Reframing water efficiency: towards interventions that reconfigure the shared and collective aspects of everyday water use

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Claire E. Hoolohan

School of Mechanical, Aeronautical and Civil Engineering
Tyndall Centre for Climate Change Research

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Thesis Abstract

University of Manchester
Claire Hoolohan
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Reframing water efficiency: towards interventions that reconfigure the shared and collective aspects of everyday water use
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This is a thesis about water efficiency, a particular set of practices in the water industry of England and Wales designed to reduce end-use water demand in homes and businesses. Broadly, the thesis aims to understand how water efficiency activities organised and funded by water companies might more effectively support the development of sustainable patterns of domestic demand, in order to contribute to long-term sustainable water management. To achieve this aim, mixed qualitative methods are used to; a) evaluate the extent to which two non-conventional water efficiency activities engage with the collective elements of everyday consumption that existing research deems necessary to steer demand (Strengers, 2012, Macrorie *et al.*, 2014, Shove, 2014, Geels *et al.*, 2015); b) develop a conceptual understanding of demand management as a professional practice, to understand how Water Company activities are shaped, sustained and stifled; and c) develop an understanding of what future water efficiency activities might look like that take account of the findings from this research.

Central to this research and analysis is the notion of 'collective', a term that denotes a conceptual perspective on demand that departs from a focus on individuals, towards the shared social, technological and natural relations that structure everyday activity (Browne *et al*., 2014). The analysis uses this notion of collectives to examine the impacts and limitations of *Save Water Swindon,* a large-scale 'whole-town' approach to water efficiency (Case Study 1); to explore how *Care for the Kennet* contributes to demand management by reconfiguring relations between water in the home and water in the river (Case Study 2); and to uncover the collective context of the professional practices of managing demand (Case Study 3). The findings illustrate that demand is shaped by routines that extend far beyond the spaces in which water is used, both intentionally and unintentionally, and therefore highlight a distributed web of people and practices that might be involved in demand management. The findings from these empirical enquiries are used to as the basis to work with the water industry to reimagine interventions that engage in the collective context of demand, and elicit conceptual understandings of the processes and actors involved in governing social change.

Overall, the approach taken in this thesis demonstrates the vitality of practice-based enquiry that provides deep analytical detail to better understand the mundane yet complex processes that sustain everyday water use. Supplementing the analysis with ideas from a variety of social science disciplines and working alongside the water industry, facilitated by the CASE studentship, pushes the analysis beyond the confines of domestic practices typical of practice-based research. Subsequently this research offers contributions to policy, practice and theoretical developments as it explores the intersections between demand and professional practices and local environments, evaluates interventions, examines practices of demand management, and unravels the possibilities for future intervention. Consequently, though focused on water management in the UK, this research offers insights for other resource agendas and regional contexts, expanding discussions in these spaces to think creatively about avenues for future policy and management practice.

Declaration

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1. Introduction

"We have a water crisis in the United Kingdom. You would not have thought that yesterday […] when you saw the rain pouring down and the rivers rising. However, in reality, every year for the past few years the Minister, his predecessors, civil servants and people who work in the water industry have become more and more nervous about the lack of rainfall in winter."

(Thomas Docherty; MP Dunfermline and West Fife at the Public Bill Committee for the Water Bill 17th December 2013)

Water presents an increasingly complex set of challenges, both globally and for the UK. Globally, water is central to the sustainable development agenda, closely related to issues of health, sanitation, sustainable food and economic growth – all of which are components of the United Nations' *Sustainable Development Goals*. Within the UK, as indicated in the opening quote, water shortage is becoming a particularly pressing concern. Despite the UK's temperate climate, recent research indicates there are regions – particularly in England – that are among the most 'water stressed' in Europe; an expression of a system's ability to meet human and ecological demand based on a measure of water use as a proportion of effective rainfall. In 2013, the Environment Agency designated nine Water Company regions 'seriously water stressed', where the majority of available rainfall is already in use and the opportunity for developing new water supplies to cater for their growing populations is minimal (Environment Agency and Natural Resources Wales, 2013). This finding is corroborated by earlier research in

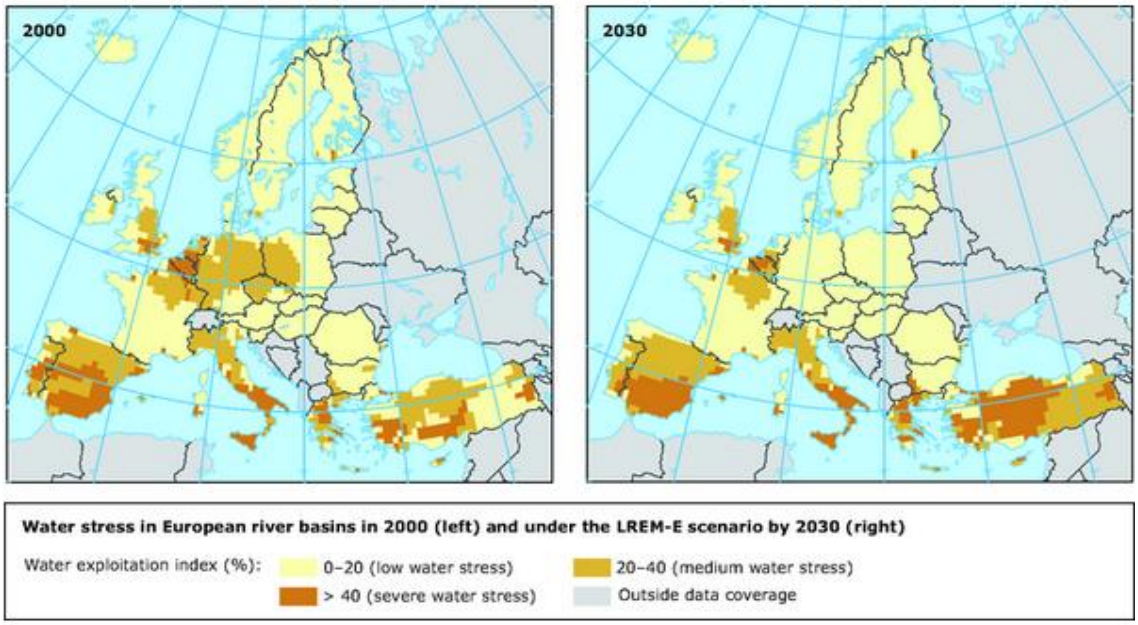

Figure 1: Water stress in European river basins (left: year 2000, right: forecast 2030) (reproduced from European Environment Agency, 2007)

which the European Environment Agency likened the southeast of England to the south of Italy, south of Spain and much of Turkey (European Environment Agency, 2007; see Figure 1).

Predicting future demand is complicated as the supply-demand system is dynamic and intersects with changes in climate, development, economy, and ordinary consumption, all of which contain considerable uncertainty (Walker, 2013). Yet, despite such uncertainties, water companies are increasingly forecasting substantial supply deficits (see Figure 2) as anticipated population growth offsets the benefits of leakage reduction and other activities designed to enhance the efficiency of supply (Brooks *et al.*, 2009). This is particularly true in the south of England and especially in urban areas where demand is already high, however water demand is becoming an issue for water companies throughout England and Wales. In addition changing patterns of water use have led to higher levels of domestic demand, connected to the proliferation of plumbing and appliances (Taylor and Trentmann, 2011), changing conventions around cleanliness and convenience (Shove, 2003, Hand *et al.*, 2005), and technological innovations such as the power shower that are designed to meet the needs and desires of contemporary consumption with little regard for the water use incurred (Taylor *et al.*, 2009).

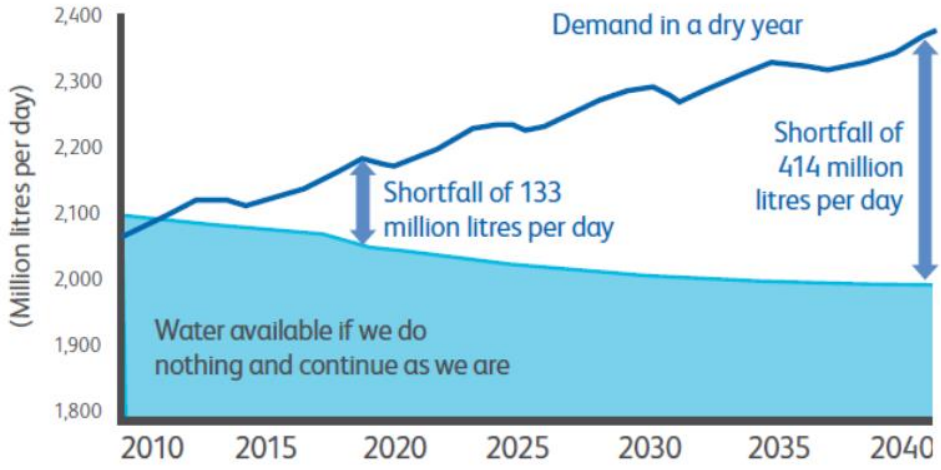

Figure 2: Forecast imbalance between supply and demand in London (Thames Water, 2015a, 2015b)

These changes occur against a backdrop of climate change and an associated rise in extreme weather patterns that is anticipated to create more volatile supply conditions (Bates *et al.*, 2008, Committee on Climate Change, 2012). Drier summers promise to increase demand and diminish supplies, while more turbulent winters compromise the replenishment of water supplies and pose a heightened risk of flooding that undermines demand management efforts (Whatmore, 2013). To add to these challenges, abstraction

reforms running parallel to the 2014 amendments to the Water Act have reduced the volume of water that may be taken from many rivers in order to protect riparian ecosystems (TSO, 2014). Thus, there are both immediate and long-term pressures on supply security that mean 'business-as-usual' is no longer a viable option for many water companies.

Faced with such challenges, demand management has emerged as an international policy and research imperative, providing a means of responding to existing stresses, mitigating the social and environmental impacts of consumption, and preparing for uncertain future supply-demand conditions. In the UK, the utilities sector has been at the forefront of this agenda, departing from the technology driven management paradigms that dominated resource management throughout the twentieth century, towards more people-oriented approaches that seek to engage with demand (Sharp *et al.*, 2011, Browne, 2015). In addition to enhancing the efficiency of production and supply, demand management activities are increasingly targeting end-users, using measures such as information, consumption feedback, and price signalling to drive retrofitting and behaviour change in the home (Southerton *et al.*, 2008). The water industry is no exception and the last decade has seen a surge in demand management activities.

At its simplest water demand management may be defined as "any action that reduces the amount of fresh water we use" (Brooks, 2006, p. 523) and various approaches have been developed by water companies to achieve this aim including metering programs, leakage reduction, and water efficiency activities. The last of these, water efficiency activities, form the primary focus of this thesis and refer to those activities undertaken to reduce water use in homes and businesses (Waterwise, 2010a, 2015a). Following the introduction of the first systematic targets during the 2010-2014 management planning period (AMP5/PR09), water efficiency has become a core feature of Water Company practice. The savings reported often exceed those anticipated, for example, in 2013/2014 Thames Water estimated reductions of 5.19 mega litre (Ml) per day compared to their 4.42 Ml target (Thames Water, 2014a). Yet despite such progress water demand remains higher than policy visions – such as Future Water's aspiration to see per capita consumption reduced to 130 litres per day by 2030 (Defra, 2008) – and there are concerns mounting regarding the scale and rate of change, echoing debates throughout the sustainable consumption agenda.

In the main, criticism focuses on the lack of radical or transformative change; that which involves fundamental alterations to the way resources are embedded in our social and material worlds (Dixon *et al.*, 2014), and the consequences this has for the ongoing evolution of demand. Existing efforts to reduce consumption tend to keep within existing technological and economic paradigms (Dixon *et al.*, 2014), seeking to enhance services of provision without altering the routines in which unsustainable patterns of demand emerge (Shove and Walker, 2014) and thus stop short of the deep reconfiguration of social and material life deemed necessary to address socio-environmental challenges (Spurling and Mcmeekin, 2015). Consequently, these activities result in what Marres describes as "the change of no change" (2011, p. 517), and risk reaffirming unsustainable patterns of resource use.

This observation resonates with a growing critique of water efficiency that describes how existing activities "tinker at the corners of what is actually a diffuse and complicated system of demand" (Browne *et al*., 2014, p. 75). This critique identifies how simplistic models of demand and consumer behaviour (Hobson, 2002, Shove, 2010, Sofoulis, 2011a) lead to the prioritisation of small-scale efficiency measures and provision of information in an effort to modify consumer behaviour (Sharp, 2006, Strengers and Maller, 2012). Such activities occur at the expense of deep reconfiguration of the social and material world and thereby form a management agenda that is constrained in its capacity to deliver the changes required to manage demand (Strengers, 2012, Browne *et al*., 2014, Shove, 2014). Industry observers reinforce this critique, highlighting the cursory attention paid to water reclamation, recycling and substitution activities (Waterwise, 2015b); the limited engagement with social and cultural dimensions of water use (Turton, 2015); and the restricted involvement of partner organisations that might steer change (Waterwise and UKWRIP, 2014).

1.1. This thesis

Given the challenges faced by the water industry, finding ways to make deep, reconfigurative changes to the social and technological fabric of water use is vitally important. This thesis focuses on water efficiency activities, providing a critical investigation of their role in demand management, and their contribution toward long-term sustainable water management in the UK. In order to guide the research, the term 'collective' is used throughout, as a transdisciplinary tool that highlights more-than-

individual elements and processes that shape patterns of everyday water use and water management, and aids the identification of pathways for future intervention. The term enables a discussion that spans various social science disciplines, and also connects to industry discussions concerning how to extend beyond conventional approaches to behaviour change. Thus, rather than emerging from individual decisions and values, the emphasis on collectives positions resource use as an endogenous outcome of everyday routine, which in turn emerges from, and contribute to, social, material and natural elements (Browne et al., 2014).

A synthesis of this literature is provided in the following chapter, which establishes the theoretical basis for this research. Much of this literature emerges from within the practice turn in social theory (Schatzki *et al.*, 2001) that explores how reframing demand as collective and emergent from social and material elements poses opportunities for demand management (Reckwitz, 2002, Sofoulis, 2005, Shove *et al.*, 2009, Schatzki, 2010). The shift from 'people' to 'practices' proposed by social practice theorists reframes governance of social change (Browne, 2015), demonstrating how individual behaviour is entrenched in shared and collective systems of meanings, competencies and materials (Shove *et al.*, 2012a). Rather than top-down flow of policy and management or the bottom-up agglomeration of individual choices, everyday resource use emerges from, and contributes to, the assemblage of these social and material elements during routine activity (Chappells and Shove, 2005, Hand *et al.*, 2005)(see Chapter 2 for discussion).

In addition to social practice theories, this research incorporates ideas from urban geography (e.g. Gandy, 2004, Hodson and Marvin, 2010, Dicks, 2014), political ecology (e.g. Castro *et al.*, 2003, Heynen *et al.*, 2006, Swyngedouw, 2009a) and post-humanism (e.g. Hinchliffe and Whatmore, 2006, Whatmore, 2006), literature that has a history of engagement with the water industry and that gives voice to other factors that influence domestic life. As a starting point, these studies enable the notion of collective to be traced throughout the history of water management (covered in detail in Chapter 2 but presented briefly here for context).

The nineteenth century saw the centralized provisioning of water, organised by the state for a collective of citizen-consumers (Guy and Marvin, 1995, Bakker, 2003). Modern engineering saw the extensive, state-led development of infrastructure and technologies in an attempt to establish universal access to a standardised singular resource. Later, the rise of neoliberalism in the public sector resulted in a dismantling of this imagined

consumer collective and its replacement by active individuals, and the collective state-supplier replaced by water companies and a responsive market (Bakker, 2003, Page and Bakker, 2005). Yet even in this devolved supply-demand system there is a residual notion of collective, as a heterogeneous consumer base is flattened by positivist and technocratic management models, rendered a consistent whole for convenient inclusion in management (Sharp *et al.*, 2011, 2015). The recent turn to practices detailed in Chapter 2 provides a strong critique of individualism in the sustainable consumption agenda and introduces a notion of "collectively shared elements" (Gram-Hanssen, 2011, p. 75) to reframe demand in a manner that stands to reimagine the resource management agenda. Thus the notion of collectives speaks to and across quintessential social sciences discussions relating to change, agency and governance as well as to more recent themes within the remit of global change research, such as sustainability, resilience and demand management.

With both industry and academia calling for changes to water efficiency and demand management, this thesis sets out to understand what the turn to practice, and other advances in allied social science disciplines might offer for designing interventions into domestic water demand. Conceptually this research aligns with the literature that decentres agency from individuals or macro-societal processes of power and control. This is a deliberate departure from the psychological and economic research that provides the basis of much policy and intervention in the water sector (see Russell and Fielding (2010) for a review), and represents an effort, to paraphrase Walker (2015, p. 47), to re-socialise, re-institutionalise, re-materialize and re-contextualise the processes of social change. These are marked departures from the conceptual foundations of conventional water efficiency initiatives (see Russell and Fielding, 2010 for a review) wherein might lie fruitful avenues for future intervention.

1.1.1. Aims

The aim of this thesis is to understand how the water efficiency activities organised and funded by the water companies might more effectively support sustainable patterns of water use. The increasing urgency of demand management combined with the emerging critique raises significant empirical questions regarding the trajectories future management might take. The notion of collective is used to explore these questions; to identify how collective elements structure domestic water use and the professional

practices of managing demand; and to explore the opportunities these findings present for demand management. To these ends this thesis has three objectives:

1. *To evaluate the extent to which recent developments in water efficiency further the contribution of demand management to long-term sustainable water management;*
2. *To investigate how demand management activities are shaped, sustained and suppressed by the routine practices of water management; and*
3. *To develop both practical and conceptual understandings of how water efficiency might otherwise be designed to facilitate lower levels of domestic water use.*

By drawing on insights from different social science disciplines, the empirical work explores the collective contingencies of domestic water use and management, and later develops an understanding of how management activity might respond to these. The empirical research is divided, focusing first on the experiences of residents within the regions targeted by two case study initiatives and later those of professionals employed in water efficiency to understand the collective context of demand management and the possibilities for water efficiency going forward. Despite focusing on the water industry in England, it is anticipated that the findings will provide insights into management in other resource sectors including energy and transport, and may be used to inform investigation in other geographic contexts.

1.1.2. Overview of the thesis

Following this Introduction, ***Chapter 2: Water in the UK: trends, policy and theory*** reviews developments in the policy and practices of water demand management, focusing on England since privatisation (circa 1989), and synthesises the parallel developments in academic research. The chapter draws together insights from various bodies of research around a number of core criticisms and alternative conceptualisations of the management agenda, therein establishing the limitations of conventional approaches to demand management and furthering our understanding of the principles that might guide future management activities.

Chapter 3: Research design and methodology outlines the methods used in this research, and the theoretical orientation that underpins them. This includes an introduction to the case studies and the basis for their selection; the methods used in the case study research and evaluation, and those used to develop the initial findings into practical and conceptual reimagining's of demand management intervention. In addition,

this chapter provides two methodological reflections, considering the use of talk-based methods for research into inconspicuous consumption (Hitchings, 2012, Pink and Leder Mackley, 2012, Martens *et al.*, 2014, Browne, 2016), and discussing the opportunities for, and implications of, industry-academic collaborations for global change research (Weichselgartner and Kasperson, 2010, Castree *et al.*, 2014, Panda and Gupta, 2014), thereby contributing to two ongoing methodological debates in the social sciences.

The first two empirical chapters (4 and 5) attend to the first objective of this thesis, evaluating two recent examples of water efficiency initiatives in terms of their capacity to engage with the collective context of demand. The case studies are selected on the basis that they operate in a single Water Resource Zone and share the objective of reducing demand on the river Kennet, a delicate chalk stream ecosystem (full details of this are provided in Chapter 3). Aside from these similarities, each case study takes a distinctly different approach to managing demand and the consequences of these activities, and the extent to which they surpass conventional water efficiency interventions (see review in Chapter 2 for details and critique of conventional activities) in terms of engaging with the shared and collective nature of everyday demand, is as yet unknown.

Chapter 4: A critical evaluation of Save Water Swindon, investigates the first 'whole-town' water efficiency initiative in England and Wales, established as a large-scale initiative and a testbed for ongoing development of water efficiency activities. The evaluation seeks to understand the collective context of domestic demand in the Swindon, the extent to which the large-scale activities of *Save Water Swindon* gain access to these in order to develop less intensive patterns of domestic demand, and identify opportunities for future development.

Chapter 5: A critical evaluation of Care for the Kennet, examines a community-led initiative that uses personal one-to-one communication and hands-on learning in an effort to redevelop connections between local water sources and domestic water use. In this case the evaluation explores how water participates in the collective context of demand, and what can be learned from this case study to develop both conceptual and practical understandings of demand and intervention.

