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Research Paper

The interaction of risk allocation and governance arrangements in innovative urban stormwater and recycling projects

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HIGHLIGHTS

- Risk conceptualisation, allocation and management may change in project development.
- Clear roles and regulatory predictability help innovation in devolved governance.
- Regulatory clarity helps legal and financial certainty and guides risk allocation.
- Less prescriptive regulation may help innovation among trusted public institutions.

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ABSTRACT

Successful innovation requires clarity around the identification and allocation of risk and the responsibilities of stakeholders in its management. The quest for water security in large cities has led to consideration of alternative water sources, which may involve new risks. In initiatives for integrated urban water management, stormwater is increasingly viewed as a resource rather than simply as a flood or pollution hazard, with implications for how risk is conceptualised and managed. This paper addresses the question of how governance arrangements and formal risk allocation interact with risk perceptions to either promote or constrain innovative initiatives involving the use of stormwater as a potable source. The local development scale at which such initiatives are often realised also poses new challenges for the management of risk, particularly where initiatives require devolved governance arrangements and fragmented responsibilities for managing different types of risk at different stages of project development. We compare two examples of innovative local development-scale test cases involving stormwater capture and treatment in different Australian cities. While both test cases involved devolved governance, there were different organisational arrangements and regulatory frameworks relating to land use planning and water services. Our conclusions endorse the importance of effective risk management in facilitating technological innovation at the local development scale, and an ongoing role for trusted government authorities in overseeing effective risk management.

1. Introduction

The demand for secure and reliable water supplies in large cities has continued to increase, in response to continued population growth and climate change. One potential resource for augmenting urban water supplies is the capture and treatment of stormwater. However, current regulatory frameworks and organisational arrangements for managing stormwater are grounded in a paradigm based on managing stormwater as a flood or pollution hazard rather than a water resource (McCallum & Boulot, 2015; Roy et al., 2008). Governance arrangements for flood and pollution management involve different organisations and regulations to those for potable water (Roy et al., 2008; Morrison & Brown, 2011), and the risk issues are conceptualised and managed very differently in each case.

The tensions concerning divergent understandings of stormwater for both urban and rural areas continue to be debated within the context of implementing more holistic approaches to Integrated Water Resource Management (IWRM) (Solanes, 1999). In the context of urban water planning, Integrated Urban Water Manage-

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ment (IUWM) has become an internationally supported approach, driven by new and pressing imperatives for urban water services to address a much wider range of social and environmental functions than in the past (Brown, Keath, & Wong, 2009; Gleick, 2000; Mitchell, 2006; Troy, 2008; van de Meene & Brown, 2009). IUWM emerged as planning framework to account for the water cycle as a whole, recognise and encourage a full range of consumptive and non-consumptive uses, and coordinate fragmented organisational responsibilities for delivering more sustainable water services and environmental outcomes (Burns, Fletcher, Walsh, Ladson, & Hatt, 2012; Sharma, Burn, Gardener, & Gregory, 2010; Sharma, Tjandraatmadja, Cook, & Gardner, 2013). As a planning goal, there was broad support for attempting to achieve more fully integrated processes, but the politics of implementation and coordination for IUWM and IWRM have proved to be problematic, with the slow pace of progress attracting considerable criticism (e.g. Jeffrey & Gearey, 2006; Medema, McIntosh, & Jeffrey, 2008). Clearly the IWRM issues were not solvable by water engineers alone; the regulatory and inter-organisational challenges were even more difficult (Blomquist, Heikkila, & Schlager, 2004). In urban contexts, there has been a poor level of integration between innovative decentralised physical infrastructure systems, designed to capture stormwater as a resource for re-use at local scale (including potable consumptive use) and the existing centralised reticulation and treatment systems (Burns et al., 2012; Sapkota et al., 2015; Sharma et al., 2013). Decentralised technical solutions have required more devolved governance approaches that coordinate the activities of a range of organisational actors including private sector as well as public sector organisations (Bakker, 2010; Quezada, Walton, & Sharma, 2016).

