

Indirect flood risk management in Austria

Challenges and ways forward



Fact sheet

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Indirect flood impacts and cascading risks

Natural disaster risks are among the greatest threats of the 21st century putting political, social and economic systems increasingly under pressure and at risk of instability (UNDRR/CRED 2020). Especially in recent years, the cascading effects and risks associated with such events have received great attention as economic losses and consequences have mounted (Handmer et al. 2020; Reichstein et al. 2021). Due to increasingly complex economic networks and interdependencies, natural disasters can result in large ripple effects including business or supply chain interruptions, changes in economic productivity or increased indebtedness. These so-called indirect losses can amount to or even exceed direct damages (Koks et al. 2015; Dottori et al. 2018).

Climate change exacerbates the intensity and frequency of flood events. Accompanied by socio-economic changes this leads to increasing flood damages. Therefore, more holistic and long-term disaster risk management (DRM) strategies that tackle indirect effects and which take into account climate change effects are called for. To implement these strategies, we require a deeper understanding of who could be involved in indirect flood risk management (FRM), which management strategies are already implemented and which should be implemented in the future, as well as what are the corresponding implementation barriers. These issues are addressed in this fact sheet in the context of Austrian climate risk management strategies discussing how indirect risks from floods are currently considered and how they could be proactively integrated on various scales (the discussion is based on Reiter et al. 2022).

Indirect flood risk management in Austria

Risk-based approaches are recommended in many fields of activity in the Austrian National Climate Change Adaptation Strategy, most notably in the field of “Catastrophe Management” (BMNT 2017). However, traditional risk management focusses on the *direct* effects of natural disasters. While direct risk management also reduces the chances of indirect risks, as the latter emerges in association with the former, indirect effects are particularly important for economies characterized by a high degree of specialization and strong inter-sectoral linkages, such as the Austrian economy. For example, the extreme flood events in Austria in 2002 caused production losses of about 200 million Euro (total costs including damages to private property were estimated to be 3.1 billion Euro, ZENAR and BMLFUW 2003). A further aspect that is worth noting is that indirect risks can also emerge *as a result* of direct risk management, i.e. false adaptation or maladaptation can create path dependency and develop into cost traps. This includes long-term maintenance costs of structural measures for disaster risk reduction as, for instance, levees, dams, etc. The fact that indirect damages prove especially difficult to be identified, modelled and quantified adds further obstacles to their active integration in DRM.

The MacroMode project¹ aimed at identifying stakeholders involved in the Austrian FRM apparatus who are or could be involved in indirect FRM and in determining which management actions they (could) take. A stakeholder analysis with a detailed and iterative interviewing process yielded insights into the most important FRM options currently implemented for indirect risks. Moreover, future planned/desired management options as well as the difficulties and obstacles faced in their implementation were inquired. Based on these interviews, we present the most important management tools or adaptations of the current modus operandi to facilitate the development of more holistic FRM strategies, taking into account also indirect risks (for more details we refer to Reiter et al. 2022 and Hochrainer-Stigler and Reiter 2021).

Current management measures of indirect risks

Currently, only few management instruments are in place to tackle indirect flood risks in Austria. Yet, stakeholders recognize indirect flood risks as substantial burdens on both the individual and the national level. Instruments currently in use include:

- Privately offered, voluntary **insurance products** with limited cover sums. These include business interruption insurance to firms and business owners. However, such insurance is not available or affordable for everyone. Some stakeholders therefore argue for a mandatory insurance against natural hazards for wider coverage.
- **Cost-benefit-analyses**, which provide a qualitative description of loss of value added in the flood-affected region. These estimates, however, are typically only for small regions and do not consider macroeconomic feedback effects. This process is to be automated so that this loss of value added is determined by a mark-up factor, that is, a fixed daily rate for each production day lost.
- Increasing resilience of **critical infrastructure** (i.e. more resilient energy distribution systems or transportation routes) as part of the *Austrian Program on Critical Infrastructure Protection* (APCIP), which has been in place since 2008.
- (Inter)national financial aid to assist in a quick recovery provided by e.g. the Austrian **disaster relief fund** or the European Union Solidarity Fund (EUSF). The former is made up of revenues from corporate and income tax as well as taxes on capital. With large parts of the fund spent for preventive measures, it is one very important instrument in Austria to finance public DRM.

