3</sup>Department for Environmental Systems Science, ETH Zürich, Zürich, Switzerland

Climate change interacts with a multitude of socioeconomic characteristics (i.e. income, age, employment), determining individual risk and coping capacities. However, existing impact assessments of climate risk commonly focus on aggregate levels, leaving blind spots with respect to within-country distributional effects. Adhering to the concept of intersectionality, this study examines differential vulnerabilities and factors determining heterogeneities on a household level in the context of heat and flood related risks in Austria.

We extend upon previous research by identifying differential vulnerabilities and the patterns determining heterogeneities among agents. To this end, we develop a mixed-methods approach, bringing together two ends of the spectrum: the generic representation of a single representative household and highly context specific individual risk determinants. Building on stakeholder involvement at different governance levels, qualitative insights from workshops and interviews are developed into narratives and storylines. These are vital for identifying key drivers of vulnerability and later integrated and combined with multivariate statistical analysis. Using the K-modes clustering algorithm, we combine geocoded socioeconomic data (e.g. age, sector and type of employment and income) with climate impact data (flood inundation level for different return periods, kysely days) on a 1kmx1km scale. Such development of archetypes aligns quantitative clusters with qualitative narratives, fostering mutual validation and a profound understanding of differential climate risk. Thus, the iterative exchange between quantitative and qualitative methods constitutes the backbone of this study.

Through this approach, we identify reoccurring indicator combinations to disentangle the socioeconomic drivers of differential vulnerabilities and coping capacities in the context of flood- and heat-related climate risk. This sheds light on the within-country distributional implications of climate change, characterizing archetypical patterns of vulnerability and the constraints underlying adaptive capacities. Our findings contribute towards a more nuanced representation of society in climate impact assessments and enhance the understanding of the individual constraints limiting

adaptive capacities, informing the development of targeted and just adaptation.