



CRC for
Water Sensitive Cities

Australian Domestic Water Use Cultures: A Literature Review

Sian Supski and Jo Lindsay



An Australian Government Initiative



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ISBN 978-1-921912-18-4

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Publisher

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Date of publication: June 2013

An appropriate citation for this document is:

Sian Supski and Jo Lindsay. (2013) *Australian Domestic Water Use Cultures: A Literature Review*. Melbourne, Australia: Cooperative Research Centre for Water Sensitive Cities, ISBN 978-1-921912-18-4, June 2013.



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Executive Summary

This literature review is part of project *A2.1 Understanding social processes to achieve water sensitive futures* in the CRC for Water Sensitive Cities. The objectives of this project are to understand the social and historical processes of water use in Australian cities.

The aim of this literature review is to:

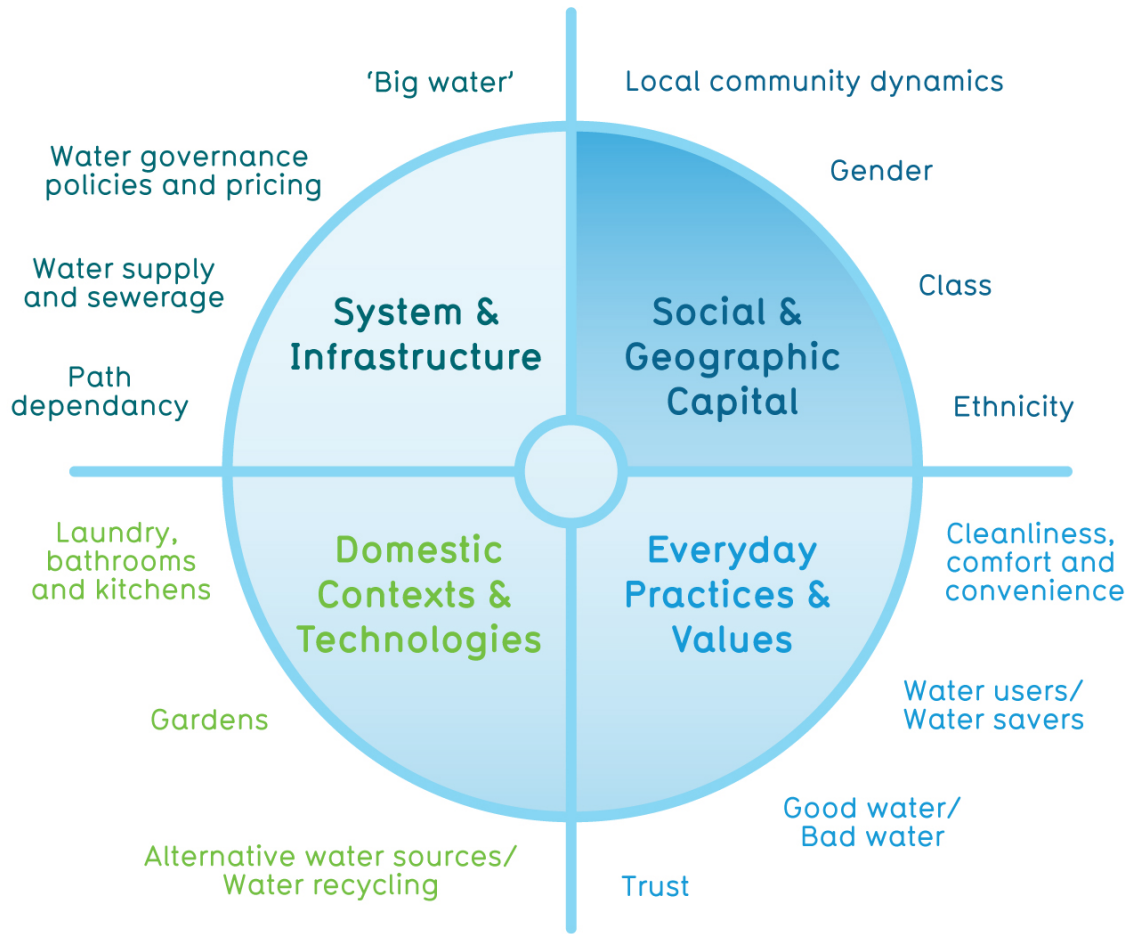
1. Identify key concepts useful to understand Australian domestic water use cultures
2. Outline key research findings on domestic water use cultures and contexts.

We focused on literature that explored domestic water consumption from a sociological and cultural perspective, rather than a psychological, behavioural or economic perspective. The key concepts, ideas and authors identified in the review are the socio-technical perspective (Shove 2003), risk (Marks, Martin and Zadoronzyj 2008), a cultural approach to everyday water use (Allon 2006; Allon and Sofoulis 2006; Sofoulis 2005, 2006, 2008; Sofoulis and Williams 2008), everyday water practices (Davison 2008; Gardiner 2009, 2010; Head 2006, 2012; Head and Muir 2007; Moy 2012) and social and cultural capital (Askew and McGuirk 2004; Miller and Buys 2008).

We outline available research findings on water use patterns, water use values and Australians' responses to the recent drought. We focus primarily on domestic water consumption and everyday practices including the use of alternative water sources, such as rainwater tanks and the willingness to accept water recycling. Social values associated with domestic water use underpin how Australians use water and their relationship to it. For example, we describe how deeply embedded ideals – of cleanliness, comfort, convenience, trust and risk – play a significant role in our understandings of water. We argue that more research is required on local community dynamics, geographic comparisons and the impact of social variables such as gender, class and ethnicity on water use practices.

In conclusion, on the basis of our review we identify four domains that should be taken into account to adequately understand Australian water use cultures before seeking to change water use practices (Illustrated in the figure below). These are: 1. Systems and infrastructure, 2. Social and geographic capital, 3. Domestic water use contexts and technologies and 4. Everyday practices and values.

Understanding Water Cultures



Introduction

This literature review is part of project *A2.1 Understanding social processes to achieve water sensitive futures*. The objectives of this project are to understand the social and historical processes of water use in Australian cities. The main outcomes will be a typology of water use cultures and contexts – including information about community values, ideals and perceived risks and recommendations for the development of effective and socially acceptable water sensitive interventions.

As the first stage in this project this literature review was undertaken to 1. Identify key concepts useful to understand Australian domestic water use cultures, and 2. Outline key research findings on domestic water use cultures and contexts.

Water is a finite resource that is impacted upon by climate change, human use and steadily declining natural supplies. The term ‘water cultures’ acknowledges that although water is a human necessity, it is integrated into our everyday lives in ways that are inherently cultural and social, but that we mostly take for granted. The visibility/invisibility of water illustrates its cultural embeddedness. Water is so integral to our everyday lives that its taken-for-granted status is one of the reasons why it has been rendered ‘invisible’, except for when there is none or too much (drought/flood).