Thus Chapters 4 and 5 provide two original empirical case studies of recent developments in water efficiency, allowing the intricacies of these cases to guide their evaluation. The findings demonstrate that while advances are made, each case study is

limited with regards to reconfiguring the collective elements that shape patterns of domestic water use and consequently risk reaffirming unsustainable practices. Thus ***Chapter 6: An enquiry into the practices of managing demand*** responds to the second objective of this thesis; investigating how demand management activities are shaped, sustained and suppressed by the routine practices of water management. Positioning demand management as a set of professional practices, mixed methods are used to identify the elements that sustain conventional demand management activities and suppress experimentation. This provides a unique empirical case study of water efficiency as a professional practice and contributes to a discussion regarding how social practice theories might extend beyond a discussion of domestic practices to conceptualise the processes of governing social change.

Building on these case studies, Chapters 7 and 8 respond to the third objective of this thesis. While there has been much critical discussion (e.g. Southerton *et al.*, 2008, Sofoulis, 2011a, Shove *et al.*, 2012a) and a growing number of conceptual reframing's of demand management (e.g. Strengers, 2012, Shove, 2014, Browne, 2015, Geels *et al.*, 2015), to date there is limited practical suggestion as to what alternative demand management activities might look like (Shove *et al.*, 2012a), and few real-life examples from which inspiration might be drawn. Davies *et al.* argue that critical enquiry must contain both "explanatory-diagnostic and anticipatory-utopian dimensions" (2012, p. 54), particularly where research relates to socio-environmental challenges as dominant trends are part of the problem (Dreborg, 1996). Therefore, these chapters seek to address the absence of practical examples, working closely with the CASE partner[1], Thames Water, and other industry stakeholders to develop both practical and conceptual understandings of what future demand management activities might look like.

Chapter 7: Reimagining water efficiency reports on the proceedings of two 'practice innovation workshops' held with demand managers to develop the empirical findings derived from Objectives 1 and 2. The methods for this are presented in Chapter 3 while Chapter 7 presents the six 'imagined initiatives' that resulted from these workshops and discusses them in the context of existing academic critique and findings that emerge from the previous chapters.

[1] This research is funded by the ESRC and Thames Water through a CASE (Collaborative) Studentship. The CASE studentship programme enables academics to apply for funding for doctoral projects in partnership with external organisations. Doctoral researchers then work alongside both academic supervisors and external partners throughout the course of their PhD.

Chapter 8: Reconceptualising water demand management develops the ideas from the workshops further, reflecting on what the findings throughout this thesis contribute to conceptual understanding of demand management, both to the critique of conventional approaches, and to our understandings of future options and possibilities. Three alternative approaches to demand management are described that offer complementary lines of enquiry in a multifaceted agenda designed to leverage the diversity and complexity of everyday practice to reduce domestic water demand.

Combined, these chapters aim not to be prescriptive, but to reflect on how management activity might respond to the findings presented in contemporary social science research within and beyond this thesis, and to fuel ongoing discussions in academic literature regarding how change to unsustainable practices might be achieved.

Finally, ***Chapter 9*** concludes the thesis, integrating the principal findings to summarise the implications of this study for the ongoing development of research, policy and management practice, and to identify further avenues for research.

2. Water efficiency in the UK: recent developments in policy, practice and theory

Chapter 1 outlines how climate change, socio-demographic change, and changing patterns of everyday consumption are creating complex new challenges for the water industry. In response, there has been a shift in water management in recent years from traditional supply-led planning towards activities designed to balance supply and demand. An integral part of this shift is the emergence of the demand management agenda; posed as a cost effective, 'no-regrets' complement to traditional supply-side activity (Bates *et al.*, 2008, Parker and Wilby, 2013). The terms supply-side and demand management describe complimentary yet parallel streams of management activity. Supply-side management refers to actions designed to meet demand (and, historically, to accelerate it) such as developing new resources and extending water supply and sewerage infrastructures. Demand management refers to activities that reduce the resource intensity of supply that may be further disaggregated into two streams: upstream management activities, which engage with the infrastructural requirements of supply (e.g. by reducing leakage and managing network connections), and downstream management activities, which seek to reduce end-use water demand in homes and businesses.

Demand management has been the subject of much critical discussion in recent years, within both academia and industry. In particular, there remain outstanding questions regarding the conceptual framing of demand and intervention, and the most appropriate site and scale of demand management activities. These are important questions for policy makers and practitioners who wish to reduce domestic demand, and for researchers interested in changing patterns of consumption. This chapter synthesises the insights gained from existing critical literature with a summary of recent developments in policy and practice to establish the foundations for the work undertaken in this thesis. The following sections summarise significant social, political and environmental milestones that provide the landscape to water companies' present demand management activities (Section 2.1); characterise existing best practice in water efficiency activities undertaken by water companies (Section 2.2); and synthesise the critical literature relevant to demand management (Section 2.3). In this latter section, emphasis is placed on socio-technical perspectives to understand demand as a collective and emergent phenomenon (Section 2.3.1); to characterise existing 'distributed' alternatives to conventional water efficiency measures (Section 2.3.2); and to distil the overarching principles that might

inform future activity (Section 2.3.3). Finally, the chapter concludes by identifying gaps within this literature and provides an overview of how this thesis will address them.

2.1. A brief history of demand management in the water sector

Over the last decade or so demand management has become a central feature of policy and planning in the water sector. Yet it remains embryonic, continually evolving against a changing social, political and environmental backdrop. Table 1 documents key landmarks in this evolution, listing events, policies and publications that have shaped demand management since privatisation of the water industry in 1989, when the floating of the water companies on the stock exchange formalised the creep of market mechanisms into the water sector (Guy and Marvin, 1995, Bakker, 2003, Kaika, 2003). The commentary alongside discusses the consequences of these landmarks for the framing of demand management.

For the present discussion, the principal consequence of privatisation was an epistemic reframing of water that had practical implications for water management (Guy and Marvin, 1995, Bakker, 2003, 2013, Walker, 2014a). For much of the twentieth century, water was managed under municipal control, cast as a public good and a privilege of citizenship in a successfully industrialised society (Sofoulis, 2005, Chappells & Medd, 2008). Graham and Marvin (2002) refer to this management paradigm as the 'modern infrastructural ideal', Bakker (2003) the 'state hydraulic model' and Walker (2014a) as 'supply-driven planning', terms that hint at the governance arrangements during this period and the consequences for the objectives and activities of water resource management. These managerial models rested on a discourse of natural abundance and societal need – although this discourse was not always matched with ecological or social realities (Taylor *et al.*, 2009, Rahiz and New, 2013). This framing justified the development of what Sofoulis describes as 'Big Water' (Sofoulis, 2005, Allon and Sofoulis, 2006), a universal supply of high quality, reliable water for modern cities driven by large-scale engineering projects. Big Water saw the rapid development of new resources and the expansion of a storage and distribution infrastructure to supply to people's homes and tacitly positioned consumers as the collective recipients of water services. Demand management was limited to efforts to predict future demand and develop supplies in order to provide for these predictions (Walker, 2013).

In contrast, towards the end of the twentieth century, the neoliberal ideologies of the global sustainable development movement, reframing water as a scarce natural resource (Bakker, 2003). Early research highlighted the potential vulnerability of water supplies in England and Wales to future population growth and climate change, sparking calls for a more socially, economically and environmentally informed approach to water management that was reinforced by a series of droughts in the early nineties (Marsh and Wilby, 2007). Guy and Marvin (1995) locate the origins of demand management in a series of reports published by conservation groups in the early 1990s that sought to reorientate water management. These documents placed emphasis on strategic asset development; prioritising the maintenance and upgrade of existing infrastructure, and challenging investment in new supplies where options to reduce demand were available (Bakker, 2003).

In 1996, the Department of Environment responded to this movement by calling for a twin-track approach whereby demand management activities would sit alongside supply-side activities to enhance efficiency of supply (Parker and Wilby, 2013). Emphasis was places on upstream demand management activities – those relating to supply infrastructure – particularly leakage (DoE, 1996). Leakage reduction targets, introduced in 1997 and refined in 2002, require water companies to demonstrate effort to reduce leakage where the potential benefits outweighed the financial cost with an aim to ensure a safe and reliable water

Table 1: Political and environmental landmarks

1989: Water Companies float on the stock exchange, the final stage of privatisation. Ofwat and The Drinking Water Inspectorate established as regulatory bodies.

Department of Environment commissioned a review of the potential impacts of climate change on water supply (Beran and Arnell, 1989)

1989-94: Conservation groups make case for demand management agenda citing the global sustainable development movement (e.g. RSPB (1994) and the Council for the Protection of Rural England (1989, 1991, 1993)).

1990-1992: First major drought since 1976 with widespread rainfall deficiencies resulting in exceptionally low groundwater levels. Summer 1992 saw groundwater reach the lowest level in at least 90 years).

1991: The water industry Act introduces an obligation for WCs to promote the efficient use of water to customers (effective as of 1996).

1992: The Department of Environment publishes 'Using Water Wisely'; a consultation to understand the "scope for reducing demand for water use as an alternative to major works to increase supply" (DoE, 1992b, p4).

1991-3: A rhetoric around 'using water wisely' develops in support of water efficiency activity (e.g. Parliamentary Office of Science and Technology (1993), Department of the Environment (1992), National Rivers Authority (1994), Ofwat (1991, 1992, 1993) and the National Consumer Council (1992).

1995/6: Widespread drought, Yorkshire particularly badly affected and WC blamed for mismanagement.

1996: The Department of Environment publishes an agenda for action, urging a twin-track approach.

1997: The Deputy Prime Minister presents a ten-point plan including mandatory leakage targets and vigorous promotion of water efficiency at the Water Summit.

2002: Leakage targets refined, introducing an obligatory Base Level and a Sustainable Economic Level of Leakage.

2005: Waterwise is established; an organisation funded by the water industry to support sustainable innovation.

2005/6: Major drought affects much of England and Wales but with extensive regional variation (Taylor *et al.*, 2009).

Beat the Drought, a co-ordinated campaign organised by 8 WCs and the EA, aims to shift public perception to support precautionary drought measures.

2008: *Future Water* establishes a vision for demand reductions in-line with 130l daily per capita consumption.

Ofwat introduces formal water efficiency targets for AMP5, the 2010-2014 planning period.

Waterwise establishes the *Evidence Base for Large-scale Water Efficiency*.

2009: WC Water Resource Management Plans finalised for AMP5 (2010-2035) and Business Plans submitted for review (PR09).

Ofwat determination and price review emphasises target based performance monitoring.

2010: Ofwat targets for water efficiency come into effect.

2011: Defra publishes *Water for Life*, an agenda setting document for the water industry.

The regulators publish the 'guiding principles' for water management, to inform the WC Water Resource Management Plans for AMP6.

service for consumers with minimal environmental impact.

Running parallel to this reorientation of management activities was an emerging rhetoric around 'using water wisely' (Guy and Marvin, 1995), highlighting the potential for individual action in the household to contribute to sustainable resource management, a notable departure from notions of water users as the passive collective recipients of water services in Big Water. A review of demand management activities entitled *Using Water Wisely* by the Department for the Environment encouraged water companies to provide readily available, authoritative and comprehensive guidance to support consumers:

> *"In order for ordinary citizens to make the maximum contribution to greater efficiency, not only in droughts but all year round, they need to have authoritative and comprehensive guidance readily available about preventing waste, and what are the most efficient ways of using water, and the relative costs"*
>
> (DOE, 1992, p. 7; in Walker, 2012, p. 48).

Also embedded in this report were recommendations regarding the provision of basic information regarding efficient water use and ways of preventing waste, accompanied by the potential benefits of action/costs of inaction. In 1991, changes to the Water Industry Act made it an obligation for water companies to "promote the efficient use of water to their customers" (Section 93A) as the principal beneficiaries in a privatised system of the financial costs avoided by reducing demand. A noticeable transition in the years that followed saw increasing emphasis on downstream demand management to

reduce end-use water demand in homes and businesses.

In 2008, Defra's *Future Water* sought to establish downstream demand management as an integral part of water resource management, introducing an aspirational target to reduce per capita consumption to 130 litres per day by 2030 (against a 2006 baseline of 150 litres per capita day). Priorities included establishing voluntary conservation agreements with commercial users, enhancing water efficiency in new housing developments and retrofitting existing housing stock, as well as behaviour change. These proposals set out a clear role for water users in demand management, and following *Future Water* downstream water efficiency measures became an industry priority alongside leakage reduction and other upstream demand management.

2011/12: Major drought, extending over 24 months in which England and Wales received less than 85% average rainfall, particularly concentrated in localised areas of the Southeast.

2012: The Collaborative Fund established to fund joint research to improve the industry's knowledge of the impact of water efficiency interventions.

2013/14: WRMPs finalised for AMP6 (2015-2020). The EA report a 50/50 split between proposed supply side and demand side measures on water; compared to a 90/10 split five years before (covering the PR09/AMP5 period).

2014: Water Act revised to place emphasis on resilience and increasing competition in the water industry.

WC Business Plans submitted for review (PR14).

Ofwat determination emphasises outcome-based monitoring and incentive/ penalty system. Price limits reduce average bills while anticipating increased service, reduced leakage, and reduced abstraction. No specific industry guidance for water efficiency and targets now

In 2011, *Water for Life* (Defra, 2011) extended the vision presented in *Future Water* to inform the regulatory guidance provided for the water companies' 2015-2040 Water Resource Management Plans (Environment Agency *et al.*, 2012a, 2012b), documents produced every five years that set out how water companies will manage water resources for the following 25 years. This document introduced a political imperative to find ways of involving "everyone" in water management to serve the dual purpose of ensuring supply security while maintaining an affordable service:

> *"Water is a necessity and must remain affordable to all. At the same time everyone has a role to play in using water more efficiency. This White Paper […] explains how we can all use water more efficiently and protect ourselves from higher water bills"*
>
> (Defra, 2011, p. 8)

This is a marked departure from the Big Water model. Rather than the passive recipients of water services, water users are explicitly positioned as customers with responsibility for water efficiency. This responsibility is framed not only in terms of managing environmental impact, but also for maintaining the affordability of water supply. These traits are classic features of a neoliberal sustainable consumption agenda, that emphasises the choices and agency of consumers, and seek to govern change through state-society relations with the water companies acting as conduits for this governance (Jones *et al.*, 2011, 2013, 2014). These sentiments extend into upstream demand management with *Water for Life* directly challenging the traditional positioning of water companies as the sole actor responsible for leakage reduction:

> *"We often think water should be the responsibility of water companies and point to water lost through their leaking pipes. But in 2009-10, almost a quarter of water lost through leakage was lost in the pipes householders are responsible for."*
>
> (Defra, 2011, p. 82)

In a privatised system the costs of managing water supply and sewerage systems are ultimately borne by consumers. While Ofwat uses a price cap system that limits how much water companies are allowed to charge for water services, *Water for Life* accentuates the responsibility of consumers in managing their personal demand in order to participate in managing the costs of water supply.

Yet alongside this devolution of responsibility, rhetoric emerges around upscaling that emphasises that responsibility for water management remains collective:

> *"As a country we need to decide how to balance our need for water with protection of the environment, and reach a collective judgement on the resources and standards of supply we want – and are prepared to pay for – in the future."*
>
> (Defra, 2011, p. 79)

To complement this there is a focus on devising co-ordinated management agendas and centralised systems for monitoring and evaluation between the water companies. The 2010-14 planning period (PR09/AMP5) saw the introduction of the first systematic framework for monitoring water efficiency across the industry (Ofwat, 2008), two-tier[2]

[2]The water efficiency targets incorporated a 'Base service water efficiency' (BSWE); requiring companies to demonstrate the efforts to reduce household water use by one litre per property day and 'sustainable

targets base on those used to incentivise leakage reduction, incorporating standardised volumetric targets and guidance for their achievement. In order to achieve these targets Ofwat stipulated a range of activities expected of water companies. Base Level activity required water companies to develop and disseminate water efficiency devices, provide information on "wise water use" to consumers, and to contribute toward the *Evidence Base*; a centrally co-ordinated resource designed to collate best practice and develop the business case for water efficiency activities (Ofwat, 2008). Recommendations for activities extending beyond the Base Level were less clearly defined, but included reference to metering programmes, along with "innovative water efficiency activities" where these meet the sustainable and economic criteria for appraisal.

The targets encouraged co-ordinated activity across all Water Company regions, and challenged water companies to work together to establish an evidence base to support large-scale activity, and were accompanied by the *Collaborative Fund*, to which water companies would contribute to support joint research to address knowledge gaps and develop innovative management activities. This fund was designed to enhance procedural efficiency and reduce the cost of research and development:

> *"The central co-ordination of pilots and trials will avoid any unnecessary duplication of effort as this will not add value to the national evidence base."*
>
> (Consumer Council for Water, 2008, p. 5)

In 2016, the evidence base and *Collaborative Fund* remain in place, despite the water efficiency targets lapsing in 2014. The targets were a widely celebrated gesture of government support for water efficiency, creating a space and establishing impetus for water efficiency where previously there was none. Despite this many welcomed their removal following concerns that the targets were too prescriptive and not sufficiently far-reaching. For example, across the industry the 1l/property/day amounts to only 23.3 Ml/d, or approximately 0.34% of total water supplied to households (WWF, 2009), thus making only a small contribution to the vision set out in *Future Water* that aims to reduce per capita consumption by 20 litres per day (approximately 15% reduction on

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economic levels of water efficiency' (SELWE), an unquantified target requiring water companies to demonstrate efforts to exceed BSWE in order to balance supply and demand. BSWE consisted of a mega litre (Ml) per day target based on an annual target of one litre of water per property serviced per day for all companies reporting per capita consumption (PCC) greater than 130 litres per day, in line with the vision presented in *Future Water* (Defra, 2008). For example, Thames Water reported serving 3.45 million billed properties in 2008, resulting in a BSWE target of 3.45 Ml/day. Ofwat states that this establishes a minimum level that companies are expected to already be achieving, and should aim to exceed over the 5 year period (Ofwat, 2008).

demand). The overview provided in this section is not exhaustive, but illustrative of how the framing of demand management activity, and water efficiency as a subset of these activities, has evolved in the decades following privatisation. The following section explores existing water efficiency activities undertaken by the water companies to understand how the framings presented in the paragraphs above manifest in water efficiency activities.

2.2. Water Company water efficiency activities 2010 - 2015

The term water efficiency refers to a subset of demand management activities designed to reduce water use in homes and businesses. This thesis focuses on the activities undertaken to reduce domestic demand in the Thames Water region, where domestic demand accounts for approximately 73% of water use (i.e. excluding leakage and minor components)(Thames Water, 2015c), and therefore is a priority for demand management. Current water efficiency activities led by water companies consist of a relatively uniform package of interventions. These can be grouped into three main categories; providing information to consumers, retrofitting homes, and educating children as future consumers. Table 2 provides a summary of common water efficiency activities at the time this research was undertaken (based on interview data and documentary evidence) compared to that reported by Waterwise in its 2010 review of the industry.

Table 2: Water efficiency initiatives: a comparison between 2010 and 2015

	Water efficiency in 2010 (Adapted from Waterwise (2010))	**Progress in 2015 (from fieldwork)**
Informing consumers	All company websites have sections offering tips and facts on water efficiency. There are often leaflets to download and sometimes self-audits.	Most companies offer self-auditing tools (e.g. water efficiency calculators) and 'tips' on water saving are provided on websites, social media and in print.
Retrofitting homes	All companies offer free cistern displacement devices for customer-installation. Many offer other products through partnership websites.	All companies offer a range of products online and in printed materials. Most are moving away from self-install towards 'home-makeovers'.
Educating children	Most companies offer information and presentations in schools, some have education centres where local schools receive hands-on experience of water management.	Several companies are involved in 'edutainment' activities and most offer school retrofitting enrolling pupils as monitors to learn about demand management.

Firstly, as described in Section 2.1, policy and planning guidance requires water companies to provide their customers with information about water saving opportunities.

In 2010, Waterwise reported that most companies offered information in printed materials (e.g. on bills and leaflets) and most had dedicated webpages offering tips on water saving. This activity rapidly increased since 2010, and by 2015 many water companies had introduced interactive tools on their websites, several using the Energy Saving Trust's water calculator while others developed their own tools to allow consumers to find out how much water (and energy) they use at home (Thames Water, 2015d). Several water companies also offer other interactive tools such as Thames Water's '*Waterwisely: the water saving community'* an interactive too designed to allow consumers to explore water at a community level (Thames Water, 2014b). Such tools are accompanied by information on how to reduce water use in the home (United Utilities, 2013, Essex and Suffolk Water, 2015, Thames Water, 2015e, Wessex Water, 2015) with an increasing focus on social media, particularly for 'tips' which fit the limited character formats of social media sites (see Figure 3).

