Klimatag: Motto „**Stadt** und **Land** im **Fluss**"

Building quantitative and qualitative archetypes of households to assess vulnerability to flood and heat-related risks in Austria.

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Themenstellung

Climate change interacts with a multitude of social structures, determining individual risk and coping capacities. Existing socio-economic impact assessments of climate risk commonly focus on aggregate levels, such as GDP, leaving severe blind spots with respect to within-country distributional effects of climate change impacts. While research addressing this gap remains scarce, a profound understanding of social vulnerabilities across societal groups and the integration of these insights in impact and adaptation assessments is key for effective adaptation policy processes.

Our study extends upon previous research assessing socioeconomic aggregates by shedding light on distributional effects of flood and heat-related climate risks within the Austrian society. We explore differential vulnerabilities and the patterns determining heterogeneities among agents through developing household archetypes. As this requires impact assessments to move beyond representing average regional effects, we bring together two ends of the spectrum: namely the generic representation of a single representative household and highly context specific risk determinants of individual households, by means of identifying recurring patterns.

Methode

This study employs a mixed-methods approach, iteratively integrating qualitative insights with quantitative socioeconomic and climate hazard data to develop household archetypes. Situated between the two extremes of overgeneralization in quantitative studies and overly context-specific qualitative studies, archetype analysis constitutes a comparative approach to identify recurrent patterns to explain outcomes.

Stakeholder engagement constitutes an important building block for determining archetype profiles of vulnerable households. Thus, a comprehensive stakeholder engagement process, where profiles of vulnerable households are co-developed, constitutes the backbone of this study. This approach is illustrated in the figure attached.

For further characterization of vulnerability, quantitative archetypes are developed by means of a statistical cluster analysis, as suggested in previous work. This data-driven method identifies archetypical patterns of climate risk, revealing reoccurring indicator combinations. By applying the K-prototypes clustering algorithm, we are able to combine categorical and continuous geocoded socioeconomic data on household characteristics (e.g. age, sector and type of employment and income) available through Statistik Austria with climate impact data (flood inundation level, summer days) as a measure for exposure on a 1kmx1km scale.

The development of archetypes integrates qualitative insights and aligns them with quantitative clusters, fostering validation and alignment. Qualitative methods, including literature reviews, stakeholder workshops, and key-informant interviews from which narratives are developed, are

employed to identify key drivers of vulnerability to climate risks and inform the clustering process. A stakeholder mapping effort identifies organizations representative of vulnerable groups, providing insights for the storylines.
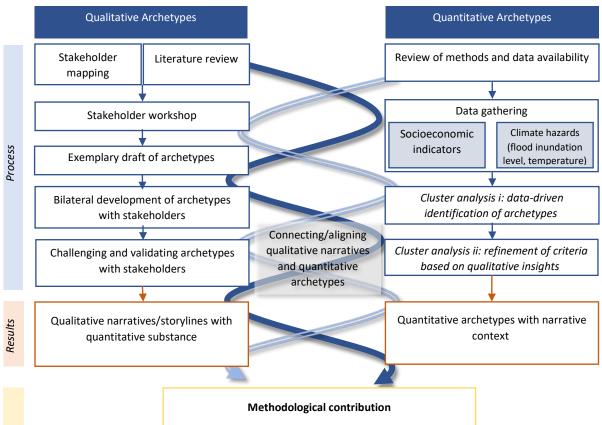
Ergebnisse

The result of the qualitative analysis of the literature and the stakeholder engagement will be a set of storylines on social vulnerability to flood- and heat-related health risks in Austria on a household level. The narratives enhance evidence on social vulnerability and its underlying drivers in Austria and contribute to a more nuanced understanding and communication of the model results.

By developing quantitative archetypes with narrative context, household heterogeneities can be better captured in model-based assessments, going beyond the depiction of representative agents, towards a more accurate representation of society. As household archetypes are differentiated based on quantitative terms, a translation into model language is possible, while keeping track of qualitative characteristics for substantiating results.

This study enhances the understanding of the within-country distributional implications of climate risk, going beyond quantitatively measurable indicators. Thereby it disentangles the drivers of social vulnerability to better understand the individual constraints limiting adaptive capacities and autonomous adaptation of private agents. Drivers are for example, income or the lack of financial assets to restricted mobility or language barriers. The results support a) the design and implementation of just and effective public adaptation to enhance adaptive capacities where most needed, and b) the implementation of the goals set under the EU Green Deal and EU Adaptation Strategy to achieve climate resilience in a just way.

Abbildung

Qualitative Archetypes

Quantitative Archetypes

Process

Stakeholder mapping

Literature review

Review of methods and data availability

Stakeholder workshop

Exemplary draft of archetypes

Data gathering

Socioeconomic indicators

Climate hazards (flood inundation level, temperature)

Bilateral development of archetypes with stakeholders

Cluster analysis i: data-driven identification of archetypes

Challenging and validating archetypes with stakeholders

Connecting/aligning qualitative narratives and quantitative archetypes

Cluster analysis ii: refinement of criteria based on qualitative insights

Results

Qualitative narratives/storylines with quantitative substance

Quantitative archetypes with narrative context

Contributions

Methodological contribution

- Quantitative archetypes to disaggregate households in model-based assessments
- Storylines to further contextualize generic risk assessments and add nuanced understanding

Policy relevance

- Quantitative and qualitative insights to inform the design of just and effective risk management and adaptation policies
- Disentanglement of the drivers of population heterogeneities in the context of climate risk