Difficulties and obstacles

One of the main identified reasons why management measures for indirect risks are not yet implemented is **missing data** on indirect costs of floods (see Fig. 1). This includes data for past events as well as reliable predictions for the future development of costs that include climate change. Since such data is not readily available and modellings are tied to intrinsic uncertainties, stakeholders are reluctant

¹ Macroeconomic Modelling of Indirect Risks for Climate Risk Management, funded by the Austrian Climate Research Programme (ACRP)

to introduce costly measures without being able to ground these decisions on reliable indirect loss data. Much more fundamental, though, is the lack of a *clear and collective definition* of what indirect damages are and how to measure them. This is an issue of great concern among stakeholders as it impedes indirect FRM too.

As indirect damages are difficult to determine, also the allocation of responsibility concerning their management is unclear. In general, responsibilities and competences in the Austrian FRM are departmentalized to a high degree due to the complex nature of the challenge; however, this also leads to *institutional barriers* in the coordination and communication of FRM efforts for indirect risk. These institutional barriers hamper the development of a systems perspective and can lead to one-sided FRM approaches. A broader portfolio of FRM measures, which takes into account the spatial and temporal dependencies of floods and their indirect effects on socio-economic dimensions is essential for avoiding maladaptation. For example, spatial planning is seen as a vital and powerful tool, balancing social, environmental and economic needs. However, more and more assets have been accumulating in flood zones and flood-prone areas in the past, which require flood defense, typically in the form of dams or other structural measures.

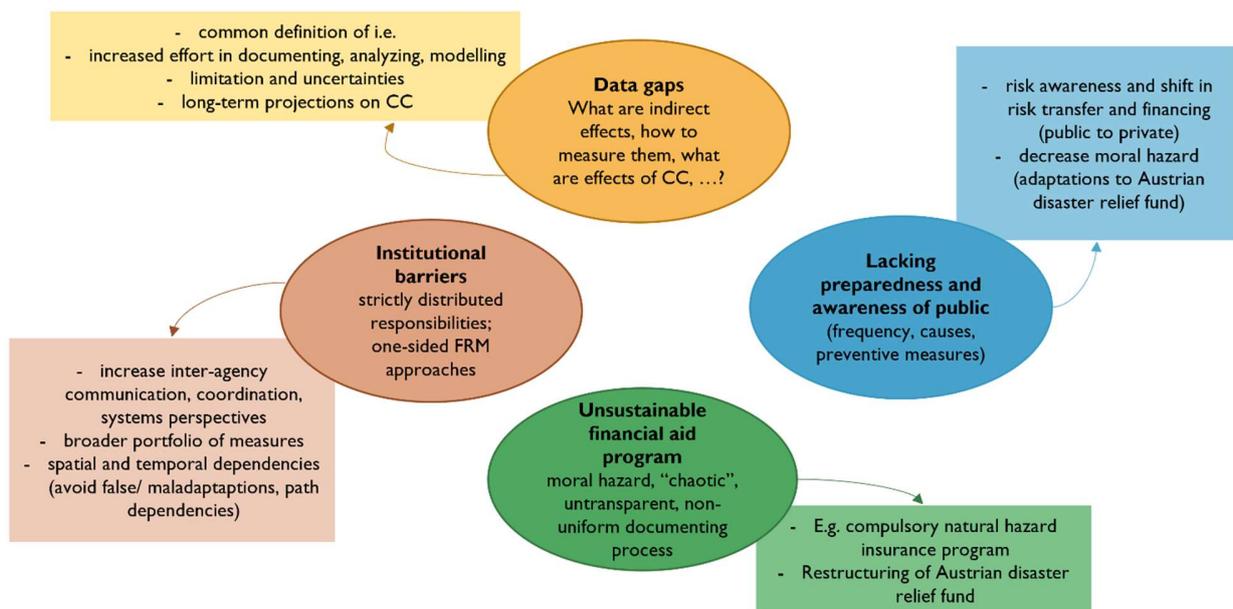


Fig. 1. Main obstacles (ellipses) in today's flood risk management that inhibit the implementation of more holistic risk management strategies, which effectively target both direct as well as indirect flood risks. Boxes show the suggested remedies for the identified difficulties.

