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Scientist–stakeholder workshops: A collaborative approach for integrating science and decision-making in Austrian flood-prone municipalities

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ABSTRACT

Both the scientific and decision-making aspects of the nascent paradigm of risk-based flood management are highly complex. While scientists must account for potential future dynamics in flood risk resulting from climate change or settlement growth, decision-makers are urged to consider a host of flood management options and thus face a significantly enlarged decision scope. In light of the complexities that arise from the shift in flood policy, there is a growing need to better integrate science and decision-making and develop an interface to combine different knowledge domains. This paper discusses scientist–stakeholder workshops (SSW) as a collaborative approach within a flood-related Integrated Assessment (IA) to connect the assessment of (flood) risks more closely to the process of policy implementation. We present findings from two SSW conducted as part of the project RiskAdapt in two Austrian flood-prone municipalities with the aim of (i) reflecting the determinants of vulnerability, (ii) identifying local context conditions, (iii) developing adaptive measures for extreme scenarios and thereby (iv) facilitating anticipatory adaptation to flood risk dynamics. We illustrate the potential and constraints of SSW as a participatory method in flood risk management and discuss the possibilities of institutionalizing SSW in the context of the EU Floods Directive implementation in Austria.

1. Introduction

Flood policy across Europe is shifting from a structural, security-based approach of flood protection towards an integrated, risk-based approach of flood management. While the traditional approach was informed by a firm belief in controlling rivers via engineering solutions (Van Veen, 1962), flood policy today aims at reducing the adverse consequences of flood events (Begum et al., 2007). Integrating all aspects of the flood risk management cycle – prevention and mitigation, preparation, response and recovery (Lumbroso, 2007) – the nascent risk-based flood management paradigm acknowledges that 'total safety' cannot be guaranteed and promotes adaptation strategies that account for extreme flooding scenarios (Nachtnebel and Faber, 2009; Plate, 2002).

The shift towards an integrated flood risk management is prominently outlined in the EU Floods Directive[1] (Hartmann and Juepner, 2014). Flood risk management plans (FRMP) are being developed by EU member states (before the end of 2015) for areas with potential significant flood risk based on flood hazard and flood risk maps containing, inter alia, low probability flooding scenarios (Art. 6/3). FRMP shall be coordinated at the river basin level (Art. 7/1) and "address all aspects of flood risk management focusing on prevention, protection and preparedness" (Art. 7/3). They are to be periodically reviewed and updated if necessary, taking into account the likely impacts of climate change on the occurrence of floods (Art. 14).

Science assumes a prominent, albeit transformed, role in new flood policy paradigm. By generating scenarios of future environmental or socio-economic developments, science can identify drivers of change and analyze vulnerabilities (Welp et al., 2006).

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[1] Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks.

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In flood-related planning – where flood management decisions generally come with long-term commitments and a strong demand for anticipating future developments (Hallegate, 2009) – science thus provides an important base of evidence to support decision-making processes (Pregernig, 2007). Science's supporting role is gaining importance as the on-going shift in flood policy expands the portfolio of potential flood management options and enlarges the decision scope. In addition to structural flood protection measures, decision-makers must increasingly consider non-structural measures to reduce the vulnerability to flood hazards (Wiering and Immink, 2006; Greiving, 2002) and to mitigate damage potentials in 'protected' areas, i.e., behind dams (Habersack and Moser, 2003).

The complexities that arise from the shift in flood policy have generated a growing need for better integration of science and decision-making (Jasanoff, 1990; Cash and Clark, 2001; Innocenti and Albrito, 2011) and the development of an "interface to combine different knowledge domains" (Welp et al., 2006: 173) by "mediating between stakeholders and finding new forms of collaboration" (Hartmann and Driessen, 2013). Integrated Assessment (IA) provides a framework to accommodate these needs. As"a structured process of dealing with complex issues" (Rotmans, 1998: 155), IA is generally characterized by two defining elements: (i) interdisciplinarity and (ii) policy orientation or decision-making support (Rotmans, 1998).

IAs have a long tradition in environmental planning (Toth and Hizsnyik, 1998; Weyant et al., 1996) but have only recently found wider application in flood risk research to account for the complexities and uncertainties related to climate change and socio-economic change (Brouwer and Van Ek, 2004; Chang and Franczyk, 2008; Holman et al., 2005; Kleinen and Petschel-Held, 2007). The flood-related IA literature mainly mirrors the integration of knowledge over a range of relevant scientific disciplines to develop impact assessments and "provide information suitable for decision making" (Harremoës and Turner, 2001:57). However, only a few studies have combined science- and stakeholder-based knowledge domains to develop response options (cf. Haque et al., 2012).

