Flood risk management in mountain regions: a policy coordination perspective

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POLICY INTERACTION IN FLOOD RISK PREVENTION

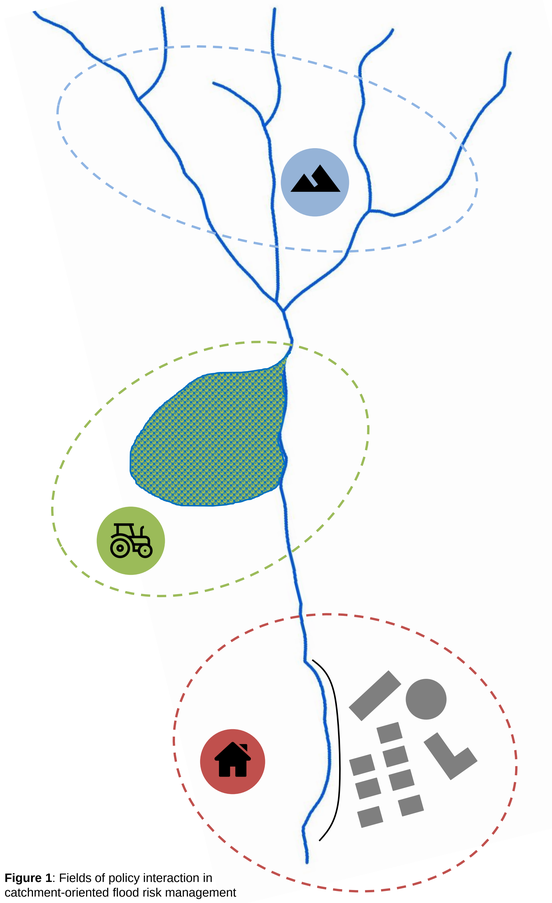

Figure 1: Fields of policy interaction in catchment-oriented flood risk management

Policy efforts to retain and accommodate water on land and to develop flood-adapted land uses come with the need to improve **cross-sectoral policy coordination at the land-water nexus.** In the traditional defense-oriented approach flood protection was considered the sole responsibility of hydraulic engineers and water managers who had the task to control floods and to keep flood water away from vulnerable land uses. With the on-going policy shift flood risk management becomes an integrated, multi-sectoral effort characterized by a pluralization of actors and interests.

In a catchment perspective **three specific fields of policy interaction** can be distinguished (see Fig. 1):

I. Flood Retention in the Headwaters

Flood risk in alpine areas is influenced by the natural and man-made possibilities for water and flood retention in the headwaters. Long-term changes in land use and land cover related to deforestation/afforestation but also the intensification of tourism in Alpine areas, i.e. ski runs, alter the **natural retention potential of alpine catchments**. With the construction of **hydropower dams**, starting in early/mid 1900s, large artificial reservoirs were created, which now provide a significant potential for **attenuating peak flows**. In the event of flooding the opening of dams, however, can also aggravate flooding downstream. After floods hydropower companies often face the criticism that they did not adequately manage their reservoirs to reduce the flood peak. Notwithstanding their significance for flood control, operators of hydropower plants are generally reluctant to uptake responsibilities in flood risk management since their primary goal is electricity generation.

II. Flood Storage on Agricultural Land

Flood storage is ideally realized in areas with a low damage potential. Agriculture can – and is increasingly expected to – provide the much-needed space to alleviate flooding. The **accommodation of flood water on agricultural land**, however, is associated with limitations in agricultural production (e.g. crop failure, soil erosion or soil contamination) and **infringements on existing rights of property and land use**. Mobilizing (privately owned) land for risk reduction services thus marks a serious challenge for flood policy and there is growing need to develop innovative approaches, especially regarding the necessity to balance relations between the (upstream) providers and the (downstream) beneficiaries of flood retention. In a historical perspective, the active function of agriculture for flood alleviation today stands in stark contrast to early flood defense policies and river training works, when agricultural land was protected from floods to ensure favorable conditions for agricultural production.

III. Flood Protection and Land Development

Flood protection has the core function to protect humans, settlements and other assets against floods. Flood protection schemes, however, also enable the use of former flood-prone riverside properties for housing and commercial development. This so-called **"levee effect"** often leads to the accumulation of damage potential in protected areas. In alpine areas these interdependencies are particularly pronounced due to the concentration of vulnerable land uses in the valleys and the limited possibilities for land development. **Mitigating future increases in flood damage** and developing flood-adapted land uses presents a key challenge, also against the likelihood of climate-induced increases in flood discharge and the risks associated with the overtopping and/or failure of flood protection. This consideration of extreme events and "residual risks" is a rather new phenomenon, which stands in contrast to historical land use strategies (i.e. hazard avoidance) and also differs from the existing planning practice (i.e. unrestricted land development in protected areas).

Policy Domain	Interests	Constraints
Flood Protection	• protect human lives, settlement areas and economic assets • reduce the probability and intensity of flood events	• limited availability of land for flood defense structures, flood storage and flood runoff
Hydropower	• manage reservoir levels to maximize electricity production • provide a steady supply of energy • limit responsibilities for flood protection	• flood retention capacity in reservoirs • dam operations rules
Agriculture	• minimize flooding impact on agricultural production • limit infringement on agricultural land use and private property rights	• storage of flood water on agricultural land • conversion of agricultural land for settlement and commercial use
Spatial Planning	• minimize flood hazard exposure and flood damage • preserve areas for flood retention and flood runoff	• socio-economic pressure to develop floodplains • accumulation of damage potential in protected areas ("levee effect")

RESEARCH DESIGN

The project PoCo-FLOOD **explores sectoral Interdependencies, conflicts and options for policy coordination in the three fields of interaction** (i) Flood Retention in the Headwaters, (ii) Flood Storage on Agricultural Land and (iii) Flood Protection and Land Development. The project is guided by the following overarching research question:

How does the shift toward integrated flood risk management in mountain areas alter the interdependencies between policy domains and lead to a growing need for policy coordination across the different policy sectors and administrative levels?

