Assessing human vulnerability: Daytime residential distribution as a vulnerability indicator

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Natural hazard risk management is based on detailed information on potential impacts of natural hazards. Especially concerning fast onset hazards such as flash floods, earthquakes but also debris flows and landslides, knowing potential hotspots of impact to both, assets and human lives is essential. This information is important for emergency management and decision making in the response phase of the disaster management cycle.

Emergency managers are in need of information regarding not only the number of humans being potentially affected but also the respective vulnerability of the group affected based on characteristics such as age, income, health condition, mobility, etc. regarding a certain hazard. The analysis presented focuses on the distribution of the population, assuming a certain pattern of people in a certain radius of action. The method applied is based on a regular pattern of movement of different groups of people and a pattern of presence in certain units, e.g. schools, businesses or residential buildings. The distribution is calculated on a minimum of available data including the average household size, as well as information on building types.

The study area is located in the Southwest of Lower Austria, Austria. The city of Waidhofen/Ybbs can be regarded as a regional center providing basic infrastructure, shops and schools. The high concentration of buildings combining shops and residential units leads to a high damage potential throughout the whole study area.

The presented results indicate the population distribution within the study area on an average working day. It is clear that explicitly high numbers of people are located in specific buildings (e.g. schools and hospitals) which also include highly vulnerable groups especially to fast onset hazards. The results provide emergency services with the information that they need in order to intervene directly where large numbers of victims or people that need to be evacuated are located. In this way, emergency services can focus and prioritize their actions in order to save lives and reduce the number of potential victims.