Part One of this review outlines the key concepts that emerged from the literature review that are useful for understanding Australian domestic water use cultures. These include a socio-technical perspective (see Figure 1), a cultural approach to understanding water consumption and perceptions of risk and social and cultural capital.

Part Two of this review outlines findings about key domestic water use contexts, including water use, practices and values. Specifically, these include indoor and outdoor water use, alternative water sources and water recycling, and everyday water practices and values, such as, cleanliness, comfort and convenience, ‘good’ water/‘bad’ water and the ‘yuck’ factor. We identify areas that are in need of further research, in particular, local community dynamics, geographic comparisons and how gender, class and ethnicity affect everyday water use practices.

This literature review was undertaken between February and May 2013 and includes articles written between 2002 and 2012. The date range is limited because the sustained study of domestic water use from a social and cultural perspective in Australia is a relatively recent phenomenon. A comprehensive search of social science databases was undertaken using Sociological Abstracts, APAIS, APA-FT, Expanded Academic ASAP and Bloomsbury Journals. The literature search was conducted using keywords, such as, but not limited to, water culture, everyday water, domestic water recycling, greywater, domestic water use/consumption – garden, bathroom, kitchen, ‘yuck’ factor and household/domestic rainwater. Further references were gathered from bibliographies of relevant articles and books already identified.



These searches yielded 41 references which specifically focus on Australian domestic water use and consumption primarily from a sociological and cultural viewpoint. Although articles from different countries were identified, for example, domestic water use in Barcelona (Domene 2005; Domene and Sauri 2006) and the impact of showering in the UK (Hand, Shove and Southerton 2005), this review concentrates on Australian studies. In addition a number of reports were located via Google scholar. A key reference was *Tributaries: A Directory of Social and Cultural Research on Urban Water* (Humphry, Sofoulis, and Upadhyay 2011). The majority of the relevant scholarly journal articles, book chapters and reports we identified use a qualitative methodology, although a few undertook mixed methods research (for example, Moy 2012). The studies that concentrated on gaining cultural understandings of water use employed mostly qualitative methods, such as water diaries, focus groups and interviews. Quantitative studies used surveys, questionnaires and existing data sets of water use provided by water authorities.

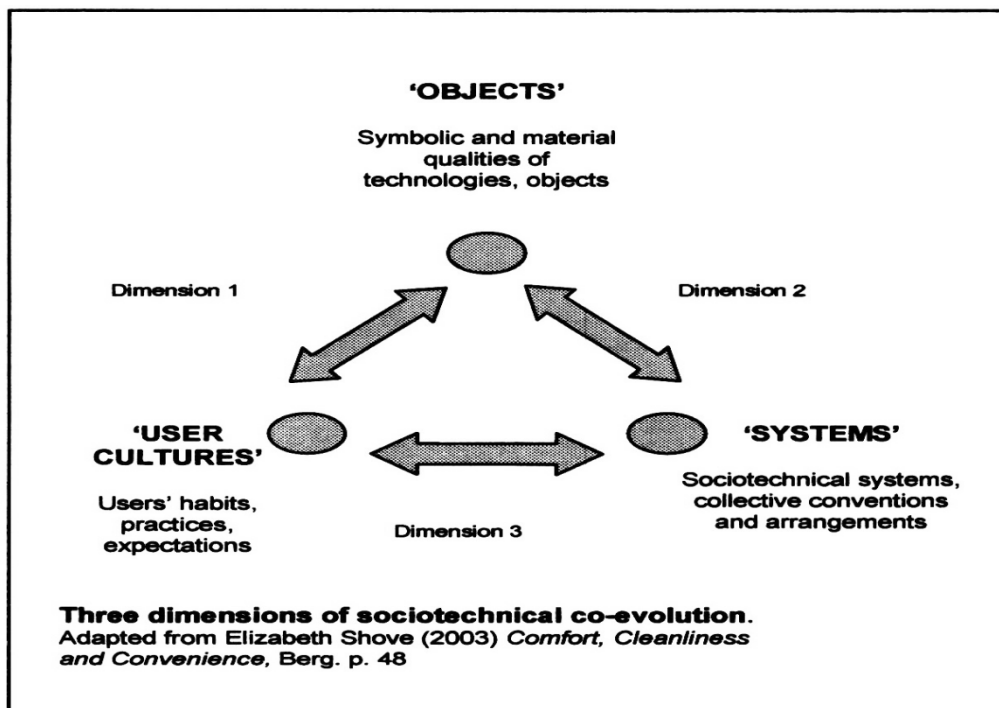
Part 1: Key Concepts for understanding water use cultures

The socio-technical perspective

The dominant social and cultural approach to understanding everyday water practices is a socio-technical perspective which draws on the work of Bruno Latour (1993) and Wiebe Bijker (1997). Elizabeth Shove (2003) has been highly influential in bringing a socio-technical perspective to understanding everyday water practices, in particular through a co-evolutionary process. In Australia Zoe Sofoulis has been the main proponent of this approach (Allon and Sofoulis 2006; Sofoulis 2005, 2006, 2008; Sofoulis and Williams 2008).

A socio-technical perspective is premised on the understanding that human societies co-exist with many non-human entities (technologies, plants, animals, climate) and these are interwoven in our everyday lives. It links relations between users, technologies and large systems (Sofoulis 2005, p 447). In a socio-technical perspective users are regarded as active participants.

Figure 1. The co-evolutionary triangle (from Sofoulis and Williams 2008, p 54)



Shove (2003, p 56) outlines three dimensions of socio-technical ‘co-evolution’. She describes the co-evolution process as the interdependencies between objects, systems, and practices/habits. Australian scholar Anne Gardiner provides a succinct definition of the process:

objects themselves and the social circumstances of their use undergo a co-evolutionary process mediated by a number of factors, including the impact of path dependency, the degree of coherence between existing habits and expectations of users, and the conventions inherent in the design of the socio-technical systems and the ‘scripting practice’ used to create understanding of the object (2010, p 102).

The way in which the socio-technical model has been taken up by various researchers to understand the interrelationship between objects, systems and practices provides a useful tool in thinking about how water practices can be changed to incorporate new habits which promote water sustainability. Importantly, through a socio-technical perspective the emphasis is just not on individuals water use, but must necessarily incorporate real change to the systems, infrastructure and objects that bring water into the home (Sofoulis and Williams 2008). Further, a socio-technical perspective, emphasizes that ‘changes in practice can generate new social values and social identities, for example, water saving practices can lead people to identify as ‘water savers’ (Sofoulis and Williams 2008, p 53). Thus, ‘acknowledging people’s unique cultural histories is important, but cultural innovation may also require building new kinds of identities (‘recyclers’, ‘watersavers’)’ (Sofoulis and Williams 2008, p 53). These new social identities take into account water histories, gender, ethnicities and can be promoted through ‘meso-level’ groups such as ethnic community groups and other local groups based on ‘shared hobbies, pursuits, and interests’ (Sofoulis and Williams 2008, p 53). We discuss these issues in the sections below.

