

THE TRANSITION TOWARDS WATER SENSITIVE URBAN DESIGN: A SOCIO-TECHNICAL ANALYSIS OF MELBOURNE, AUSTRALIA

Dr Rebekah Brown

Monash University
School of Geography and Environmental Science,
PO Box 11a, Clayton, VIC 3800 Australia.

Rebekah.Brown@arts.monash.edu.au ; Jodi.Clarke@arts.monash.edu.au

Keywords: Socio-technical, transition, stormwater quality, institutional change.

Urban water managers and policy makers around the world are struggling with the challenge of transitioning to the wide-spread practice of sustainable urban water management (Saleth and Dinar, 2005). The Australian terminology of this is Water Sensitive Urban Design (WSUD) and this paper largely focuses on the stormwater quality management aspects of WSUD. Current practice seems to be limited to ad-hoc, albeit well intentioned, project interventions (Vlachos and Braga, 2001; Brown 2005). In Australia, like other places, this transition requires a radical shift from the traditional paradigm of urban stormwater management, and to date, progress has been slow, with a diverse group of commentators identifying numerous impediments to change (see for example Mitchell 2004; Brown 2005; The Barton Group 2005; Wong 2006).

It is now reasonable well accepted that unless new technologies are socially embedded into the local institutional context, their development in isolation is insufficient to ensure their successful implementation in practice (Brown 2004; Elzen and Wieczorek, 2005). Therefore, to address urban water sustainability issues, current research must consider both the technical and social dimensions of systems, and understand that they are co-dependent, which is encapsulated by the term “socio-technical systems” (Geels, 2004). Understanding the nature of socio-technical change requires an interdisciplinary and integrated perspective. It is therefore important to draw insights from the rapidly emerging, although somewhat loosely coordinated, international sustainability scholarship on socio-technical systems (see for example Berkhout et al., 2004), to help address the current impediments to a sustainable urban stormwater transition.

This paper presents a socio-technical analysis of the transition to sustainable urban stormwater quality management across Metropolitan Melbourne. It identifies the key drivers and events that have enabled the transition so far, and the current challenges and opportunities for completing the transition. Metropolitan Melbourne was considered highly suited for analysis, because it is often informally identified by both the Australian international water industry as a leading city in this area, and therefore well placed for providing transition insights. There are also a number of practical indicators that support this view of Melbourne’s progressive urban stormwater management performance, including the recent introduction of a sophisticated market-based stormwater pollution credit trading system, mandatory stormwater quality control provisions for all development over 0.4 hectares, and the integration of the latest stormwater biofiltration technologies within Melbourne’s most iconic developments. Melbourne is also relatively representative of the pressures and constraints typically faced by modern cities such as rapid population growth, increasing patterns of urban development, aging infrastructure, waterway degradation, climate change, water supply vulnerability, overlapping (and

sometimes conflicting) administrative responsibilities and variable levels of commitment to environmental management across local government.

In order to understand this transition, an in-depth historical case analysis was undertaken from the mid 1960s; when stormwater quality was first formally identified as a potential issue. Based on the qualitative case study approach (see Yin, 1994), multiple sources of evidence were collected and synthesized. This included primary data through recording oral histories from 28 expert interviewees across multiple sectors, facilitating one scientist-based focus group and two industry focus groups. This data was cross-referenced with secondary sources including the review of historical policy, media, organizational and other forms of industry literature, in addition to existing scientific peer-reviewed literature in the field. This data was analysed by applying the 'Multi-Level Perspective' (MLP) (see Geels, 2004 for an authoritative account) as a conceptual framework for understanding the transition within Melbourne so far. The MLP is a relatively recent development that emphasizes the importance of historical analysis and reflection to understand how future transitions could be best induced. A number of scientific investigations of high profile transitions have been published over the last five years, such as transition in transportation (from the 'horse and cart' to the automobile) and shipping (from sail-boats to steamships) (see Geels, 2005). Studies such as these reveal important insights into the architecture of socio-technical transitions, and this research on urban stormwater quality contributes to this emerging area of scholarship.

The application of the MLP concept assisted in the identification of three different societal levels of change and a number of interactions between these level, which facilitated positive change across Melbourne. At the "macro" or broad societal and landscape level, there was a broad shift in dominant values and thinking with the mobilization of socio-political capital for waterway health, appropriate urban development and passive recreation and parkland amenity values, which also reflected the global social movement of environmentalism. At the "macro" or governance regimes and institutional level, there was a response to this landscape shift with the formation of a new sub-institutional regime that advanced learning and a new science for urban stormwater quality management. At the "micro" or technologies and processes level, a number of innovative stormwater treatment technologies were designed and actively implemented. This research reveals that although this transition is still not complete, there has been a significant shift towards sustainable urban stormwater quality management in Melbourne.

