

## **A toolbox to visualise benefits resulting from flood hazard mitigation**

Sven Fuchs, Thomas Thaler, and Micha Heiser

University of Natural Resources and Life Sciences, Institute of Mountain Risk Engineering, Vienna, Austria  
(sven.fuchs@boku.ac.at)

In order to visualize the benefits resulting from technical mitigation, a toolbox was developed within an open-source environment that allows for an assessment of gains and losses for buildings exposed to flood hazards. Starting with different scenarios showing the changes in flood magnitude with respect to the considered management options, the computation was based on the amount and value of buildings exposed as well as their vulnerability, following the general concept of risk assessment. As a result, beneficiaries of risk reduction may be identified and – more general – also different mitigation options may be strategically evaluated with respect to the height of risk reduction for different elements exposed. As such, multiple management options can be ranked according to their costs and benefits, and in order of priority.

A relational database composed from different modules was created in order to mirror the requirements of an open source application and to allow for future dynamics in the data availability as well as the spatiotemporal dynamics of this data (Fuchs et al. 2013). An economic module was used to compute the monetary value of buildings exposed using (a) the building footprint, (b) the information of the building cadaster such as building type, number of storeys and utilisation, and (c) regionally averaged construction costs. An exposition module was applied to connect the spatial GIS information (X and Y coordinates) of elements at risk to the hazard information in order to achieve information on exposure. An impact module linked this information to vulnerability functions (Totschnig and Fuchs 2013; Papathoma-Köhle et al. 2015) in order to achieve the monetary level of risk for every building exposed. These values were finally computed before and after the implementation of mitigation measure in order to show gains and losses, and visualised. The results can be exported in terms of spread sheets for further computation.

### References

- Fuchs S, Keiler M, Sokratov SA, Shnyarkov A (2013) Spatiotemporal dynamics: the need for an innovative approach in mountain hazard risk management. *Natural Hazards* 68 (3):1217-1241
- Papathoma-Köhle M, Zischg A, Fuchs S, Glade T, Keiler M (2015) Loss estimation for landslides in mountain areas - An integrated toolbox for vulnerability assessment and damage documentation. *Environmental Modelling and Software* 63:156-169
- Totschnig R, Fuchs S (2013) Mountain torrents: quantifying vulnerability and assessing uncertainties. *Engineering Geology* 155:31-44