Journal of Hydrology 519 (2014) 2415–2435

Contents lists available at ScienceDirect

Journal of Hydrology

journal homepage: www.elsevier.com/locate/jhydrol

Politics of innovation in multi-level water governance systems

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ARTICLE INFO

Article history:
Available online 9 September 2014

Keywords:
Multi-level governance
Water management
Innovation
Politics
Expertise

SUMMARY

Innovations are being proposed in many countries in order to support change towards more sustainable and water secure futures. However, the extent to which they can be implemented is subject to complex politics and powerful coalitions across multi-level governance systems and scales of interest. Exactly how innovation uptake can be best facilitated or blocked in these complex systems is thus a matter of important practical and research interest in water cycle management. From intervention research studies in Australia, China and Bulgaria, this paper seeks to describe and analyse the behind-the-scenes struggles and coalition-building that occurs between water utility providers, private companies, experts, communities and all levels of government in an effort to support or block specific innovations. The research findings suggest that in order to ensure successful passage of the proposed innovations, champions for it are required from at least two administrative levels, including one with innovation implementation capacity, as part of a larger supportive coalition. Higher governance levels can play an important enabling role in facilitating the passage of certain types of innovations that may be in competition with currently entrenched systems of water management. Due to a range of natural biases, experts on certain innovations and disciplines may form part of supporting or blocking coalitions but their evaluations of worth for water system sustainability and security are likely to be subject to competing claims based on different values and expertise, so may not necessarily be of use in resolving questions of "best courses of action". This remains a political values-based decision to be negotiated through the receiving multi-level water governance system.

1. Introduction

Innovation is important in the water sector. Many of the world's water systems are under increasing stress due to a range of factors, including growing populations, changing consumption patterns, pollution and environmental degradation, infrastructure legacies, water sharing conflicts, a lack of coordinated management, as well as climate variability and change. There is thus a growing recognition that more sustainable forms of water management and innovative technologies are required to provide water security for populations' needs over the coming decades (UN Water, 2013). Societies throughout history have innovated and adopted a range of water management practices and governance structures to solve problems they face and to further develop their societies in ways that match their values (Delli Priscoli and Wolf, 2009; Daniell, 2012). Such innovations include the development of water storages and irrigation systems that have helped to drive food production and population growth, carefully engineered water supply and sewage systems that have provided public health improvements, and levees and drainage systems that have mitigated flooding to allow development on fertile floodplains and reclaimed land. Laws and incentive schemes to control pollution, and determine water rights and sharing plans have also been developed in some places together with government agencies and stakeholder management groups to manage water access, safety and use. However, with increasing system stresses, the drawbacks of many of these water innovations are being more widely acknowledged and debated.

In response, calls for innovation and improvements in water management and related systems that promote greater sustainability (e.g. Dovers and Handmer, 1992; Fleming, 1999; Gleick, 2003; Pahl-Wostl et al., 2007) or increase water security (and hence reduce water-related risks) (e.g. Hashimoto et al., 1982; Allan, 1999; Hall and Borgomeo, 2013) have become common. Yet, exactly what constitutes "greater sustainability" or "less risky"

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http://dx.doi.org/10.1016/j.jhydrol.2014.08.058
0022-1694/

remains highly contested due to difficulties and differences in conceptualising and measuring these values-based concepts (Daniell, 2012). It has been suggested that a move to greater sustainability could involve pursuing a "soft" path of management options (e.g. Gleick, 2003; Pahl-Wostl et al., 2007). Such a strategy would imply minimisation of impacts of water system innovations on ecological values and key earth system processes, which underpin adequate functioning of our societies (Rockström et al., 2009), with social and economic values also being enhanced where possible. Such proposed directions aim to maintain the hydrological integrity and adaptive capacity of systems to support ecosystems. These may include: encouraging responsible water usage and using standards of water that are fit-for-purpose to reduce treatment needs; promoting local reuse of water to avoid extra energy use; and developing environmentally appropriate flood alleviation systems, such as increasing surface permeability to encourage infiltration rather than runoff and giving floods the space they require in a traditional drainage paradigm (see, for example, Keath and Brown, 2009). These emerging water cycle solutions need to be implemented across multiple dependent scales with greater consideration and knowledge of local behaviours and management throughout human settlements (Coombes, 2002).

