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The Atlas of Natural Hazards and Risks of Austria: first results for fluvial and pluvial floods

Martin Mergili (1), Andreas Tader (1,2), Thomas Glade (1), Clemens Neuhold (3), and Heinz Stiefelmeyer (3)

(1) University of Vienna, Department of Geography and Regional Research, Vienna, Austria (martin.mergili@univie.ac.at), (2) BOKU University Vienna, Institute of Applied Geology, Vienna, Austria, (3) The Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management, Vienna, Austria

Incoherent societal adaptation to natural processes results in significant losses every year. A better knowledge of the spatial and temporal distribution of hazards and risks, and of particular hot spots in a given region or period, is essential for reducing adverse impacts.

Commonly, different hazard and risk estimations are performed within individual approaches based on tailor-made concepts. This works well as long as specific cases are considered. The advantage of such a procedure is that each individual hazard and risk is addressed in the best possible manner. The drawback, however, consists in the fact that the results differ significantly in terms of quality and accuracy and therefore cannot be compared. Hence, there is a need to develop a strategy and concept which uses similar data sources of equivalent quality in order to adequately analyze the different natural hazards and risks at broader scales. The present study is aiming to develop such a platform.

The project Risk:ATlas focuses on the design of an atlas visualizing the most relevant natural hazards and, in particular, possible consequences for the entire territory of Austria. Available as a web-based tool and as a printed atlas, it is seen as a key tool to improve the basis for risk reduction, risk adaptation and risk transfer. The atlas is founded on those data sets available for the entire territory of Austria at a consistent resolution and quality. A 1 m resolution DEM and the official cadastre and building register represent the core, further data sets are employed according to the requirements for each natural hazard and risk.

In this contribution, the methodology and the preliminary results for fluvial and pluvial floods and their consequences to buildings for three selected test areas in different types of landscapes (rural, urban and mountainous) are presented. Flooding depths expected for annualities of 30, 100 and 300 are derived from existing data sets for fluvial floods and are computed using the model FloodArea for pluvial floods. Land cover parameters necessary for flood routing are deduced from the official cadastre. The values exposed to each flood scenario are quantified on the basis of objects. In this study, the focus is on buildings, thus the official building register is employed as a major data source. The same register is used to derive the vulnerability of each building with regard to floods. Combining exposed values and vulnerability, the risk for each building, expressed as the expected damage per unit of time, is derived.

Furthermore, a methodology to automatically regionalize the object-based hazards, exposures, vulnerabilities and risks to any spatial unit desired is presented. This enables us (i) to adapt the web-based atlas to different zooming levels and to flexibly react to (ii) the needs of the users of the atlas and (iii) the availability of reference data for validation of the analyses.

The next steps will include (1) extending the analyses for fluvial and pluvial floods to the entire territory of Austria, employing advanced computational techniques such as the use of a cluster; (2) deriving hazards, exposures, vulnerabilities and risks related to a variety of other hazardous processes as well as to chains and combinations of processes (multi-hazard); (3) considering the consequences of hazardous processes not only for buildings, but also for infrastructures and even humans; and (4) elaborating future scenarios, based on possible environmental (including climatic) and socio-economic changes.