CAN DEMONSTRATION PROJECTS ACT AS A MECHANISM FOR PROMOTING A TRANSITION?

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Introduction

Traditional governance of the urban water sector supports a reductionist approach, whereby infrastructure and management is compartmentalised into three core functional areas of water supply, wastewater and stormwater which operate in a framework that prioritises expansion and efficiency (Newman, 2001). However, the capacity of this traditional system to respond to emerging challenges, including uncertainty and complexity related to global climate change and increasing demand, is currently being questioned. Sustainability commentators are calling for transformative change in the sector, towards more sustainable urban water management practices (i.e. water sensitive cities). Such an approach would emphasise an adaptive framework, prioritising flexible, inclusive, and collaborative practices, operating within organisational cultures that embrace experimentation and learning to foster sectoral adaptation (Maksimovic and Tejada-Guibert, 2001; Folke, 2006; Pahl-Wostl, 2007; Wong and Brown, 2008). This would provide, for example, the broad scale introduction of alternative water servicing options at centralised, hybrid and decentralised scales (i.e. PMSEIC, 2007; Wong *et al.*, 2008; Brown *et al.*, 2009a). Creating such a radical departure from current practice requires fundamentally different technologies and practices and introduces profound uncertainty into public policy making.

Supporting a transition to water sensitive cities will require fundamental, systemic change across the water sector, but this introduces the question of where does such a journey begin? Although creating water sensitive cities is an objective of the Australian Government's National Water Initiative (COAG, 2004: Clause 92:20), they provide no formal definition of what a water sensitive city comprises, or direction on how to get there. Addressing this deficit, recent academic commentary suggests that water sensitive cities would be underpinned by sustainability principles including, among others, social capital, intergenerational equity, diverse water sources and an integrated, total water cycle approach (Wong *et al.*, 2008). Furthermore, Brown and colleagues (2009a) assert that water sensitive cities would function as a catchment, provide ecological services, and include engaged, water sensitive communities.

Nonetheless, government-led reforms for achieving sustainable urban water management have largely focused on regulatory, structural and efficiency mechanisms. Yet, recent evaluations of the implementation of environmental policy broadly, demonstrates a level of 'policy failure' and ad hockery (May, 1992; Arentsen *et al*., 2000; Backhurst *et al.*, 2004; Dovers, 2005). The disconnect between policy and implementation in the urban water sector can been understood as a result of historical and contemporary factors including the compartmentalisation of infrastructure and management, privileging of scientific, technical, linear solutions (Ingram, 1990; Giddens, 1999) and an emphasis on the efficiency of outputs introduced by new public management (Bennett, 2000). Further compounding such disconnection is the systemic institutional barriers related to unclear roles and responsibilities, fragmented institutional arrangements, insufficient resources, variable organisational commitment (Brown and Farrelly, 2009) and practitioner perceptions of risks,

such as public health implications when introducing alternative water servicing (Brown *et al.*, 2009b).

Drawing on the proposed principles of water sensitive cities (Wong *et al.*, 2008), new technologies and practices must be introduced. Recent research suggests that introducing new technologies and approaches through 'demonstration projects and training' may be one of many key 'enabling context factors' that can support a transition (Brown and Clarke, 2007). Importantly, demonstration projects are widely used in the urban water sector as a tool for engaging and promoting new technologies and policies 'in-action'. However, such projects often remain isolated, resulting in limited replication and limited influence on future policy decisions (i.e. failing to encourage a transition), due in part to insufficient monitoring and evaluation, but also due to poor information exchange (e.g. Gardiner and Hardy, 2005; Mitchell, 2006; Roberts and Brown, 2007). Similarly, scientific and technical innovation can be seen to introduce uncertainty and risk (Giddens, 1999). Despite current limitations, other industry commentators have called for further demonstration projects to support the diffusion of new and emerging technologies in the urban water sector (Mouritz, 2000; Kelly, 2004; Radcliffe, 2004; Mitchell, 2006).

