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Developing a water infrastructure planning framework for the complex modern planning environment

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ABSTRACT

Prevailing water infrastructure planning frameworks tend to present planning processes as rational and objective, paying little attention to whose interests are served. In reality, the planning process is inherently subjective and shaped by social and political dimensions. In this paper we develop a water infrastructure planning framework that is mindful of this context, beginning with a review of the evolution of planning theory. Existing frameworks are compared in order to develop a draft framework, which was then refined through consultation with water industry experts. Compared to the prevailing frameworks, our approach: (1) makes explicit the iterative process between decision analysis and decision taking, (2) ensures that cost-sharing arrangements are in place before final recommendations are made, (3) considers the effects of public and media perceptions about project outcomes on future planning, and (4) makes explicit the impact of government and community preferences on the planning process. We recommend this framework for use in both planning and analysis.

1. Introduction

1.1. Changing context and drivers for the water sector

Water policy is understood as an emerging priority for governments (Heathcote, 2009). As countries all over the world approach, and often exceed, sustainable environmental limits, there have been increasing occurrences of water shortage (Bouwer, 2000). Water managers are required to consider climate change (Khouri, 2006), contamination of water supplies, population growth, and migration, all while suitable locations for new dams and river extraction points become increasing limited (Bouwer, 2000; Biswas, 2004). The United Nations has predicted that a business-as-usual approach to water resources will result in a global fresh water deficit of 40% by 2030 (UN Water, 2015).

The field of water utility management, which was traditionally an engineering-based, technical practice, is now far more complex (Bell, 2012), with many interrelated factors to consider (Vugteveen and Lenders, 2009). Water utilities are currently required to integrate an increasing array of water resource technologies, such as desalination, rainwater tanks, and water reuse, in combination with water efficiency measures. In addition to these technical functions, water managers have an expanding mandate to consider ecosystem protection and restoration, with endangered species present in peri-urban rivers (Morley and Karr, 2002) and "Ramsar" classification of sewage treatment plants for having internationally significant wetlands (Hamilton, 2007).

Other than technical and environmental considerations, values-based and less quantifiable social factors, such as liveability and social amenity, should also be considered. To effectively incorporate these factors into planning, stakeholders should be more actively consulted and water authorities should be involved in urban planning and building regulations (Morison and Brown, 2011). The traditional framework within which urban plans are made first to set broader urban development objectives, followed by water plans, is no longer seen as the best way to plan urban areas. Benefits can be accrued from creating "integrated" plans that consider water and broader urban planning considerations in combination.

Increasing scrutiny by the media and community members are also pulling water infrastructure issues into the political cycle (Ravesteijn and Kroesen, 2007), creating a more complicated relationship with government actors and funding sources. Two examples of the politicization of infrastructure planning are given in Section 1.3 below.

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Water utility management in some areas of the developed world is currently moving towards sustainable “fit-for-purpose” water management in the form of decentralised stormwater and wastewater treatment and reuse (Institute of Sustainable Futures (2013); Office of Living Victoria (2014); Bell, 2012; Ferguson et al., 2013), as has been predicted by some academic researchers (Brown et al., 2009). However, as Bell (2015) points out, there is a simultaneous counter trend towards capital and energy-intensive desalination plants, as well as environmentally damaging inter-basin transfers. The direction that urban water management takes in a particular region or city will be greatly affected by social and political factors in the planning process.

1.2. Water utility management practices in transition

Changing context and drivers for the water sector are making it necessary for water management practices to adapt and evolve (Bell, 2015). A number of related water management paradigms are emerging around the world in response to the trends described above.

Although this transition is occurring sporadically across the globe, parallels can be drawn between the global sustainable development agenda and specific paradigms such as Integrated Water Resource Management (IWRM), Integrated Urban Water Management (IWRM), and Water Sensitive Urban Design (WSUD) (Furlong et al., 2015). Key principles of IWRM include integrated management practices, seeing water from economic, social and environmental perspectives, and the participation of communities and women in key processes (Global Water Partnership, 2012). IUWM can be described as a strategic long-term planning approach to urban water that considers and includes all potential water sources, services, stakeholders, and impacts in order to create the best possible community outcomes (Mukheibir et al., 2014). WSUD describes the approach of incorporating best-practice stormwater management, such as implementing biofilters and wetlands, into urban areas in order to improve liveability and environmental outcomes (Brown et al., 2009).