The accumulation of assets in flood zones points also towards a more general problem, i.e. a *lack of awareness* of flood risks of the public, which was identified as another major obstacle in FRM. This lack of awareness results in people being unprepared for flooding and little private risk mitigation. The current financing scheme of disaster risk management adds to this as it does not provide an incentive to take private preventive measures or to "build back better". Financial aid programs like these are at risk to be *unsustainable* for covering future losses as the reserves of the Austrian disaster relief fund will not

suffice with rising losses and little proactive FRM (see Schinko et al. (2017) and Prettenhaler et al. (2015) for additional information).

Ways forward to overcome identified difficulties and obstacles

Based on these challenges, we propose to establish a more holistic FRM concept, which takes into account the spatial and temporal dependencies of floods and indirect risks. Especially policy options need to be developed, which factor in the total i.e. direct as well as indirect damages of floods and that adopt a more long-term perspective. As a first step, we recommend introducing indirect FRM as a separate pillar within DRM, which can form effective and holistic climate risk management (CRM) in combination with climate change adaptation (see Fig. 2).

To put indirect FRM on track, a common definition of indirect effects and how they are measured after events

needs to be established. Additionally, the data on documented and/or estimated indirect damages as well as projected climate change effects need to be more widely considered in current and future project planning. High priority should be given to filling the lack thereof and learning processes as well as adaptive measures should be foregrounded, which allow for flexible and adjustable decision-making processes. As a consequence, modelling approaches that are able to capture indirect risk should be used not only for the assessment and measurement of it, but expanded to include also risk management options that are targeted at indirect risks.

Restructuring the FRM also requires an increase in inter-agency communication and coordination of management measures to facilitate the flow of information, the streamlining of processes and the implementation of management measures that have a systems perspective at their core. The inclusion of possible indirect risk management options within current direct risk-related strategies in Austria is one possible step forward in this process. Thereby, maladaptation can be prevented as best as possible without dismissing neither indirect damage nor climate change effects on the grounds of limited data. A possible risk-layer approach to indirect risk, which discriminates between different management options depending on the interconnectedness of the respective system (e.g. economic or social) may provide a promising way forward, similar to the case of direct risk (Hochrainer-Stigler and Reiter 2021). The Austrian financial management scheme for flood risk provides acute and vital help to those affected by flood damages and a reliable funding source for preventive measures. Nevertheless, a more sustainable risk financing program should be institutionalized which instigates a transfer of risk reduction from the public to private domain. This would not only help tackle the issues of lacking awareness of flood risks but would also help take steps toward a more sustainable financing scheme for the future.

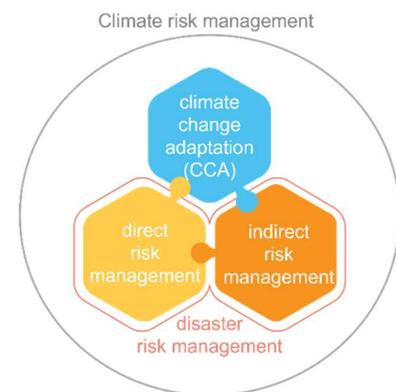


Fig. 2. Schematic representation of direct and indirect RM as pillars within disaster risk management, which, in combination with CCA measures, could form holistic CRM.

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Glossary

cascading/ripple effects: a chain of events spreading in a system triggered by the impact of a single physical event

climate risk management: the implementation of strategies and decision-making that takes into account the effects of a climate variability and change

cost-benefit analysis: a strategic process to facilitate decision-making by contrasting potential benefits of a situation/action and its total costs

critical infrastructure: assets or systems of utmost importance for a functioning society and economy

disaster risk management: measures set to reduce existing/potential disaster risk and manage residual risks

risk-based approach: an approach that identifies the spectrum of risks faced and their priority and which aims at developing management strategies to mitigate them

stakeholders: all persons, groups, organizations with an interest in the decisions and actions made in a project/organization

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