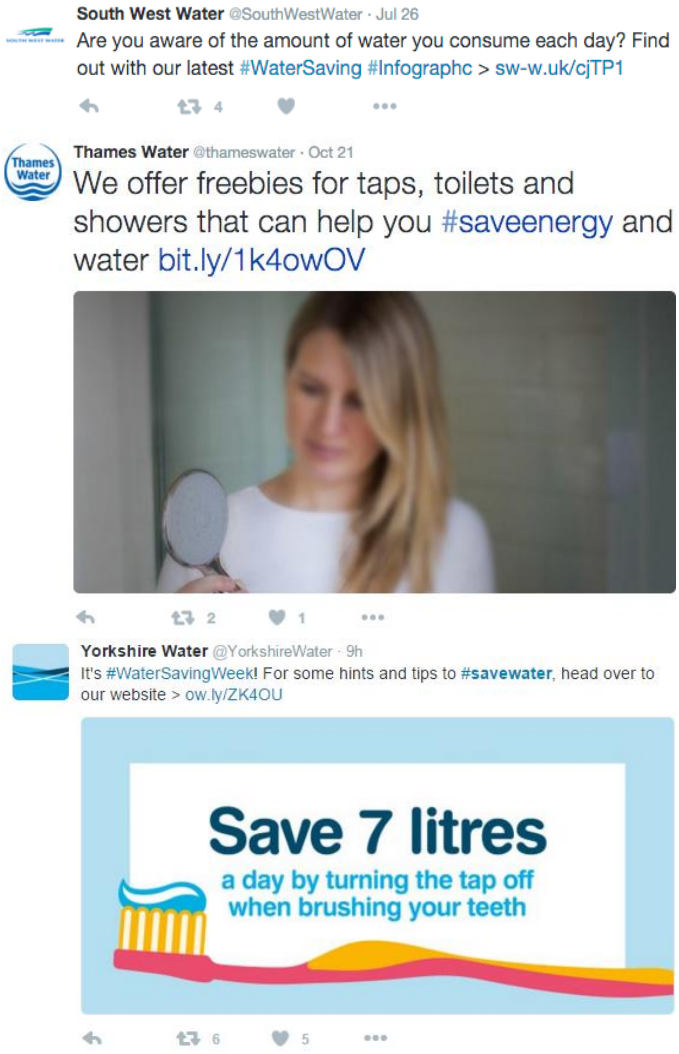

Figure 3: Twitter tips
(Source: Twitter - Selected examples Oct 2015-March 2016)

Secondly, most companies are involved in disseminating water efficient devices and home-retrofits. In 2010, much of this activity focused on disseminating products such as cistern displacement devices and water butts to their customers, particularly through online and print materials but also at roadshows and other events. For example, in 2009 Veolia Water sent 250 customers water-efficient packs offering free water efficiency devices while Severn Trent Water offered discounted water butts to its customers, selling over 24,000 between 2005 and 2010 through a partner website (Waterwise, 2010a). This

activity continued in 2015, with most companies hosting dedicated webpages that enabled customers to order ‘water saving kits’ (Waterwise, 2015a). There was also a more extensive range of devices available including water efficient showerheads and tap regulators; garden gadgets including trigger fittings for garden hoses and water-storing polymer beads; and water butts and water free cleaners (at a cost). However, following concerns that devices remained uninstalled, and therefore offered no reduction in water demand, by 2015 most water companies had shifted focus to home makeovers, where a range of devices could be fitted, on request, by a partner organisation.

Thirdly, most companies work with partners to deliver projects aimed at children. In 2010, most water companies provided educational material to schools while some established interactive education centres for school visits. For example, Sutton and East Surrey Water have an education centre at Bough Beech Treatment Works and Reservoir that allows children to learn about how water is treated and pumped. In 2015, most water companies prioritised the delivery of projects in schools through partner organisations in assemblies, classroom projects and targeted events. Common activities include retrofitting in schools where pupils are enrolled as monitors and auditors to receive practical, hands-on experience of water management at a property level. In addition, a number of companies are involved in ‘edutainment’ activities; initiatives that aim to incorporate water efficiency education in children’s entertainment. For example, Essex and Suffolk Water support *Little Green Riding Hood*, a play delivered by a partner organisation in the classroom, United Utilities and Southern Water endorse *GabiH2O* a cartoon that provides 60- and 30-second educational advertorials, and Thames Water developed *Splash Trumps*, a water-themed card game. These activities are used as a vehicle to reach parents and homeowners to deliver the information and encourage uptake of water efficient products.

Finally, initiatives functioning on a larger than individual household scale are becoming increasingly common, in an effort to optimise the efficacy of consumer-facing demand management activities. Popular recent experiments include the ‘whole-town approaches’ developed in *Save Water Swindon* and *H2Eco*, the former being a case study in this thesis, the latter a similar initiative carried out by Essex and Suffolk Water. Others include efforts to involve communities in specific areas or issues such as *Care for the Kennet* (another case study in this thesis), which focuses on reducing abstraction in villages around the river Kennet; ethnic groups such as the Fit to Drink campaign that worked with the Muslim Women’s collective to tailor water efficiency programmes

towards the Muslim community; or socio-economic groups such as projects working with Housing Associations. These are recent developments within the water industry that are designed to increase the quality of consumer engagement and enhance the water demand reductions from interventions. They are, however, relatively under-researched and thus are the focus of discussion throughout this thesis.

This brief review demonstrates the progress that has been made in water efficiency over the last five years. However, it also reveals a tendency to accelerate fundamentally similar activities, rather than the radical reinvention of water efficiency. This is echoed in industry commentary. For example, Waterwise, an influential organisation that provides water efficiency expertise in the water industry, identified that, in spite of the increasing quality and availability of information, water efficient products and education programmes, there is little evidence of a collective and societal shift towards lower levels of demand:

> *"The past ten years have seen dramatic progress in water efficiency, with large-scale retrofits taking place across the country, greater public understanding of the issues, a massive range of water efficient products and an up-skilling of the sector. However, we have not yet achieved a water saving culture among the general public. […] water companies have ambitious plans for water efficiency within the next AMP cycle, but this will require a step change in activity. "*
>
> (Waterwise, 2015c)

Waterwise's observations resonate with the critique developing in academic literature. For example, Browne *et al.* (2014) observe:

> *"Water efficiency programs [...] focused as they are on the simple provision of technologies and communication about ways to change behaviour, tinker at the corners of what is actually a diffuse and complicated system of demand."*
>
> (Browne *et al*., 2014; p. 75)

This observation aligns with a growing body of research that challenges the simplistic behavioural models that underpin existing management activities and their limited recognition of the complexity of social life (Shove, 2010). Consequently, the resulting techno-economic interventions fall short of delivering the desired outcomes (Chappells and Medd, 2008, Macrorie *et al.*, 2014) and result in what Marres describes as 'the change of no change' (2011, p. 517) as they reaffirm unsustainable ways of living.

Gatersleben *et al.* remark that unless the broader context of individual behaviour is reconfigured, "any change towards pro-environmental behaviour will be piecemeal, slow and disjointed" (2012, p. 376) carrying with it the risk of rebound effects that undermine long-term efficiency gains. Thus, recent research proposes to position demand as the emergent outcome of everyday routines, redirecting managerial attention to the shared and collective elements that sustain current patterns of everyday water use.

2.3. Theoretical developments: Reconceptualising demand

This thesis draws on literature from a range of disciplines to explore the 'diffuse and complicated system of demand' Browne *et al.* (2014) describe. The aim is to contribute to a conceptual understanding of the collective context from which demand emerges and to understand how this might be used to identify alternative avenues for intervention. In particular the empirical research explores how the elements and processes that exceed individual agency contribute to reproducing and reinforcing existing water-intensive patterns of domestic demand. Thus demand is understood to be a co-evolutionary outcome of systems of everyday practice and provisioning, in which the ecologies of everyday life, and a plethora of professional practices (including, but not limited to, demand management) have implications for steering change in domestic water use (Shove *et al.*, 2012a, Spurling *et al.*, 2013).

Primarily, this research speaks to the academic community interested in demand, within which researchers working with theories of social practice have carved out a substantial niche (Welch and Warde, 2014). These researchers emphasise the social and material contingencies of demand and criticise conventional management activities for failing to adequately engage with these in favour of individualistic, psycho-economic approaches to behaviour (Hobson, 2002, Shove, 2010, Browne *et al.*, 2012). While diverse in their application, centring variously on topics such as energy (Strengers, 2008, Gram-Hanssen, 2011, Shove, 2014, Walker, 2014b), fuel poverty (Day and Hitchings, 2011, Day and Walker, 2013), transport (Watson, 2012, Bache *et al.*, 2015), water (Chappells and Medd, 2008, Browne, 2015, Yates and Evans, 2016), and food (Southerton *et al.*, 2012, Welch and Warde, 2014) among others, theories of social practice share common ground that provides foundations for the empirical research in this thesis, as will be returned to momentarily, and to which the case studies in this research contribute conceptual insights.

This research also resonates with certain strands of geography that give voice to other relational elements that are significant to everyday resource use and resource management. These literatures retain distance from individuals but have developed with an eye on the intersections between natural, social and political processes and the implications for social life rather than on topics of demand and sustainable consumption. For example, Sofoulis (2011a, 2011b, 2014) examines the politics and practices surrounding systems of water provision, and how these contribute to the socio-materiality of supply-demand systems. Kaika, Swyngedouw and co-authors (Kaika, 2004, 2005, Swyngedouw, 2004, 2009b, Heynen *et al.*, 2006) focus on the intersections between water management and broader political-ecological systems, revealing water as a socio-natural fluid through which nature and society are inseparably entangled. In a similar vein, Bell (2011, 2013, 2015) investigates the inter-relationship between material infrastructures of supply and systems of water use; and Ferguson and colleagues (Ferguson *et al.*, 2013, De Haan *et al.*, 2014) analyse how specific hydro-social relations are embedded and enabled in the fabric of cities. Finally, inspiration is taken from post-humanism to examine the ways in which water contributes to the practices of water use and water management as a lively co-contributor to socio-material systems (Bakker and Bridge, 2006, Swyngedouw, 2009a, Bakker, 2012a, Barnes and Alatout, 2012, Whatmore, 2013). These angles differ from social practice theories, and while retaining a focus on the relationships between the social and natural world in the Global North, demand has rarely been the principal topic of concern in these literatures. Thus, it is anticipated the intersections between these diverse literatures may provide fruitful grounds for the development of theory and promising avenues for designing intervention in domestic demand.

2.3.1. Inconspicuous, collective, emergent and distributed: contemporary reconceptualisations of domestic demand

In 2001, Shove and Warde described how, despite significant progress in understanding changing patterns of goods and services, inconspicuous consumption remained "a realm ignored by studies of consumer culture" (Shove and Warde, 2002, p. 241). Consequently, the social sciences lacked the conceptual resources to contribute to the blossoming demand management agenda in the utilities sector described in Section 2.1. This gap has since been the subject of significant research, resulting in the rapid development of concepts and methods to understand the processes that shape and sustain routine activity.

At the centre of such research are the ordinary, unspectacular dimensions of daily life like heating, lighting and laundry that have consequences for domestic resource use (Allon and Sofoulis, 2006). The greatest contributions in this regard have emerged from theories of social practice, where the focus on inconspicuous consumption supports the reattribution of agency for social change, shifting from individualistic behaviour models towards social practices as a means of conceptualising demand (Reckwitz, 2002, Walker, 2014b, Welch and Warde, 2014, Browne, 2015).

Gram-Hanssen defines practices as "collection[s] of sayings and doings performed by individuals but formed and sustained by collectively shared elements" (2011, p. 75). In some cases researchers further distinguish between 'practices-as-entities'; the 'block' of relational elements that collectively structure action (Reckwitz, 2002) and 'practices-as-performances'; "the moment of doing in which the elements are integrated by people in specific situations" (Kuijer and Bakker, 2015, p. 227). While some have argued that social practice theories provide an additional theoretical resource to inform demand management (Wilson and Chatterton, 2011, Hargreaves *et al.*, 2013), others argue that the 'turn to practice' represents a fundamental shift in how action, stability and change are accounted for, that make its compatibility with behavioural theories uneasy (Schatzki *et al.*, 2001, Welch and Warde, 2014, Strengers and Maller, 2015a). Firstly, agency is distributed throughout the 'block of relational elements' that structure action; rather than located in the deliberative processes of individual or macro-social processes (Schatzki, 2001, 2011, Reckwitz, 2002, Shove and Pantzar, 2005, Spaargaren, 2011). Secondly, demand is reframed as the performative outcome of everyday routine in which these collective elements are reassembled, rather than the product of actionable knowledge (Watson and Shove, 2008). Consequently, every practice performance, however mundane, is charged with potential to alter the trajectory of consumption, an act of reproduction, reconfiguration or defection that contributes to the ongoing evolution of practices-as-entities (Shove and Pantzar, 2005, Hargreaves, 2011).

In this way, current levels of demand may be understood as the outcome of repetitious (re-)assembling of collectively shared elements during everyday activity. There is no singular definition of Gram-Hanssen's collectively shared elements, however this is a notable departure from notions of collective embedded in water management, referring to neither the public as collective recipients of water services as in Big Water, nor the devolved yet universal responsibilities of consumer-customers post-privatisation (Spaargaren and Oosterveer, 2010, Barr *et al.*, 2011). Instead, practice theories disperse

the notion of collective to a range of objects and phenomena that structure everyday action. Reckwitz's work identifies "forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge" (2002, p. 249). More recently, Shove (2012) has popularised a straightforward schema consisting of *meanings*, tacit understandings that guide everyday activity; *competences*, practical knowhow about to go about everyday activity; and *materials* including objects, technologies and infrastructures that enable everyday activity. These definitions lead to a different understanding of the collective nature of demand that rests on a notion of distributed agency (Browne *et al.*, 2014). While many of these collective elements are located in individuals and households, they intersect with broader social and material systems that shape and sustain existing patterns of unsustainable demand.

In research relating to water, inconspicuous consumption has been used as a means of conceptualising demand for a resource "so normal it retreats into the background of awareness" (Sofoulis, 2005, p. 448). These studies identify a range of collective elements that shape and sustain existing patterns of unsustainable water use. For example, Jack demonstrates how conventions, "shared, accepted ways of doing things" (2013a, p. 4) support specific modes and patterns of clothes washing. Likewise, Chappells *et al.* (2008, 2008, 2011) describe the evolution of garden spaces with social compulsions to provide functional spaces along with tacit understandings of the supplier-user relationships that shape watering dynamics (see also van Vliet *et al.* (2005)). From a longitudinal perspective, Hand *et al.* (2005) explore how the changing social meanings that revolve around bathing (for example, from rejuvenation to hygiene to comfort) co-evolve with changes in the technologies and infrastructures of water supply. This resonates with historical accounts that identify today's near universal supply of standardised high quality, hot-when-required, on-demand water as an evolutionary outcome of systems of water provisions (Trentmann and Taylor, 2005, Taylor and Trentmann, 2008, 2011). In a similar vein, Kuijer's (2014) experiments with bathroom design illustrate how water use is embedded in the material configuration of homes and technologies (see also Allon and Sofoulis (2006) and Yates and Evans (2016)).

Individual experience, exposure and interaction with these various collective elements vary and consequently so do practice performances. Research demonstrates how individual practices vary within and between households (Sofoulis, 2011a, Pullinger *et al.*, 2013) and throughout the life course (e.g. in relation to pregnancy and menopause)

(Hards, 2011, Pullinger *et al.*, 2013, Bhakta *et al.*, 2014, Burningham *et al.*, 2014). However, this heterogeneity is finite (Fam *et al.*, 2015) as many elements are common across large swathes of the population (e.g. domestic technologies, infrastructures and systems of provision; the weather; and daily rhythms of life, labour and leisure) and such commonalities mean that the diversity of practice performance is limited. Using large-scale survey methods in an effort to paint a generalised picture of water use in southeast England, Pullinger *et al.* (2013) identify half a dozen clusters of bathing, laundry and gardening practices that typify everyday performance. Thus, social practice theories offer a powerful critique and potentially useful alternative to socio-economic segmentation models (Browne *et al.*, 2013), that are sensitive to diversity while pragmatic in the identification of the collective elements that sustain practice (Ang, 2011, Fam and Sofoulis, 2015, Sharp *et al.*, 2015).

The addition of material systems is a particularly significant feature in theories of social practice, although it is an inclusion shared with researchers from a number of other disciplines. For example, from a multi-level perspective, Geels and Schot (2007) illustrate how the collaborations between health professionals and engineers in the nineteenth century culminated in the sanitation reforms that led to the modern sewerage system (see also Halliday, 2001 and Bell, 2012). Similarly, using historical methods, Taylor and Trentmann (2011) unravel the 'liquid politics' of water supply that ideologically and physically altered the meaning of water and its role in sustaining modern life (see also Strang, 2004 for an ethnographic perspective). In urban geography, Kaika (2004) illustrates the role of state and corporate partners in extending domestic plumbing and associated appliances, altering the material configuration of homes (see also Castro *et al.*, 2003, Castro and Haller, 2009, Swyngedouw, 2009a). The combined contribution of these literatures is to highlight how technologies, infrastructures and other objects shape demand, and demonstrate the socio-political qualities of material systems. In doing so, they reveal the relationships between domestic demand and a plethora of professional and political practices that, whether intentionally or not, have consequences for domestic water use.

However, there are notable limits to the inclusion of materials in practice-base enquiry. The co-evolution of patterns of demand and demand management with technologies and infrastructures of provisioning is well researched. Less commonly considered are the influences of so-called 'more-than-human' elements such as weather, landscape, flora and fauna (Whatmore, 2006). The connections between social worlds and more-than-

human materialities run deep, with humans having extensive effects on the natural world (Castree, 2001, Castree *et al.*, 2004). Simultaneously, "more-than-humans" retain the capacity to influence human life with potential to effect and unsettle both domestic practices and those of resource management (Bakker and Bridge, 2006, Whatmore, 2006). This is demonstrated in post-humanist research, for example Woelfe-Erskine (2015a, 2015b) explores how living with salmon, springs and rainwater tanks produces new understandings and a broadened sense of interdependence that affects everyday practices of water use. Hinchliffe (2003) describes how encounters with nonhumans in the city enhance convivial relations and Whatmore (2013) how 'natural' disturbances such as floods expose the assumptions of policy and planning. There is a small body of literature emerging within social practice theories that speaks to these themes, for example Hitchings (2011a, 2011b) investigates how individual experiences of weather and seasonality entwine with notions of comfort, Maller and Strengers (2013) how weather memories aid the mobility of practices as people migrate, and de Vet (2014) how changing climates affect the evolution of everyday practices. However, how our embodied experiences of more-than-humans shape demand and create potential avenues for demand management has yet to be thoroughly investigated.

The approach offered by these literatures enables a view of how pathways for future action are structured by collective elements that inhibit top-down control, or individual deliberative action. However, elements are useful only as long as they are used, and therefore may be seen to co-evolve with everyday action:

> *"Each time we switch on a light bulb we are connected to an invisible hinterland of expertise, wiring, utility investment and power generation. The act of flicking the switch is, in an important sense, part of this complex system. It is so because consumers and users are actively involved in reproducing and sustaining collective socio-material and related expert systems, Networks require re-currant use in order to survive."*
>
> (Van Vliet *et al.*, 2005, p. 20)

In this example van Vliet *et al.* (2005) make explicit the manner in which routine behaviour (such as flicking a switch) connects individual practices to 'systems of practice' that are spatially and temporally distributed (Macrorie *et al.*, 2014) that not only effect domestic practice but are affected by it (Shove *et al.*, 2012a). The extract demonstrates how the act of flicking a switch reaffirms existing systems of provision and embedded practices of design, manufacture and management. Similarly, Watson (2012)

describes how transport systems are sustained not only through material technologies and infrastructures (e.g. cars, road networks and carparks), but the competences and modes of bodily conduct that specific modes of transport provoke and require. Likewise, showering, laundering etc. not only allow access to desired standards of comfort, cleanliness and convenience but serve to perpetuate them (Shove, 2003).

Such observations provide a critical reflection on intervention, repositioning management as not prompting change, but guiding the ongoing evolution of practice (Schatzki *et al.*, 2001, Welch and Warde, 2014). There is a gap in the literature regarding the specific forms that management activity might take as the stylised reframing of demand management in the literature are compromised by the messy realities of everyday life (Geels *et al.*, 2015). However, this review identifies two recent papers, by Browne *et al.* (2014) and Makropoulos and Butler (2010), that develop 'distributed' approaches to water resource management. The two approaches differ, the former focused on demand and based in social theory, the latter on supply systems and based in engineering, yet both offer heightened sensitivity to the collective and emergent properties of water demand. The approaches in each paper are discussed briefly in the next section as it is proposed that the intersections between these papers enable a number of principles to be identified that may guide the further development of concepts and practices.