This paper further explores how demonstration projects could act as a mechanism to support a transition in urban water management, to achieve water sensitive cities. Demonstration projects can be conceived as bounded experiments where the application/implementation of new technology, infrastructure or science/policy/programs that attempt something new (an innovation) is trialled. For example, demonstration projects can either be structural (i.e. technology or infrastructure) or non-structural (i.e. policy and people) projects applied in real-life (grounded) situations to test whether they can successfully offer new insights about enhancing or transforming current practice. Such projects are often found throughout Australian cities and can include a single technical innovation (i.e. sewer mine integrated into an office block) through to a whole development incorporating multiple innovations (i.e. streetscape biofiltration, wetlands and third-pipe wastewater). Similarly, non-structural techniques such as innovative policy mechanisms are increasingly being used, although such techniques remain supplementary to the standard technical, infrastructure solutions (e.g. Rauch *et al.*, 2005; Mitchell, 2006; Coppock and Brown, 2007).

The focus of the paper is about exploring practitioner perceptions of experimentation (where experimentation equals demonstration of innovation) in the urban water sector, understanding what constrains experimentation and what mechanisms are required for the broad scale adoption of new approaches and techniques. To begin, the paper presents recent discussion on the social science theory of transitions, which draws connections to the importance of promoting a learning environment, supported by experimentation. The overall research approach is presented, followed by a discussion regarding the research outcomes and concluding remarks.

Transitioning

Creating water sensitive cities will require system-wide changes from the current socio-technical system (traditional management) to sustainable urban water management approaches (i.e. water sensitive cities). Transition management theory is identified as one of the most promising field of research in promoting change for sustainability (e.g. Meadowcroft, 2005). Rotmans *et al.* (2001) argue that transition management is a basis for coherent, consistent public policy which is not deterministic, but rather offers a range of possible pathways for change (see also Geels and Schot, 2007). Thus, transitions cannot be

managed by traditional practices (such as command-control), but instead requires processes of influence, including steering and coordination (Loorbach and Rotmans, 2006), and the promotion of management as a learning approach (Pahl-Wostl, 2007).

Transition processes are complex, involve long-timeframes and include multi-factors, multi-actors and occur across multi-levels (Rotmans *et al.*, 2001; Geels, 2002). For example, a transition involves different processes that occur across technological, cultural, institutional, economic and ecological spheres of society (Geels and Schot, 2007). Drawing on the standard S-curve of technology diffusion, Rotmans *et al.*, 2001 propose four different transition phases: predevelopment, take-off, acceleration and stabilisation (Figure 1). These four phases can be characterised as (modified from Loorbach and Rotmans, 2006 pg190):

- *predevelopment phase*: where much experimentation at the individual level occurs;
- *take-off phase*: where the process of change challenges traditional systems;
- *acceleration phase*: where structural changes begin to reflect the implementation of socio-cultural, economic, ecological and institutional changes; and
- *stabilisation phase*: where a new dynamic equilibrium is reached (see also, van der Brugge and Rotmans, 2007).

Achieving stabilisation in Figure 1 represents an ideal transitions pathway for achieving sustainable urban water management; however, other pathways typically occur due to the complexity of interactions, potentially leading to either 'lock in', 'system breakdown' or 'backlash'. van der Brugge and Rotmans (2007) suggest that certain innovations often fail to break through take-off and either reinforce the status quo (i.e. system breakdown), or leads to the introduction of efficiency-focused innovations (similar to the business-as-usual approach) culminating in technology 'lock-in'. Alternatively, the innovations may be unable to self-sustain, leaving no adequate substitute for destabilising the regime, resulting in system breakdown. Backlash refers to the lack of widespread adoption of innovations, resulting in disincentives to do anything different, thus further reinforcing traditional practices. Collectively, the numerous institutional impediments facing the introduction of innovations can lead to system backlash. Indeed, many sustainability technologies have failed to become mainstream practice because of a failure to address such barriers (Brown and Keath, 2008), thus we have failed to achieve the required step change to stabilise sustainable urban water management.

