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Editorial

Transitions through a lens of urban water

1. Introduction

The aim of this special issue is to showcase a selection of articles which, together, illustrate that in-depth studies of urban water transition cases can be instrumental in the further advancement of the sustainability transitions field.

Urban water scholarship and practice has been grappling with both the 'sustainability challenge', in terms of what a sustainable water future entails, as well as the 'transition challenge', in terms of how a desired future might be realised. These challenges have been particularly acute because urban water system functioning is so dependent on natural water ecosystems. Not only does urban water servicing impact on ecosystems, but it also critically depends on the health of the ecosystems and natural environmental rhythms such as rainfall. While the operations in many sectoral systems have negative consequences for ecosystems, in urban water, a degraded ecosystem also has negative consequence for the quality and safety of the sectoral services provided. For example, the security and safety of water supply depends directly on adequate rainfall and rivers' ecological health.

Against a backdrop of a sector that has been characterised as risk averse, technocratic and locked in (Brown et al., 2011), one can see pockets of progress around the world towards addressing the sustainability challenges at hand (see for example Brown et al., 2013; Fuenfschilling and Truffer, 2014). Front-running actors in these pockets have taken considerable steps towards identifying what a sustainable urban water future would look like. Common features of the visions developed by these actors include providing a diversity of water supply options, not viewing water as a disposable good, removing pollution from wastewater, improving waterway health, installing adaptable and flexible infrastructure that can cope with extremes, recognising that urban water planning ties in with urban design and managing the interactions between energy, food, heat, amenity and water.

Sustainability challenges have driven urban water scholars and practitioners in a number of cities to actively initiate transition processes towards delivering upon these visions, entailing innovative technologies as well as new management practices and governance arrangements. This is interesting for the study of transitions on three fronts:

1. Urban water provides a comprehensive and representative context for exploring the dynamics of sustainability transitions.
2. There are rich, well-known examples of urban water systems having moved beyond take-off phase of a sustainability transition despite strong path dependencies and the sector's typically risk-averse culture.

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3. The established scholarship on urban water provides a solid scientific basis, which enables deep case studies that can make ample use of primary data of contemporary, and ongoing, urban water transitions.

In the following, this article provides background to the historical development of urban water systems and transitions involved. It then makes a case for urban water as a valuable area of study for transitions scholars regardless of their sectoral interests, and introduces the articles in this special issue and their key contributions. It concludes by calling for the development of a shared agenda for urban water and transitions research to the advancement of both fields.

2. Transitions in urban water

2.1. Historical urban water developments

Historically urban water has seen a range of system innovations that occurred in a similar sequence around the world as the drivers for these systems progressively emerged. Typically, cities first dealt with their need for drinking water by installing main pipelines and plumbing to deliver centrally supplied water. This can be seen as a transition from low-technology solutions like village wells and pumps to high-technology solutions as part of large-scale public water networks.

Later, more people living in cities, outbreaks of diseases like typhoid and cholera, and the – back then – recent awareness that these were caused by polluted water paved the way for sewerage networks that transported human and industrial waste away from populated areas. While this involved the roll out of new infrastructure on a scale similar to water supply, this was not so much a transition as adding new services to the portfolio of an existing servicing approach. Similarly, the roll out of separate stormwater[1] drainage infrastructure, predominantly in the new world because of different climatological conditions, added new services to an existing portfolio.

These stages of development have been described by Brown et al. (2009) as part of a nested urban water continuum that identifies distinct socio-technical states emerging in response to accumulating socio-political drivers (Fig. 1). In addition to the above sketched historical development, the continuum also defines aspirational states in the light of newly emerging socio-political drivers. In contrast to the more incremental expansion of the water regimes through the *water supply*, *sewered* and *drained cities*, moving to the *waterways*, *water cycle* and *water sensitive cities* would constitute a transition because their infrastructural and institutional solutions do not align with the established regimes. Researchers found these aspirational stages on the right-hand side have rarely been reached in water practice to date (Jefferies and Duffy, 2011). Similar to other sectors, this is typically attributed to path-dependencies and lock-in (Pahl-Wostl et al., 2007; Dominguez et al., 2009; Brown et al., 2011).

Despite the challenges there is persistent policy rhetoric around sustainable urban water management, integrated water cycles, water sensitive cities and the like, as a constant reminder that the drivers on the aspirational side of the continuum are real and must be dealt with. Climate change projections indicate that cities all over the world will face threats to water supply security, heightened flood risks and severe heatwaves (Bates et al., 2008, p. 210); impacts which are already being felt in many places. For example, in the last fifteen years Melbourne has faced chronic drought to an extent that water security could not be guaranteed with the existing infrastructure (Grant et al., 2013). Extreme heat reached levels far beyond discomfort, resulting in spikes in mortality and morbidity over summer periods (Loughnan et al., 2013), all this in times when water was too scarce to be used for keeping the city cool and green. This drought was followed by rain so intense that the drainage networks could not cope and severe flash flooding events occurred (Rogers et al., 2013).

Apart from climate change impacts, waterway pollution is recognised as putting urban ecosystems around the world at risk, for example in the United States (Roy et al., 2008), Denmark (Birch et al., 2011), United Kingdom (Ashley et al., 2010), South Africa (Armitage and Rooseboom, 1999) and

[1] Stormwater is rainwater or melted ice or snow running off elements of the built environment, e.g. hard surfaces like roofs or roads.