2.3.2. Distributed solutions for collective conundrums

In both papers the term 'distributed' is used to describe activities that are neither individualistic nor centralised. In the first, Browne *et al.* propose the concept of 'distributed demand' as a means of identifying alternative, 'distributed', forms of intervention:

> *"Understanding demand as a socio-technical-natural assemblage means understanding its creation, maintenance and transition as distributed across space and time."*
>
> (Browne *et al.*, 2014, p. 75)

Interpreting demand in this way does two things that are of significance for how intervention is understood. Firstly, by recognising demand as an assemblage it suggests it is a) made up of many things and b) a precarious achievement (Day and Walker, 2013, Shove *et al.*, 2015), and thus positions demand management as shaping this assemblage by engaging with the elements involved in its achievement. This position redirects

intervention toward the technologies of demand; the (often unplumbed) social and material components that shape and sustain specific forms of resource use in the home. As opposed to technologies of supply such as showerheads and toilets, demand management is reoriented towards aspects such as clothing, home design, hair and gardens. In turn, this reorientation connects domestic water use to other practices of leisure and work that intersect with people and places beyond the home, but also to the practices of other actors that possess the capacity to guide and influence the collective contingencies of demand, such as retailers, manufacturers, and employers (Shove, 2014).

Specific examples used to illustrate what 'distributed demand' management might look like are limited, however the authors draw inspiration for such intervention from two commonly cited cases; 'Splash' and 'Cool Biz'. Splash, a participatory design experiment orchestrated by Kuijer (2014) explores the co-evolution of water use with bathroom design, and how these contribute to the evolution of water services such as cleanliness, relaxation and freshness. This research illustrated how experimenting with different bathroom technologies (a splash wash) led water users to find alternative ways of fulfilling, if not exceeding, the services provided by showers without the associated water use. In this instance, the notion of distributed demand supports the proposition that engaging a range of intermediaries – "such as designers, product manufacturers, and lifestyle product retailers" (Browne *et al*., 2014, p. 80) – may identify design opportunities to achieve greater reductions in domestic demand.

This potential is demonstrated in the second example, Cool Biz, a Japanese initiative designed to reduce energy for space heating by restyling workplace dress codes (Southerton *et al.*, 2011). Collaboration between government agencies, employers and the fashion industry stimulated innovation in fabrics and fashion to develop work attire better attuned to seasonal temperature variations. For example, the 'Su-Su-Suit' made of a merino wool composite, delivers a cooling effect of 4^{o}C (Fibre2Fashion, 2007) and challenges social standards that enforce formal workplace dress codes. By 2010 Cool Biz was estimated to have saved over 2 million tonnes CO_2 from air-conditioning in offices (Mckean, 2014). A decade on, commentary suggests Cool Biz has extended as far as to influence conventions and normative dress codes (Mohajer-va-pesaran, 2014), demonstrating the capacity of professions distant from the demand management agenda to effect change in energy use. Consequently, Browne *et al.'s* (2014) 'distributed demand' expands the options and possibilities for demand management.

The second paper focuses on 'distributed infrastructures', a concept developed by Makropoulos and Butler (2010) to refer to supply infrastructures and technologies that are neither centralised, nor individualistic. Their analysis identifies an extensive range of possible configurations of supply-demand systems, yet highlights that currently only a small number of these options are deployed in the UK. Makropoulos and Butler (2010) propose that alternative supply configurations may yield potential benefits for water productivity; defined as the value of goods and services produced per unit of water used (Grant *et al.*, 2012). In particular, options to enable substitution and regeneration measures could be designed into homes and communities at a range of scales, reducing demand for mains water with co-benefits for energy and emissions reduction, ecosystems services, and flood risk management.

Existing examples of distributed infrastructures range in scale. At one end of the spectrum, small-scale technologies such as air-displacement toilets, which use air to replace the majority of water used for toilet flushing, enhance water productivity in single technologies, rooms or homes. On a larger scale, the authors cite Hong Kong's dual water system which supplies seawater for non-potable functions, reducing municipal water demand by 20% (Leung *et al.*, 2012), and suppliers in southern California using treated waste water to avoid the inefficiencies of inter-basin transfers (Stokes *et al.*, 2013), demonstrating the capacity for towns and cities to be provided for by decentralised systems. These technologies may also be used at intermediate scales to make use of context-specific supply-demand characteristics. For example Hong Kong International Airport uses a triple water system (freshwater, seawater, and treated greywater) at a business level to reduce municipal water demand by 50% (Chen *et al.*, 2012); and Hockerton Housing project has developed a three-tier substitution and regeneration system to service a small-scale residential community (Southerton *et al.*, 2008).

The 'distributed infrastructures' model endorses systems of provision that are appropriate to the local supply-demand characteristics in which they are situated, incorporating factors such as hydrology, population density and local social-economic profile (i.e. the specific blend of domestic / agriculture / industrial water use) into their design (Makropoulos and Butler, 2010, Grant *et al.*, 2012). Existing water industry activities are insensitive to such diversity, entrenched in an infrastructural and institutional legacy designed to provide a universal supply of standardised water to homes and businesses. Working within these spatially specific characteristics, 'distributed infrastructures'

present solutions to balance supply and demand with regards to the specific characteristics of local areas; offering greater opportunity to reduce demand for mains water (which in itself is a water-intensive production process) (Dicks, 2014, Bell, 2015).

At first glance, these two 'distributed' approaches appear to sustain a division between supply and demand. However, discussing distributed demand and distributed infrastructures in parallel reveals synergies that set them apart from both upstream and downstream demand management activities as they are currently practiced in the water industry. Consequently, these synergies provide potentially fruitful grounds for future demand management activity, and a basis to inform the research undertaken in this thesis. Firstly, both approaches make the case for sensitive, context-aware management activity as offering greater potential for long-term sustainable water management. Secondly, both approaches suggest that to substantially alter emerging patterns of domestic water use there is a need to reconfigure the social, material and natural context of demand. Thirdly, both describe approaches that are outside the mainstream. Both offer case studies and examples in practice, but also describe approaches that are by and large untested and therefore contain considerable uncertainty, not only regarding whether the approaches described will work, but how they will work and therefore call for further experimentation. The following paragraphs discuss these core principles in more detail, outlining how they provide the basis for further research.

2.3.3. Principles for long-term sustainable water management

From 'Big Water' to 'water sensitive'

Both distributed approaches align with a broader discussion in the literature regarding the shift from universal solutions towards sensitive, context-aware management options. As described in Section 2.1, Big Water is the term used by Sofoulis (2005) to describe the centralised provision of universal water services that dominated water resource management in many developed nations for much of the twentieth century. While current modes of demand management increasingly incorporate devolved, consumer-centric activity (Bakker, 2005), the Big Water approach remains evident in supply development[3], and arguably continues to feature in upstream demand management activities. Furthermore, a tendency towards one-size-fits all approaches in consumer-focused management activity sustains a tendency to gloss over the heterogeneity of water use and

[3] For example, several recent large infrastructure projects have been commissioned including the Thames Tidal Tunnel and United Utilities' 'West Cumbria water supply project'.

context-specific characteristics of supply and demand (Fam and Sofoulis, 2015). Simultaneously, evidence of decentralised planning and design is as yet lacking, suggesting that the continuation of 'Big Water' is at the expense of alternative solutions (Bell, 2011).

In contrast, 'water sensitive' measures are defined as "adaptive, multi-functional infrastructure & urban design reinforcing water sensitive behaviours" (Brown *et al.*, 2009, p. 852). Water sensitive design principles share heritage with the 'soft path approach' developed by Lovin (1977) who proposed maximising resource productivity as opposed to developing new supplies, or relying on efficiency improvements (Brooks *et al.*, 2009, Brandes and Brooks, 2010). In their vision of a water sensitive city, Brown *et al.* describe how "technologies, infrastructure and urban form would be diverse and flexible, designed to reinforce sustainable practices and social capital, recognising the implicit link between society and technology" (2009, p. 854). Thus, water sensitive approaches are those that seek to effect change in water use via engagement with the socio-technical context of domestic water use.

Each of the distributed approaches outlined above depend on sensitive measures to maximise the impact of water management. 'Distributed infrastructure' makes the case for the development of technologies and systems that are tailored to work with specific local supply-demand characteristics (Makropoulos and Butler, 2010). The approach described takes into consideration the various potential sources of raw water, and also opportunities for regeneration and substitution, factoring in what water will be used for to assess the opportunities for alternative supplies. For example, coastal regions have greater capacity to integrate salt water into supply systems than rural areas where lower population densities render them better suited to small-scale rainwater harvesting or greywater recycling measures. Thus Makropoulos and Butler's (2010) approach is based on a fundamentally different hydro-social contract to Big Water, one that deprioritises universal supply in favour of a programme of options appropriate to the area for which they are designed.

Browne *et al.* (2014) provide a different outlook that also resonates with water sensitive design principles, highlighting how changes to the technologies of demand might facilitate reductions in the resource intensity of practices. The inclusion of technologies such as bathroom technologies and clothing extends the boundaries of intervention into the human dimensions of demand without perpetuating narrow understandings of

behaviour and demand (Shove, 2010, Wilson and Chatterton, 2011). Further, by recognising the variation in individual interactions with socio-technical systems, for example, as a result of different social and working lives or throughout one's life-course (Pullinger *et al.*, *2013*, Burningham *et al.*, 2014), distributed demand recognises the need for solutions tailored to engage with the routines in which everyday practices are embedded. Consequently, distributed demand adds a different element to the water sensitive cities literature that extends beyond built design and supply systems to identify possibilities for intervention that are sensitive to heterogeneity without being overwhelmed by complexity (Ang, 2011, Browne *et al.*, 2013, Fam and Sofoulis, 2015).

It is worth noting that the shift from Big Water to water sensitive does not directly relate to scale, but represents a call for critical consideration of the situated nature of water use, and to consider how diversifying the scale of water management poses opportunities to reduce demand. Each approach offers a different reflection on scale; Makropoulos and Butler (2010) highlight that despite extensive activity at the large (i.e. city) scale and at the household scale, limited attention has been devoted to understanding the opportunities presented at intermediate levels; "that of the small new development, community or neighbourhood" (up to 5,000 households) (2010, p. 2796). The authors focus on this gap to explore the socio-technical systems that might be implemented at the intermediate scale to offer water sensitive alternatives to centralised supply systems. In contrast Browne *et al.*, (2014) take a different approach highlighting the inter-scalar relations that shape domestic water use, identifying how elements and processes at different spatial and temporal scales influence domestic practice. The authors then look to understand how these elements might be substituted and processes unsettled to aid the emergence of alternative, water sensitive, practices. Fundamentally, both distributed management approaches present a call for management activity that is sensitive to, and situated in, the collective social, natural and technological context of water use.

From weak interventions to socio-material reconfiguration

The second principle these distributed water management models share is an endorsement of a shift from weak interventions – those that "tinker at the corners" of complex systems of demand (Browne *et al.* 2014, p. 75) – towards those that engage with the social and material configuration of domestic water use. Within the sustainable consumption literature there is much discussion regarding the extent that socio-technical systems must change in order to deliver the reductions in resource use necessary to manage socio-environmental challenges. At one end of the spectrum, the critical

literature uses the term ‘weak intervention’ to describe those based on an assumption that socio-environmental problems are “politically, economically and technologically solvable within the context of existing institutions and power structures and continued economic growth” (Bailey *et al* , 2011, page 683 in Hobson, 2013). Characteristically, weak interventions rely on technological efficiency and economic measures based on property rights, incentive and education (Hobson, 2002, Mansfield, 2004, Whitmarsh *et al.*, 2011, Lorek and Fuchs, 2013), responses that do not fundamentally alter socio-technical systems (Guy and Shove, 2000).

Conventional demand management activities described in Section 2.1 and 2.2 display many characteristics of weak intervention (Sofoulis, 2005, 2014, Sharp, 2006, Swyngedouw, 2009b, Browne *et al*., 2014). Technological fixes (e.g. leakage reduction and distribution of water efficient devices) and economic incentives (e.g. full cost pricing and metering) are quintessential techno-economic measures, as is the devolution of responsibility of demand management to consumers described above (Spaargaren, 2000). Such interventions position resource use as an inherent feature of society, frame intervention as exogenous to socio-technical systems, and aspire to modify technologies and behaviours such that routines may persist with reduced environmental impact. Speaking with regards to climate change, though the statement is equally applicable to water demand, Geels *et al.* describe how such approaches are problematic as they are “limited in [...] potential to foster environmental sustainability and timid with respect to the urgency demanded by problems such as climate change” (2015, p. 2).

The principal counter position to such weak interventions are those used in support of anti-capitalist, anti-consumerist movements, revolutionary approaches that call for overhaul of the social and economic foundations of modern society (Geels *et al.*, 2015). However, such approaches remain, unsurprisingly, politically marginalised and offer limited insight as to how change might occur (Miller, 2001), particularly as they focus on abstract macro socio-economic structures rather than the everyday experiences of producers and consumers (Slater, 2010, Geels *et al.*, 2015). Thus Geels *et al.*, (2015) propose reconfiguration as a politically palatable alternative to weak interventions. Reconfiguration seeks to guide transitions in socio-technical systems to support more sustainable patterns of resource use (Geels, 2002, Tukker *et al.*, 2008, Harvey *et al.*, 2012, Spurling *et al.*, 2013). Such approaches challenge conventional hierarchies of knowledge and power, however, rather than aiming to overthrow macro-contexts or reform technologies and behaviours, emphasise the need for transformation of the social

and material elements that support current modes of resource intensive practices (Spurling *et al.*, 2013, Dixon *et al.*, 2014, Geels *et al.*, 2015).

Both distributed management approaches fit with the notion of reconfiguration, supporting the case for interventions that aspire to change the social and material elements that sustain high levels of water demand. Makropoulos and Butler (2010) focus on the infrastructures that abstract water – both physically and metaphorically – from its socio-natural context in order to strengthen the connections between water use and water supply (Swyngedouw, 2009a, Linton, 2010, Chilvers *et al.*, 2011). The activities described challenge modernist notions of universal abundance and contribute to the emergence of socio-technical systems and practices that are attuned to temporal fluctuations and spatial variance in water supply. In contrast Browne *et al.*, (2014) focus on the mundane social and technical elements that contribute to patterns of water use in the home. They propose interventions that seek to introduce alternative social and material elements to provoke changes to domestic water use, and substitute water-intensive practices for alternatives that enable access to services such as cleanliness and convenience in a less water-intensive manner. In doing so distributed demand calls for more participatory and inclusive forms of demand management, which recognises the role of multiple intermediary actors that might contribute to the substitution of elements that sustain high levels of water use (e.g. designers), and develop new connections between elements (e.g. media and retailers). Thus, both distributed approaches challenge conventions in scientific knowledge embedded in design of material systems, but also the governance arrangements associated with water supply and use and the social meanings and conventions with which they co-evolve.

Towards adaptive management practices

Finally, less explicit in the overview provided above is how both distributed management models support the notion of adaptive resource management. Historically, water resource planning has relied on simplistic assumptions regarding system dynamics to predict, and therefore meet, future demand (Guy and Marvin, 1995, Walker, 2013). These assumptions – based on estimates of population growth and extrapolation of recent trends in water demand – do not accurately account for the complex and dynamic nature of society, legitimise particular forms of knowledge and effectively silence a critical dialogue regarding systemic uncertainties (Walker, 2013). This is particularly problematic when such models are used to support large-scale engineering projects, as has been the case throughout much of the twentieth century, as the resulting

infrastructural systems are resistant to change (Pahl-Wostl, 2007, Pahl-Wostl and Kranz, 2010), and set in motion pathways for future activity that rely on assumptions that change will be linear and controllable (Folke *et al.*, 2002a). The fallacies of such 'predict-and-provide' practices are exposed as demand fails to evolve as anticipated, the Kielder reservoir being an oft-cited example. In Kielder's case, the rapid decline of local industrial water demand in the 1980s resulted in debt of £150 million and a 200,000 Mega litre reservoir with limited local demand. Consequently, the water was earmarked for transfer, a largely inefficient means of supplying water, but a potential way of recouping financial losses (Guy and Marvin, 1995, Grant *et al.*, 2012, Walker, 2013).

Amidst concerns regarding the increasing pace of change and unknown future social and ecological conditions in which water management will be situated, adaptive management is proposed as a means of managing uncertainty. Adaptive management has been subject of discussions for a long time, and is rooted in Holling's (1978) model of ecosystem stability and change. Built on the supposition that the future of socio-ecological systems cannot be known or predicted with sufficient accuracy to determine an dependable solution, adaptive management described an approach that aims to remain capable of responding to new knowledge and emerging conditions (Smith *et al.*, 2013). Pahl-Wostl *et al.* (2012) describe adaptive management as a systematic process of experimenting, learning and critical reflection in order to improve policy and management. Thus adaptive management is inherently about developing adaptive capacity of a system; "the ability of a socio-ecological system to cope with novelty without losing options for the future" (Folke *et al.*, 2002b, p. 17). As a management approach this necessitates flexible, experimental approach to intervention.

Despite advances since the 1980s, contemporary planning processes remain reliant upon 'realistic assumptions' and micro-component models (Walker, 2014a), methods whose embedded scientific realism render them poorly equipped to monitor the complex changes posed by distributed management approaches (Sharp *et al.*, 2011, Parker and Wilby, 2013). Particularly problematic is the proliferation of averages that gloss over spatial and temporal irregularities and subdue the heterogeneity of people, practices and places (Sofoulis, 2011a), thereby reducing the options and possibilities for resource management. These averages have been describes as fictitious at best and misleading at worst, containing implicit assumptions about the future that legitimise specific modes of management (Walker, 2013) and inhibit effective engagement with social dimensions of water use (Sofoulis, 2011a). These examples suggest that water management models are

unable to accommodate the continual churn of demand in everyday life. Consequently, demand management risks becoming maladapted to the practices in which it seeks to engage and retrofitting activities return lower than anticipated savings as a result of rising technological efficiencies and changing patterns of use (Southerton *et al.*, 2011, Gram-Hanssen, 2014, Macrorie *et al.*, 2014) and messaging activities are met with complacency and fatigue (Sharp, 2013). This is problematic as it suggests demand itself is not the root of demand management response, incorporated into the methods and plans of demand management as a static – or at least predictably evolving – feature of society.

Though neither of the two distributed approaches directly discusses adaptive management, both resonate with these discussions. Firstly, both recognise the complexity and diversity of socio-ecological systems, and that any ability to predict the outcome of management responses is limited. Browne *et al.*, describe water management as "encompassing a range of reactions and counter reactions meaning that a change at one site in this distributed demand system could be related to change or maintenance of the status quo at another point in this system" (2014, p. 3). Consequently, the authors propose that demand is continuously emerging in relation to demand management and other influences and therefore requires flexible models of intervention. Secondly, each paper outlines a suite of possible pathways for demand management, as opposed to a singular solution – particularly Makropoulos and Butler (2010) who provide a list of options ranging from conventional practices to novel developments. In both cases, the proposed avenues for intervention are untested and unproven, and by proposing to reconfigure the social and material context of demand, the extent and speed of change resulting from distributed approaches contain considerable uncertainties. Such uncertainties are problematic in an industry dominated by evidence-based action and, though neither paper discuss directly, require reflexive models of critical evaluation to understand their progress. Finally, though not discussed here in detail, one of the principles of adaptive management is inclusivity recognising that the efficacy and legitimacy of management measure depend on the inclusion of others (Adger *et al.*, 2005). This resonates with the call made in both papers for decentralised management strategies that incorporate a range of intermediary actors to facilitate alternative patterns of ordinary consumption. Thus, both approaches are intuitively attuned to the principles of adaptive management in their proposition of alternative approaches to demand management.

2.4. Conclusion: identifying avenues for further research

This chapter provides a synthesis of the recent history of water demand management in England and Wales, accompanied by a discussion of current practice in water efficiency, a specific subset of demand management activities that are core to this thesis. The latter sections distil from the academic literature the critical debates around demand management, and the implications of these debates for development of future interventions. Fundamentally, this literature demonstrates how the shift from people to practice reframes demand as a form of everyday consumption that is implicated in routine activities (Browne, 2015), contingent upon various social, material and natural relations that are shared and collectively derived (Warde, 2005, Browne *et al.*, 2014, Shove, 2014), and co-productive of systems of provision (Van Vliet *et al.*, 2005, Harvey *et al.*, 2012, Mcmeekin and Southerton, 2012). In this way practice theories and the related literatures introduced in this chapter, present a possible starting point for the 'step-change' industry and academics call for (Browne, 2015, Waterwise, 2015c). Thus the latter discussions develop two examples of distributed approaches to demand management that alight with such a reframing of demand to understand the principles that might inform evaluation and enquiry into how the water efficiency activities organised and funded by water companies might more effectively support a transition towards more sustainable patterns of demand.