Despite their wide proliferation, the impact of IA models on decision-making is difficult to assess. These models have been criticized for mostly "danc[ing] around the policy arena and not in that arena" (Rotmans, 1996: 44). In response to the need to bring together scientific and political rationalities in a participatory process (Rotmans, 1996), we discuss scientist–stakeholder workshops (SSW) as a collaborative approach to connect the assessment of (flood) risks more closely to the process of policy implementation. We present findings from two SSW conducted as part of the project RiskAdapt in two Austrian flood-prone municipalities to facilitate anticipatory adaptation to flood risk dynamics.

This paper addresses two overarching research questions: Are SSW able to transmit the results of flood hazard and vulnerability scenarios into the realm of politics and planning to derive useable adaptive measures for extreme flood risk scenarios? Which factors determine whether SSW are a suitable framework for integrating different knowledge domains in flood risk management?

The paper proceeds as follows. In the next section, we present the theoretical underpinnings of IA and SSW as a conceptual framework for integrating science and decision-making. Section three outlines the components of the IA, consisting of the interdisciplinary assessment of local changes in flood risk and the implementation of SSW in two Austrian case studies. In section four, we present the process and policy outcomes of the SSW and reflect on the effectiveness and feasibility of the proposed adaptation measures. Finally, section five discusses the opportunities and limitations of SSW and considers possibilities for institutionalizing SSW in the context of the EU Floods Directive implementation in Austria.

2. Scientist–stakeholder workshops in an integrated assessment

IA "has emerged as an approach to link knowledge and action in a way that is suitable to accommodate uncertainties, complexities and value diversities of global environmental risks" (Kloprogge and Van der Sluijs, 2006). More specifically, IA describes a process with an inter- or multidisciplinary analytical core, where knowledge is integrated from various user domains with the aim of supporting policy-making (Rotmans, 1998; Salter et al., 2010). Assessments usually do not create new science but rather organize existing knowledge in such a way that it becomes usable in real world decision-making processes (Lemos and Morehouse, 2005; Parson, 1995).

Scientific analyses, such as runoff calculations, hydrodynamic modeling or the assessment of damage potentials provide a basis for evidence-based flood management decisions. However, flood-related assessments contain inherent and epistemic uncertainties (Apel et al., 2004), making them rather ill-suited to directly accounting for qualitative changes in behavior or decision-making (Salter et al., 2010). Thus, in an IA, science is not an authoritative enterprise per se; instead, it serves as a problem recognition or early-warning system and as a legitimate supporter of political decision-making processes (Pregernig, 2007). As such, scientific collaboration can be used to expedite information gathering or to facilitate learning (Michaels, 2009). In this realm, science can still be recognized as a reliable source and, most importantly, can serve as an intermediary to broker knowledge exchange between policy-makers and practitioners (Jasanoff, 1990; Cash and Clark, 2001).

"IA is largely based on the concept that the future is unknowable through conventional scientific means, and therefore IA needs to be a reflection of people's anticipatory knowledge and informed choices" (Salter et al., 2010: 704).

To co-produce science and policy in IAs, it is essential to include the stakeholders' beliefs, perceptions and ideals (Lemos and Morehouse, 2005). Moreover, a good assessment must incorporate local policy processes, be responsive to various user's needs and jointly identify activities to ensure its practicality (Pellizzoni, 2003; Lemos and Morehouse, 2005; Scherhaufer, 2014).

In conclusion, flood-related IA is a structured process that integrates knowledge from actors in different domains (such as water experts, civil servants, politicians and representatives from the civil society) and produces adaptation strategies in regions thought to be vulnerable to expected changes in flood risk. IAs thus have a strong focus on the substantive dimension (improving the quality of information) (Salter et al., 2010) while also emphasizing the instrumental or procedural dimension, as "the quality of decisions made [...] is strongly dependent on the nature of the process leading to them" (Reed, 2008: 2426).

Within the analytical framework of IA, this paper conceptualizes SSW as a collaborative approach to connect the assessment of flood risks more closely to the assessment of response options and the process of policy implementation. We define an SSW as a structured and moderated communicative process of linking scientists with selected actors to articulate and exchange their knowledge on a particular policy issue (Van Asselt Marjolein and Rijkens-Klomp, 2002; Welp et al., 2006). As a "means to enrich assessment and decision-making through the involvement of (...) stakeholders in the process" (Van Asselt Marjolein and Rijkens-Klomp, 2002: 169), SSW are located at the interface of IA and the policy process (see Fig. 1).

The schematic figure illustrates that stakeholder participation in the SSW is practically oriented and forms "part of a decision-*support* process" [emphasis in original], unlike participatory