Major institutions have examined how water management practices can be improved in order to achieve sustainability. The SWITCH project, funded by the European Commission and involving 33 different organisations, investigated a wide array of topics related to managing water (Howe et al., 2011). The Global Water Partnership was instrumental in advocating for the creation of IWRM plans across the world (Global Water Partnership, 2014). The introduction of the Water Framework Directive in the European Union in 2000 was largely prompted by water pollution concerns but actually addressed many water challenges and encouraged a comprehensive approach to both water quantity and water quality (Science for Environment Policy, 2015). Another project, known as Prepared Enabling Change, is focused on preparing water utilities for the effects of climate change (Hulsmann et al., 2010).

1.3. The need for an improved water infrastructure planning framework

One aspect of water management involves decisions around what water infrastructure should be built and where. Water infrastructure includes the physical structures that capture, hold, treat, and transport fresh/potable water, wastewater and stormwater and are generally managed and planned by water utilities, also known as water authorities or water service providers. Planners within water utilities conduct analysis to develop infrastructure recommendations that are then assessed and reviewed by management within the utility as well as external government regulators, as applicable. Elected politicians impact the infrastructure planning process by exerting either direct or indirect influence on utilities and regulators, sometimes in order to pursue partisan policies.

“Water infrastructure planning frameworks” are used to guide and augment project planning by specifying the process and steps for identifying infrastructure solutions. It is typical for planners to agree on an infrastructure planning framework at an early stage in the planning process. Frameworks are usually either set at an institution/department level or determined on a case-by-case basis.

“Infrastructure planning framework” is a general term used by the water and transport sectors (CSIRO, 2010; WSAA, 2014), but also in fields such as communications and electricity supply (Wilmoth, 2003). These frameworks include a number of fundamental steps such as goal setting, identification and evaluation of options, and implementation of decisions, which generally can be described as consistent with the rational planning tradition (Hudson et al., 1979).

It has long been recognized that although planning is often represented as rational and objective, in reality it is inherently subjective and affected by social and political dimensions, as well as prone to unavoidable conflicts (Lane, 2001; Minnery, 1985). Lindblom (1959) famously described planning as “the science of muddling through.” One only needs to look briefly into the decision-making processes involved in any major infrastructure project to discover just how subjective and political planning can be. Two obvious examples from Australia include the national broadband network, which was re-designed mid-rollout due to a change in government (Murphy, 2015; Safi, 2014), and the Melbourne desalination plant, which was used as a political point scoring exercise to the extent where one newspaper headline read as “the state election that neither side deserves to win” (Davidson, 2014). Although planning processes are ideally informed by science and evidence, it is problematic to consider planning decisions as entirely objective or rational, as all are made by humans and are therefore open to interpretation and opinion.

It has been noted that even 21st century paradigms such as IWRM and IUWM pay relatively little attention to social issues such as “whose interests are served, and whose voice is being heard,” having a general tendency to focus mainly on technical aspects of planning (Mukhtarov, 2008). Recent works by CSIRO (2010) and Rodrigo (2012) continue to represent water infrastructure planning as linear, rational, and expert driven. Considering that water infrastructure outcomes are affected by a variety of social and political factors, it is logical and desirable that water infrastructure planning, and the frameworks that guide it, should explicitly address and incorporate these factors.

1.4. Focus and structure of this paper

The focus of this paper is on understanding the reality of planning in the modern context, and creating a water infrastructure planning framework that is tailored to this environment. To be more specific, the research develops a list of the steps that should be conducted in a water infrastructure planning process, but not the particulars of what should be done in each of these steps.

One explanation for why researchers have chosen to not discuss specifics borrows language and concepts used in psychology by the developers of Neuro-Linguistic Programming (NLP). NLP practitioners provide clients with “process instructions” that are deliberately left “content free”. This is because if the “content” of the process is included, and it does not match what the client is looking for, then the client is likely to reject the process itself. In other words the more content details provided within a process framework, the greater the probability of rejection (Grinder and Bandler, 1981). This likely also applies to the field of water management, where if a practitioner observes that the content of a planning process is not relevant to their situation, they will likely disregard the overall structure and process. Put another way, the developed