Throughout this synthesis emerge a number of gaps in the literature, quiet spaces that are pertinent to the research objectives in this thesis. It is these spaces in particular that this thesis aims to contribute and they are thereby worthy of brief expansion. Firstly, there is an absence of discussion regarding the benefits and limitations of management activities related to scale. While critics find both centralised and individualistic management models lacking, recent experiments in the water industry that implement water efficiency on intermediate scales such as the 'whole-town' approach or community led initiatives are yet to receive much attention. Indeed, literature within urban geography suggests that such initiatives may be beneficial. While many regions are vulnerable to generic socio-environmental problems, these are geographically located with important social and physical characteristics that provide opportunities for managing change (Swyngedouw, 2006, Hodson and Marvin, 2010). Consequently to varying degrees cities, catchments and communities have been described as optimum spaces for research, and strategic scales in which to implement interventions (Hargreaves *et al.*, 2008, Moloney *et al.*, 2010, Bulkeley and Castan Broto, 2013, Hodson and Marvin, 2014). However others are

more cautious. Recent discussions in the demand literature are largely critical of efforts to 'scale-up' intervention that risk over-investing in one-size-fits-all approaches at the expense of the site-specific work needed to realise the opportunities afforded by situated management activities (e.g. Fam and Lopes, 2015, Fam *et al.*, 2015). While there are examples of large-scale water efficiency activities emerging in the water industry, it is as yet poorly understood as to whether these address the criticisms of conventional demand management, thus identifying a space that may benefit from empirical research and evaluation.

The second gap is with regards to water itself. As described above, researchers in various disciplines recognise the vitality of water and its contribution to material systems (Bakker, 2003, 2005, Page, 2005, Bakker and Bridge, 2006), political ecologies (Heynen *et al.*, 2006, Swyngedouw, 2006, 2009a), water management (Whatmore, 2013) and social conduct (Strang, 2004). Yet this discussion is muted with regards to demand; those writing from a demand perspective rarely reflect on how embodied experiences of water effect practices, and those writing about hydro-social relations rarely relate their findings to discussions regarding demand and demand management. A small body of research illustrates how embodied experiences of the natural world shape infiltrate everyday practices; inspiring adaptations (de Vet, 2014), developing embodied knowledge (Hitchings, 2007) and contributing to practice memories (Maller and Strengers, 2013). However, these discussions have been confined to discussions of the weather (Hitchings, 2011a, de Vet, 2013, 2014). Thus, it seems pertinent to address this gap and to understand how experiences of water intersect with everyday practices of water use and whether this might pose opportunities for intervention.

Thirdly, there is a notable gap relating to the professional practices of managing demand. The turn to practice reframes demand management such that the resulting questions relate to how policy and management might work with the collective context of domestic resource use to steer everyday practices towards more sustainable levels of demand (Strengers, 2012, Spurling *et al.*, 2013, Shove, 2014, Strengers and Maller, 2015a). Subsequently, social practice theories contribute a rich account of demand that aids the identification of elements and relations that embed particular forms of unsustainable practice (Watson, 2012), and thereby extend the range of options and possibilities for demand management. Yet despite the "growing reservoir of ideas" (Shove, 2014, p. 1273) management remains embedded in narrow models of demand that risk limiting the efficacy of intervention (Foulds *et al.*, 2014). Such tenacity makes understanding how

pathways for demand management are shaped by organisational practices (Walker, 2015) however there has as let been limited enquiry along these lines. The research that exists focuses on how various professional practices intermediate between everyday practices and energy use in buildings (Janda and Parag, 2013, Macrorie *et al.*, 2014, Sharp *et al.*, 2015), and would benefit from further research.

Finally, despite extending the range of options and possibilities for demand management, there are relatively few case studies and limited practical ideation of what future demand management activities might look like (Shove *et al.*, 2012a). While the lack of real-life examples is testament to the dominance of conventional management models, the absence of discussion regarding what future activities might look like is problematic. The challenge perhaps resides in the intricacy of practice-based empirical research that risks what Hitchings describes as "paralysis in terms of immediate action" (2011b, p. 2852). The attention to detail in 'small-n' qualitative studies that are common of practice-based research reveals such diversity and complexity that "there is fear of being plunged into a meaningless chaos of infinite individual differences" (Fam *et al.*, 2015, p. 643). However, at the other end of the spectrum, where demand management is reconceptualised, the literature tends to present stylised accounts that relate awkwardly to the real world (Geels *et al.,* 2015). Consequently, when introduced into the practical spaces of policy making and demand management, theoretical advances are subsumed into existing managerial frames (Bakker *et al.*, 2010). This is problematic as the solutions of socio-environmental problems are considered likely to deviate from existing practices of managing resources and societies (Gibson *et al.*, 2015). Tentative discussions are emerging that aim to envisage alternative future practices and consider the governance systems that might enable these (e.g. Kuijer (2014); Davies *et al.* (2012); Dorrestijn and Verbeek (2013); and Spurling and McMeekin (2015)). However these are exceptions within the literature and there remains space, and indeed demand (see discussion in section 3.2.1), for further efforts to translate theoretical ideas into practical examples.

This thesis attends to these gaps in the pursuit of its own aims and objectives. Attention is paid throughout to discussions of scale – the *Save Water Swindon* case study presented in Chapter 4 addresses this explicitly – enquiring as to how the UK's first whole-town approach engages with the collective context of demand. Likewise, hydro-social relations are relevant throughout Chapter 5, which relates to *Care for the Kennet,* and are placed centre stage to explore the relationships between people, practices and water and the impacts of strategic efforts to facilitates embodied experiences that benefit demand

management. The focus of research then shifts to the practices of managing demand (see Chapter 3 Methodology for further details) with Chapter 6 exploring how water efficiency activities are shaped and supressed by the shared and collective context of demand management. Chapter 7 continues to focus on professional practices to explore what alternative demand management activities might look like and what would be needed to enable their implementation in the UK context. Finally Chapter 8 discusses the contributions this research makes to conceptual understandings of managing domestic demand.

3. Methodology

This thesis uses a two-part mixed method research model to investigate the research questions. It will seek to develop an understanding of the experiences of those targeted by the initiatives and of those who organise them, with a range of qualitative methods used to access different aspects of the research objectives. In taking such an approach, this thesis makes two methodological contributions. Firstly, the thesis promotes the use of talk-based methods such as interviews and focus groups (in this instance supported by documentary analysis) to explore the heterogeneous context of demand. The use of these methods has been the subject of some discussion in recent years, with many social theorists questioning their capacity to adequately represent the tacit and embodied qualities of everyday practice. This critique will be explored in further detail in Section 0, along with the practical detail of the work carried out in the first part of this research. The empirical research undertaken in this thesis, however, demonstrates the value of talk-based methods in accessing the diverse personal reflections of consumers and demand managers on the collective processes and elements that shape and sustain specific forms of water use in the home.

The second methodological contribution is to reflect on how collaboration between academia and industry pushes the boundaries of social theory beyond critique, and aids the development of solutions-oriented research (De Fries *et al.*, 2012, Castree, 2016). Typically, social theory offers little by way of practical recommendation, focused instead on problematizing current understanding and elucidating the nuances of the questions at hand. Such discussions are vital to develop both theoretical understanding of everyday life and robust concepts to inform policy-making and demand management practice (Panda and Gupta, 2014). However, the lack of practical discussion renders research difficult to apply and risks critical insights being watered down to fit within existing conceptual frames. This is problematic in research agendas pertaining to socio-environmental change where critical insights might offer the basis for novel forms of intervention (Castree, 2016). To this end, this research works with demand managers to develop the case study findings into alternative visions of future water efficiency activities (Chapter 7), to understand the processes that inhibit these being realised at present (Chapter 6), and how they might be implemented in future (Chapter 8). Section 3.2.3 reflects on this process as a means of developing both the theoretical and practical applications of this research.

This chapter sets out the practical details of the empirical work undertaken towards this thesis in two overarching sections. The first documents the case study research, including the background to and selection of the case studies, and the methods involved in their evaluation. The second describes the industry-focused research encompassing expert interviews, two practice innovation workshops and documentary analysis that support the second part of this research. Each section closes with a methodological reflection relating to the topics outlined above.

3.1. Case study research

The first part of this research uses case studies to explore the collective context of domestic water demand, the distributed elements and processes that shape and maintain unsustainable patterns of demand, and to evaluate how non-conventional water efficiency activities contribute to long-term sustainable water management via engagements with these. Baxter describes case study research as:

> *"The study of a single instance or small number of instances of a phenomenon in order to explore in depth nuances of the phenomenon and the contextual influences on and explanations of that phenomenon."*
>
> (Baxter, 2010 in Hay, 2010, p. 81)

Carefully chosen case studies are critical to the development of social theory (Flyvbjerg, 2006a). The rich analytical detail afforded by case study research provides an opportunity to interrogate theoretical concepts in complex real-world situations, thus posing opportunities for new understandings to emerge (Silverman, 2005). This thesis draws on two case studies, each used to explore how non-conventional water efficiency activities might reduce domestic demand by engaging with the collective context of water use. While comparative case study analysis is possible, Castree (2005) suggests that insights are best attained by exploring differences between case studies and divulging the context through which such diversity arises. In addition, while findings from case study research do not offer generalizable representations of the wider subject field, through careful selection, case studies offer opportunities for learning that may be transferred to develop ongoing research (George and Bennett, 2004).

The case studies selected are two initiatives organised by a single Water Company, Thames Water – the CASE partner for this research[4]. These were identified as 'critical cases' as they are of "strategic importance in relation to the general problem" (Flyvbjerg, 2006b, p. 14). The general problem identified in the previous chapter is that in spite of recent progress, the water industry's approach to demand management, and the role of water efficiency within that agenda, remains limited despite a growing body of research that seeks to reconceptualise demand and demand management (Strengers, 2012, Shove, 2014, Browne, 2015). The cases selected, *Save Water Swindon* and *Care for the Kennet*, are of strategic importance as they each provide examples of approaches that exceed conventional Water Company activities, both having received awards that celebrate their efforts to push the boundaries of water efficiency in a water scarce region.

Each case study takes a different approach, and therefore each stands to offer different contributions to the ongoing development of both social theory and management practice. However, to date these case studies have received little empirical attention from either industry or academia. Consequently, exactly how, and to what extent, each initiative breaks from existing practice (as described in Chapter 2) is unclear, as is the extent to which the contribution of these cases towards more sustainable levels of domestic demand exceeds that of conventional approaches. The case study analysis is used to address the first two objectives of this thesis; to investigate the collective context of demand within the populations targeted in each of two case study initiatives; and to evaluate the extent to which the case study initiatives are effective in engaging with the collective context of demand to reduce domestic water use.

3.1.1. Case study selection

The case studies selected were chosen on the basis of a number of similarities and differences. By way of similarities, they share a number of important hydro-social characteristics. Firstly, both are funded by Thames Water, one of England's largest water companies and are core components of Thames Water's water efficiency programme, aligned with the statutory water efficiency targets during the 2010-14 planning period

[4] This research is funded by the ESRC and Thames Water through a CASE (Collaborative) Studentship. The CASE studentship programme enables academics to apply for funding for doctoral projects in partnership with external organisations. Successful doctoral researchers then work alongside both academic supervisors and external partners throughout the course of their PhD.

(PR09/AMP5) (Ofwat, 2008, Thames Water, 2015c). Secondly, the initiatives are both collaborative ventures and while the blend of partners and their contribution to the initiative is different in each case study, each incorporates a mixture of NGO's, industry stakeholders and representatives of their associated local communities. Finally, both initiatives operate within a single Water Resource Zone (WRZ) – Swindon and Oxfordshire (SWOX) – and share a common goal of reducing abstraction on the river Kennet, an issue that has been a source of dispute for several decades.

Water in this region is drawn from two principal rivers, the Thames and the Kennet, the latter of which has been a focal point of research and discussion on abstraction, water valuation and governance since the early stages of privatisation (Moran, 1999, Bateman *et al.*, 2000, Lawson, 2008, BBC, 2014). As one of only 200 chalk streams in the world, the Kennet is of significant geological and ecological interest (its upper reaches are designated a Site of Special Scientific Interest), as well as being of broad recreational and aesthetic value to local residents (WWF and Natural England, 2009). While the Environment Agency grants abstraction licences for Thames Water to supply homes in the surrounding towns (approximately 10,000 homes) and the south of Swindon (approximately 30,000 homes) (see Figure 4) the conditions of these are becoming increasingly stringent to reduce environmental degradation.

The pressure on the river during dry periods, which are thought to be exacerbated by abstraction, have been the source of dispute between Thames Water and various campaign groups for several decades. Specific concerns arise regarding the redirection of 6-7 mega litres from the Kennet to the Ray via homes in Swindon (see red arrows at the left of Figure 4). These losses reduce water flow in the river Kennet, which increases the river's vulnerability to periods of low rainfall and pollution. Consequently, there have been a number of incidences when river ecology has been seriously affected. For example, in 2011 and 2012, as a result of prolonged below average rainfall across the UK, the river Kennet ran dry with significant negative ecological impacts (Tarring, 2011, Murchie, 2012). In addition, during the course of the fieldwork there were several acute pollution incidences resulting from chemical spillage, a diesel spill from a major traffic incident, and contamination from drain overflow during winter flooding, each raising concerns of ecological disruption (BBC, 2013, Action for the Rvier Kennet, 2014).

In recognition of these negative impacts, Thames Water announced plans to build a pipeline connecting homes in south Swindon to the Farmoor reservoir near Oxford (red arrow at top of the graphic). The proposed 18.2km pipeline is due for completion at the end of 2016, and it is estimated that it will reduce abstraction on the Kennet by approximately 50%. However, this pipeline provides only a short-term solution; shifting demand into another already water stressed region[5]. Consequently, reducing water demand remains a critical issue. In 2011, per capita consumption in SWOX was 143 litres per day (l^{-1} day^{-1}). While this makes per capita consumption among the lowest in the Thames Water region (average 160 l^{-1} day^{-1}) (Thames Water, 2015c), these values remain substantially higher than the industry's vision of 130 l^{-1} day^{-1}. Given that domestic use accounts for approximately 73% of water use (i.e. excluding leakage and minor components) in the Thames Water region, and that population growth alone is forecast to increase demand by 20% by 2040[6], reducing domestic demand in SWOX is a management priority.

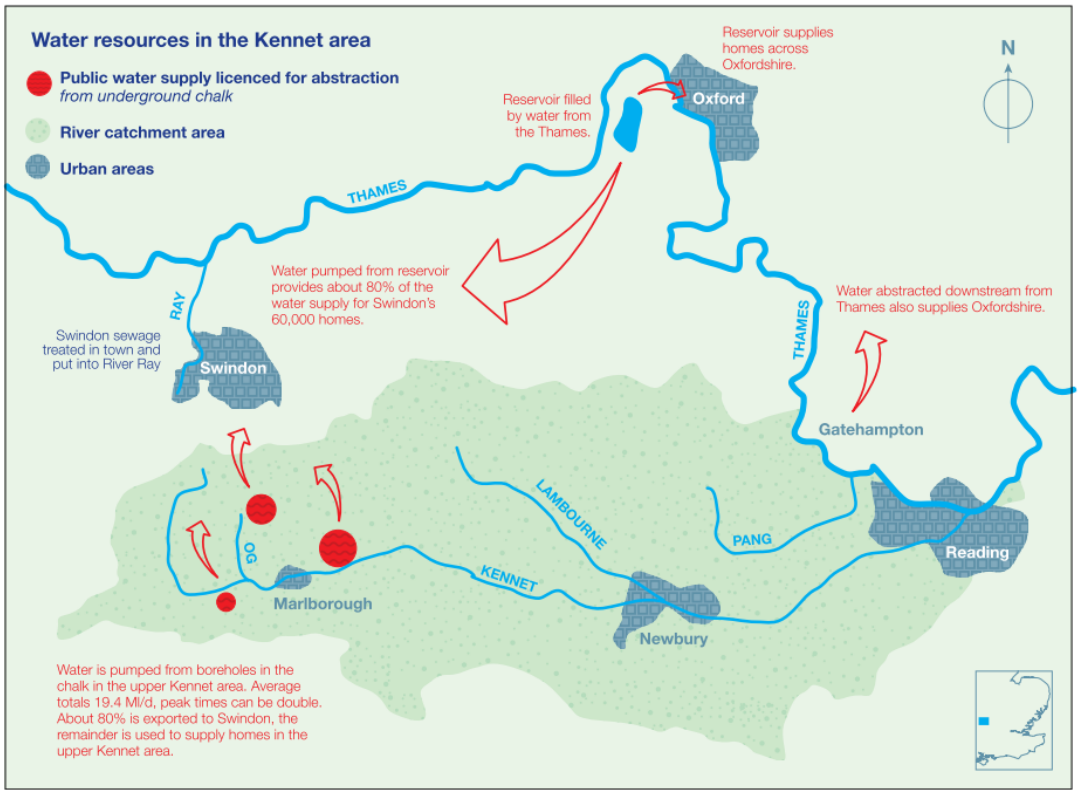

Figure 4: Water resources in the Kennet catchment
(Reproduced from WWF (2010), numbers within the text refer to the updated values reported in Thames Waters 2015 WRMP)

[5] Thames Water forecast dry year deficits to increase throughout their supply region (see Figure 3, Chapter 1) in SWOX these deficits are forecast to increase - 0.14 Ml/d in 2020 to -32.7 Ml/d by 2040; in London (where the pipeline sources from) from -133 Ml/d to -414Ml/d (Thames Water, 2014c).
[6] Approximately 26.67 Mega litres per day by 2040 which equates to 20% compared to 2011/12 levels (Thames Water, 2015c).

The case study initiatives form part of Thames Water's efforts to balance demand with supply and are core components of Thames Water's SELWE (Sustainable Economic Level of Water Efficiency) activities; those which extend beyond the Base Service activities to deliver water savings. Yet despite these commonalities, the differences in scale, scope and aims of the initiatives give rise to different lines of enquiry pertinent to the topic at hand. The following sections provide a brief overview of each case study and the questions arising with further details presented in Chapters 4 and 5 (which deal with *Save Water Swindon* and *Care for the Kennet* respectively).

Case study 1: Save Water Swindon

In summer 2010 *Save Water Swindon* was launched as the first 'whole-town' water efficiency initiative in the UK and was awarded the *Environment Agency Chairman's Award* in the Waterwise Water Efficiency Awards in 2012. This award celebrates activities led by water companies that exceed regulatory requirements to reduce water demand. Specifically, the award commended the scale of *Save Water Swindon*. The volumetric target of 1 mega litre per day by 2014 was an ambitious effort to bring localised water efficiency activities towards the 130 litre per day vision presented in *Future Water* (Defra, 2008), and the initiative trialled various means of boosting participation to get wider support from the public. In addition, the award recognises the experimental aspects of the initiative, which aimed to test new interventions and to establish a blueprint for large-scale water efficiency that may be replicated in other towns and regions (Environment Agency and Waterwise, 2012a).

