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## Water policy reform and innovation: A systematic review

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### ABSTRACT

A growing need for innovation in water policy is increasingly recognized within water policy and governance scholarship, but the types of innovation and changes being considered or undertaken, and the conditions that enable or hinder those changes remain unclear. A systematic review of water policy reform literature was undertaken to investigate how innovation is defined in this area of scholarship and the enabling conditions or barriers shaping the innovation process. The findings of the review demonstrated that the mainstream water policy reform scholarship that examines innovation is limited. A small portion of the water policy reform literature that addresses innovation considers different types of policy changes as innovative. Therefore, the results are used to propose a typology of water policy innovations. Furthermore, the results demonstrated that preliminary knowledge about the role of policy entrepreneurs, networks, social learning, adaptive approaches, and niche experiments in the innovation process emerge in a sub-set of the water policy reform literature.

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## 1. Introduction

Balancing environmental, social, and economic issues through policy is a well-established priority in environmental governance research in general, and in water governance specifically. The role that innovation can play in water policy in altering decision making structures, management practices, and operational routines to address these issues thus provides a highly relevant lens for insight into the broader environmental governance field.

Understanding how policies change and the subsequent effect on practice is emerging as an important field of inquiry

as governments, civil society, and industry look to address growing water quantity and quality concerns. Increasing conflict associated with outdated or inadequate water allocation systems, the need to consider the multiple interests of indigenous nations, licensed users, and general stakeholders, coupled with the growing industrial, agricultural and urban demand for fresh water are all driving an interest in water policy reform (Heaney et al., 2007; Prasad, 2008; Wheida and Verhoeven, 2007; Wilder, 2010). Adding to these drivers are additional broader factors, including climate change and its impact on the hydrological cycle, political reform agendas and the growing public awareness about water issues (Neuman, 2010; Nicol and Mtisi, 2003). Studies that examine these drivers

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and factors in water policy reform are widespread and cut across the global, continental, national, and more local basin and watershed levels (e.g. Gutierrez, 2010; Ioris, 2009; Lein and Tagseth, 2009; Nhapi, 2009; Wilder, 2010), indicating that water policy reform is a universal concern.

A growing emphasis, particularly by scholars, has been placed upon the need for innovation—and in some cases “radical” change - in water policy and the processes that enable or shape it (e.g. Biswas and Tortajada, 2010; Pahl-Wostl, 2002; Rahaman and Varis, 2005). Biswas and Tortajada (2010, p. 130) contend: “There have to be radical changes in the governance processes and the institutions responsible for water to cope with the immediate challenges, potential future changes and uncertainties both from within the sector and around the sector”. Similarly, explicit sentiments are offered by de Graaf et al. (2009) who state “[w]orldwide, the need for transformative change in urban water management is acknowledged by scientists and policy makers” as well as by Fish et al. (2010) who assert that innovation is necessary to grapple with the uncertainty and complexity faced in water policy today. Although the literature reveals no clear consensus about the definition of this “transformative” or “radical” change, it tends to be associated with the major and radical policy changes identified in policy science literature in general, as opposed to minor and incremental changes (e.g. Geels et al., 2004; Szekely and Strebel, 2013). Perhaps most importantly, from a practical perspective it requires substantially different outcomes in a given watershed, including potentially different roles and levels of influence of existing and new actors, the integration of knowledge systems, and new norms or cultures about the human-water relationship.

The search for innovation in the water sector mirrors the growing interest for innovation in environmental policy fields more generally. For instance, the energy sector has emphasized the importance of innovation, often focusing on the uptake of efficient or alternative technologies to access new or more sources of energy. Similarly, technological innovation has been an important and much studied aspect in the water field. For example, rainwater harvesting techniques, drip irrigation, and wastewater treatment technologies have all received substantial scholarly attention (e.g. Bentama et al., 2004; Verma et al., 2004). But any role for policy in these cases tends to relate only to whether or not a policy is in place that permits or promotes the diffusion of such technologies.

Yet, water policy reform scholars and practitioners have acknowledged that protecting water quality and quantity requires not just technological innovation, but also social, political, economic, and behavioural changes (e.g. Brandes, 2005; Head, 2010; Wolfe and Hendricks, 2011). Importantly, this perspective re-orientates the focus on water policy reform to include social innovations. Beyond the water policy literature, a growing body of work examines the idea of social innovation for complex social and ecological challenges (see Leach et al., 2012; Westley et al., 2006; Geels, 2002). Within this literature, innovation is studied from a systemic perspective, drawing on theoretical concepts from transition theory, multi-level perspectives, complex systems theory, and resilience. In this context, innovation is understood as involving any “new products, processes or programmes that profoundly change

the basic routines, resource and authority flows, or beliefs of the social system in which the innovation occurs. Such successful social innovations have durability and broad impact” (Westley and Antadze, 2010, p. 2). This social innovation research highlights that innovation is a process – one that involves distinct phases, such as generation, testing, prototyping, resource searches, expanding, and institutionalizing with a critical role for entrepreneurship and networks in each phase (Moore et al., 2012; Van de Ven, 1999).

But with water policy reform scholars having recognized the need for innovation and transformative change, and that such change requires social rather than just technological innovation, two substantive challenges remain. Firstly, when moving beyond issues related to technology, the scholarship tends to “blackbox” the notion of innovation. For example, water policy innovation is recognized as needed to transform social, political, and economic systems, yet very little understanding exists about the type or form that these policy innovations should take across the water policy literature. Without an analysis on the range of possible policy options available, a more complete understanding of what an innovation in water policy entails, and what different types of policy changes constitute an “innovation” is not possible. Secondly, previous research on social innovation has identified that innovation is a multi-phased process, yet, within the water policy context, significant questions remain about the conditions in which the water sector and its entrenched priorities and practices could support or hinder water policy innovation.

To resolve these outstanding challenges, this paper investigates two core questions across the current water policy reform literature. Firstly, how is innovation defined in the field of water policy reform and what are the types of innovation involved? Secondly, what conditions enable or hinder innovation in water policy reform? Through this exploration, this paper will track whether a re-orientation has occurred in the theoretical and analytical tools being used to examine water policy reform to intentionally focus upon social innovations.

## 2. Methods

A systematic review of water policy reform journal articles was employed to identify how the term “innovation” is used in this body of scholarship. Systematic reviews are utilized to aggregate answers to specific research questions by providing an overview of existing primary research within a body of literature (Cochrane, 1999).

The multidisciplinary database Scopus was used to identify water policy reform literature within the five-year time frame of 2009 to 2013 (April). This database was specifically selected for its broad coverage of environmental studies, social sciences and natural sciences. As with any time-bound study, limitations exist. However, given that the emphasis on innovation in water policy and governance is a relatively recent phenomenon, it is expected that the literature in the last five years will be representative of key themes.

Search parameters further limited the literature review to the water policy reform theme – as a specific subset of the more general water policy literature. This decision was based on the

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