



Pathways of system transformation: Strategic agency to support regime change



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ABSTRACT

There is a well-recognised need to transform existing systems of production and consumption towards a more sustainable orientation. However, there is much uncertainty about how to achieve sustainability transitions in practice, and what transition advocates and actors can do to catalyse and steer regime transformation. We therefore need evidence of how transitions are operationalised, in order to better understand the on-ground dynamics of regime change. To address this gap, this research paper examines three contemporary cases of transformational change in the Australian urban water sector and the dominant strategic approach to change adopted in each city. It focuses on the strategic behaviour of actors, in particular examining how agents navigate and respond to the opportunities and constraints of their context, and what initiatives (or combination thereof) can facilitate innovation diffusion and regime transformation. The results reveal three distinct patterns of change, each of which favour particular strategic interventions by transition proponents.

In order to incubate transformational change, the results suggest that actors may be best served by initially employing strategies that are immediately compatible with their existing context. However, examination of the strengths and weaknesses of each pattern confirm that no single strategic approach is in itself sufficient, and in order to embed a novel innovation and bring about regime change, actors will eventually need to broaden the range of interventions used. The results also reveal the possibility of a 'pattern-dependence' that actors need to deliberately work to overcome in order to fully mainstream the desired change. These findings therefore provide insight into the links between regime transformation, patterns of change and actor strategies while also offering practical guidance that can be used to inform the design and implementation of regime transformation agendas and programs.

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1. Introduction and background

Sustainability innovations are critical to addressing complex and interrelated problems such as climate change, environmental degradation and natural resource limitations. Such innovations can be technological, social or organisational in nature (Kemp et al., 2000), and should go some way to protecting or minimising the impact of human activities on the environment (Shrivastava, 1995). The increasingly urgent need to address contemporary environmental challenges is reflected in persistent calls across policy, practice and scholarly spheres for radical change in sectors as diverse as energy (e.g.: Shaw et al., 2014), water (e.g.: Brown et al., 2013), food production (e.g.: Ruttan et al., 1994) and transport (e.g.:

Geels et al., 2011). In order to meaningfully and effectively address such grand challenges, sustainability innovations must transform mainstream practice.

The relatively young sustainability transitions literature has emerged as a field of scholarship that seeks to understand transformative change processes in socio-technical systems (Rotmans et al., 2001; Geels, 2002; Kemp et al., 2007). A successful sustainability transition relies on socio-technical regime transformation, whereby the dominant means of production and consumption shift towards a more sustainable orientation. Regimes are “strongly embedded and self-reinforcing systems” (Smith and Stirling, 2010, p.13) that are comprised of “coherent, highly interrelated and stable structure[s] characterised by established products, technologies, stocks of knowledge, user practices, norms [and] regulations” (Markard and Truffer, 2008, p.603). A sustainability transition is conceptualised as a shift from

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one regime to another, such that the whole network of interrelated technologies, structures, actors and practices change fundamentally and eventually establishes a new dynamic equilibrium. More broadly, it relies on transformation of the cultures, structures and practices of a system (Rotmans and Loorbach, 2009), which refers to the dominant ways of thinking (i.e.: shared narratives and paradigms), organising (i.e.: legal, organisational structures) and doing (i.e.: pilot projects, infrastructure implementation) (Geels, 2002; Werbeloff and Brown, 2016).

The transitions literature, as well as the neighbouring scholarship on science, policy and innovation studies (Martin, 2012), makes clear that regime transformation is difficult to achieve. The well-documented path dependence phenomenon (Dosi, 1982; Nelson and Winter, 1982) presents a significant barrier to regime transformation, with the consequence that innovation and change is typically incremental, rather than radical, given that an initial institutional or technical step often sets the direction towards which “problem solving activity” subsequently moves (Dosi 1982; p.153). This phenomenon of positive feedback means that “the probability of further steps along the same path increases with each move down that path . . . because the relative benefits of the current activity compared with the once-possible options increases over time” (Pierson, 2004; p.21).

Given the path dependent evolution of existing regimes, as well as the inertia that typically characterises large socio-technical systems, the impetus for radical regime change has often been understood as a large and unexpected system shock, typically caused by factors outside the system (i.e.: drought, flood, financial market crash) (Smith et al., 2005, 2010; Geels, 2011). These ‘punctuated equilibrium’ models of change characterise the regime as existing in a relatively static equilibrium, during which time the system is able to make incremental adjustments in response to internal or external perturbations without changing the organising and underlying paradigm. The ‘punctuations’ refer to sudden, revolutionary and discrete periods of rapid change which occasionally flare up and disturb the equilibrium (Gersick, 1991), typically in response to external system shocks.