The scale of *Save Water Swindon*, along with its aspiration to experiment with novel approaches to water efficiency in order to maximise demand reductions, presents interesting points of departure for analysis. Firstly, the whole-town approach offers an opportunity to refocus managerial activity away from individuals and onto the collective context of demand at the town scale. Consequently, the whole-town approach, whether intentionally or not, responds to one of the key criticisms of contemporary approaches and provides an opportunity to engage with demand in a more sophisticated manner. However, the continued use of retrofitting activities and messaging raises questions regarding the extent to which this vision is embedded in the design of interventions and how innovative the whole-town approach really is. Secondly, and also related to scale, is a question regarding the nature of upscaling – or 'supersizing' (Tucker, 2014) – of activities. Recent research offers a cautious critique of upscaling as the assumptions and framings of demand embedded in such initiatives render them 'technocratic fallacies'

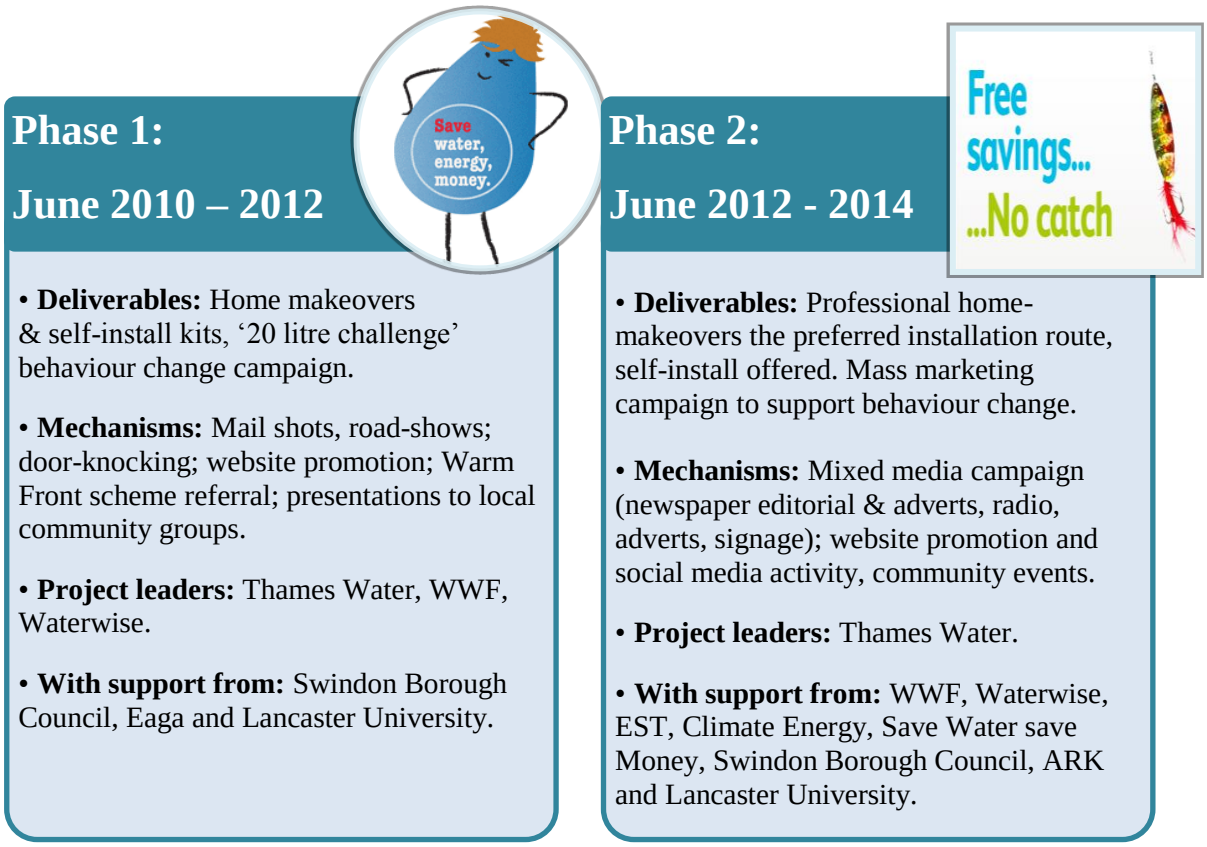

Figure 5: Overview of Save Water Swindon

unfit for practical application (Fam and Sofoulis, 2015, Fam *et al.*, 2015). The lack of empirical case studies to substantiate these concerns leaves a question regarding the relative efficacy of large-scale intervention. Thirdly, the combination of outcome-oriented aims (demand reduction) and process oriented aims (development of interventions and blueprints) raises an interesting question regarding the relationships between data, evaluation and progress – specifically how success is defined, monitored and reported. This question is critical to the evaluation of *Save Water Swindon*, yet it is also a complex theme for social theorists who call for a reframing of demand management activity (Strengers, 2012, Shove, 2014, Browne, 2015).

These observations form the points of departure for the analysis undertaken in Chapter 4 that seeks to understand how *Save Water Swindon* contributes to long-term sustainable water management via large-scale water efficiency activities. Interviews, focus groups and documentary analysis, as described in Section 3.1.2 are used to develop an understanding of the collective context of demand as it relates to the residents of Swindon, and explore the extent to which the initiative engages with this context to reduce domestic demand.

Case study 2: Care for the Kennet

In contrast to *Save Water Swindon*, *Care for the Kennet* is a small-scale, community-led initiative working with residents in towns along the length of the Kennet. While funded by Thames Water, the initiative takes a partnership approach and is primarily implemented by local ecological action group Action for the River Kennet (ARK). The focus of the project was to "reconnect water in people's homes to the water in the river" (Spokesperson at ARK AGM 2012) and, unlike *Save Water Swindon*, the organisers rejected a large-scale approach in favour of personal one-to-one interactions with local residents, aiming to reacquaint domestic demand to the river from which it is supplied. A range of community-based activities is used to deliver the initiative's objectives including roadshows, river visits, schools projects and localised/short duration retrofitting drives (see Figure 6).

Figure 6: Overview of Care for the Kennet

Again, this case study raises its own interesting themes. In particular, the initiative introduces a notion of disconnection between domestic water and river water, in an epistemic move that extends the boundaries of both water efficiency and of social theory

to think about how hydro-social relations matter to domestic water demand. Further to this are a series of questions related to this disconnection: how water in the home becomes disconnected from water in the river; what is the nature of this disconnection (given that water in the home is connected to water in the river – indeed this is the very reason that domestic demand is in question); whether this disconnection has implications for domestic demand; and, finally, whether *Care for the Kennet* is capable of countering such disconnections to reduce domestic demand.

These are novel questions that emerge from the assumptions embedded in the initiative and its aims and objectives. Further, they are not only interesting with regards to the practical question of managing demand, but stand to offer interesting theoretical contributions to our understanding of how demand is configured. The analysis contained in Chapter 5 expands upon each of these questions to establish an understanding of how the collective context of demand is founded on, and contributes to, particular configurations of hydro-social relations. In addition, the evaluation considers the extent to which the schools projects and river visits undertaken within *Care for the Kennet* are effective in working with the socio-natural context of demand to engender embodied experiences of water that benefit demand management.

3.1.2. Research methods: Mixed method analysis of the case study initiatives

The differences between the case studies raise different questions. In order to do justice to the unique intricacies of each case study, the methods used are tailored to fit the specifics of the case study. In general, case study research follows no specific methodological framework, instead driven by the specifics of the case. The basic idea, as described by Punch, is that

> *"One case (or perhaps a small number of cases) will be studied in detail, using whatever methods appropriate. While there may be a verity of specific purposes and research questions, the general objective is to develop as full an understanding of that case as possible."*
>
> (Punch, 2014, p. 120)

As discussed in Section 3.1.1, there are similarities between the case studies. However, there are also important differences between the initiatives that provide more useful ground for theoretical development and learning. In particular, the initiatives operate on different scales, *Save Water Swindon* is notable as being one of the largest

geographically-targeted initiatives in operation in the UK; *Care for the Kennet* for providing a much more intensive and localised initiative. Secondly, the specific interventions involved in each case study differ. *Save Water Swindon* prioritises retrofitting accompanied by a behaviour change campaign underpinned by media and marketing activities; *Care for the Kennet* a series of classroom projects and community outreach activities designed to develop a more ecologically sensitive understanding of water use, accompanied by retrofitting and behaviour change activities. Further, the evaluation and knowledge exchange element is central to *Save Water Swindon*'s objectives, but plays a lesser role in *Care for the Kennet*. Finally, each initiative incorporates a different ensemble of actors in its implementation. The previous chapter discusses the limitations of water efficiency activities that are common across the water industry, and the case studies selected present two very different examples of management activities within the industry that depart from such conventions, both of which offer opportunities for practical and theoretical development.

A variety of qualitative methods were used to unpack the intricacies of the case studies in relation to the research questions. Semi-structured interviews were held with those responsible for designing and implementing the initiatives in order to understand the nature of demand according to those organising each initiative. Complementing the interview data, documentary evidence including project planning documents, current and historical project materials and existing evaluation documents were analysed to understand the evolution of each initiative and provide material for evaluation of the initiative's interventions. And finally, focus groups were held with residents in each catchment region to understand the specific context of domestic water use in the initiatives regions and the extent to which activities were effective in contributing towards lower levels of domestic water use. The rationale and specifics of each method are described in the following sections.

Interviews

Interviewing is perhaps the most ubiquitous research method in the social sciences. Wengraf (2001) describes qualitative interviews as "high-preparation, high-risk, high-gain and high-analysis operations" (in Byrne, 2012, p. 215), an observation that succinctly covers some of the methodological considerations of qualitative interviews. In the first instance, care is needed to ensure that interviews achieve the coverage and depth required for analysis and, to achieve this, researchers must prepare and, to some extent, anticipate the subject matter that might be covered. However, in exploratory research

such as this where the aim is a greater understanding of a complex topic, there must also be sufficient flexibility to enable participants to lead the research into areas they deem important and interesting, from which the researcher may learn (Byrne, 2012).

In order to enable this flexibility, qualitative interviews tend not to be scripted, but structured around a predetermined set of topics and core themes to guide the discussions a method commonly referred to as semi-structured interviews (Flick, 2009a). In each case study, semi-structured interviews were carried out with those responsible for designing and implementing the initiatives (two interviews for *Save Water Swindon* and three for *Care for the Kennet*). The interviews covered broadly similar topics (see Box 1) focusing on: the origins and aims of the initiative and how these have changed throughout its duration; the benefits and challenges encountered; the methods used throughout the initiatives and how these have evolved; and the extent to which organisers consider the campaign to have been a success (deliberately left open). The semi-structured format enabled a time-effective[7] means of exploring the key questions whilst enabling participants to contribute insights and observations they deemed important to the research.

Box 1: Topic guide for case study interviews

1) What were the overall aims of the initiative and who were the target audience?
2) What does the initiative do, and how has this changed (if at all) from its first conception?
3) What aspects of the initiative are collaborative and how has this changed (if at all)?
4) What has been achieved so far during the initiative, and what do you hope to achieve going forward?
5) Has the initiative been successful, and in what ways?
6) What have been the challenges so far, and what are the challenges going forward?

The interviews were transcribed verbatim and analysed for content and emerging themes using Atlas.ti, with ethical approval granted by the University of Manchester Research Ethics Committee in October 2013. The detailed personal reflections of interviewees provide rich accounts of the initiatives as they were planned and implemented, thereby enabling greater understanding of the world in which resource managers operate. Thus while the interviews pose a resource intensive form of data collection for a seemingly narrow view of the world, they provide a rich and detailed description both explicit and implicit processes involved in the organisation of such initiatives coming from those most actively involved in their orchestration (Dunn, 2010).

[7]Each interview lasted approximately one hour, a duration that respects the schedules of professionals who are likely to have taken time out of their working day to contribute to the research.

Documentary analysis

In addition to the interviews, documentary evidence was gathered for each case study to inform the evaluation of the initiatives. The interviews were used as a basis for identifying secondary source material such as project planning documents, marketing materials and project evaluation documents. In addition to these materials, other documentary evidence was collected such as newspaper articles and social media feeds to observe the ongoing progress of the projects and other events that intersect with their implementation. Thames Water also arranged for observation of planning and progress evaluation meetings, enabling an opportunity to gain a deeper understanding of the ongoing development of the initiatives and an appreciation of the context in which managerial decisions are made. To further supplement this data, presentations by project organisers were observed at a number of events and conferences. In all instances documentary evidence data was collated and analysed in Atlas.ti. The documents were cross-coded against interview data to identify common themes and also coded for emerging themes.

The combination of interviews and documentary analysis provides insights into how complex understandings of consumers, demand, and resource management zones are translated into the initiatives' messages, mechanisms and approaches. Interviews provide windows through which to gather a basic understanding of the project, and to allow participants to reflect on key themes. However, they offer only momentary glimpses into one person's account, situated in a specific time and space. Further interview data should always be understood as an outcome of the researcher-participant dynamics. In contrast, gathering documentary evidence provides a more reflexive and dynamic mode of data collection, carried out throughout the fieldwork and into the early stages of writing up, providing a longer-term and wider-ranging view of the context from which initiatives emerge. Gathering supplementary data provided an opportunity to corroborate statements made in the interviews and add further detail to these discussions. enabling a deeper understanding of the emerging themes, as well as providing a means of understanding how such documents are used and their implications for the everyday practices of managing water demand.

Focus groups

In order to understand the everyday context of domestic water use and explore the case studies in terms of their capacity to influence domestic water use, focus groups were held

with residents in the catchment areas of each initiative. Chapter 2 presents an overview of the academic discussions relating to demand that suggests that "types and levels of consumption tend to be determined socially and collectively" (Warde and Southerton, 2012) and that rather than being the result of individual deliberative processes, domestic water use emerges from social, technical, and natural relations (Browne *et al*., 2014). This framing of demand poses a methodological challenge as water becomes "so normal it retreats into the background of awareness" (Sofoulis, 2005, p. 448).

Recently, Hitchings (2012) has reaffirmed the ability of people to discuss the context of ordinary consumption, particularly when routine behaviours are called into question. However, the challenge implied by the trivial nature of research questions and enquiry into mundane, often very personal aspects of everyday life (Hitchings, 2012) creates further ground for caution. To overcome this, Hitchings and Day (2011) established an interview process that allowed the exchange of alternative accounts between different participants. This exchange draws attention to the differences between individual routines, exposing taken-for-granted practices and offers an opportunity for participants to reflect on personal habits without risking problems from direct questioning. More recently, Browne (2016) demonstrates how humour, more naturally occurring in a focus group setting, alleviates pressure and lessens the potential discomfort of discussing topics such as showering, shaving legs and washing bed sheets.

Given then that patterns of resource use are collectively contingent (Shove and Warde, 2002), that people can talk about their practices (Hitchings, 2012), and that the weaknesses of interview methods appear to be overcome through the exchange of alternative accounts (Day and Hitchings, 2011), the relative under-reporting of focus group methods in practice-based studies seems surprising. This relates to a broader discussion of the role of talk-based methods in practice-based enquiry which will be returned to in Section 0. For the present discussion Conradson suggests focus groups are particularly useful "to explore the complex understandings and interactions that people have with their everyday environments" (2013, p. 128), while Bloor *et al.*, (2001) argue that focus groups are invaluable tools "to study group norms, group meanings and group processes". Thus, focus groups not only overcome Hitchings (2012) concerns, but provide an environment in which comparison, opposition, and discussion regarding everyday diversity arise naturally (Berg, 2001).

Berg (2001) describes how focus groups provide a unique format to elicit accounts of mundane aspects of everyday life, particularly where individual accounts are likely to vary substantially:

> *"In focus groups, the goal is to let people spark off one another, suggesting dimensions and nuances of the original problem that any one individual might not have thought of."*
>
> (Berg, 2001, p. 115)

Water use is deeply personal, connected to sensitive and intimate aspects of daily life. However, Browne (2016) describes how focus groups provide a safe space to develop detailed accounts of how and why practices vary between different people, and in different spatial and temporal contexts. Thus the space created in focus groups enables access to multiple dimensions of demand, painting a fuller picture of the collective elements and processes that contribute to patterns of everyday water use (Halkier, 2010, Martens *et al.*, 2014) that may be used to identify avenues to steer change (Hitchings, 2011b).

In total, two pilot studies and six focus groups were conducted towards this research, with ethical approval granted by the University of Manchester Research Ethics Committee in October 2013. Neither pilot was used to collect data, but to evaluate aspects of the research methodology. The first was carried out within the University of Manchester research community to gain feedback on the specific methods and questions developed for this research; the second with residents in Marlborough, in order to identify potentially obstructive topics and strong consumer interests that may be detrimental to the research.

Following the two pilots, three focus groups were held with residents in each of the two initiative catchments. Based on recommendations from the literature, each group was attended by between five and eight participants to enable balance between multiple views and enable sufficient space for discussion (Cameron, 2005, Barbour, 2008). However, to reflect the differences between the case studies, each set of focus groups employed different techniques to unpack the relevant research themes. The following sections describe the sample structure, recruitment process and methods of each set of focus groups and the specific topics each one was designed to explore.

Save Water Swindon

As small 'n' studies, focus groups do not claim to be representative of the wider population and instead, as is the case here, are designed to capture diversity. The sampling structure used in this research aimed to bring people with similar socio-demographic characteristics to explore the similarities and differences in domestic water use, and understand the context within which these arise. The first set of focus groups worked with residents in Swindon to consider the context of demand and reflect on the messages and mechanisms used in *Save Water Swindon*. The purpose was to explore the context of domestic water demand, and to evaluate the initiatives in terms of their ability to reduce demand and shape more sustainable patterns of water use.

Sample

A structured sample was used to recruit participants. The basic criteria required potential participants to be resident within Swindon (identified by three digit postcodes), with the majority from the south of Swindon, thereby reflecting the geographic reach of the initiative. The groups were divided into three age groups (25-35, 36-49; 50+) taken as a proxy for life-stage, which previous research suggests has a stronger relationship to domestic water use than most socio-economic variables (Pullinger, *et al.*, 2013). This relationship was evident in the focus groups, for example, the 25-35 group participants were mostly new home owners or tenants in rental properties; young parents or single; and employed. By contrast the 50-70 group were mostly home owners who had lived in Swindon for a significant length of time (most at least 10 years), had children who no longer lived at home, lived either alone or with a partner, and while some remained employed, these were mostly part-time or casual positions. These details were derived during the recruitment process and a short holding survey carried out prior to commencing the focus group.

In addition to these selection criteria, each group was recruited to include a mix of male and female participants, and metered and unmetered customers representative of the local population. The 2013/14 Annual Population Survey [8] shows the gender division in Swindon to be 50:50 for adults aged 16+. While this was recruited for and sufficiently balanced in two of the three groups, last minute cancellations meant the group aged 25-35 was under-attended by male participants. Thames Water estimate metering penetration at 54% in SWOX, higher than the regional average of 30% (based on

[8] Nomis data NUTS Category 3, July 2013-14, Output area: Swindon

2011/12 data) (Thames Water, 2015c). With data unavailable at the town level recruitment aimed to reflect the regional average. The ratio of metered to non-metered respondents in the focus groups ranged from 3:2 to 2:6. The higher ratio in the focus group with participants aged 25-35 was to be expected as water meters are primarily fitted in newer homes or on change of occupancy.

Table 3: Breakdown of focus group participants by gender and metering penetration

Respondents	Group 1 (25-35)	Group 2 (36-49)	Group 3 (50-70)
Gender (F:M)	4:1	4:3	4:4
Metering penetration (Metered: Unmetered)	3:2	3:4	2:6
Total participants	**5**	**7**	**8**

Recruitment

A market research company was employed to recruit participants. Aside from the practical benefits, the experience of the company in recruiting for similar industry focus groups allowed this research to reflect the recruitment method typically used for consumer research in the water industry (e.g. Humphreys and Gill, 2014). Previous focus group participants were excluded from the sample, as were Thames Water employees and their families, and others employed within the water sector.

The recruitment process involved the provision of an initial invitation to partake in a two-hour focus group in the centre of Swindon on an unspecified topic, as is typical of invites sent by recruitment companies. On response to this initial invitation, potential participants were provided with a summary of the research and the topics to be covered during the session to enable informed consent to be obtained (see Appendix B). The introduction on the day provided further detail along with reiteration of the participants' right to withdraw at any time. This tiered introduction to the research themes reduced the likelihood of recruiting participants with a strong interest in water related issues, Thames Water, or other topics that may affect discussions, while also facilitating informed consent.

Offering payment for participation in research is a contentious area in the social sciences, carrying the risk of jeopardising informed consent and compromising the validity of data (Head, 2009). However, focus groups require lengthy and engaged participation from participants, and often – as is the case in this research – require them to visit locations outside of their normal work-life routine. Consequently, it was considered appropriate to

reimburse participant attendance, with the value of £40 deemed sufficient to cover any costs incurred (e.g. travel costs or babysitters) and thereby broadens participation without introducing an undue influence on their contributions to the research. In addition, after the focus group participants were given details of how they could order a home makeover from Thames Water (water efficient devices that offer savings of £85/annum). These were not used as the principal means of advertising and recruitment or to incentivise attendance, as can sometimes be the case (see examples cited by Grady (2001)), but offered as a compensation for contributing to research that has no immediate benefit for its participants.

Finally, the methodological consequences of using market research companies has received little critical discussion, yet is becoming increasingly common place in the social sciences. The concern within this research was regarding the attendance of career respondents. Market research companies use databases as the principal means of identifying participants which contain details of individuals who have either registered interest in taking part in research, or have taken part in previous projects. While most market research companies restrict the frequency of participation, there is a risk that participants might have substantial experience in focus group evaluation that risks upsetting group dynamics and undermining the validity of their contribution (attending with a preconceived notion of what research is for, based on previous experience). While the reality of these risks is poorly understood, , screening for participants who had been involved in focus groups in the last 12 months negated these concerns. In addition, introductory conversations sought to identify the presence of experienced focus group participants in order to inform the analysis. Three participants were identified that had been involved in research for product evaluation (e.g. tasting instant soups); however no participants had been involved in an academic research project.

