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Considering Time-Dependency of Social Vulnerability in Crisis Modeling and Management

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Crisis and disaster management is much more than the immediate first-response actions following an incident. In many projects the main focus has been on the phase starting at the point when an unwanted event happens and lasting until the activities return to normal routines (i.e. ad hoc reaction rather than proactive mitigation). There has been less emphasis on the other phases of the disaster management cycle such as prevention, preparedness, recovery and reconstruction, even though those phases have a strong influence on the general status of a society and its citizens. Especially the potential of a crisis to escalate into a large-scale disaster is heavily dependent on the overall level of preparedness as well as on the planning of mitigation and response actions and their timely execution. There is a need for improved decision-making support that enables modeling of different crisis scenarios and their impacts according to chosen prevention and response actions.

Vulnerability describing the status of a society with respect to an imposed hazard or potential impact is considered a strongly multidisciplinary concept. A central objective of vulnerability assessment is to provide indications where and how people – and more specifically, what kind of people – might be affected by a certain impact. Results should provide decision- and policy-makers with supporting information to target response and mitigation actions adequately. For assessment of the social dimension of vulnerability, population exposure mapping is usually considered the starting point. Integration of social structure and varying aspects of resilience further differentiate situation-specific vulnerability patterns on a local scale.

In a disaster risk management context, assessment of human vulnerability has generally been lagging behind hazard analysis efforts. Accurately estimating population exposure is a key component of catastrophe loss modeling, one element of effective integrated risk analysis and emergency management. The vulnerability of each relevant element at risk, including human beings and society in general and its time-dependent variation is characterized both by its pre-event status and by its possible evolution during a crisis. Particularly in metropolitan areas, the spatial distribution of population is highly time-dependent due to human activities and mobility. Identifying distinct day-/nighttime population distribution characteristics is a major improvement compared to standard residence-based models, but does however only display part of reality. New technologies and data processing capabilities allow moving into the field of real-time representation of human movement. The focus of this contribution will be on illustrating, through project examples and by putting it in an emergency and crisis management context, two main categories, (1) the mapping of cell phone user activity, and (2) the use of volunteered geographic information (VGI).