A cultural approach to understanding water consumption

Sofoulis (2005, 2006, 2011) has been a major advocate of developing a cultural approach to understanding water in Australia in all its complexity. The ‘Everyday Water’ project (Allon and Sofoulis 2006) conducted with Sydney Water sought to understand domestic water cultures within a cultural, social, political, economic and technological framework. Integral to this project was the explication of the way in which water supply and demand has been defined in Australia. Sofoulis (2005) calls this dominant model, ‘big water’, which refers to,

Australia’s dominant sociotechnical system for municipal water supply, where a centralised public or corporatized utility pursues large scale engineering projects – dams, pipelines, central sewage treatment plants – and assumes almost complete responsibility for the supply of drinking quality water for disposal after all-purpose, one-time use (Sofoulis 2005, p 452).

A more holistic approach which Allon and Sofoulis (2006) outline in the ‘Everyday Water’ project, and which they call ‘everyday water’ or ‘small water’, acknowledges ‘the minutiae of everyday practices around water use in the domestic home and garden’ (Allon 2006, p 10; Allon and Sofoulis 2006). Such an approach emphasises and values the cultural and social specificity of everyday water use.

In thinking about water from an ‘everyday’ perspective, Sofoulis argues that domestic water use is ‘embedded in the meaning-laden contexts of everyday life, and arising from cultural and social conventions’ (Sofoulis 2005, p 447). She argues that:

to develop more nuanced and culturally sensitive approaches to reducing water demand, we need a cultural model of users, pitched between the macro-level of whole populations, and the micro-level of individual psychology. This model recognizes that although people might use water as individuals, they do so largely according to collective social, political and economic conventions, cultural and technological formations, and particular histories and geographies. Users’ water consumption practices are embedded in material cultures and ways of life, and are tied up with diverse meanings, habits, rituals, pleasures and aspirations. Water habits and services create and maintain shared social and cultural norms, and cultural and personal identities and affiliations (Sofoulis 2006, pp 108-109).

Sofoulis (2006, p 112) argues that ‘the cultural approach calls for greater support of diversity in water use practices (for example, by implementing quotas within which people could choose how to use water)’. This is also a concept that participants in Head’s (2006; 2012; Head and Muir 2007) study believed would be more equitable – that is, each household would be given a ‘ration’ of water which they could use according to their needs and desires (that is, numerous showers, filling the swimming pool, watering the garden). Further, Head (2012) notes that the ‘ration’ system was used effectively in Melbourne and Brisbane during water conservation campaigns (in Melbourne the quota was 155L per person per day, in Brisbane it was 140L per person per day). The aim in understanding diverse water practices ‘would be to foster cultural change by recruiting and rewarding water-savers as part of an enlarging network of households, businesses, community groups and utilities and government departments sharing co-responsibility for wise water management’ (Sofoulis 2006, p 112). It is here that the meso-level is important in a cultural approach as it relies on a participatory and democratic model. (See social and cultural capital discussion below.)

Perceptions of risk

Perceptions of risk are key to understanding everyday water practices and the possibility of using alternative water sources to augment existing water supply (Marks, Martin and Zadoroznyj 2008; Po, Nancarrow, Leviston, Porter, Syme and Kaercher 2005; Slovic 1987). The key Australian sociological study in this field was conducted by Marks, Martin and Zadoroznyj (2008). They undertook research that explored Australians’ feelings and levels of acceptance of recycled water use and willingness to incorporate recycled water into their everyday water practices. A comprehensive analysis of risk theory and how it could be potentially related to water values and practices is beyond the scope of this review. Instead we outline the concepts presented in the key article we located by Marks, and colleagues (2008).

When considering risk from a sociological perspective there are three key understandings: a realist view; a cultural perspective (informed by the work of Mary Douglas); and a risk society view (informed by the work of Ulrich Beck and Anthony Giddens) (Lupton 1991; Marks et al. 2008).



The realist perspective recognises risk as an ‘objective reality’ and is regarded as a techno-scientific view espoused mostly by water professionals and policymakers. In this view ‘risks are understood as phenomena that can be identified and scientifically measured’ (Marks et al. 2008, p 85).

By contrast, cultural meanings of risk take into account perceptions of risk ‘as a reflection and manifestation of wider social processes and cultural contexts’ (Marks et al. 2008, p 85). Douglas’ work on purity, danger and pollution shows how cultural, historical and social understandings of purity inform people’s responses to risk. Marks et al. (2008) contend that Douglas’ (1985) conceptualisation of risk is tied to the way in which people judge what is an acceptable level of risk understood within a specific cultural and social context. This context includes how purity, danger and pollution are viewed within society. In particular, for Douglas (1966) ‘ideas about dirt are not so much a reflection of hygienic values per se as symbolic systems to maintain order and stability’. Douglas’s cultural understanding of risk may help to explain why people feel that recycled water contravenes ‘cultural constructions of purity, danger and pollution’ (Marks et al. 2008, p 85).

Beck develops the risk-society perspective and argues that it is possible to ‘empirically assess, measure and calculate risk as a probability’ (1992; 1995; Marks et al. 2008, p 86). For Beck there is a gap between what experts see as risk and how the public perceives risk. From the public point of view the type of risk faced in this century is largely invisible and comes from sources such as genetically modified food or chemical pollution. However, the public must rely on scientific experts to both warn them of the risks and also counteract or diminish them. Beck’s understanding of risk is useful for articulating the fundamental distrust of experts and the public’s fear of risks. This conceptualisation allows us to understand disparity between the risk perceptions of policy makers and water industry experts and members of the general public. By acknowledging the disjunction between professional and public perceptions of risk articulating the risks associated with recycled water perceived risks can be dealt with accordingly (Marks et al. 2008).

Marks et al. (2008) found the cultural perspective most useful in explaining participants concerns and level of acceptance of recycled water. In their study ‘purity’ was identified as a key value. Water sources were assessed according to the ‘purity’ of the water they produce, people are more comfortable with uses and sources they perceived as more pure. Water uses were ordered according to their culturally understood need to ensure ‘purity’.

Thus, agricultural uses, which involve indirect ingestion of impure recycled water, create far greater hesitation than does using the same water for gardens. Similarly, using this water for laundry raises people’s concern. Moreover, when it comes to alternative sources of household water, the purest source (rainwater) is the least problematic for respondents, while water of ‘unclean’ origin (reclaimed water and stormwater) causes the most hesitation (Marks et al. 2008, p 97).

