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Institutional settings in flood hazard and risk management



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Framing justice considerations within flood risk management

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Justice (i.e. fairness, equity) is often a neglected topic in risk management, while it contributes to sustainability. A literature review has been conducted to investigate why and how justice is considered within flood risk management, identify gaps when it comes to its contribution to sustainable development and discuss justice frameworks in their applicability to societal risk management in general, and flood risk management in particular. 19 scientific documents published between 2015 and 2020 are reviewed and analyzed.

Justice is an underdiscussed topic when it comes to decision-making of flood strategies, while it is important for several reasons. First, because of the unevenness of the impacts of floods on different people and places. Secondly, for institutional reasons such as the formal requirement of some policies (e.g. the European Floods Directive) to strengthen public support. Thirdly, because the perception of fairness matters, both at the individual (exposed people are more willing to seek individual complementary measures) and collective levels (protests can emerge and legitimacy be questioned if the strategy is perceived as unfair).

Justice issues raise at all stages of flood management: from preventive strategies and resilience building processes to emergency responses and recovery plans. The literature distinguishes between procedural and distributive justice. The judgement of what is fair or not relates on justice philosophies such as utilitarian, egalitarian, Rawlsian, elitist, hierarchical approaches. Which one applies depends on the country, the type of risk and the type of strategy.

The reviewed literature shows a strong focus on social and spatial justice issues. However, when it comes to the contribution of fairness to sustainability, the impacts on non-human entities (e.g. ecological, multispecies justice) and the long-term (e.g. intergenerational justice) may also be relevant to consider, although they are identified as gaps in the selected literature.

Since framing justice is complex, a risk justice analytical framework is suggested that gathers several facets of existing justice literature and applies specifically to societal risk management. Risk justice considers both procedural and distributive justice under four dimensions: social (who?), ecological (what?), spatial (where?) and temporal (when?). Considering all of them can reduce institutional vulnerabilities during the decision-process, increase chances of success of the strategies and contribute to sustainability. Risk justice translates into practical tools such as a matrix which is offered for flood managers to think its various aspects. The framework needs further elaboration and is open to suggestions.

Local innovations in flood hazard risk management in the past 10 years: the potential of upscaling niche developments to reduce institutional vulnerability in Austria

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Current procedures in flood risk management request new institutional settings to effectively respond to observed dynamics. This paper aims to assess and explain institutional innovations in natural hazard risk management by analysing different examples of innovative risk management strategies, which are distinctive to mainstream solutions. We analysed eight innovative strategies across the country that combine several different strategies (e.g. risk management, sustainable land-use development, urban resilience, individual preparedness and well-being) concerned with mitigation systems in order to save space, time and possible arising costs. The paper uses a mixed method approach. The first step includes 72 qualitative standardized semi-structured interviews with key experts from public and private sector at national, regional and local level connected to proposed innovative risk management strategies. These interviews were conducted in eleven selected study sites between 2012 and 2021. As a second step, we conducted an explorative scenario analysis. The results highlight that institutional innovations in risk management are depend on bottom-up initiatives instead of top-down decisions. Consequently, these measures also need a larger risk acceptance among decision makers and the public. Innovations are based on individual interests and certain policy entrepreneurs at local level; however, national authorities act as 'gatekeepers' which allows innovation at local level. Based on these variables, two selected scenarios were developed to show the tipping points necessary for policy transformation in natural hazard risk management.

Flash flood risk management in Malloa (Central Chile) during the 29-31 January 2021 precipitations: insights on social and institutional vulnerabilities

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Flash flood hazard and risk management in Chile is still reactive. In the context of climate change, the distribution of areas exposed to extreme precipitation events has changed, now including areas previously characterized by low return periods. In this sense, flood risk assessment and management requires the integration of the scientific knowledge to the institutional disaster governance at communal and regional scales; it requires the generation of detailed susceptibility, hazard and risk maps developed by both Earth and social sciences professionals with the goal of better understanding multidimensional flood risk (Cruden, 1991; Oliver-Smith, 2016). This is especially relevant when the exposed communities comprise low-income rural areas with absolute lack of historic experience to cope with flood hazard, thus increasing the vulnerability of local institutions to successfully respond and recover from the emergency. We investigated the 29 and 31 January 2021 extreme rainfall event which affected central Chile, producing catastrophic flash floods in both the Andean and Coastal Mountains. This event represents a rare case of torrential hail and rainfall storm during the southern hemisphere summer affecting an extensive segment of central Chile. Our study focuses on the small commune of Malloa, which has been not previously affected by historic flood events, however during the storm experienced severe impacts of flash floods, including 200 injured and 73 damaged houses. In order to assess the stakeholder decision making process, we carried out a detailed mapping of the local geology and geomorphology, plus a comprehensive mapping of the 29-31 January deposits and impacts. In parallel, the study involved the sociocultural analysis of vulnerability to floods, with special focus on the disaster experience of the local community. Along this process, we also discovered several institutional factors increasing risk, such as: 1) lack of experience related to flood risk management; 2) limited response due to limited resources; 3) complex inter-institutional networks for decision-making; 4) political factors playing a role in the response and 5) long-term territorial planning restricted by existing law framework. Our study involved roundtable exercises with the direct participation of the community, stakeholders and institutional authorities, concluding with several recommendations for flood risk prevention, mitigation and capacity building at community and institutional levels.

