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Land use scenarios for flood risk analyses

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Common risk assessments are usually based on current hazard and vulnerability analyses and are thus only reliable for the contemporary state. Considering future dynamics like land use changes, shifts in the hazard potential, economic development etc. in risk analyses, however, provides long-term risk assessments that may serve as a basis for appropriate adaptation planning of policy-makers and stakeholders. Although such approaches are still rare, they should increasingly be taken into account for long-term and sustainable risk assessments.

Within the FloodTimeS-project flood risk time series will be generated for the next decades in the area of Reutte in Tyrol (Austria) located in the Lech catchment. Besides the estimation of the hazard potential the flood impact, i.e. flood losses, are investigated as well. To derive potential flood prone areas, future settlement areas were estimated. This was realized by conducting land use simulations on a raster basis with the regional land use model CLUE S. This model is, in contrast to other empirical models, capable of simulating multiple land use types simultaneously through the dynamic simulation of competition between all considered land use types.

At first a stepwise logistic regression was performed to identify the statistical relationship between the considered land use types and different driving factors, which are considered as the proximate cause of land use change. These driving factors were represented by various socioeconomic (e.g. population density, ratio of labour forces per 100 inhabitants etc.) and biophysical (e.g. slope, exposition and degree of accessibility to infrastructure) variables. The land use types were received from actual land use maps from the CORINE programme. Additionally neighbourhood functions, zoning restrictions such as danger zone plans for rivers, mountain torrents etc. and decision rules which specify the possible/impossible transitions between the considered land use types were included. Before the land use changes were allocated in specific land use patterns, reliable land use demand scenarios (i.e. the annual quantitative change for each land use type) had to be chosen. For that, the spatial planning scenarios for Austria published by the Austrian Conference on Spatial Planning were used. These scenarios provide thresholds for the same land use types based on the global mega trends. Finally annual land use maps for different scenarios were calculated which can be used as input for the flood loss estimation.

This contribution presents a possible concept how future land use dynamics could be simulated on a local scale and integrated in flood risk analyses. First results will be introduced and discussed with regard to the applicability for risk assessments in alpine regions.