In summary, cultural perceptions of risk, purity and danger are useful concepts for understanding domestic water use in Australia.

Social and cultural capital

The concepts of social and cultural capital have been used in understanding domestic water practices. The two kinds of capital have distinct meanings. Social capital in a water cultures context draws on the work of Pierre Bourdieu (1984), and further developed by Robert Putnam (2000). *Social* capital can be defined as ‘the social connectedness of a community or the glue that enables people, organisations, communities, and nations to work together collaboratively for mutual benefit’ (Miller and Buys 2008, p 245). *Cultural* capital also draws on the work of Pierre Bourdieu (1984) and can be broadly defined as cultural competencies and resources (such as, education) that reproduce and reinforce status and power (Beilharz and Hogan 2012, xxvii).

The concepts of social and cultural capital assist in understanding variation in everyday water practices. Two studies were identified that pointed to the ways in which a social and cultural approach might incorporate ideas of cultural and social capital (Askew and McGuirk 2004; Miller and Buys 2008). Social and cultural capital can encourage environmentally sustainable water practices at an individual and community level (at micro and meso levels). By enhancing social and cultural capital within households we may encourage people to ‘act at a community level and work together for mutual benefit on environmental and sustainable initiatives’ (Miller and Buys 2008, p 245).

Miller and Buys (2008) suggest that the presence of strong *social* capital might encourage sustainable behaviours because people will be concerned about how their behaviours will impact on others and how their neighbours will interpret their behaviours. They suggest, along with Head (2012), that outdoor water uses may be easier to change than indoor uses because they are publically visible. For example, gardening and car-washing activities may be curtailed or restrictions followed more closely or water sensitive gardens planted if people believe that this will maintain or strengthen social capital.

Askew and McGuirk suggest that the accumulation of *cultural* capital through consumption practices, in this case, garden watering practices, affords participants ways in which to express social identity, distinction or status, and social conformity. Askew and McGuirk (2004) examine the intersection of suburban gardens, domestic water use and the acquisition of cultural capital. They focus on the establishment of gardens in a new housing estate and examine the water use, conservation strategies and socio-cultural variables that impact on the decisions about the style of garden, native or non-native, outdoor leisure activities, such as swimming pools, entertainment areas and lawns, and how these relate to consumption practices. Askew and McGuirk (2004, p 34) suggest that the

socio-cultural meanings associated with the suburban garden interact with the construction of suburban identities and space, and indeed the water consumption practices enacted within the domestic sphere.

Askew and McGuirk (2004, p 34) contend that water sensitive practices need to be nuanced and take into consideration the 'complex associations' that people have with their gardens. For example, they make the claim that people seek social distinction through cultural capital by using water-minimising strategies (such as reticulation and rainwater tanks), but that due to the types and styles of gardens and the ways in which people use their gardens for recreation a concomitant reduction in water use is not always apparent or possible. Importantly, they suggest that social conformity is potentially more useful in reducing water use, particularly in relation to rainwater tanks. Askew and McGuirk (2004) suggest that rainwater tanks are a way to reduce water consumption because they assist people's desire for social conformity by displaying their responsibility to practice water sensitive behaviours. Thus, social conformity in relation to cultural capital provides the stimulus to reduce, use or conserve water.

In part 2 of the review we outline available research on specific water use contexts.

Part 2: Key contexts for water consumption

Domestic water use contexts and technologies: The laundry, bathroom and kitchen

'who normally entertains an attitude about a tap, a drain, or a sewage pipe?'
(Sofoulis 2005, p 448)

The above statement highlights clearly the invisibility of the technologies and systems which bring water into the domestic sphere and for which our everyday water use is taken-for-granted (cf. Bauman 1999). However, as Head and Muir (2007, p 892) contend it is 'precisely everyday objects such as these that connect consumers and householders to the wider socationatural networks that constitute 'waterscapes' (Swyngedouw 1999)'. It is therefore important to understand the habitual interaction that people have with taps, pipes and buckets.

Head (2012, p 35) suggests that the 'inside of the home remains a frontier to be conquered for water conservation'. Considerable research has concentrated on water use in gardens and alternative water sources, in particular, rainwater tanks (Askew and McGuirk 2004, Gardiner 2009, 2010; Head 2007; Head and Muir 2007; Hurlimann 2011; Moy 2012). Much of the discussion around domestic objects and everyday water use in the laundry, bathrooms and kitchens centres on the cultural and social influences regarding morality, cleanliness and public health.

Davison (2008), provides the most useful chronology to date, of changes in Australia, of technologies and tastes surrounding washing, bathing, flushing, 'watering and wallowing'. Davison (2008) suggests that historically there have been three periods of household water 'usage' characterised by increasing levels of consumption until more recent times, when a fall in consumption was recorded due mainly to climatic influences. In the late 1800s piped water and underground sewerage was introduced to urban homes, which dramatically increased consumption. The post-war period witnessed the housing boom and introduction of labour-saving devices (for example, washing machines and dishwashers) which again further increased consumption. It was not until after the 1980s that water consumption dropped due mostly to sustained drought, which increased water prices. Technological changes within the home such as water-saving devices (dual flush toilets and low-flow showerheads) also impacted water consumption. Importantly, Davison (2008) highlights that domestic water use in Australia has been influenced by two interrelating factors: the cultural context of water use practices and path dependency. Specifically, he suggests that the way in which we use water is shaped by cultural factors such as 'tastes, fashions, perceptions of health, virtue and comfort' and by the technology that delivers water to our homes. Path dependency is defined as 'the particular array of technologies, governmental and pricing regimes we have created to supply and use water' (Davison 2008, p 38; cf. Shove 2003). These two factors structure much of how we understand how water is used, for what purposes and through which mechanisms (Davison 2008).

Water use, especially inside the house, is related to cultural ideals of cleanliness and personal hygiene. Over the twentieth century this has seen a significant increase in water consumption per capita. Changed etiquette about toilet flushing, bathing and the need for clean clothes on a daily basis have resulted in a phenomenal increase in water consumption. Understanding the ways in which cultural and social attitudes impact and inform daily practices will enable or inhibit water conservation. For example, many people are willing to change their habits perhaps on clothes washing, but are quite resistant to changing showering habits or to reduce toilet flushing.

It should be noted that little sociological research has been undertaken on domestic water consumption inside Australian houses (but see Fielding et al. 2012). This is in part due to its private nature; it is far easier to observe outdoor water use, especially in relation to water use during restriction periods and the installation of rainwater tanks.

Domestic water use contexts and technologies: Gardens

Gardens feature prominently in the exploration of everyday water use practices. This is in part due to their location in public view, but is also because of particular associations and meanings that many people attach to their gardens (cf. Seddon 1997). For example, Askew and McGuirk (2004) suggest that gardens, in particular backgardens, have become more important in a risk-oriented society. That is, because public space and public security are diminishing, the private sphere has taken on greater significance.