Process

The focus groups were held in December 2013 and, following an initial introduction, two semi-structured exercises were used to explore the research questions set out in Box 2. The first exercise, lasting approximately 40 minutes, explored the everyday context of domestic water use, the aspects of daily life that influence behaviour and response to water efficiency. First, participants were asked (unprompted) to list anything they felt influenced their use of water in the home, and then anything in their local area that either deliberately or inadvertently raised their awareness, or changed their use of water in the home. These were first recorded individually on notecards and then shared with the

group, building up a picture of the context of water use, and the similarities and differences between participants. Following these conversations participants were presented with images of activities incorporated in *Save Water Swindon* including posters, examples of mail-outs, comparative bills, water saving devices, newspaper articles and adverts. In addition to these were images of other things they might have encountered while *Save Water Swindon* was active; a dry river bed (the Kennet), children campaigning to save water (from the *Care for the Kennet* project) and a water meter, designed to represent other activities ongoing in their local area. These images were used to prompt participants to reflect on their experiences of *Save Water Swindon*, enquiring as to the relative effectiveness of different interventions to alter patterns of water use in the home.

Box 2: Summary of research questions and discussion topics for Save Water Swindon

RQ1: What are the collective contexts of existing patterns of domestic water use?

Focus group questions:

- What influences and shapes water use in the home (unprompted)?
- In a 130 litre per capita day scenario what would normal everyday water use look like (prompted)?

RQ2: How effective is *Save Water Swindon* in engaging with, and reconfiguring, this collective context to contribute towards lower levels of domestic water use.

Focus group questions:

- To what extent do participants recognise *Save Water Swindon* and other initiatives active in their local area? (unprompted)
- To what extent have participants engaged with the initiative (for example, have they received water efficient devices, shower timers etc.)? (prompted)
- How effective are the messages and mechanisms of *Save Water Swindon* in shaping the context in which water use is implicated? (prompted)

In the second exercise, lasting approximately one hour, participants were asked to role-play a consumer panel tasked with presenting water managers (deliberately unspecified) with a portrait of 'normal' water use. Participants were asked to work together to select from a range of approximately 120 cards those which best represented how they would use water in this scenario. Each card described a function of water use (e.g. bathing, laundry), a variant of this practice (e.g. bath, shower, flannel wash for showering), a frequency and/or duration where applicable, and a typical volume of water specific to the variation of practice detailed on the card. These variants and water use figures were derived from data in the Energy Saving Trust's *At Home with Water* project (EST, 2013). Blank cards were also provided for participant to contribute their own options (see Figure 7). After 45 minutes of discussion, participants were asked to finalise their list, producing

a single version of "normal" and then requested to review this list in light of *Future Water*'s vision of 130 litres per person per day to indicate which practices they would moderate, remove or add to align with this target.

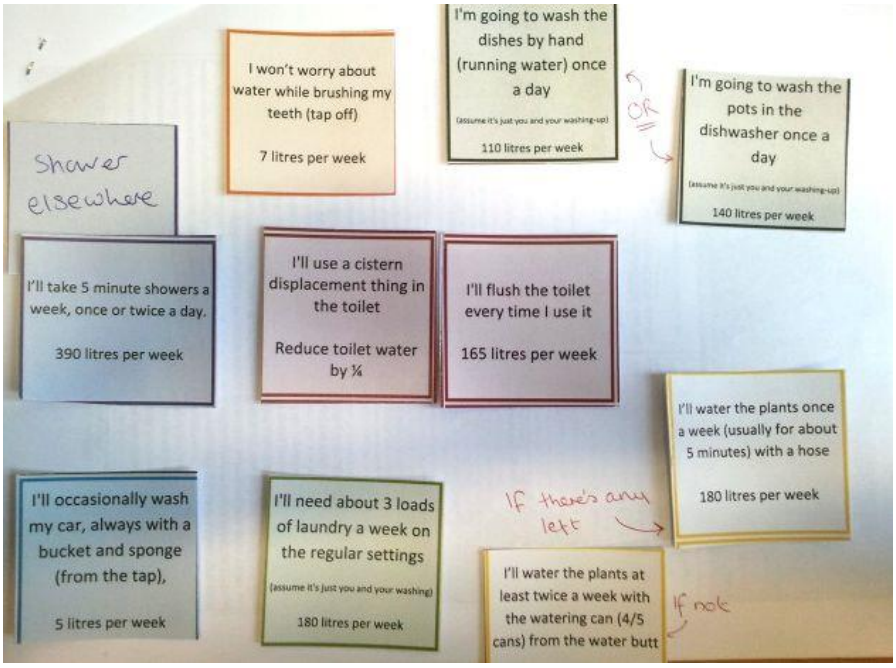

Figure 7: 'Normal' everyday water use in a 130 litre scenario (data from 50+ group)

The starting point for these focus groups is that minimal thought is given to why water is used the way it is throughout the course of everyday life (Strengers and Maller, 2012). Thus the cards were used to air differences between individual practices to prompt reflection and provide a starting point to explore how routines are shaped by collective elements, as described in Chapter 2. In this way, the cards provide a provocation, designed to reveal the context of individual behaviour, allowing the identification of shared social and material elements that sustain certain patterns of water (Hitchings, 2012), while allowing the heterogeneity of individual experience to guide discussions (Pullinger *et al.*, *2013*).

Care for the Kennet

The second set of focus groups worked with residents in Marlborough (2 groups) and Aldbourne (1 group), two of the towns at the focal point of *Care for the Kennet*. The aims of *Care for the Kennet* were suggestive of a different set of socio-material relations driving demand, specifically emphasising personal hydro-socio relations as context for which domestic demand is shaped. Thus, the focus groups undertaken in the *Care for the Kennet* initiative area sought to draw out these research themes more strongly (see Box

3), using a different set of discussion topics and less structured design to explore the key themes. In addition, the small-scale nature of this campaign required different sampling and recruitment techniques as detailed below.

Box 3: Summary of research questions and corresponding discussion topics for *Care for the Kennet*

RQ1: What are the collective contexts of existing patterns of domestic water use?

Focus group questions:

- What influences and shapes water use in the home (unprompted)?
- How does interaction with the river shape water use in the home (unprompted)?
- How do extreme events such as floods, droughts and pollution events shape water use (prompted)?

RQ2: How effective is *Care for the Kennet* in engaging with, and reconfiguring, this collective context to contribute towards lower levels of domestic water use?

Focus group questions:

- How does *Care for the Kennet* influence water use in the home?
- How effective is the initiative in changing relationships between people, homes and water?

Recruitment and sampling

The recruitment criteria required participants to be resident in one of the towns / villages involved in *Care for the Kennet* and with at least one child in a class involved in the initiative's schools project. Due to the smaller scale of the initiative (a maximum target population of 10,000 properties compared to Swindon's 83,000 properties[9]) and the subsequently limited pool of potential participants, an alternative mode of sampling and recruiting participants was required. Snowball sampling was used to recruit participants by word of mouth, three participants were identified and then asked to assist in the recruitment of a further five to seven parents, giving a total of three focus groups and 16 participants (with 32 children involved in the initiative). Snowball sampling enables greater access to participants in the initiative with the combined benefit of providing a naturalistic sample, mimicking the natural relationships and conversations thought more likely to encourage reciprocal storytelling, dispute and jest to enable the discussion of more complex research questions (Flick, 2009b).

The focus groups were held during June 2014, each lasting for two hours. In this instance, all participants were female, most were part-time employed or stay-at-home mums meaning male counterparts worked full-time and were therefore less available for discussion. The sample retained a mix of metered and unmetered respondents, however metering in these towns was thought to be less common due to the older housing stock in the area, and this was reflected in the focus groups with only around 30% of participants

[9] Derived from Thames Water statistics on properties and populations (Thames Water, 2015c).

living in metered properties. Again, shopping vouchers (£40 per person for a two hour focus group) were provided as a reimbursement for time and travel required to take part in the research.

Process

Along with different recruitment and sampling techniques, the specific methods and the discussion topics used in the focus groups were varied to reflect the differences between the two initiatives (see Box 3). The *Care for the Kennet* focus groups revolved around a set of questions designed to learn about participants' experiences of the initiative, and that of their children. In addition, a further set of questions were designed to interrogate the relationships between people, practices and water – particularly water in the river but also related to the weather and extreme events to explore the implications of these for domestic water use (these themes are described in more detail in Chapter 5).

The first exercise, lasting approximately 40 minutes, followed a similar format to that used in the *Save Water Swindon* groups, however when presented with examples of water efficiency activities these had a greater focus on *Care for the Kennet* including images of the classroom projects, fish releases and materials sent home to parents as well as an image of the *Care for the Kennet* roadshow stand. Again, the structure for discussions began with an unprompted individual reflection, progressing to a group discussion of the experiences and implications of different water efficiency activities.

The second exercise, lasting approximately 50 minutes, focused on a semi-structured discussion of participants' experiences of rivers and waters in their local area. These discussions evolved naturally, reflecting themes of relevance to the participants, and consequently varied between the different groups. For example, recent localised flooding featured as a topic for discussion in all three groups, and a pollution incident just before the third meant this was discussed only in the final group. Participants were also prompted to consider their own childhood experiences of rivers and waters and those of their children, before, during and after the initiative, and reflect on the extent to which these connected with water use at home. Finally, participants were asked about their experiences of drought and their implications for domestic water use. Following the themes in the previous discussions, several participants reflected on their experiences of the 1976 droughts, when many of them were children, compared to the impact of the 2011/12 drought on their families, their homes and their water use. Finally, in the remaining time, the focus of discussion was returned to *Care for the Kennet* to reflect on

the implications of the initiative for how both children and parents understand the relationship between water in the river and water in the home, and if and how the initiative effects these relations.

Analysis of focus groups

In both cases the focus groups were recorded[10], transcribed verbatim and analysed in Atlas.ti. In order to provide insight into the collective context of everyday water use the analysis was grounded in the empirical findings rather than interpreted using a pre-existing conceptual framework. In practice this entailed an iterative process of analysis and interpretation, identifying themes emerging within the discussions in an exploratory fashion. First open coding was used to identify contingencies of everyday water use, including contextual features that shape demand (e.g. hairstyles, dress-codes, practices of relaxing or cleaning), influence how water is used (e.g. bathroom configuration) and guide reactions to water efficiency activities (e.g. trust, sense of entitlement). Secondly the data was thematically coded, grouping similar themes and exploring corroborative and conflicting accounts. At this point further coding layers were added to consider personal (e.g. quiet time, bodily experiences of sweat and odour), domestic (e.g. taps and boilers, laundry routines) and supra-domestic contextual features (e.g. weather, experience of people in the workplace). Emphasis was placed on identifying themes that might be used to orientate future water efficiency activities, and leading to the distinction of *expectations*, tacit understandings of what water is and what water is for with reference to notions of needs, entitlements, and responsibilities; *experiences*, how understandings of ordinary water use and the socio-material world that creates and enables water use are formed; and *materialities*, the socio-material aspects of water use that shape demand and shape and constrain the options and possibilities for meeting demand. These themes were then used to explore the case studies, to interpret discussions of water efficiency initiatives, and understand the interactions of people and water. They also provide the basis to begin the visioning exercise in the workshops.

3.1.3. Methodological reflections 1: Using talk-based methods to explore the collective context of demand

Theories of social practices, and related social theories, have been described as opportunities to re-focus enquiry from the cognitive, discursive and individualistic

[10] With consent, in accordance with the University of Manchester Research Ethics.

motivations for behaviour, towards the messy inconspicuous goings on in everyday life (Reckwitz, 2002, Shove, 2003). This is as much a methodological opportunity as an epistemic one, and calls into question the most appropriate methods for researching social life (Halkier and Jensen, 2011). Thus talk-based methods have been the source of some debate with regards to research related to everyday consumption (Hitchings, 2012), with many researchers reticent regarding their capacity to capture the subtle, subliminal processes that shape everyday action compared to observational and digital methodologies (Simpson, 2011). The case study research undertaken towards this thesis uses talk-based methods, namely interviews and focus groups, to access the research questions therefore offers further contributions towards this debate.

Much of the critique of talk-based methods rests on a discussion regarding what conversation can and cannot capture with regards to everyday activity. The core criticism being that much of everyday activity is not driven by conscious decision, but automated, habituated and routine (Shove, 2010). Consequently talk-based methods are seen to risk glossing over important embodied, sensory aspects of everyday action (Martens *et al.*, 2014). Further, because action is habituated, participant recall is compromised and the diversity and complexity of mundane activity is lost or rendered insignificant due to its trivial nature (Thrift and Dewsbury, 2000).

In response to, or more accurately, co-evolving with this critique, researchers have experimented with various methods to supplement or replace talk-based methods in topics relating to everyday consumption. Examples include audio-visual methods (Simpson, 2011, Brown and Dilley, 2012, Muir and Mason, 2012, Pink and Leder Mackley, 2012), ethnography (Macpherson, 2010, Hargreaves, 2011), photography and scrapbooking (Latham, 2003, Watson and Shove, 2008, Strengers and Maller, 2012), and a small but growing number of researchers who use participatory design and experimentation to unravel practices in different contexts (Jack, 2013a, Kuijer, 2014, Davies and Doyle, 2015). With regards to ethnography, but arguably applicable to many of these methods, Hargreaves describes how it provides "richer and more subtle accounts of action in context that, whilst more modest, might also be more valuable" (2011, p. 85).

More recently, researchers have rallied to defend the role of talk-based methods in practice-based enquiry (Halkier, 2010, Hitchings, 2012, Browne, 2016). Hitchings reflects that participants in his research were "entirely able to talk about relatively mundane actions" (2012, p. 65) even where actions were carried out unthinkingly (see

also Hitchings, 2011b). Hitchings illustrates that interviews enable participants to critically reflect on their personal practices, and what influences them, and compare against known alternatives, findings corroborated by Browne (2015) and Halkier (2016), who illustrate that talking together in focus groups aids these conversations. However, Macpherson (2010), who supplements interviews with auto-ethnography, concludes that while talk-based methods should not be rejected, there is a need to pay attention to the aspects of everyday activity that they prioritise, and those that they neglect.

The research undertaken in this thesis rests on the assertion that the appropriateness and efficacy of a given method is not predetermined, but entirely dependent on the research questions being asked. Much of the criticism regarding talk-based methods is levelled at research that seeks to understand and depict *what people do* (Martens, 2012). These are classic lines of enquiry for those working with social practice theories and alike, useful for diversifying our understanding of everyday action and counteracting pervasive notions of averages (Sofoulis, 2011a) or consumer segments (Browne *et al.*, 2013) that emerge from other disciplines. Research related to water is especially rich in this regard, with historical and longitudinal analysis (Trentmann and Taylor, 2005, Davidson, 2008, Taylor and Trentmann, 2008, Chappells and Trentmann, 2015), large-scale quantitative studies (Browne *et al.*, 2014) and detailed qualitative cases (Medd and Chappells, 2008, Woelfle-Erskine, 2009, Jack, 2013a, Yates and Evans, 2016), which have succeeded in establishing some conceptual guidance on how to navigate the complexity of everyday life (Sharp *et al.*, 2011, Fam *et al.*, 2015).

However, this is only one aspect of theories of practice, and only one set of research questions to which they might contribute. For policy makers, demand managers and theorists alike, other questions are becoming increasingly important (Castree *et al.*, 2014); particularly mechanistic questions – *'what are the elements and processes that shape the ongoing evolution of everyday activity?'*, and strategic questions – *'might we harness some of these elements and processes to steer everyday activity towards desirable ends?'*. These are very different types of questions that lend themselves to different methods, but exciting ones that practice theories appear well equipped to explore. The distinction between practice-as-performance and practice-as-entity introduced in the previous chapter is pertinent to this discussion. Practice-as-performance refers to the 'doing' of practices such as showering, cooking or driving, while practice-as-entities refer to the 'block' of relational elements that collectively structure action (Reckwitz, 2002). They are closely related, and co-productive of one and other, yet have

different epistemological consequences, and methodological needs. The debate around talk-based methods does not always distinguish between these and there is therefore a risk of dismissing talk-based methods unduly.

The present research prioritises these latter questions. While understanding 'what people do' – the performative aspects of practice – is important, the research within this thesis makes no attempt to describe the intricacies of practice performance. The exception to this is in initial interviews with initiative organisers. In this instance, the interviews provide a compromise, with the potential for inaccuracy and a glossing over of important details balanced against the time required to gather the data and the burden placed on interviewees. In order to address this, the documentary analysis is used to support and corroborate the interview data as well as enabling a more reflexive mode of data collection (Atkinson and Coffey, 2010). Even here, talk is used to guide the analysis, identifying events, documents and technologies of significance in order to gain a sense for what is important amidst the myriad of processes and elements that surround water resource management.

In the focus groups, talk-based methods are used differently, the principal concern being not to establish a picture of typical water use or explore the minutiae of practice variation, but to explore the processes and elements – dispersed across time and space – that collectively structure everyday water use. Further, the strategic interest was to understand how these elements and processes shape patterns of water use, and how these might provide avenues to reduce water demand. These sorts of question pose different methodological challenges. The breadth and extent of relational elements that structure everyday action render observation difficult, yet existing research demonstrates that people can reflect on the elements that comprise practice-as-entities when called into question (Day and Hitchings, 2011, Hitchings, 2011b, 2012). Focus groups were chosen as a means to initiate discussion, allowing for alternative accounts to brush up against each other (Berg, 2001) that organically lead to discussions regarding how and why such heterogeneity exists that reveal the context of demand (Browne, 2016). The roleplay exercise in particular aids this process, tasking the group to define 'normal', a fallacy that becomes obvious in light of individual comparison (Sofoulis, 2011a), thus resulting in rapid appraisal of the circumstances surrounding these differences.

Thus the methodological framework presented here aligns with the work of researchers such as Hitchings (2012), Halkier (2010, 2011) and Browne (2016), who defend the use

of talk-based methods in practice-based enquiry, particularly where research questions are mechanistic or strategic. The research demonstrates how such methods may be used creatively to elucidate the complex social and material worlds within which people use (and manage) water, adapting talk-based methods to gain access to the specifics of the research questions.

3.2. Industry-focused research

The second stage of this research shifts focus from the consumer-oriented activities of the case studies to the professional practices of managing demand. In doing so, there were two principal objectives. Firstly, to explore how water efficiency activities might operationalise findings such as those produced in this thesis to steer demand and reduce domestic water use, and what interventions based on those findings might look like. Secondly, to explore how existing management activities are shaped, sustained and suppressed by the elements and processes involved in managing demand. In order to achieve these objectives, the findings from the initial fieldwork were used to stimulate a dialogue with professionals routinely involved in water efficiency activities in the water industry. Again, a mixed-method approach was used, incorporating expert interviews, two 'practice innovation workshops' and document analysis to explore how water efficiency might develop in the future and the institutional context that supports existing interventions in their conceptually narrow forms (Shove, 2014). The following sections describe the methods used in this empirical work and Section 3.2.3 reflects on the notion of co-production in industry-focused sustainability research and how collaboration between academia and industry pushes the boundaries of social theory. Firstly, the following section briefly summarises the context to this research.

3.2.1. Context

The preliminary findings of the case study research were presented at WatefCon2014, one of the UK's leading water efficiency conferences attended by stakeholders from a range of backgrounds, including from academics, water companies, and the regulators (see Hoolohan and Browne, 2014). The presentation drew out the implications of the findings for how demand management is framed, identifying a need for distributed approaches to intervene in the collective context of demand. from academia, water companies and the regulators. The resulting feedback and discussion suggested interest

from both academic and industry stakeholders as to how to implement such findings in policy and management practice (see Box 4). However, alongside this lay uncertainties regarding the practical feasibility of such reconceptualisation of demand management. In addition, a significant number of questions related to what such approaches might look like and how they would fit into the already busy professional lives of demand managers. Subsequently, these reflections were used to inform the research question in the second part of this thesis, and a mixed method approach was designed to access these.

Box 4: Industry reflections on Stage 1

"I fear the low hanging fruit has been reaped, and well and then what? We still need to reduce demand, some of us do at least, but how to do that is a different matter" (Water Resources Manager).

"If you had one or two simple recommendations, what would they be? What could we be doing?" (Water Efficiency Manager)

"It's not like there's loads of ideas out there that we're ignoring, I genuinely don't think anyone knows how best to proceed" (Demand Strategy Analyst)

"We know the limitations of current activities, but knowing what else to do is a different story!" (Water Efficiency Manager)

"I just think everyone is really busy, there's not much time to think about things like this" (Director of Research)

3.2.2. Research methods

Interviews

This secondary phase of interviewing provided a different function to those carried out in reference to the case studies, offering an opportunity to collect a more diverse range of opinions and experiences, providing a broader understanding of demand management in the water industry. In total, 21 semi-structured interviews were held with water industry professionals, including representatives from seven of the nine water companies in England and each of the main regulatory bodies, as well as a number of individuals working with water companies in the design and implementation of water efficiency activities, either as consultants or partner organisations involved in implementation. Potential interviewees were approached at a conference following a presentation of the focus group findings, with all but one agreeing to take part in the research.

