Research article

Mind the gap! Lessons from science-based stakeholder dialogue in climate-adapted management of wetlands

Mateusz Grygoruk a,*, Sven Rannow b

a Department of Hydraulic Engineering, Warsaw University of Life Sciences - SGGW, ul. Nowoursynowska 159, 02-776 Warsaw, Poland
b Müritz National Park Authority, Schlossplatz 3, 17237 Hohenzirritz, Germany

Abstract

Effective stakeholder involvement is crucial for the management of protected areas, especially when new challenges like adaptation to climate change need to be addressed. Under these circumstances, science-based stakeholder involvement is required. However, there is often a gap between the information produced by science and the need for information from stakeholders. Along with the design and implementation of adaptive management strategies and policies, efforts must be taken to adjust messages about conservation and adaptation issues, to make them easier to understand, relevant and acceptable for stakeholders. In this paper, the experience of closing the gap between scientific information and the user needs of stakeholders in the Biebrza Valley is documented. The requirements of efficient stakeholder dialogue and the raising of awareness are then indicated. We conclude that many attempts to raise awareness of environmental conservation require improvements. Messages often need to be adjusted for different stakeholders and their various perception levels to efficiently anticipate the potential impacts of the changing climate on ecosystem management. We also revealed that the autonomous adaptation measures implemented by stakeholders to mitigate impacts of climatic change often contradict adaptive management planned and implemented by environmental authorities. We conclude that there is a demand for boundary spanners that can build a bridge between complex scientific outputs and stakeholder needs.

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1. Introduction

Adaptation to climate change is focused on the adjustment of ecological, social or economic systems to prevent or reduce harm or to benefit from potential opportunities (Smit and Pilifosova, 2001). In recent years, the planned adaptation to climate change has moved from being a theoretical concept to being implemented on the ground (Cuevas et al., 2016; Picketts et al., 2013). Science-management partnerships have been identified as useful tools for initiating local adaptation processes (Granath et al., 2010; Littell et al., 2012; Lonsdale and Goldthorpe, 2012). Cooperation between science and local administrations has focused on adaptation in different contexts and locations (Cross et al., 2012; Picketts et al., 2013; Prober et al., 2012). There are several arguments in favour of participatory approaches to also involve the wider public outside of institutionalized organizations (Bulkeley and Mol, 2003). However, the successful implementation of this stakeholder involvement and an effective communication about climate adaptation are still considered a challenge (Blake, 1999; Raymond et al., 2013). This challenge has been found of critical importance in natural resources management, where the societal and economical drivers have to compromise with the requirements of environmental conservation (Moss et al., 2010).

The climate-adapted management of wetland areas is a complex arena with a high priority for the mitigation of the negative impact of a changing climate on biodiversity and ecosystems (Bonn et al., 2014; Gitay et al., 2011). Despite the increasing research activities in connection to the conservation and restoration of wetlands worldwide (Zhang et al., 2010), there are still issues to be solved: the interrelationship of social and environmental sciences requires enhancement for better communication and management of climate-related risks (Capon et al., 2013; Erwin, 2009; Fischhoff, 2011; Grygoruk et al., 2014b; Ignar and Grygoruk, 2015; Rannow and Neubert, 2014; Rowell, 2005). The effects of climate change often add to or interact with existing pressures on wetlands that originate from societal behaviour, which is usually driven by the economy (Gitay et al., 2011). Therefore, stakeholder involvement and the influencing of human attitudes by means of appropriate
target groups (Bostrom et al., 2013; Reed et al., 2009) and the adjusting of messages (CRED, 2009) must become an inherent element of climate-adapted management of wetlands (Walker et al., 2002). On the one hand, this must include stakeholders who are oriented towards the use or exploitation of resources like: agriculture, forestry, fisheries, water extraction for drinking and industrial use, civil protection, transport, energy production and tourism. On the other hand, conservation of biodiversity and sustainable use of ecosystem services must be guaranteed.

The action of local conservation management in the planned adaptation to climate change is as much an ecological as a cultural and social challenge (Baron et al., 2009). By definition, adaptive environmental management calls for integration of environmental, social and political dimension. It aims at the reduction of uncertainty and nonlinearity in environmental systems management through continuous monitoring and adjustment of management strategies (Holling, 1978; Rist et al., 2013; Walters, 1986; Williams, 2011). Hence, specific and local knowledge are crucial for successful implementation of an adaptive management. The information provided by scientists must support the development of local adaptation strategies but should not prescribe decisions (Brooks et al., 2011). The active involvement of local communities and decision makers implies effective communication of scientific results, but it is a challenge to transfer information from research into domains outside academia (Ungar, 2000; Weingart et al., 2000; Welp et al., 2006). Therefore, the targeting of specific audiences with tailored information on climate change is essential for the success of communication and any resulting cooperation (Adger et al., 2005; Bostrom et al., 2013).