New initiatives to manage stormwater as a potentially potable resource are largely focused around local developments, as this is the scale that offers clear efficiencies for incorporating locally harvested stormwater in Water Sensitive Urban Design projects (Sharma et al., 2013; Yu, Farrelly, & Brown, 2012). However there is often a disjuncture in roles and responsibilities – local development approvals and land-use planning are typically the responsibility of local or municipal governments, whereas bulk water supply is typically the responsibility of state government agencies and regional water suppliers. As each of these operates within a different regulatory context, it has become necessary to develop cross-organisational relationships for successful IUWM initiatives focused on stormwater management. While there has been some past discussion of regulatory barriers in the literature on IUWM (Brown & Farrelly, 2009; Marlow, Moglia, Cook, & Beale, 2013), the significance of organisational relationships across multiple scales warrants more careful attention (Marlow et al., 2013; Quezada et al., 2016), particularly in relation to how risks are identified and managed throughout project development.

Initiatives for IUWM have emerged alongside a questioning of the long term adequacy of centralised water system solutions, and a new focus on fit-for-purpose and non-traditional water sources that will include decentralised options (Mitchell, 2006; Sharma et al., 2010; West, Kenway, & Yuan, 2015). Stormwater recycling is one of several options for sourcing alternative water supplies for cities in Australia and elsewhere (CSIRO, 2009; Vaisman, 2014; Wong et al., 2013). However, initiatives for stormwater harvesting and treatment are typically embedded within the water decentralisation agenda. Australia appears to be breaking new ground with innovative local development projects that harvest stormwater and rainwater with advanced treatment that meets the standards for drinking water (Sharma et al., 2013). Our concern is with the development of appropriate governance arrangements to manage these technological innovations safely.

In this paper we address the question of how governance arrangements and formal risk allocation interact with risk perceptions to either promote or constrain a shift from managing stormwater as a hazard to managing it as a resource. In particular, we analyse how risk has been conceptualised and managed in innovative test cases involving stormwater recycling and treatment for potable use in two Australian cities – Melbourne, capital of Victoria, and Brisbane, capital of Queensland. While centralised urban water management systems in Australia have effectively managed water quality risk for many decades, decentralised developments pose new challenges for understanding and managing risk (Wallington, Robinson, & Head, 2012), particularly where they involve a wide range of organisations and governance arrangements that may shift between the project development stage and implementation stage. A well-documented contamination case at Walkerton, Canada, in the early 2000 s highlighted the potential for a public health disaster if decentralised water supply initiatives failed to have adequate procedures managing water quality and appropriate oversight from regulators (Hrudey, Hrudey, & Pollard, 2006; O'Connor, 2002a, 2002b). While there has been a preparedness to invest in local scale innovation in the urban water sector, Farrelly and Brown (2011) found that these initiatives had little impact on larger water management regimes in Australia because of limited policy attention to institutionalise their diverse requirements into a more sustainable urban water management approach. Their contexts and outcomes are clearly influenced by interaction between regulatory frameworks and organisational arrangements governing new initiatives for stormwater and rainwater recycling. To better understand the dynamic character of this interaction and its influence on innovation, we compare similar initiatives in Melbourne and Brisbane in order to explore,

1) the relationship between the capacity for technological innovation and the regulatory space shaping land use planning and water supply;
2) the allocation, perception and management of risk throughout the developmental stages of innovative stormwater recycling projects, and the implications for devolved governance arrangements for urban water at the local development scale.

2. Background and conceptual framing

Australia has a federal system of government with law making institutions and powers at federal, state, and local or municipal levels. Urban water supply is primarily a state responsibility and most laws relating to water are state laws. However stormwater management has traditionally been a responsibility of local government agencies concerned with drainage and flood mitigation, and has evolved differently in various Australian cities (Crase, 2010; Roy et al., 2008; Troy, 2008). Thus, the physical location of urban water initiatives is crucial because each project is embedded within a unique regulatory space comprising all the relevant laws and regulatory tools impacting on urban water management in that location.

From the late 1990s to the late 2000s, all the eastern states of Australia experienced a significant dry period, termed the Millennium Drought. This fuelled increasing governmental concern to guarantee urban water security, prompting strategic policy attention to more integrated approaches to sustainable urban water management (Roy et al., 2008). In Queensland a novel regulatory requirement was introduced to mandate the inclusion of rainwater tanks in new housing developments. In Victoria, concerns about water quality prompted legislative changes that required stormwater management plans in all new urban development, and measures to reduce the flow of pollutants from urban lands into riverine and marine environments (Appendix A Table A1). In each case there were implications for urban planning at the local