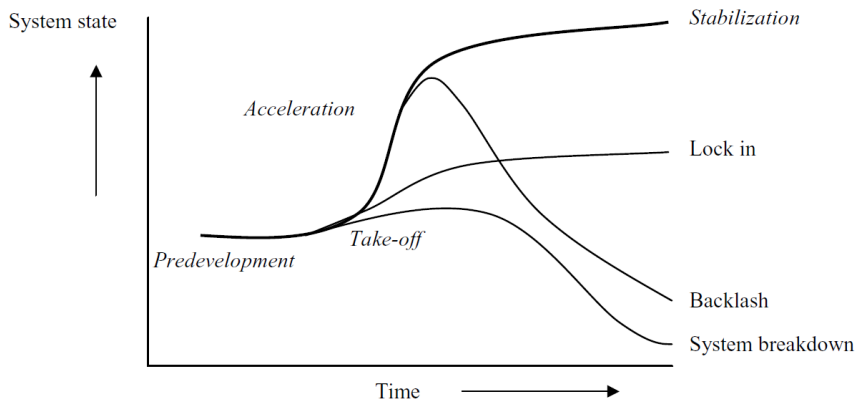

Figure 1: **Possible system pathways of a complex adaptive societal system.**
Source: van der Brugge and Rotmans (2007:255).

Transition pathways are highly influenced by the interplay among the multiple levels of social structure: macro level (landscape); meso-level (regime) and micro-level (niche) (Geels

2002, 2005) (see Table 1). Also, the strength, scope, speed and frequency of landscape pressure, stability of the regime and its ability to respond to pressures and the sophistication of the niche innovations will also create different transition pathways (Geels and Schot, 2007). Thus, when a window of opportunity arises to create change, if the niche is not adequately reinforced and/or the regime is resistant to change, then traditional approaches can become locked in (Brown and Keath, 2008).

Table 1: The multi-level concept

Macro Level (landscape)	The macro-level landscape incorporates dominant cultures and worldviews, as well as the natural environment and large material systems such as cities. Change at this level is generally slow (decades and generations) and often beyond the direct influence of individual actors or organisations, and might include changes in population dynamics, political models, macro economics or environmental conditions.
Meso Level (regime)	The meso-level is where regimes operate. Regimes are broad communities of social groups with aligned activities who operate according to formal and informal rules and norms, which are maintained to deliver economic and social outcomes. The urban water regime in Australia would be typically populated by water authorities, regulators, state and local governments, land developers, consulting organisations, manufacturers, academic institutions, community groups and professional bodies. Change at this level is thought to move in decades
Micro Level (niche)	The niche operates at the micro-level, providing a protective space for radical products, processes and technologies to emerge that are substantially different from the status quo. These innovations are fostered and protected from the dominant regime by a small network of dedicated actors, sometimes operating outside of the dominant regime. Changes at this level are the most rapid and can occur in months and years.

Source: Geels, 2005

An important process of transition management is based on the concept of learning-by-doing and doing-by-learning; "because the road is unclear, experimentation is essential in order to learn" (van der Brugge and Rotmans, 2007:259). Experimentation is undertaken predominantly within the niches (micro-level) which require support and coordination to up-scale to influence the regime (meso-level) upon which reinforcement across the broader regime networks is required (Brown and Clarke, 2007). Thus, experimentation can promote the acceleration of the transition pathway to achieving stable sustainable urban water management practices (Figure 1). Indeed, many sustainability scholars have argued that a key element in coping with uncertainty and building resilience (a proposed principle of a water sensitive city) requires institutional learning (Breit *et al.*, 2003; Gunderson *et al.*, 2006), also referred to as social learning (e.g. Pahl-Wostl, 2002; van de Kerkhof and Wieczorek, 2005; Ison *et al.*, 2007). Social learning can be conceived as many things including as i) a conceptual framework, ii) an operational principle iii) a policy instrument and iv) a process of systemic change (Ison *et al.*, 2007). While it is widely encouraged as a process for promoting transitions (e.g. Pahl-Wostl, 2002, Pahl-Wostl and Hare, 2004; van de Kerkhof and Wieczorek, 2005), recent reviews point to significant challenges for social learning that need to be addressed, including rigid bureaucratic structures, lack of political transparency and poor public access to information (Tippert *et al.*, 2005; Mostert *et al.*, 2007).