However, recent commentators have observed that in practice, many systems are largely unchanged by system shock, instead showing remarkable stability and coherence both before and after the event(s) in question (Mahoney and Thelen, 2010; Van Der Heijden, 2010; Brousseau and Raynaud, 2011; Dolata, 2011). This has given rise to a number of critiques of punctuated equilibrium models of change, noting that such theories effectively exclude endogenous sources of change and are also unable to account for more incremental or evolutionary change models (Djelic and Quack, 2007). A second and related shortcoming is that these models of change do not grant actors any ability to change the system during its stable phase (Breznitz, 2010). These critiques, coupled with the oft-observed stability of socio-technical regimes despite system shock, have led to increasing calls for examination of endogenous sources of change.

There have so far been a handful of studies examining pathways of system transformation (e.g.: Smith et al., 2005; Geels and Schot, 2007; de Haan and Rotmans, 2011). These studies present overall archetypes of change based on theoretically derived conceptualisations of how regime transformation may unfold. Although there is a bias towards exogenous explanations of change in these patterns (Geels and Schot, 2007), some notable exceptions include the ‘empowerment’ and ‘adaptation’ pathways described by de Haan and Rotmans (2011), and ‘endogenous renewal’ pattern of change outlined by Smith et al. (2005). In order to better understand the internal dynamics of endogenous regime transformation, there is a need for detailed empirical examination of successful cases of change. As Pahl-Wostl et al. (2013, p.44) note, in understanding regime change, we need to account for “the

interplay between institutional factors and human agency and its translation into the barriers and drivers of societal change”.

Thus key to understanding endogenous patterns of regime change is the role of strategic agency, which examines how individuals and groups leverage resources to transform or create new institutions and regimes (DiMaggio, 1988; DiMaggio and Powell, 1991; Battilana et al., 2009). This research responds to calls for further exploration of how strategic agency unfolds in practice (Grin et al., 2011), examining how agents navigate and respond to the opportunities and constraints of their context, and what initiatives (or combination thereof) can facilitate innovation diffusion and regime transformation. To this end, three cases of transformation in the Australian urban water sector were explored; two cases of transition in stormwater quality management and one in stormwater harvesting. Stormwater quality management refers to the use of decentralised, biological treatment systems (i.e.: wetlands and biofilters) distributed throughout a city designed to capture and clean stormwater in order to improve the health of receiving waterways. Stormwater harvesting refers to systems that collect, treat and store stormwater for fit-for-purpose reuse.

The examination focuses on the dominant strategic approach to regime change adopted in each city and discusses the implications for practitioners in relation to innovation diffusion and regime transformation more broadly. From this analysis, three distinct patterns of regime change are identified, as well as the relative strengths and vulnerabilities of each approach. This helps to further understandings of strategic agency in the context of endogenous regime change, and also provides practical insight for cities and sectors around the world grappling with the challenge and necessity of transformation towards sustainability.

2. Research approach

A multiple case study research design was adopted (Yin, 2009) to facilitate the identification of macro level trends and patterns in relation to the transition process and the consequent embedding of a new approach or innovation. Following this design, each case study city is considered a whole case and analysed as such, followed by comparison across cases (Yin, 2009).

2.1. Case study selection

A purposeful sampling strategy was adopted for this research (Patton, 1990) in order to examine notable examples of successful institutionalisation where the phenomenon of interest, being the embedding of a new innovation or practice, is “transparently observable” (Van de Ven, 2007; p.212). A key challenge for transitions research is that an entire system transformation can take up to 50 years (de Haan and Rotmans, 2011), and can therefore only be identified with the benefit of hindsight once the stabilisation phase has established a new sectoral norm. Nevertheless, examination of contemporary cases of transformative change remains useful for generating timely insights that can inform unfolding transitions. In such a circumstance, determining appropriate case studies is an empirical question.

For this research, the selection of each case was based on scholarly observation of the comparatively advanced level of sustainable stormwater management in each city and the large number of reported stormwater treatment and/or capture systems implemented in each city. Melbourne and Adelaide are considered both national and international leaders in terms of stormwater quality management and stormwater harvesting respectively. Brisbane is generally regarded as the second highest performing Australian city in terms of stormwater quality management. In each case, there has been a fundamental shift in the dominant

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