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COMMENTARY

One Person's Drain Is another's Water Supply: Why Property Rights, Scope, Measurement and Hydrology Matter when it Comes to Integrated Water Resources Management

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ABSTRACT

The expansion of Integrated Water Resource Management (IWRM) philosophies has given rise to some improvements in decision-making with greater attention being given to the relationship between upstream choices and downstream consequences. However, the limits of IWRM also need to be recognised, especially the demands on water planners seeking to balance multiple objectives across multiple sites. This paper scrutinises the need for superordinate integrated decisions when property rights are already well-defined and tradeable. By using simplified examples derived from the Australian milieu, we also consider cases where the property rights are less-well defined and trade is not an easy option. The examples demonstrate that efficient decisions can arise without a superordinate water utility making integrated plans but the scale of decisions does matter, as does the measurement of the attributes of water in question. The paper also shows the necessity for understanding and linking institutional scope, hydrological influences and ecological responses whenever IWRM is purportedly seeking to simultaneously bring about ecological gains. Vesting integrated decisions in water utilities on the basis of their revenue-raising capacity is also briefly scrutinised.

1. Introduction

Choices about water have often been dominated by engineering or supply-side considerations, but this is not necessarily controversial or a limitation. After all, urban communities in the developed world have benefited greatly from well-designed water infrastructure that has underpinned major improvements in human wellbeing.[1] More specifically, well-engineered water supply, sewage and drainage systems routinely deliver high-quality potable water and simultaneously transport hazardous waste. This is also done at relatively modest financial cost and in a manner that limits the impacts on human health and the environment. Modern water infrastructure can even induce environmental improvements, with adequate technology and resourcing (Shannon et al., 2008). But despite the long history of success for many urban water and wastewater supply systems (see, Angelakis et al., 2012), several stresses have emerged, giving rise to calls for different perspectives to decision-making.

First, greater variability in the availability of the resource, especially the increased incidence of drought, has meant that in many settings there has been a reconceptualization of the balance between supply and demand responses. Demand and the appropriate mechanisms for including it in water management options has generally been given more prominence in recent decades than was previously the case (see, for instance, Russell and Fielding, 2010): demand and supply are now generally considered simultaneously, or at least in an integrated fashion.

Second, there has been increased enthusiasm for rethinking the fugitive nature of water resources and an accompanying expansion of so-called integrated water resources management (IWRM) (e.g. Bowmer, 2014). Upstream choices about the use of water result in downstream consequences and IWRM is increasingly seen as doing a better job of resolving perceived 'head-of-system-tail-of-system' trade-offs, since it employs a more holistic view of resource management. This approach includes giving attention to the water that is returned to a system/drain after use, but it also incorporates interest in the possibilities of harvesting water in different locations to meet specific demands. Situated within this genre of approaches is consideration of different technologies that can facilitate harvesting water that would

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[1] This is not to say that significance challenges remain in the context of delivering reliable water and wastewater services in many parts of the world (e.g. Srinivasan et al., 2010).

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normally be considered as drainage. Sometimes this method is given a specific title, like water-sensitive urban design (see, for instance, Morison and Brown, 2011).

Third, the IWRM philosophy has been expanded in many settings to go beyond water management to include other resources. This extension to IWRM stems from recognition that water is only one of many input in most production system, including those related to environmental goods. For instance, the nexus between food, energy and water has become a common theme in debates (e.g. Romero-Lankao et al., 2017) and urban water managers are increasingly being asked to give greater attention to the link between water supply options and the energy requirements that attend each. This is particularly the case where power costs are rising along with concerns about the potential longer term nexus between some energy sources and climate change.

Fourth, the necessity to develop integrated decisions about complex water management options has been taken by some to imply an expanded role for planners and government, since these agents are perceived to be better equipped to deal with these complexities (see, for instance, Varis et al., 2014). More specifically, a planner, blessed with an intimate understanding of hydrology is increasingly assigned the task of optimising water resource allocation across multiple users and at different scales. In Australia, for example, the much-publicised Murray-Darling Basin Plan requires a single planning agency (i.e. the Murray-Darling Basin Authority) to develop and implement a water resource sharing plan that simultaneously optimises economic, social and environmental outcomes. This is expected to occur across a basin comprising five separate state jurisdictions, urban and rural communities and covering more than 1 million square kilometres of agriculturally and ecologically significant land (Crase, 2012). In an urban water context, less ambitious planning processes have been assigned to water planners empowered to use an integrated approach in order to meet specific, but hard-to-measure ambitions, like 'improved liveability' (see, for example, Melbourne Water, 2017).