Allon (2006, p 11) suggests that gardens are often a 'landscape of memory, and a space for working through ideas of place and identity and narratives of social relations'. They also serve multiple purposes – escape, solitude, pleasure, sensuality, relaxation, recreation. Further, as both Allon (2006) and Askew and McGuirk (2004) contend, gardens are a site of social distinction and display of cultural capital.

Gardens are particularly important in the Australian imaginary because of the link to ideas of nation-building. Holmes (1999) suggests that in particular back gardens were connected to 'colonial ideas of the garden as a way of claiming alien spaces and promoting good citizenship' (Askew and McGuirk 2004, p 21). As with other everyday practices discussed in this review, water use in gardens is underpinned by deeply held values, cultural and social ideals and expectations. These values and ideals impact directly on domestic water use. For example, the suburban lawn can account for much of household water consumption (Askew and McGuirk 2004). Suburban lawns link directly back to our colonial heritage (a type of 'English rural life'), whereas native gardens connect to nation-building ideas ('perceptions of nationhood and adaptation') (Askew and McGuirk 2004, p 21).

Importantly, the high value placed on gardens in everyday life often provides intense motivation for people to recycle or collect water in order to sustain their gardens as places of relaxation, leisure and identity in times of water scarcity and drought (Allon 2006, Askew and McGuirk 2004, Gardiner 2009; 2010, Head and Muir 2007, Moy 2012). One important way that people can do this is through installing rainwater tanks as a means of using or saving water.

Water saver vs water user identities – The case of rainwater tanks

Rainwater tanks are positioned within the literature as being important for individual householders and their ability to either conserve water or use water – to be water savers or water users. People’s perception of the ‘ownership’ of the water collected in tanks also needs to be taken into consideration as it often structures how they use the water. Thus, rainwater tanks have the potential to change the way people understand water consumption but this does not always happen in a consistent manner. Allon and Sofoulis (2006, p 45) suggest that changing conventions in household water management embodied in technological innovations, cultural meanings and social practices are ‘evident in people’s creativity and resourcefulness’ (Gardiner 2010, p 101). Rainwater tanks and the ways in which people use them are one example of creativity and resourcefulness.

Gardiner’s (2009; 2010) studies conducted in South-East Queensland (SEQ) found that rainwater tanks can be perceived as a challenge to ‘big water’ (Allon and Sofoulis 2006; Sofoulis 2005). Gardiner asks the question: does the installation of rainwater tanks change cultural attitudes to water and water use? (2009, p 109). She contends that tanks are valued highly but people have different motivations for installing them; for many they provide independence from the mains supply and this allows people to continue to water their gardens and undertake other water activities, such as washing driveways and cars even though water restrictions are in place.

Gardiner (2010, p 110) identified three main user groups in her study. Each of these valued water tanks differently:

1. retrofitters: value understood in terms of ‘independence’ from ‘centralised water management decisions’
2. environmentally motivated tank purchasers: the water tank is an extension of already existing environmentally conscious practices, including recycling and the avoidance of plastic bags (see also Fielding et al. 2012)
3. new home builders: have tanks imposed upon them and perceived tanks as a ‘fair manifestation of centralised decision-making in response to drought conditions’.

The values identified by Gardiner are not held universally by all groups. There are also points of crossover between each group (2010, p 106). For example, Gardner suggests that the installation of water tanks emphasises the distinction between basic water supplies as provided by centralised water authorities and ‘luxury’ water from the tank. Tanks have provided people with the opportunity to continue their outdoor activities through the ‘independent’ supply created by the rainwater tank, thus simultaneously affording them with identities of water savers as well as water users. As a result Gardiner concludes from her research that there has not yet been a consistent cultural change in which tanks are routinely installed, used and valued.

Candace Moy’s (2012) study, conducted in the Illawarra region, NSW, also provides a typology of water users (similar to Gardiner’s categories) that is instructive in thinking about

how the use of alternative water sources, in particular rainwater tanks, can inform new ways of bringing about change in domestic water consumption patterns.

Moy's (2012, p 204) typology outlines three categories of tank owners:

1. water users – largest group, tanks gave them independence to continue to engage in their water activities
2. light green – tanks were part of a set of environmentally friendly practices they undertook; did not necessarily change consumption habits
3. frugal group – many had been raised in rural areas, they were the water savers

The first two groups are similar to Gardiner's retrofitters and environmentally motivated tank owners. Along similar lines, Fielding et al.'s (2012) research in South East Queensland found that households with a water conservation culture were more likely to conserve water through tank use (and other technologies). The third group Moy (2012) identifies are people with specific 'water histories', that is, past experiences of water use that inform their current attitudes and practices. Other Australian researchers have found that participants who had lived in rural or regional areas or had a history of living in a different country often considered water as a scarce resource and used it minimally (Allon and Sofoulis 2006; Head and Muir 2007).

Moy's study also highlighted the 'good' water/'bad' water dualism in which water is conceptualised differently depending on its source: "Mains water' and 'tank water' had different associated meanings, quality, and subsequently, different household purposes' (p 214). In effect, for the people in Moy's study mains water was regarded as 'good' water and tank water as 'bad' water.

Moy's findings parallel those from Gardiner (2010) in that independence from mains water is highly valued in order to continue outdoor water activities. However, they also contrast to Gardiner's: whereas Gardiner's participants in SEQ had a primary ethic of 'water saving', Moy's NSW participants had a primary ethic of 'water use'. For Moy's participants rainwater tanks allowed people to continue in their watering activities (maintaining non-native gardens, lawns and swimming pools) even during restrictions. Further, 'tanks give freedom to use water how and when which provides autonomous control to owners because they believed that the tank captured their 'own water'. In this way water changes from a public to a private good and therefore use can be unrestricted' (Moy 2012, p 213).

By bringing to light the ways in which people engage with systems, through either a 'big water' or an 'everyday water' lens, their relationship to water enables an 'active engagement with these processes [which] enhances their capacity to manage and reduce consumption' (Troy 2008, p 3). The research on water tanks illustrates how differing cultural values and contexts will impact on how technological solutions such as water tanks are taken up and utilised.

Everyday water practices and values

The history of water use in Australia is important as it shows the ways in which social and cultural understandings of water and technological infrastructure have deeply influenced water cultures in Australia. In acknowledging this legacy which continues to influence contemporary water practices and decision-making it is not the purpose of this review to present a comprehensive historical background. However, it is worth noting that Graeme Davison's (2008) chapter 'Down the gurgler: Historical influences on Australian domestic water consumption' provides a useful synopsis of the main influences on water use in Australia since white settlement. (More extensive and detailed understandings of the historical changes in everyday water practices across Australian settlement will be examined in the urban histories informing this project.)