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An institutional vulnerability perspective on Flood Disaster Risk Management in Ghana

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Policies of food risk assessment and mitigation in the face of climate change have come under tremendous debate. The analysis of flood vulnerability in sub-Saharan African countries has often been submerged by dominant focus on the geophysical and biophysical neglecting the institutional dimensions (Amoako & Inkoom, 2018). Till present, understandings of the multiple facets of flood vulnerability in these countries have been conceptually and practically limited. In this research, we take a closer look at institutional settings in Ghana that are responsible for different dimensions of flood vulnerability. This work is part of the current transdisciplinary PARADeS research project.

With the overarching goal of enhancing Ghana's flood disaster risk management system, the PARADeS-project is led by German research institutions in close collaboration with partners in Ghana. Essentially, emphasis is on integrating and enhancing stakeholder participation. In line with Lang et al. (2012) and Mielke et al. (2016), the research in PARADeS is a holistic approach to sustainability issues based on the need for "constructive input from various communities of knowledge" integrating scientists from different disciplines and non-academic-actors (including decision-makers) as well as allowing for incorporation of "goals, norms, and visions".

The proposed research design adopts the conceptual understanding of institutional vulnerability as presented by Papathoma-Köhle et al. (2021). Papathoma-Köhle et al. (2021) suggest a framework that helps to understand the structure of institutional vulnerability and its interaction to other vulnerability dimensions. The framework depicts interactions between drivers of institutional vulnerability and indicators of other vulnerability dimensions (physical, social, economic, cultural and environmental). The interactions between institutional vulnerability and other vulnerability dimensions in Ghana are envisaged to 1) reveal embedded institutional weaknesses and 2) provide a starting point for strengthening such systems towards achieving resilient societies.

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HAZARD CLASSIFICATION AND FLOOD RISK FOR THE GREEK PART OF ARDA RIVER

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The European directive 2007/60/EC introduces general concepts regarding “the reduction the risk of adverse consequences, especially for human health and life, the environment, cultural heritage, economic activity and infrastructure associated with floods”. In this work we have determined the flood risk of the Arda river, based on the directive, and giving more specific expression.

The downstream part of Arda river has a length of about 35 km from the Bulgarian-Greek border up to confluence with Maritsa river, it flows outside the mountainous watershed, through an agricultural plane land, with a mild slope, close to several small agricultural villages. There is also a small part of Arda between the Greek-Turkey border and the confluence with Maritsa river (about 500 m), which belongs to Turkey.

For a deep understanding of the hydraulic behavior of the Arda river, an extensive hydraulic study was done, using HEC-RAS software, for seven different flood scenarios for return periods of T=5, 10, 20, 50, 100, 1000 and 10000 years. For each scenario the free surface elevation at 36 cross sections was calculated and compared with the elevation of the levees. When the levee elevation is smaller than the free surface elevation, then clearly there is an overflow from the levee out of the main Arda river flow. For each scenario, the discharge of the outflow was simulated, the width along the levee of the “overflow weir”, and the water depth of the flooded areas were calculated.

In Great Britain the flood hazard rating (HR) is calculated as a function of velocity (v), depth (d) and a debris factor DF such that $HR = d \times (v + 0.5) + DF$. The hazard rating provides an assessment of the direct risk to life arising from the combination of water depth and velocity, based on experiments, and includes a debris factor which recognizes that debris-filled flowing water increases the danger to people. In addition a roadmap to reduce the vulnerability to flood is proposed. For this purpose a categorization of the vulnerability into three domains with respect to the intensity of hazard is proposed.

We apply this methodology for two sites, which presented significant hazard, i.e. Kastanies Church and road pavement Kastanies –Erdnine, close to train embankment and we estimate the degree of flood hazard.