



Flood risk in a changing world – a coupled transdisciplinary modelling framework for flood risk assessment in an Alpine study area

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Devastating flood events have caused substantial economic damage across Europe during past decades. Flood risk management has therefore become a topic of crucial interest across state agencies, research communities and the public sector including insurances. There is consensus that mitigating flood risk relies on impact assessments which quantitatively account for a broad range of aspects in a (changing) environment. Flood risk assessments which take into account the interaction between the drivers climate change, land-use change and socio-economic change might bring new insights to the understanding of the magnitude and spatial characteristic of flood risks. Furthermore, the comparative assessment of different adaptation measures can give valuable information for decision-making.

With this contribution we present an inter- and transdisciplinary research project aiming at developing and applying such an impact assessment relying on a coupled modelling framework for the Province of Vorarlberg in Austria. Stakeholder engagement ensures that the final outcomes of our study are accepted and successfully implemented in flood management practice. The study addresses three key questions: (i) What are scenarios of land- use and climate change for the study area? (ii) How will the magnitude and spatial characteristic of future flood risk change as a result of changes in climate and land use? (iii) Are there spatial planning and building-protection measures which effectively reduce future flood risk?

The modelling framework has a modular structure comprising modules (i) climate change, (ii) land-use change, (iii) hydrologic modelling, (iv) flood risk analysis, and (v) adaptation measures. Meteorological time series are coupled with spatially explicit scenarios of land-use change to model runoff time series. The runoff time series are combined with impact indicators such as building damages and results are statistically assessed to analyse flood risk scenarios. Thus, the regional flood risk can be expressed in terms of expected annual damage and damages associated with a low probability of occurrence. We consider building protection measures explicitly as part of the consequence analysis of flood risk whereas spatial planning measures are already considered as explicit scenarios in the course of land-use change modelling.