We have identified a number of cultural and social values that inform everyday water practices including, cleanliness, comfort and convenience, the 'yuck' factor and 'good' water and 'bad' water.

Cleanliness, comfort and convenience

Elizabeth Shove (2003a & b) provides a useful framework for understanding domestic water use in Australia. She argues that cleanliness, comfort and convenience are 'three domains of daily life' which are useful in capturing the ways in which our everyday lives are connected to large infrastructure, technology and daily practices. Shove suggests that these connections are for the most part invisible and our consumption of resources is inconspicuous (cf. Giddens 1984). She highlights the interplay of practices and systems and how these are informed by ideas of cleanliness, comfort and convenience. In bringing to light these domains of daily life she hopes to highlight 'conspicuous consumption' that foregrounds our reliance on infrastructure, technologies and systems and, if necessary, bring about change. Thus, she uses the three Cs (cleanliness, comfort and convenience) to show the embeddedness of particular technologies, systems, products and practices which shape our resource consumption. These domains can be understood in broad terms:

- Comfort – domestic hot water provision facilitates bathing, washing, showering
- Cleanliness – changes in practice of frequency of washing, bathing, etc. Tied to significant cultural understandings of what it is to be clean
- Convenience – proliferation of technologies, products, arrangements that make everyday life easier (washing machines and showers), but also use resources in ways that are often not sustainable (Shove 2003b).

Shove (2003a) suggests that in terms of comfort, heating and cooling are uppermost, next is the provision of hot water. In the Australian context Davison (2008) suggests that the provision of domestic hot water was the most important innovation in domestic water use in the 20th century.

The three Cs relate to the energy consumption associated with each domain, the deeply embedded cultural and social practices and habits that guide them and the implications for changing them. Shove (2003) sets these up as categories that must be addressed when thinking about how sustainable practices can be encouraged. We must first understand the motivations, the cultural meanings and technologies associated with 'systems' that are resource intensive before we can contemplate change. Hence the need to make them visible.

The socio-technical perspective (discussed in Part 1) highlights the embeddedness of daily practices into systems and technologies that are often path dependent and resistant to change. If change is to be brought about to enable more sustainable water use, then understanding these domains of daily life – comfort, cleanliness and convenience – and their social and cultural importance is imperative.

Understandings of 'good' water and 'bad' water

Maria Kaïka (2005, p 54) defines 'good' water as water that has been 'processed, controlled, commodified', and 'bad' water refers to 'untreated metabolized water, to be found in city rivers, lakes, rainwater, sewerage'. This distinction is thought to underlie dominant cultural understandings about water and is useful in relation to recycled and alternative water sources. The dualism has been used by researchers to understand people's perceptions of the acceptability of the use of recycled water (collecting water in buckets, greywater) or alternative water sources (rainwater tanks). We note that anecdotal evidence suggests that in some Australian contexts cultural understandings are reversed and people often perceive their tank water as 'good' water and that mains supplied water is 'bad' water. However, we have not found empirical evidence to support this understanding.

The dualism between good and bad water is predicated on the invisibility of sources and networks (pipes, dams, reservoirs) that bring 'good' water into the home and removes 'bad' water. Kaïka (2005) demonstrates that taps and toilets facilitate our everyday connection to water. Therefore, our engagement with everyday water is structured, invisible and determined largely by supply systems outside of our control.

However, other researchers such as Head and Muir (2007) and Moy (2012) contest Kaïka's argument suggesting that Australian householders 'actively intervene in water production networks in the home' (Moy 2012, p 208). That is, they use greywater from washing machines, water collected in buckets from showers and sinks to water plants in the garden and vegetable patches in times of water scarcity. Thus, Australians are using potentially 'bad' water to supplement their domestic water use. Head and Muir (2007, 892) 'argue that there is a false separation between pure and 'dirty' water in the home and that by tolerating 'dirty' water through recycling activities, inhabitants become part of the network, rendering it visible. Further, they suggest that Australian gardens are a site in which householders make the networks visible as they are actively intervening in them on an everyday basis. In this way they have the potential to become 'change agents' (Moy 2012, p 208).

Moy (2012) contests some of Head and Muir's (2007) findings. She suggests that people do make the distinction between the acceptability of recycled water for indoor and outdoor use. Moy contends that the 'good' water/'bad' water distinction still holds because recycled

water is only tolerated when used outdoors; there is much more resistance to using recycled water indoors.

The importance of Head and Muir's (2007) and Moy's (2012) studies are that they show that some uses of recycled water (greywater) or alternative water sources (rainwater tanks) are acceptable under some circumstances. These circumstances connect to deeply held perceptions of what constitutes clean water and the ways in which our everyday water practices maintain social and cultural ideals of cleanliness and purity and seek to diminish risk. These studies also highlight that it is possible to intervene in networks. In doing so, water networks become visible, thus bringing to light possible ways to change or intervene in systems.

The 'yuck' factor

Charles Schmidt (2008, A525) defines the 'yuck' factor as the 'influence of instinctive responses against new technology'. For Schmidt (2008, A526), the yuck factor links to other human emotions such as disgust and fear. It also potentially violates Western notions of morality and cleanliness. In this sense the yuck factor connects to other sociological/anthropological concepts, in particular, Mary Douglas' notions of purity and danger (see Perceptions of risk discussion above).

The yuck factor is important because it is often mobilized in public discourse to prevent water reuse/recycling programs. It is a 'catchall phrase to describe technophobic sentiments that vary by what triggers them. The disgust elicited by drinking reclaimed wastewater, for instance, differs from the moral outrage induced by human cloning' (Schmidt 2008, A525). The yuck factor has been utilised in a number of public debates surrounding the use of recycled water especially in relation to augmenting drinking water supplies. For example, its use in public discourse has been effective in defeating water recycling programs in California and in Toowoomba, Queensland. In 2006 a referendum was held to ask Queenslanders whether they would accept the addition of purified recycled water to dams. A resounding 'no' vote was cast, with the 'yuck' factor being employed variously in campaigns, with slogans such as, 'Poowoomba' and 'Citizens against Drinking Sewage' (Spearitt 2006, pp 25-26; cf. Hurlimann and Dolnicar 2010; Price, Fielding and Leviston 2012).

Local community dynamics

Examining local community dynamics provides a unique opportunity to explore the connections between water cultures and the groups and networks that mediate individual behaviour and the broader society. Yet this is an under-developed field in Australia. It is well-established that environmental concerns vary according to age, professional occupation and education in Australia (Tranter 2011). It is probable that some communities are more environmentally concerned than others about water too. Sofoulis and Williams (2008) suggest that community groups, neighbours and friends, what they term the 'meso-level', are the networks for the transmission of water sustainable practices and which could potentially provide assistance to users.

