

Conceptual framework for future urban social vulnerability assessment

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Floods and heat waves cause many human and material losses every year, especially in the urban systems. One of the ways to reduce the losses is to identify the risk and mitigate hazard effects. Common risk/vulnerability assessment does not take into account urban morphology seriously. Meanwhile our suggested concept, not only identifies existing, but also the future urban morphology and social systems.

Introduction

Floods are the most frequent and most material damage inflicting hazards in the world (CRED, 2012). Meanwhile, heat waves are the cause of about 95% of natural disaster human losses in post-industrial countries (Poumadere et al., 2005). According to the database of the Centre for Research on the Epidemiology of Disasters (CRED), an estimate of 80.000 casualties can be related to heat wave disasters since the beginning of the 20th century. Considering climate and demographics projections, the essential decisions should be taken in order to reduce the number of human losses by these disasters in the future.

Vulnerability assessment

Risk and vulnerability assessments are the main approaches to analyze the possible impact of a hazard. However, there is no clear indication of a methodological approach, even less so a common definition of vulnerability. Methods to quantify vulnerability are numerous and vary greatly. Plus, there is no given unit for vulnerability: it cannot be quantified given a physical unit. Therefore, the question of measuring vulnerability is still open. In our opinion, an in depth, comparative and critical analysis of existing vulnerability concepts is a compulsory first step prior the definition of a broad assessment framework.

Essential step of vulnerability assessment is the identification of susceptible populations, assets and the exposition to hazards. One of the weaknesses of current approaches is the simplified view of urban areas, especially in terms of the dynamics of morphology and social systems. It is a common practice to take into account the current sensitivity and include future projections of climate change. However, future urban change, which includes changing morphology and changing demographics, is commonly neglected. Both have a significant impact on the exposure but also the susceptibility towards heat waves and floods.

Methodology of vulnerability assessment

The methodology and outcome of this vulnerability assessment is still considerable. The results shall help to identify heat and flood hazard vulnerable people in the Hamburg area. Therefore, one of the final procedures is to identify what hazard circumstances are dangerous for certain groups of people. For the assessment of the potential hazards, knowledge about both the future distribution of people and the susceptibility of their homes to hazards are needed. Therefore, the future urban development is a necessary basis of this research.

The key – future urban development

Urban development is known as an indicator of sensitivity and/or exposure. In our research, we consider it more as an important factor of social vulnerability, because the urban development is more permanent as demographics and economics.

Former research of future urbanization scenarios for Hamburg by Daneke (2013) showed the potential of urban development projection tool, named “Metronamica”. This tool is created by “RIKS” company and use the Monitoring Land Use/Cover Dynamics (MOLAND) model. “Metronamica” is based on cellular automata model and is known for its simple interface, generic applicability, and flexibility. Daneke (2013) applied “Metronamica” for the metropolitan area of Hamburg in local scale and followed several urban scenarios including urban sprawl and compact city. However, in this research, the social-economic development was not considered. For future vulnerability projection and assessment, socio-economic indicators must be included in the modeling application. This will give us more sophisticated future urban projection for Metropolitan area of Hamburg and a good basis to apply different demographic and hazard scenarios for specified urban land-use/cover zones.

Expected results

The expected outcome of this study is a comprehensive urban social vulnerability assessment framework, which would include land-use/cover, social indicators and would provide the spatial distribution of heat and/or flood hazard, social groups, who are vulnerable to certain hazards.

References

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