Thus, operationalising transitions management requires appropriate experimentation platforms for the mobilisation of actors, knowledge development and learning (Smits and Khulmann, 2003; Loorbach and Rotmans, 2006). Therefore, the authors contend that to achieve stabilisation of sustainable urban water management practices, and to avoid the lock

in, backlash and system breakdown pathways, learning mechanisms including demonstration projects, will be an important component in building the necessary learning platforms for accelerating a transition towards creating water sensitive cities.

Research Approach

A qualitative, social science research approach was adopted, involving a series of semi-structured interviews with a range of Australian urban water practitioners. Between February and July 2008 over 150 practitioners across Brisbane (n= 43), Melbourne (n= 47) and Perth (n= 65), were asked to reflect on their experiences with and/or exposure to demonstration projects in the urban water sector, and to discuss their perceptions about why broad scale experimentation is not widely encouraged. Interviewees included representatives from local government, state government, research organisations and the private sector, who work primarily in policy, planning, engineering, design/construction, land development and implementation. Collectively, respondents had a variety of experience with, and/or exposure to, demonstration projects. Interviewees were asked to: comment on whether they agreed or disagreed with the statement "the urban water sector limits experimentation because of a fear of failure"; reflect on the likely consequences of a failed demonstration project; and to comment on what they considered to be the 'trigger point(s)' required for transitioning to sustainable urban water management practices. In this research, the language of 'failure' was defined by a lack of replication of demonstration projects and a lack of influence on future public policy-making.

Drawing on the social science concepts of transitions theory (e.g. Geels, 2002; Rotmans *et al.*, 2001) and social learning (see Farrelly *et al*., 2009), interview transcripts were coded and systematically reduced to key thematic categories to support data analysis. Practitioner perceptions about experimentation were compared against the transition model, described in Figure 1, to reveal which transitions pathway the Australian urban water sector is currently travelling and to help answer the key research question, can demonstration projects act as a mechanism for promoting a transition?

This paper represents one component of a larger social science research project and complements a broader research program aimed at facilitating the transition towards water sensitive cities (www.urbanwatergovernance.com). A companion conference paper provides further details on the specific research project and examines a broader range of results from this project, which focuses on what, and how, practitioners have learnt based on their experiences and/or exposure to demonstration projects (Farrelly *et al.*, 2009). Next, the key findings of the research project are highlighted and discussed in relation to transition pathways.

Results & Discussion

Practitioners consider demonstration projects as an important learning tool for the urban water sector. Such projects build sectoral confidence in the feasibility and performance of technological innovations and help reveal how such innovations challenge and/or fit within the current rules and regulations, often termed the 'invisible processes' (see Farrelly *et al.*, 2009). Although demonstration projects are well-regarded amongst practitioners, there remains a lack of widespread experimentation and adoption of more sustainable urban water technologies and management practices. Exploring the notion there is limited experimentation due to a broader culture of 'fear of failure', as identified in previous

research, the overwhelming majority of interviewees agreed, connecting the lack of broad experimentation to an inherent 'conservatism' and 'nervousness' promoted within the urban water sector, particularly within public agencies, and related this to the dominant risk-based management approach. The unwillingness to 'try something new' was predominantly related to the concept of risk aversion, which respondents primarily attributed to public health implications. For example respondents stated:

- *the main fear lies in the public sector; the private sector is more enterprising. Public sector is afraid of issues to do with public health*;
- *There are very real public health implications … if we get it wrong because we've been too hasty, someone's gonna get sick and we'll get sued...;*
- *When talking about public health failure…that's an unacceptable risk… if there's a risk to public health, innovation goes out the window.*