Sofoulis and Williams (2008, p 50) further suggest that a 'meso-level approach aims to concentrate on community and neighbourhood groups, young people and migrants rather

than the ‘one-size-fits-all’ technological solutions for ‘average’ households’. In effect, and in line with a socio-technical perspective, the ‘goal is a redistribution of roles and responsibilities in the relationships between water users, technologies and water authorities, initiated through the process of ‘growing networks of water-savers’.’ (Sofoulis and Williams 2008, p 50).

Research utilising the concepts of social and cultural capital (as discussed in part 1) highlights the community or meso-level as an important site for environmental action (Sofoulis and Williams 2008). For example, trust in neighbours and water authorities has been highlighted as an important factor shaping water sensitive practices.

Trust in the water authority and trust in others in the community (including different water using sectors, such as farmers, residents and industry) to take steps to reduce their water consumption will increase the likelihood that people will also take steps to reduce their water use (Graymore, Jorgensen, O’Toole 2009, p 234)

The notion of trust links to ideas relating to social and cultural capital because if people can see their neighbours, other community members, industry and government organisations conserving water this may also encourage them to use, conserve or alter their water use patterns. Graymore et al. (2009) suggest that people will not save water if they see that others are not conserving or minimising their water consumption. Further, people are less likely to conserve water if they do not believe that the water authority is behaving responsibly in relation to water policies, use and pricing.

Geographic comparisons – recognising geographic capital

In our review we identified that geographic diversity and the impact on water use cultures is an under-researched field. This project specifically aims to address the research gap in Western Australia and to build on existing cultural research conducted in Queensland and Victoria. We acknowledge that Australian cities have unique topographical and geological structures that affect water use and conservation in diverse ways. We use the term ‘geographic capital’ to refer to the water resources available in different cities in Australia.

These diverse natural resources and water cultures present different challenges to water supply and demand management by water authorities and governments, as well as to householders in different geographic locations. Even though research has been undertaken on domestic water consumption and water use patterns in a number of capital cities and urban areas, a comparative study across cities has not occurred.

The three cities in project A2.1 Perth, Melbourne and Brisbane are located in different climatic zones and have substantially different urban development histories. Moreover the three cities face distinct challenges in becoming water sensitive cities. Our project will place geographic location at the centre of our analysis in the next stages of research.

Gender

Little work has been undertaken that examines gendered aspects of domestic water consumption. Although much has been written about the gendered nature of various domestic tasks and the division of labour between indoor/outdoor tasks, a focus on the use of water is negligible. In Australia environmental values vary according to gender. Women are more likely to favour environmental protection over economic growth and believe that 'global warming poses a serious threat to their way of life' (Tranter, 2011, p92). It is likely that water use values and practices vary according to gender too. Kaïka (2005, pp 58-59) presents a brief discussion on the historical construction of the division of labour inside and outside the home in relation to water use. Women have traditionally been the water users inside the home (kitchen, bathroom, laundry). They have also gathered water from wells or springs. Men have been the 'handlers and tamers', building dams and irrigation. This gender binary is still visible today (cf. Head and Muir 2007).

One key study examined what women and men thought about water recycling in south-east Queensland (Miller and Buys 2008). Miller and Buys found that there were gender differences in knowledge and acceptance of water recycling. For example, women were often doubtful about the trustworthiness and science around the technology of water recycling, they also supported the use of greywater in the home and garden and were more accepting of desalination plants as a solution to water scarcity. Men tended to be more knowledgeable about the scientific debate and more comfortable engaging in it, they were also supportive of building dams and/or increasing the price of water. In line with other studies on perceived risk of recycled water both men and women did not want to use recycled water as drinking water (see above discussion on risk and the 'yuck' factor). Miller and Buys (2008) offer some recommendations for how proponents of water recycling such as government departments and science organisations could more readily engage women in the debate around recycled water.

Another study by Head and Muir (2007) provides some detail on different water recycling activities undertaken by men and women. In line with Kaïka's (2005) division of water labour, many women participants in Head and Muir's study gathered water in buckets in showers, laundries, kitchens and overflow water from downpipes and leaking taps, and they also collected rainfall in containers. Men's water-saving activities tended to centre around ensuring irrigation and watering systems were efficient and that correct water drainage and storage systems were installed (Head and Muir 2007, pp 896-97)

Both studies suggest that much more research could be undertaken to further explore gendered understandings and practices of domestic water consumption.

Conclusion

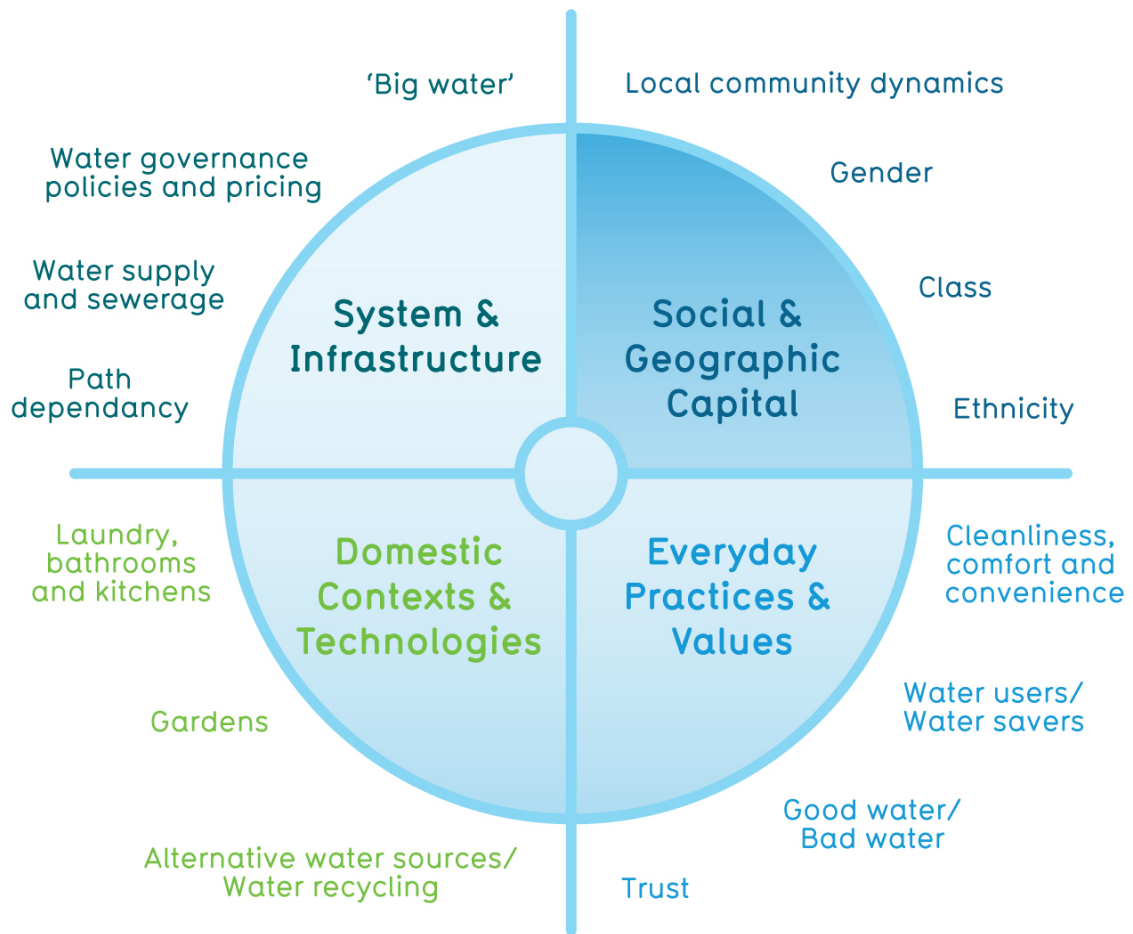
In line with key research in the field reviewed in this report we argue that a cultural and social approach, which privileges and takes into account people's everyday water practices and the cultural and social values that underpin them, is needed to fully understand domestic water consumption and how we can change water practices to progress toward water sensitive cities.