In this paper we present the lessons learned from a science-based stakeholder dialogue aimed towards fostering climate adaptation in the wetland area of the Biebrza National Park (BNP) in northeast Poland. It accompanied the preparation of a climate-adapted management plan for the BNP (Grygoruk et al., 2013b). The project presented in this article focused on the transfer of scientific information and application of existing theoretical concepts to initiate planned actions for climate adaptation in protected areas such as National Parks and Biosphere Reserves (Rannow and Neubert, 2014). Our approach was focused on the following questions:

(1) How should a science-based stakeholder dialogue for climate-adapted wetland management be organized?
(2) Do adaptation measures of stakeholders contradict or accord structured implementation of adaptive wetland management?
(3) What are the catalysts and barriers for the adaptation of wetland management?

We share the experience from this implementation project and hope to foster the scientific discussion on bridging the gap between science and local management with publishing this feedback. Therefore, drivers and resisters for stakeholder communication are highlighted and gaps are identified between the messages delivered from scientific research and the perception and needs of stakeholders in Biebrza Valley. We propose solutions that are useful for climate-related science-based stakeholder dialogue in valuable wetland areas with the intention of ensuring efficient conservation and sustainable use of resources.

2. Materials and methods

2.1. Study area: Biebrza Valley and national park

Biebrza Valley is located in the north east of Poland near the city of Bialystok. Most of this glacial-formed land depression is covered with a peat layer reaching a max. 8 m thickness, which developed on the sandy plain (Zurek, 1984). Its unique, near-natural ecosystems of mires and floodplains have been assigned international importance for biodiversity conservation in regard to hydrology (Wassen et al., 2006), ornithology (Dyrcz and Zdunek, 1993; Polakowski et al., 2016) and geobotany (Paczynski, 1975). In the regional scale, Biebrza Wetlands play an important role in carbon sequestration, which is closely linked to the role of local mires to climate change mitigation (Fortuniak et al., 2017). Some wetland ecosystems of the Biebrza Valley were modified and adjusted for agricultural purposes (land reclamation). In the 21st century several broad-scale wetland restoration projects have been implemented (Grygoruk et al., 2015). Approximately 60% of the area of the Biebrza Valley is maintained as hay meadows (Fig. 1A). Current farming practices supported by the EU agro-environmental schemes—aside from their economic benefits—help to prevent the secondary succession of shrubs on open areas of mire and shape the landscape (Fig. 1C). In 1993, the BNP was established to protect nearly 560 km² of the Biebrza Valley. Together with the buffer zone of the BNP, the area of protected environment covers some 1250 km², making this one of the largest protected wetlands in the European Union. Approximately 40% of the area of BNP is privately owned. Along with the complex proprietors structure (Fig. 1B), these private grounds remain an important issue to be addressed in managing Biebrza wetlands. Within the BNP borders, no more than 160 people reside permanently. In 118 villages and towns situated in the buffer zone of the park, approximately 27,000 people are settled, giving an average population density of 59 inhabitants per km².

The wetlands of the BNP depend on the dynamic interactions between seasonal flooding and groundwater flow, which is strongly related to meteorological and climatic variability. The Biebrza Valley is characterized by a continental climate with average annual air temperatures of 6.6 °C and strong seasonal differences. Extreme air temperatures in winter can reach −25 °C, whilst in summer, temperatures can exceed 30 °C. Average annual precipitation in the period 1996−2011 was 574 mm (Grygoruk et al., 2014b). The direct impact of climate change on the wetlands is likely to affect landscape composition, water balance (precipitation, snow cover and evapotranspiration), groundwater flow and flooding (Grygoruk et al., 2011, 2014a; Ignar et al., 2011).

2.2. Observed and expected climate-related impacts on ecosystems of the Biebrza Valley

Climate-induced impacts on wetlands first and foremost refer to hydrological processes (Acreman et al., 2009; Hartig et al., 1997; Schneider et al., 2011; Szporak-Wasilewska et al., 2015; Winter 2007). In BNP, regular flooding and high groundwater discharge are of particular importance. Both processes are vulnerable to climatic change (Schneider et al., 2011). There has been a variety of scientific approaches and projects to quantify possible climate-hydrology feedbacks (Byczkowski and Kiciński, 1983; Grygoruk et al., 2014b; Ignar et al., 2011; Maksymiuk, 2009; Maksymiuk et al., 2008). It was revealed that although the frequency of spring thaw floods has remained constant for the last 60 years, the frequency of summer flooding has increased significantly from some 1–3 per decade in the 1950s and 1960s to 10 in the decade 2001–2010 (Grygoruk et al., 2014b). This phenomenon inspired increased social pressure to restore land reclamation systems, which negatively affect the ecosystem services of Biebrza wetlands by changing flood regime and groundwater dynamics (Grygoruk et al., 2013a). The activities of landowners to mitigate the negative effects of changing hydrological phenomena by re-vitalization of land reclamation...
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