One area which has received only limited attention in this debate is the role of existing property rights and how this might impact on the need for integrated planning by a superordinate and well-meaning state authority. It can be argued that in the absence of that analysis, closer scrutiny of water planning agencies and the mechanisms by which they are presently seeking to make integrated decisions about urban water seems long overdue. This article adds to the literature that focusses on water planning and the analysis of IWRM by using specific cases drawn from Australia. Australia has an active history of water reform, especially in the three decades leading up to and during the drought years that characterised the first decade of this century. Accordingly, this offers useful insights to dealing with water scarcity, although the lessons are more generalizable. We seek to highlight the potential conflict between state-designed integrated water plans when there are already clearly assigned property rights and markets. We also highlight the role of the state when property rights are less-clearly defined and/or where measurement of precise benefits and costs is difficult. The paper focusses on specific elements of integration in urban water management and planning and in order to make the discussion manageable and accessible to a wide range of disciplines we deal with rudimentary questions, including: (1) what is being integrated; (2) who is doing the integration; (3) what measurement tools are being used to assist integrated decision-making. In answering these questions we highlight how property rights matter and why, in some cases, the need for plans to deal with IWRM is redundant. The remainder of the paper is structured around these key questions, before offering brief concluding remarks.

2. What to Integrate?

As the IWRM acronym would suggest, water is commonly the answer to the 'what is being integrated' question, but as will be noted later there are several dimensions to water. One of the obviously driving forces for integrated thinking with water has been the simple fact that water is fugitive and upstream choices have downstream impacts. In some urban domains this is less problematic than others, but to highlight the underlying source of complexity and why special planning efforts are required on the part of the state, attention here is given to how rights and responsibilities are defined. In that respect it is worth noting at the outset that Australian jurisdictions have invested significant efforts over the past three decades to define the rights to water[2] (Crase, 2008).

Property rights in this sense refers to the control over the stream of benefits that attend a resource. Property rights are also reciprocal, insomuch as the control of benefits can only come as a consequence of attenuating the control potentially exercised by others (Bromley, 1989). Even after being assigned, property rights are also generally attenuated in some form, implying there is a hierarchy of rights. Put differently, superordinate bodies seldom fully and absolutely cede control to subordinate bodies. For instance, an individual may hold a right to use a resource, but that right can be revoked and the state often retains the option of modifying rules of use. It is also important to note that property rights go beyond 'ownership' per se and include elements like transferability, divisibility, flexibility, duration, quality of title and exclusivity (Crase and Dollery, 2006).

An important part of the Australian water reforms was the efforts by affected jurisdictions to define the *quantity* of water available from different water sources and then set limits on abstraction, such that sustainable use for right holders was assured. In most cases this meant that rainfed water supplies were defined by setting an upper limit on long-term entitlements for abstraction. Ongoing access rights were also differentiated from annual abstraction rights, with the latter subject to change according to current resource availability; this allows them to reflect seasonal conditions. Accordingly, water users would need to hold an entitlement for water access, but could only abstract the quantum of water that matched availability in a given season. For example, a water user might hold an entitlement to take 100 Megalitres from a stream but if rainfall was half of the annual average, then the 'allocation' (i.e. annual right to abstract) to the individual for that year would be only 50 Megalitres.

Property rights in most cases were also further unbundled so that access rights were separated from use rights, with the latter including some constraints on harmful spillovers (e.g. the application of water to land that ultimately increased salt loads in streams could be prohibited). That said, most attention has been given to measuring and defining the quantity of water abstracted. The quality of water is usually managed through a system of state-imposed constraints supported by monitoring efforts and penalties for non-compliance.

Agriculture, as the primary extractor of water, was at the forefront of most of the property right reforms, although urban users were also touched by these changes. For instance, urban water utilities accessing water from a stream must hold an entitlement that defines the quantity of water that can be extracted and the annual allocation would vary, just as would occur with other extractive users, like irrigation.

To illustrate some basic principles on the role of property rights, a single stream is assumed to connect two urban communities; one upstream and another downstream. In this example, extracting water from the headwaters for household consumption can be offset, to some degree, and not reduced water access for the downstream community. This could be done by returning treated wastewater at a nearby location to the upstream abstraction point. The returned water can constitute a significant portion of the initial abstraction, especially in densely settled urban environments where garden use is limited; in this instance a

[2] The Productivity Commission (2017) notes that some work still remains to be done on this front and Crase (2012) and others have noted that, even where jurisdictions have complied with national reforms, greater attention to hydrological detail would have helped.