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Challenges of linking scientific knowledge to river basin management policy: AquaTerra as a case study

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Using scientific output in River Basin Management requires researchers and policy makers to acknowledge the multiple rationalities and different viewpoints that are brought in by the variety of stakeholders involved.

Abstract

The EU Project AquaTerra generates knowledge about the river—soil—sediment—groundwater system and delivers scientific information of value for river basin management. In this article, the use and ignorance of scientific knowledge in decision making is explored by a theoretical review. We elaborate on the 'two-communities theory', which explains the problems of the policy—science interface by relating and comparing the different cultures, contexts, and languages of researchers and policy makers. Within AquaTerra, the EUPOL subproject examines the policy—science interface with the aim of achieving a good connection between the scientific output of the project and EU policies. We have found two major barriers, namely language and resources, as well as two types of relevant relationships: those between different research communities and those between researchers and policy makers.
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1. Introduction

The EU Project AquaTerra (http://www.attempto-projects.de/aquaterra) is a multi-disciplinary project in the EU sixth framework research program, which aims to develop and integrate soil and water research to provide a better understanding of the river basin system. The output from AquaTerra must reflect, at least in part, the needs of both policymakers and practitioners. The EUPOL subproject of AquaTerra aims to find a way to link policy demands to the scientific information on processes in river basins at a variety of scales being generated by AquaTerra by using the platform of river basin management.

These issues must be considered by AquaTerra and other interdisciplinary science projects as they aim to bring their scientific output to a wider, more influential field. Although being a small subproject within AquaTerra, EUPOL is the main element aiming to link available science with the needs of policy in a constructive way in order for policy makers to gain maximum use from a wide-ranging, integrated group of scientific projects whose remit is to provide information of value to a wide range of policy makers and stakeholders. The linkage between science, policy and stakeholders is particularly focused on five broad policy areas, namely soil, water, agriculture, land use and climate change.

In this article, we focus on the interface between science and policy, particularly the role that AquaTerra can play in river basin management. We will present some research findings and provide recommendations as to how uptake by the policy

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community could be improved. First, however, we will examine the role of scientific knowledge in policy making.

2. Scientific knowledge and policy making

The inter-relationship between science and policy and the need to transpose information between the two in a meaningful way is becoming a pertinent issue across the EU. For example, work by Sutherland et al. (2006) identified the 100 key policy questions of ecological relevance in the UK, according to a stakeholder group of governmental institutions, non-governmental organisations policy and academic institutions. The scale of this study provides an illustration of the importance that is now being attached to the ways in which scientific information is being used by policy makers. A recent review of the use of science in policy making within the EU (Ballantine, 2005) indicated that while the use of scientific evidence within policy was a key input to improved legislation and decision making, there was also evidence of limitations affecting the uptake of scientific information. These included an inability of some policy makers to make use of highly technical advice, lack of public confidence in scientific information, the difficulty of obtaining high-quality science at short notice and a lack of universal support for scientific input into policy making due to both contradictory science and a lack of certainty surrounding the available results. The LIFE programme is one of the spearheads of the European Union's environmental policy and is the financial instrument for co-financing projects (http://ec.europa.eu/environment/life/home.htm). It was evaluated by Oliver et al. (2005) and they concluded that this programme directly addressed practical difficulties in water management, which contributed to the reduction of the gap between the needs and expectations of policy makers, scientists, researchers, managers and other stakeholders. While they had criticisms about the ability of the LIFE programme to bridge the gap between science and policy, their overall conclusion was that it helped Member States to meet some of their needs regarding the implementation of the EU Water Framework Directive (WFD, 2000/60/EC). Bridging the gap between science and policy is not easy and although there is evidence that they are sometimes well connected, the opposite is also apparent. So why is the relationship between science and policy so difficult and what is known about the mechanisms that influence the uptake of scientific knowledge by policy?

2.1. A linear model of knowledge production and use

The dominant idea in decision making is that the best choice can only be made when decision makers are fully informed of the possible outcomes of the available alternatives. Procedures for policy and decision making usually require the collection of information to support the selection of a policy option, assuming that a rational and therefore legitimate choice can be made (e.g. environmental impact assessment). In this rationalist approach, data and information play a major role in the evaluation of possible solutions. The relationship between researchers and policy makers could be described as linear, as research starts from the identification of missing knowledge to obtaining this knowledge to justify policy decisions (Weiss, 1986). In this linear model the relations between research and policy are quite straightforward. The research community produces scientific information, which is disseminated to the policy community, which then takes up the scientific information. The assumptions in this model are numerous. For instance that one can clearly discern the two communities (research and policy) and that this linearity is indeed a good description of the relationship between the two communities. The "dissemination paradigm" (Hood, 2002) is an important way of thinking in the linear model. It states that "some form of knowledge, produced someplace, is broadly disseminated to many users, often at some distance, physically and sometimes culturally, from the point of knowledge production" (Hood, 2002). Knowledge production and use are separated and the challenge is to communicate the scientific results to the policy community in such a way that the results can be taken up and used appropriately. The "two communities theory" (Caplan, 1979; Wingens, 1990) is representative of this way of thinking and suggests that the different cultures of the two communities are barriers to the uptake of science by policy. The two communities theory has received much criticism. In one study, Gibson (2003) looked systematically at the assumptions of the two communities theory and found that none of them could explain the observations from his case studies. The assumptions he tested were:

- Research can give clear messages to policy;
- Cultural differences explain the failure to use research;
- Research can be 'transferred' into policy;
- Governments should be automatically interested in research;
- Selective use of research in policy making is problematic;
- Researchers and research are apolitical and disinterested;
- Knowledge is something created and possessed by individuals outside a social context;
- Use of research by policy makers is a measure for the value of research;
- 'Research' 'evidence' and 'knowledge' are all the same thing.

From his research Gibson concludes that the two communities theory provides an inadequate understanding of the research–policy interface. Other authors also found little evidence for the two communities theory and tried to adapt it. Four alternatives have been developed: a science push model, a demand pull model, a dissemination model and an interaction model (see Landry et al., 2001, for an overview). However none of these models completely and accurately describe what happens in reality. One conclusion that is commonly cited in the literature is that an intensive interaction between researchers, policy makers and stakeholders from an early stage appears to improve the uptake of scientific information (Lavis et al., 2002; Lomas et al., 2003; Joyce, 2003). Landry et al. (2001) found that the extent of the dissemination efforts undertaken by researchers is a good predictor for the subsequent uptake of scientific information by policy makers