Respondents reflected on what they explained was a risk adverse culture, embedded within and across organisations, where failure of any kind, irrespective of context, is considered as a negative. Giddens (1999) argues that the notion of risk is tied to the need for control, stability, security and safety. In the water sector, for example, the technological advancement around engineered sanitation systems has created a strong, stable public health value set, with responsibility vested with governments to provide public health protection for growing populations (Brown *et al.*, 2009a). Perceptions of risks to public health have previously been identified as a key impediment in adopting technologies for supplying alternative water sources (Brown *et al.*, 2009b). Thus, encouraging experimentation with alternative water servicing challenges these long-held norms and requires a reorientation of broader values and perhaps a renegotiation of the implicit hydro-social contract that exists between civil society, governments and the private sector for urban water management (Brown *et al*. 2009a).

Further exploring the notion of risk, or more explicitly the perceived consequences of failure, respondents expressed concerns relating to the possibility of inducing a system backlash pathway. For example, concerns focused on: impacts from the cost burden of correcting the 'failed' experiment; the negative implications for personal and organisational reputation; potential political and legal ramifications; and the loss of future opportunities (the ability to experiment in the future). To a certain extent, the first and last point raised by respondents reflect the economic efficiency agenda of the current marketisation governance approach which (neoliberal policies) (*c.f.* Elzen and Wieczorek, 2005) dominates the urban water sector and beyond. For instance, respondents noted:

- *every dollar you spend from the public purse has to produce an outcome, and if it doesn't you're in trouble (Developer/Consultant);*
- *it takes money to write up a failure, and we would rather put that money elsewhere (Local Government);*
- *It needs to become the economically rational decision to do these things. Cost implications need to be addressed (Non-Government Organisation)*;

While an economic rationalist approach is important to ensure fiscal prudence, it places a limited value, if any, on the role of broad scale experimentation and prevents redundancy being incorporated into a system to enable adaptation and flexibility, which are core principles of a water sensitive city. For example, respondents suggested a failed project is perceived not only as misspent money, but also as a financial burden as more money may be required to overcome the negative or unintended consequences. Furthermore, interviewees highlighted that public institutions are responsible for managing public monies and consequently are required to invest in 'public good' outcomes. However, to date, the 'public

good' value of learning is not an explicit mandate of the corporatisation agenda, as it can be perceived as inefficient, yet urban water practitioners have clearly emphasised its importance (e.g. Farrelly *et al.*, 2009).

Concerns relating to political and legal implications of a failed project, a consistent theme raised in the interviews, are prevalent in today's society, reflecting broader socio-cultural aspects of responsibility. For example, Giddens (1999:8) suggests that this is a result of manufactured uncertainty (created by new science and technology) which alters the connections between risk, responsibility and decision-making, and between the collective and the individual. Reconsidering the roles and responsibilities of the various stakeholders involved in urban water management has been suggested by Brown *et al.* (2009a) to encourage a shift towards water sensitive cities. This would involve renegotiating the scale of influence, operation and management, and the roles and responsibilities of civil society, governments and the private sector in creating a new (more complex) hydro-social contract and hence the regulatory setting.

A small number of interviewees suggested that the concept of risk needs to be (re)constructed as a positive, where bold initiatives (experiments) are valued; through failure we can learn and create new knowledge. Furthermore, while a number of individuals agreed that risk aversion permeates the sector, they considered the organisations for which they work, did not express such conservatism. These organisations were considered to have the appropriate commitment and willingness to undertake innovative projects and to operate at "the cutting edge". In addition, to overcome the pervading culture of risk aversion, labelling a project a 'trial' or 'demonstration project' acts as a coping mechanism, where a safe and protected space for experimentation was allowed, and effectively quarantines negative consequences. Similarly, a number of respondents spoke of 'over-engineering' a project to avoid or limit the potential of failure. Such commentary underscores the perception of limited meso-level support for allowing individuals and organisations to be involved in innovation, where the regime remains constrained by economic rationalist approaches, which at best lead to path dependencies (lock-in).