From an institutional perspective, this progress has occurred over a short period of time. The evidence strongly suggests that the reason for Melbourne's effective progress has been entirely dependent on the development and active nurturing of the urban stormwater quality niche (formed between meso and micro levels of the MLP), over the last 15 years. This niche development was facilitated through the interplay between key champions and a number of context variables that allowed for a relatively expedited transitioning process. The key champions identified through this research were found to be an associated group of change agents across multiple sectors that worked together to advance change. This innovative group were committed to building industry capacity for the niche, expanding policy networks and promoting initiatives that were amenable to a 'best practice' ideology. The context variables that have been identified as instrumental in fostering niche development included high levels of socio-political capital, the presence of bridging organizations, scientific innovators, binding targets, strategic

funding opportunities, and a strong business case for urban stormwater quality management, which will be detailed in the paper.

This research has also informed the development of a potential hybrid transitioning pattern for urban stormwater quality management in Melbourne, incorporating existing patterns for 'technical development' (see for example Geels, 2005) and 'adaptive governance' (see for example Folke et al., 2005). The technological developments within the case study have been significant, with a succession of stormwater quality treatment technologies enable through new forms of urban design and important retrofitting opportunities within the existing urban landscape. From the adaptive governance pattern perspective, capacity development for the niche was driven by 1) an important bridging organization that facilitated collaboration across industry sectors; 2) a key organizational champion that promoted knowledge-brokering, secured funding contributions and established strategic programs for more sustainable stormwater quality management; and 3) the efforts of a group of key industry champions to promote change. This hybrid 'technical-governance' pattern identifies the enabling factors for this transitioning process, and can guide the development of future change programs to foster niche development, and induce socio-technical system transitions.

This research confirmed Melbourne's location in the transition and identified the pathway for transition completion. Melbourne now needs to focus on diffusing the gains and insights associated with the stormwater quality niche, through the design and implementation of new capacity building and cultural reform initiatives across Melbourne's administrative system. While this is a critical pathway for Melbourne, it may also guide transition development in other cities, potentially allowing for the fast-tracking of socio-technical transition processes.

Reference List:

Berkhout, F., Smith, A. and Stirling, A. (2004) 'Socio-technical regimes and transition contexts'.

In Elzen, B., Geels, F. W., Green, K. (eds) (2004) *System innovation and the transition to sustainability: theory, evidence and policy*, Edward Elgar: Cheltenham, UK, 48-75

Brown, R>R. (2004) Local Institutional Development and Organizational Change for Advancing Sustainable Urban Water Future. Keynote Address in the *Proceedings of the International Conference on Water Sensitive Urban Design: Cities as Catchments*, 21st-25th November 2004, Adelaide, Australia.

Brown, R.R. (2005) Impediments to Integrated Urban Stormwater Management: the need for institutional reform, *Environmental Management* 36(3), 455-468.

Elzen B. and Wiescorek, M. (2005). Transitions towards sustainability through system innovation, *Technological Forecasting and Social Change* 72, 651-661.

Folke, C., Hahn, T., Olsson, P. and Norber, J. (2005) Adaptive governance of social-ecological systems, *Annual Review of Environment and Resources*, 30, 441-473.

Geels, F.W. (2004) From sectoral systems of innovation to socio-technical systems: insights about dynamics and change from sociology and institutional theory. *Research Policy*, 33(6/7), 897-920.

Geels, F.W. (2005) Processes and patterns in transitions and systems innovations: Refining the co-evolutionary multi-level perspective, *Technological Forecasting and Social Change*, 72, 681-696.

Mitchell, G.V. (2004) *Integrated Urban Water Management: A review of current Australian practice*, Report of the Australian Water conservation and Reuse Research Program, a joint initiative of CSIRO and Australian Water Association. CMIT-2004-075 April 2005.

Saleth, R.M. and Dinar, A. (2005) Water institutional reforms: theory and practice, *Water Policy* 7, 1-19.

The Barton Group (2005) *Australian Water Industry roadmap: A Strategic Blueprint for Sustainable Water Industry Development*, Report of The Barton Group, Coalition of Australian Environmental Industry Leaders, May 2005.

Vlachos, E. and Braga, B. (2001) "the challenge of urban water management" In: Maksimovic, C., Tejada-Guilbert, J.A. (eds) (2001) *Frontiers in urban water management: Deadlock or hope*, IWA Publishing, Cornwall, pp 1-36.

Wong, T.H.F. (2006) 'Chapter 1 Introduction'. In T.H.F. Wong (ed.) (2006), *Australia Runoff Quality: A guide to Water Sensitive Urban Design*, Engineers Australia, Canberra, 1 (1-8).

Yin, K. (1994) *Case Study Research: Design and Methods*. Thousand Oaks: Sage Publications.