A sociological or cultural approach 'recognises that people's water practices are situated in particular historical, geographical and cultural contexts, are shaped by social, political, economic, and discursive conventions, and interact with particular cultural and technological formations, including 'infrastructures of consumption' or 'structures of provisioning' that deliver essential resources and services' (Sofoulis and Williams 2008, p 51, cf Chappells 2005; Van Vliet, Chappells and Shove 2005).

A cultural approach views water users as diverse participants embedded in cultural and social contexts that impact on their water use practices. Culture frames all human activity, even though it is acted out in different ways, dependent on dynamics of community, gender, ethnicity, class and geographic location. This meso and micro level analysis is necessary to attend to problems of water use at a national and macro level.

Our 'Understanding Water Cultures' diagram (Figure 2) illustrates the key elements identified in this review that are necessary, we argue, to adequately understand Australian water use cultures. Our diagram draws on and extends Shove's (2003, p 48) 'three dimensions of co-evolution' (see Figure 1) in which she outlines 'interdependencies between devices, systems, and practices'. In our diagram we add a further sphere of influence – social and geographic capital which takes into account the influence of social variables such as gender, class and ethnicity in conjunction with local community dynamics.

Figure 2. Understanding water cultures



Project A2.1 will contribute knowledge on meso and micro social dynamics of water use through our interlinked studies which include urban histories, a large-scale representative survey and targeted focus groups. We will develop a typology of water use cultures and contexts and distil information about community values, ideals and perceived risks to provide the basis for the development of effective and socially acceptable water sensitive interventions.



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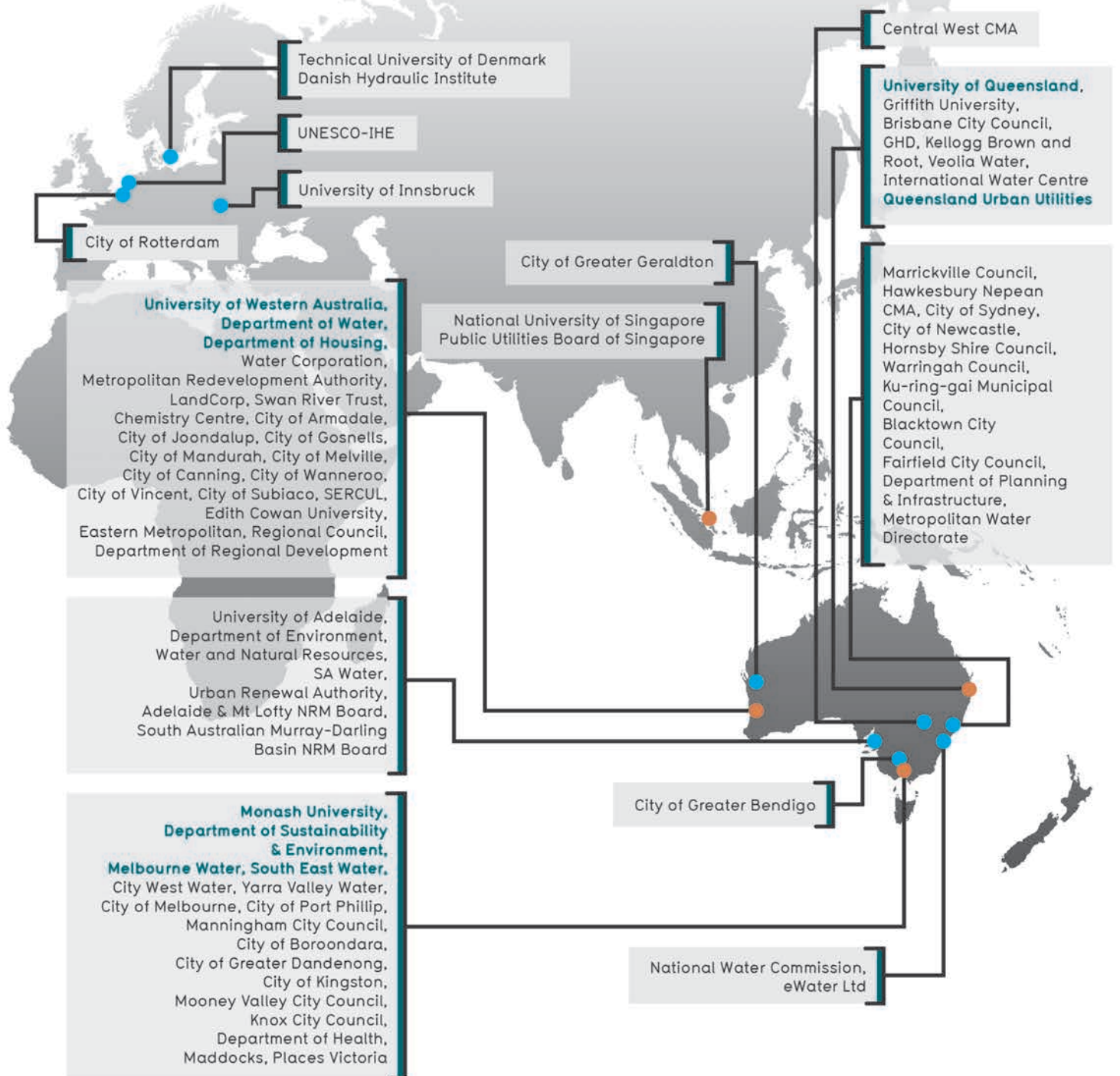
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