In each field of interaction (case study) we pursue **three research foci** (see Fig. 2):

I. **Research Focus I:** Problem structure and problem pressure
II. **Research Focus II:** Process of policy coordination – actors, goals and instruments
III. **Research Focus III**: Effects and outcomes of policy coordination

The case studies combine the following interdisciplinary methodologies (see Fig. 3):

Desk research covering internet sources, policy documents and academic literature in order to identify gaps in current research and the need for future research, to generate follow-up research questions and to develop the conceptual framework (WP1).

Reconstruction of the historical land use and land cover: To account for the long-term changes in riverine landscapes, we reconstruct the historical land cover and human land uses for all of Austria based on historical maps, in particular the Franziscean Cadastre (dating back to 1817-1861). So far, such a large-scale countrywide reconstruction of the historical land uses has never been accomplished. In addition, the historical fluvial morphology will be reconstructed in more detail for a selected alpine river basin (WP2).

Expert interviews: Qualitative semi-structured interviews with government officials responsible for flood protection, agriculture, energy and spatial planning policies at federal and state levels of government as well as stakeholders and scientists that are involved in or have expertise in flood risk management and the adjacent policy fields will play a key role in answering the research questions. We plan to conduct 10-15 semi-structured interviews in each field of study (WP3-WP5). Interviews will be recorded, transcribed and interpreted using a qualitative data analysis software (e.g. Atlas.ti).

GIS-based analysis techniques to evaluate changes in land use/land cover aiming at a qualitative analysis of potential changes in natural water retention in headwater basins; as well as to assess flood hazard exposure of agricultural and settlement for the entire Austrian territory by linking geo-referenced data sets of historical and current land uses with the HORA data set. This data basis delineates the potential flood inundation areas along rivers in Austria for discharges with recurrence intervals of 30, 100 and 200 years (WP 3-5).

River basin modelling: Within a selected alpine river basin, a hydrological model will be set up, with the aim to evaluate the quantitative changes in flood discharge as a function of land use change. The comparison will be based on current land use and land cover products (e.g. Land Information System Austria (LISA) or CORINE) and the historical reconstruction generated with the project (WP3-WP5).

Analysis of potential climate change impacts: The HORA database will, furthermore, serve as a basis to assess changes due to potential climate change impacts. For this task, the flooded areas will be enlarged to account for a 10% climate change allowance for peak flows.. This approach will account for potential changes in the hazard term in the flood risk assessments (WP3-WP5).

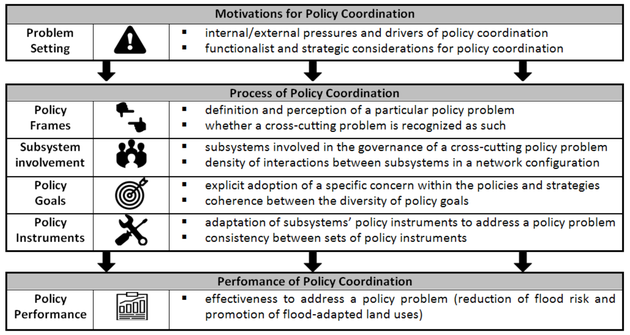

Figure 2: Analytical dimensions of policy coordination

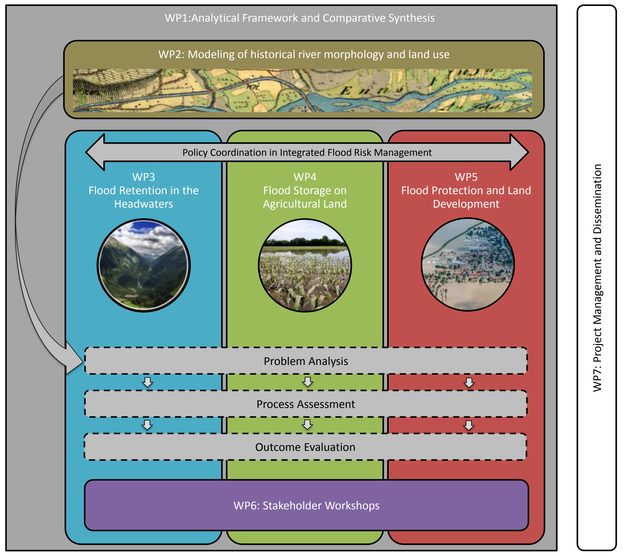

Figure 3: Overview of work package structure

A series of **stakeholder workshops** (WP 6) will address the growing need for better integration of science and decision-making. The workshops will investigate and discuss key coordination issues in the selected policy fields affecting the capacity to manage flood risks in the alpine space. The main objective is to raise awareness among relevant stakeholders and to identify opportunities and challenges connected to the coordination problems. The aim of the workshops is to present findings from the policy assessments and initiate a transdisciplinary learning process to elaborate options and suitable mechanisms for improving policy coordination among the selected policy fields. One stakeholder workshop in each case study will be conducted. 15-20 stakeholders with different stakes in flood risk management are intended to participate – e.g. politicians, civil servants, technical experts, representatives of interest groups, NGOs and members of the civil society.

PoCo-FLOOD: Integrated Flood Risk Management in Mountain Areas: Assessing Sectoral Interdependencies, Conflicts and Options for Policy Coordination
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