For such innovative systems to be implemented, there is also a widely acknowledged need for improved water governance and integrated catchment or basin management across multiple levels of administration, sectors and stakeholders that can manage water for multiple values; through so-called "multi-level governance" systems (e.g. Marks and Hooghe, 2004). Although there are growing numbers of examples of water management systems that support innovative integrated, decentralised or participatory options in urban, rural and mixed basins (e.g. Etienne, 2011; von Korff et al., 2012), widespread uptake of such innovations is slow. Rather, large-scale energy-intensive centralised innovations, such as desalination plants and inter-basin water transfers and predominantly expert-driven decision processes that accompany them, are still being adopted and invested in by Governments, businesses and international organisations, along with an increased uptake of economic innovations such as water markets and payments for environmental services (Coombes et al., 2012).

In this context, we are interested in what determines the uptake of specific types of innovations in the water sector and to what extent there are specific forms of multi-level governance that are conducive to innovation uptake. Addressing these questions involves the need to understand complex multi-level governance systems and both the open and behind-the-scenes negotiations and political struggles that are played out in between private companies, utility providers, researchers, communities and all levels of government.

This paper uses three case studies to explore struggles over innovation uptake in multi-level governance processes; in particular, struggles in the water domain between centralized infrastructure and business models, and more decentralized, participative and diversified models. We first present a three-part theoretical framework used to create an "analytic grid" for investigation of such struggles. This is followed by the research methodology that was used to gather data and study three case study examples from Australia, China and Bulgaria. In each of these cases, the multi-level processes and struggles that are being carried out to define the water policy and management agendas are outlined. Descriptions and analyses of the interests, underlying values and politics that are supporting and blocking certain innovation uptakes in these cases are also provided. Our discussion then distils insights from these cases according to the common analytical grid and examines what these mean for future innovation uptake and working towards more water secure and sustainable futures around the world.

2. Theoretical framework

In order to study the politics of innovation in multi-level water governance systems, we draw here on both theories of innovation uptake and multi-level governance, as well as some of the existing understanding on what kinds of politics typically affect innovation development and uptake. The specific use of these theories for the research is then described in the Research Methodology section.

2.1. Innovation uptake theories

Innovation has been studied in many disciplines, including science and technology, management sciences, agriculture, medicine, behavioural psychology, public policy and business studies. Here we follow Rogers in considering that an innovation is "an idea, practice, or object perceived as new by an individual or other unit of adoption" (Rogers, 1983, p. 11). We also consider David's (1996) managerial innovation classifications—the type we are interested in for studying water management innovations—to help understand their attributes and the different dynamics of their uptake. David (1996) considers that there can be "knowledge-based innovations": technical innovations – relying on knowledge and expertise; "relations-based innovations": governance innovations – which aim to alter the relationships between people in an organisation (or in our case, sometimes society more generally); and "mixed innovations" which include attributes and aims of both types. Of particular interest in the innovation literature, and to us in this paper, is how the process of innovation uptake occurs and what factors influence this eventual uptake or rejection. One example process of how innovation uptake can occur is provided in Table 1. It considers a number of stages, from having knowledge that the innovation exists and being persuaded of its benefits, to deciding on its use or not, putting it to use and then evaluating or confirming that use of the innovation was a good decision.

In line with the kind of innovation uptake process outlined in Table 1, attention has been focussed on identifying factors that are likely to increase the likelihood of particular innovations being adopted. For example, Nutley and Davies (2000) summarise five key factors that can affect innovation adoption:

- the characteristics of the adopters – whether as individuals or organizations they are typically innovators in their own right, early adopters, early majority, late majority or laggards (Rogers, 1983), to what extent they are typically successful (O'Neill et al., 1998) and their specific strategies, structures, skills, resources and politics (Dyer and Page, 1988; Schon, 1963; Maidique, 1980);
- The social network to which the adopters belong – innovation uptake may follow the fads and fashions of the network (Abrahamson, 1991);
- the innovation's attributes – for example, adaptability, centrality, technical versus administrative purpose; pervasiveness of behavioural change, radicalism and uncertainty of outcomes (Wolfe, 1994);
- characteristics of the receiving environment – high uncertainty can drive innovation uptake, while low uncertainty may promote avoidance of innovation uptake (O'Neill et al., 1998; DiMaggio and Powell, 1983); and
- characteristics of those promoting the innovation – change agent credibility and level of contact, and opinion leader buy-into innovation can drive uptake (Coleman et al., 1966; Rogers, 1983).

David (1996) also considers innovation uptake dynamics in a number of ways including through the *level of formalization* of