This is not to suggest that failure(s) should be encouraged; rather there is a need to re-conceive of failure as a learning opportunity where, through inbuilt redundancy, only one out of five experiments may be successful. For example, investment in niche creation can increase the intellectual development of the sector and increase the potential discovery of the most efficient transitions pathway for stabilisation. As reported in Farrelly *et al.* (2009) such projects, irrespective of success, help to engage with a broad network of stakeholders to achieve common goals and mutual learning, ultimately strengthening niche sophistication. Thus, through smart project design, the value of investing in redundancy helps create an adaptive governance framework, which prioritises flexibility, includes collaborative practices, and ultimately provides a pathway for stabilising sustainable urban water management. Moreover, if there is limited experimentation, the likelihood of appropriate substitutes being available to destabilise the regime is limited, thus leading to system breakdown.

Given that accelerating a transitions pathway to stabilising sustainable urban water management approaches is significantly impeded by the 'wicked' and systemic inertia of traditional urban water management (exacerbated by a conservative, techno-rationalist culture, respondents were then asked to nominate perceived trigger(s) for promoting a transition towards sustainable urban water management. Respondents identified the need for:

- improved organisational culture and commitment;
- leadership and champions;
- improved communication;
- further directive reforms aimed at legislative and policy changes;
- greater emphasis on capacity building programs;
- further risk sharing approaches;
- a change towards holistic thinking and emphasising different value sets;
- an economic framework valuing learning and appropriate pricing signals, and
- time and space for learning.

The responses reflect the perceived deficiencies of the current management approach to urban water in Australia and suggest the need to reinvigorate the sector through structural and cultural reforms. Reflecting on transitions management, the Australian urban water sector is experiencing the necessary macro- and micro-scale pressures (climate change and technological advancements respectively) needed to promote acceleration, but there remains a significant resistance at the regime level to react to these pressures. This resistance is underpinned by the strength of the conservative, risk adverse culture often promoting the status quo. For example, while there are some good examples of innovative sustainable urban water management demonstration projects, these are yet to become mainstream practice. Thus, the sector is poised at the take-off stage, but is struggling to gain the necessary support/incentives from the regime to promote acceleration.

Concluding Remarks

A significant transition in urban water management practices is required to achieve water sensitive cities. Drawing on transitions theory, this paper has analysed the outcomes of a series of practitioner-based interviews and clearly reveals the sector is not on the stabilisation pathway for sustainable urban water management practices. There are many reasons to suggest the sector is at risk of staying on the system breakdown pathway, or at best, path dependency (lock-in). More concerning, however, is the practitioner community does not feel safe experimenting and foresee the risks of the system backlash pathway, resulting in a significant disincentive to advocate for, and trial, more innovative sustainable urban water management projects. This is coupled with the historical entrenchment of how traditional urban water services are delivered to protect important societal values, such as public health. Further confounding these findings, is that where there are innovative sustainable urban water management policies, these are often not implemented in practice. Conversely, where there are innovative demonstration projects, they do not appear to adequately inform future policy decisions (with some exceptions). This disconnect is essentially a structural learning issue that needs to be acknowledged within the sector.

So can demonstration projects act as a mechanism for promoting a transition? Yes potentially, but there needs to be significant changes in the system, at a number of levels. Cultural change in the sector needs to be an explicit policy focus in promoting value in experimentation and learning using best practice social learning principles. Politicians, policy makers, implementers, scientists, and communities need to feel confident they are supported in their learning endeavours. Policy makers need to explicitly invest in demonstration projects as social learning experiments (as a policy instrument), that is reflective of the adaptive governance approach required for sustainable urban water management. At present, demonstration projects are supported by various funding initiatives, however these projects remain ineffective at capturing the required lessons to move ahead (see Farrelly *et al*., 2009).

The co-development of risk sharing mechanisms to support inter-sectoral innovations among the government, civil society and the private sector will also be required. Finally, the urban water sector needs to include research and development (science) partners in learning projects, to assist in identifying new solutions to ensure ongoing protection of public health, supply security and flood control and mitigation, but that can also deliver on environmental protection and resource efficiencies.

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