The interviews were focused on deriving a broader understanding of what shapes demand management, the type of understanding and vision that demand managers work with in their everyday working lives, the elements and processes that shape the activities undertaken in water efficiency initiatives. The interviews were semi-structured, Box 5 (next page) provides a topic guide for the interviews that were carried out with Water Company representatives and an overview that was used to structure discussions, with

Box 5: Topic guide for expert interviews

A. Progress and visions: What will a sustainable future for water look like? In your experience are water efficiency activities getting towards this at the moment? What are the biggest obstacles to achieving this? What have been the biggest steps in the right direction recently? What would be the next step to achieving this?

B. Background: How long has [organisation name] been involved in WEFF? Why is [organisation name] involved in water efficiency? What is the role of [organisation name] in achieving sustainable water future?

C. Specific projects [either pre-identified or one identified by them]: Tell me about the initiatives you are involved in at the minute? [Select one to initiative talk about] **On aims and visions:** What were the overall aims? How were the activities designed / selected? Were other activities considered? **On collaboration:** Did you work in collaboration in any way? Who with? What were the benefits of this? Were there any changes to the initial design of the project as a result of this collaboration? **On unexpected opportunities:** Were there any elements of the initiative that didn't go as expected? What have been the biggest challenges for the campaign? Was anything learnt/changed as a result? **On extreme events [probe as relevant with regards to initiative duration]:** Did the droughts (e.g. in 2011/12) have implications to the delivery of the campaign? What about the winter floods in 12/13? What other 'events' have there been that impact on water efficiency? Did anything about the campaign change as a result of these? How long-term are these impacts? Do they affect the bigger picture? **Reflections:** If you could start over on this project would you change anything? What has been learnt from these campaigns? Has anything then been adopted elsewhere?

D. Policy: What are the key policy and regulation that affect water efficiency? What implications do these have for the types of activities undertaken? Where does [project name] fit within these? What criteria do they fill? Do they exceed these criteria? How is their impact monitored and measured?

questions provided as examples. These themes were adapted to relate to the different professional roles of water efficiency managers, regulators and others to reflect their relative experiences.

The interviews incorporate different styles of questioning, designed to access different aspects of water demand management. For example, the first set of questions was followed precisely with every participant, gathering a collection of reflections on progress and visions of the future from different professionals within the industry. From there, the interview progressed through the topic guide, tailoring questions to fit with the conversation. Some questions, such as those relating to the initiatives that interviewees had been involved with, were designed to elicit personal narratives, allowing the interviewee to explain and explore different aspects of their role that they deemed important to the research. These were accompanied with more focused questions designed to investigate specific aspects, providing an account that was both rich in narrative detail and attendant to the various themes within the research. To inform section C (see Box 5), desk-based research prior to the interview sought to identify potential initiatives to discuss but remained open to unidentified initiatives. This blend of questions was designed to ensure an efficient use of the interviewees' time, while ensuring a level of narrative

detail sufficient to explore the research themes.

The interviews were transcribed verbatim on return to the office, and analysed in Atlas.ti, identifying themes emerging within the data following a process similar that of the focus groups (see page 74). This preliminary analysis was then used to inform a broader document analysis (detailed in the following section) that added supplementary detail.

Document analysis

As in the case studies, the interviews were used as an opportunity to identify further evidence to inform the analysis. There is an enormous amount of documentary evidence that might be included in this analysis thus the combination of interviews and document analysis enables identification of documents that influence the practices of those involved in demand management. These documents included online materials, conference proceedings, policy and guidance documents, consultation reports, industry position statements and planning documents, thereby providing detail on some of the context within which management decisions are made. In addition, written outputs from conferences and industry workshops were gathered as they provide an outward facing portrayal of different activities being undertaken, the priorities of different departments and the justification and basis for different forms of management activity.

The data collected paints a fuller picture of water efficiency that enables the interview data to be situated in the broader social and historical context of the water industry. Documents contain a political and historical account of the landscape in which current activities are situated, illustrating the precedence for activity, obligations that water companies must fulfil and industry expectations of water efficiency that are often implicit in discussions. In addition, documents often contain legacies of discussions and management activities that did not come to fruition, enabling a broader reflection on the process of designing water efficiency. Finally, documents and online materials illustrate the visions, narratives and discourse that surround water efficiency activity.

The documents gathered were reviewed for content initially, with a selection analysed in further detail using Atlas.ti to cross-reference against the interview transcripts. In combination the interviews and documents were used develop an understanding of the context to water demand management and water efficiency.

Practice innovation workshops

In research relating to complex socio-environmental problems some of the most useful critique is that pertaining to what alterative futures might look like, and the management trajectories required to achieve them (Elzen *et al.*, 2004, Davies *et al.*, 2012). However in much critical discussion such practical reflections are lacking (Shove, 2014). Consequently, in application, theoretical advances become watered-down, subsumed into existing managerial frames and encompassed within conventional methods and tools (Bakker *et al.*, 2010). The questions and discussions that followed the initial presentation of findings (see Box 4) highlighted an urgent appetite for pragmatic reflection that was largely unfulfilled by existing academic research. Subsequently two practice innovation workshops were conducted that aimed to develop innovative approaches to water efficiency based on the findings from of the case studies.

Sample

Two workshops were held, each with 12 practitioners. In both cases they were instigated by a senior water efficiency manager following discussions relating to the earlier stages of this research. The first was hosted by the Water Efficiency Network (WEN), a quarterly meeting of representatives from each of the water companies in England and Wales to facilitate collaborative learning and development, for example the network funds foundational research that benefits all of the companies through the *Collaborative Fund* to reduce duplication. In this instance the workshop was an item on a larger agenda and given approximately 2 hours. The second took place at Essex and Suffolk Water (E&SW). Again, there were 12 participants, but on this occasion the participants represented various aspects of the Water Company that intersect with water efficiency including communications, strategy, infrastructure development and water efficiency managers, and incorporated people from both E&SW and Northumbrian Water, the umbrella company. In this instance, a whole day was granted for discussions, with the workshop taking six hours in total.

Process

The workshop structure developed principles of design-thinking to facilitate discussions of hypothetical initiatives and the reality of implementing these (see Box 6 for an overview). Design-thinking is an unconsolidated methodology that is being applied in a range of disciplines as a means to engender different modes of thinking, to identify new directions and develop more systemic and future oriented approaches to existing challenges (Bakker *et al.*, 2010). Davies *et al.* argue that “genuinely critical geographical

enquiry must include both explanatory-diagnostic and anticipatory-utopian dimensions" (2012, p. 54) in order to break from current trends in management and consumption of resources. Design-thinking provides one methodology that aims to facilitate the anticipatory-utopian dimensions of discussions by encouraging stakeholder participation in activities aimed to encourage divergent thought and develop unconventional ideas in order to arrive at solutions (Kimbell, 2011). Both workshops used group activities to stimulate discussions and ideas around the workshop themes. The process was adapted to fit the time constraints and group dynamics in each workshop; however the structure remained broadly similar (see Box 6).

Box 6: Practice Innovation Workshop structure

Step 1: Provocation Presentation of the key findings from part 2 and a review of some of the implications for managing demand. At this point, the purpose of the workshops - to work with novel research findings to reimage water efficiency activities - was reiterated.

Step 2a: Divergence (both workshops) The first exercise expands 'the problem' (i.e. the volume of water demand used for …). Participants were provided with post-it notes to note any initial ideas about what shapes domestic demand based on their own experiences, and then a worksheet to structure a discussion about what shapes domestic demand (see Appendix C).

Step 2b: Peer review (E&SW only) An opportunity to exchange ideas was created by allowing participants a short period to look at other worksheets from other groups, and to add comments or to take back ideas to their own.

Step 3a: Developing solutions (both workshops) Participants were provided a blank sheet to consider various different options for intervention, then a worksheet (see Appendix D) that encouraged these ideas to be refined and thought about in terms of what would be done, where, who would be involved etc.

Step 4b: Practicalities (E&SW only) A third worksheet (see Appendix E) encouraged participants to consider the practicalities of implementing their imagined initiative, to consider the first steps that would be made, how success would be defined and measured and what sorts of data might be collected.

Step 5: Peer review An opportunity to discuss the imagined initiatives between the groups.

A common starting point for design-thinking is an initial expansion of the problem at hand for example, by focusing on the history in which the problem arises, the immediate and systemic context, and/or the spatial and temporal diversity and changeability of the problem (Vihalemm *et al.*, 2015). Often this phase is informed by consumer research as Brown (2008) describes how delving into the histories and experiences of consumers poses an opportunity to develop empathic insights of how end-use occurs and a focus on the details and messiness of reality over the sanitised world of constructivism (Jégou *et al.*, 2009, Bakker *et al.*, 2010). In this instance, a series of provocations were presented to introduce the topic and the empirical findings from the case studies to participants in the

workshops (see Chapter 7). Following these provocations, participants were divided into three groups, each focusing on one of three water-using practices (bathing, gardening and laundry) and tasked with mapping the context of domestic water use. This process echoes the divergent phase of design-thinking. Participants were encouraged to explore the different aspects of demand (e.g. expectations, experiences, and materialities) in view of their own personal experiences as water users, and their professional experiences of managing demand. Following this initial exercise, an opportunity for feedback was provided and, in the E&SW workshop, a brief opportunity (15 minutes) for participants to contribute to the maps made in other groups.

Following this initial exploration, design-thinking typically shifts into a solution focused mode of thinking, using the initial expansion of the problem to inspire and inform ideas for intervention (Bakker *et al.*, 2010, Dovey, 2011). Based on the mapping exercise each group was tasked with developing an intervention designed to reconfigure the collective drivers of demand and steer demand. In these discussions participants negotiate complex articulations of the problem to develop novel solutions. The structure allowed an initial period of brainstorming to generate various different options and ideas, and then encouraged participants focus on a single intervention. In the WEN workshop this was followed by a quick roundtable presentation and 'question and answer' session, with the time available for the third exercise limited this was a brief group discussion. In contrast at E&SW, groups devised a model for the trial, evaluation and roll out of their campaigns and then pitched their plans to the other groups, enabling a hypothetical discussion of the projects that might be fundable and how these may be implemented at their Water Company.

Dovey describes how, while design-thinking may sometimes be perceived as superficial, the process becomes one of "assembling possibilities out of actualities" (2011, p. 350), enabling solutions to flow from observation of a complex world. Similar principles inform back-casting (Dreborg, 1996, Robinson, 2003, Carlsson-Kanyama *et al.*, 2008, Gleeson *et al.*, 2012, Davies and Doyle, 2015) and visioning exercises (Robinson, 2008, Gregory and Brierley, 2010) both of which are methods used throughout global change research to develop scenarios, frameworks and vision statements. Such methods provide an alternative to forecasting, which by basing visions of the future on extrapolations of current trends provides limited capacity to develop solutions that break from these trends (Dreborg, 1996). Instead, Davies *et al.* describe how the utopian dimensions of these methods have potential to "liberate policymakers and other stakeholders from current

patterns of disjointed incrementalism" (2012, p. 54). By suspending practical questions and building on expansive foundations, the process creatively focuses developing innovative solutions to complex real-world challenges (Quist and Vergragt, 2006, Quist, 2007, Davies and Doyle, 2015).

The final aspect of the workshops was to provide feedback on the imagined initiatives and outputs to stimulate further discussion and ideas generation. Methods such as these have been shown to create a space for learning, challenging preconceptions and contributing to the reframing of otherwise familiar problems, however potential to instigate broader changes to policy and professional practices is less clear (Davies *et al.*, 2012). In an effort to facilitate a continued discussion, and aid diffusion beyond the workshops, outputs were generated from each workshop. From WEN, a report was produced that incorporated further recommendations based on existing research, focus group findings and where possible concrete examples of current practice (Hoolohan, 2015). At E&SW, feedback was provided collectively, with a discussant from each group drawing out key ideas, and summarising potential obstacles and challenges. In addition visual minutes (illustrated storyboards that capture key aspects of the discussions) were produced by an artist in order to exhibit at industry events, conferences and meetings to facilitate further discussion.

3.2.3. Methodological reflections 2: Co-designing future demand management

The second part of the empirical work undertaken for this thesis again uses a variety of methods to address the research questions. This research design aspired to initiate dialogue between academic critical theory and demand management practitioners for two purposes. Firstly, it marked an effort to generate robust, policy relevant research that has direct practical applications, using the research design to create a space for stakeholders to critically reflect on governance and management, and to generate possibilities for future sustainable water management based on the research findings. Secondly, it attends to a growing frustration in the research community regarding the persistence of interventions based on narrowly framed models of behaviour (Shove, 2014, Strengers and Maller, 2015a), and works with professionals involved in demand management to develop conceptual understandings of how the practices of demand management are shaped and sustained. In these ways, the industry-academic partnership from which this

thesis emerges is used to encourage two-directional learning in order to enhance its contributions both in terms of both application and theory.

Recent debates regarding research impact, including but not limited the Research Excellence Framework (Smith *et al.*, 2011), emphasise the importance of social value and application, particularly of academic research funded by the public sector:

> *"As publicly funded researchers, we clearly have a responsibility to contribute something in return to society – in other words, there is some form of a social contract that we are obliged to honour."*
>
> (Martin, 2011, p. 247, in Bannister and Hardill, 2013, p. 169)

However, as research funding is increasingly derived from heterogeneous sources, including a growing contribution from the private sector, the notion of impact is changing (Castree, 2010, 2016). For global environmental change research – a banner that includes work related to demand and sustainable consumption – De Fries *et al*. argue that the research community "needs to renew its social contract with society by moving [...] toward solution-oriented research to provide realistic, context-specific pathways to a sustainable future" (2012, p. 603). To some extent this renewal is underway, with a growing number of researchers aiming to develop novel pathways for intervention. So far however, enquiry into the 'human dimension', as Castree *et al.* (2014) describe it, is as yet stunted and the social sciences may yet make a greater contribution to understanding what is possible, appropriate and achievable in terms of global environmental change.

One of the principal challenges in collaborative research is the need to balance academic rigour against practical relevance. Numerous academics raise concerns regarding the capacity of academic research to influence practice, as it tends to remain disconnected from the real worlds of those who might implement the findings. Panda and Gupta argue that academics "tend to focus on rigorous analysis of concepts to explore inter-relationship among various concepts to explain a phenomenon, rather than on how the "research insights" culled out of academic research can solve organisational problems" (2014, p. 157). Ultimately, Panda and Gupta suggest this contributes toward an analytical blind-spot in which the "real issues and challenges being faced by [practitioners are] rarely researched" (2014, p. 158). This is particularly problematic in research pertaining to global environmental change where complex socio-environmental challenges necessitate robust understandings, which include understanding the practical politics of implementation (Cornell *et al.*, 2013). Thus the risk is that researchers assume the

provision of robust scientific knowledge is sufficient to guide the reform of policy and management practices, and ignore the complex context in which policy making and application takes place (Fernández, 2016).

In contrast, academic-industry partnerships are seen to enhance the practical relevance of academic research, especially where the research creates a space for learning and allows the translation of research findings to insights for policy and practice (Pahl-Wostl *et al.*, 2013). The research carried out in this thesis is transdisciplinary insofar as, following Walters definition, it is characterized by "a process of collaboration between scientists and non-scientists on a specific real world problem" (Walter *et al.*, 2007, p. 335), and thereby aims to contribute to decision-making capacity in the water sector as well as being underpinned by critical research. The CASE partner, Thames Water, were embedded throughout, as contributors to the research design (particularly the selection of case studies), as participants in the interviews and workshops, and as reviewers, providing feedback on the research as it developed. Thames Water were not the only stakeholders involved in this research however, and frequent contribution to industry conferences and events provided a space to engage with others, extending this understanding to multiple (sometimes divergent) perspectives across the water industry. These perspectives were also formally captured in the industry focused interviews and workshops.

The contribution of various stakeholders to this research required careful mediation to retain the freedom to pursue critical research questions and apply academic concepts rigorously, whilst maintaining real-world relevance. In practice this entailed finding terms of reference and a language that made sense both conceptually and in a non-academic setting. The pursuit of this common language further supported the research focus on *shared and collective aspects of everyday water use* as this allowed conceptual distinction whilst retaining the capacity to engage with various different literatures and disciplines, and also communicate the research in a manner that makes sense beyond academic discussion. In addition this relationship required an extra layer of interpretation of the research, translating the research findings to emphasise their relevance to critical debates and current resource management challenges in the water sector. Subsequently this thesis is accompanied by a series of publically accessible summaries that communicate the key findings and implications of this research for the water sector (Hoolohan, 2016).

In addition, the workshops undertaken aim to create a physical space for reflective and critical development of the research findings. While the case study research findings were used to introduce the practice innovation workshops, participants were encouraged to expand the problem framing based on their own experiences, which in some cases resonated with the findings, and in others resisted. In this way the workshop discussions enrich understandings of participants in the workshops – thereby opening up an inclusive and imaginative space to visualise alternatives (Davies *et al.*, 2012) – but also enable theoretical concepts to be acquainted with the messy reality of the world in which they are applied (Castree, 2005). This acquaintance enables their refinement of concepts and theories such that they better reflect the complexity of the landscape in which they seek to be applied (Castree *et al.*, 2014). In this instance the industry-academic partnership provided the opportunity to reflect on how research is translated into practice, and provided a space in which to develop a deeper understanding of the practices involved in designing and implementing critical research. Thus the methodology involved in the latter stages of this research offer novel contributions to academic discussions by demonstrating the two-directional benefits of industry-academic partnerships.

3.3. Conclusions

This chapter outlines the two-part mixed method research design used throughout this thesis to investigate the research questions. Like much of the research in social practice theories and its allied disciplines, the present research uses small-n case studies to develop a rich analytical understanding of the collective elements that shape everyday practices of water use and water management. These understandings are used to contribute to discussions in the literature regarding the future of demand management intervention (e.g. Strengers, 2012, Browne, 2015). However unlike a growing number of researchers using observational methods and other alternatives this chapter supports a case for the continued use of talk-based methods to access certain research questions. Similarly, the previous section establishes how, and to what benefit, the industry-academic collaboration behind this research is incorporated in this methodology to develop ensure both the validity and relevance of this research for both an academic and industry audience.

4. Case study 1: A critical evaluation of Save Water Swindon

The findings and discussion presented in this chapter are based on a paper prepared for WatefCon 2014 that was subsequently published in the British Journal of Environment and Climate Change (Hoolohan and Browne, 2016).

4.1. Introduction

Save Water Swindon forms a core part of Thames Water's efforts to balance supply and demand in the 'seriously water stressed' Swindon-Oxford Water Resource Zone (SWOX WRZ) (Environment Agency and Natural Resources Wales, 2013)(see Chapter 3 Section 3.1.1). In order to reduce demand by 1 mega litre per day by 2014 (based on 2010 levels), Thames Water partnered with organisations including WFF, Waterwise and Swindon Borough Council to develop the first 'whole-town approach' to water efficiency (WWF, 2009). The project aimed to develop the first integrated approach to large-scale water efficiency, in order to achieve measurable savings[11] and demonstrate the cost effectiveness of water efficiency activities for long-term sustainable water management (Waterwise, 2012). A mass media and marketing campaign incorporating direct mailings, roadshows, adverts and coverage in local media was developed in order to drive more sustainable patterns of water use and increase the uptake of home retrofits. In addition, *Save Water Swindon* provided a testbed, to establish a blueprint for delivering large-scale home retrofitting and change to water use that could be rolled out to other areas (Waterwise, 2012).

By 2014, *Save Water Swindon* had achieved its 1 mega litre target, with final estimates suggesting reductions of approximately 1.7 mega litres per day (Ml/day) (Thames Water, 2015f). Assuming Swindon's population growth and future demand reflect the assumptions made in Thames Water's estimates for SWOX (Thames Water, 2015c), a saving of 1.7 Ml/day results in a decline in per capita consumption from 143 litres per day in 2011/12 to approximately 135 litres per day in Swindon by 2015. Assuming no further intervention is made in Swindon, and population rises as expected, per capita

[11] In recent decades the lack of universal metering in the water industry and difficulties obtaining the granular data needed to measure the effect of water efficiency measures has meant estimated values are common in evaluation. This is changing and a need for a clear business case to support investment along with a drive towards evidence-based action in regulation and policy (Ofwat, 2008, Environment Agency *et al.*, 2012b) means that water companies are increasingly developing data to demonstrate measurable savings (Waterwise, 2008, 2011). This is discussed in Chapter 6.

demand in 2030 will be approximately 138 litres per day. Thus, at local level, the whole-town approach appears to offer a substantial contribution towards industry visions that aspire to see per capita demand reduced to 130 litres per day by 2030 (Defra, 2008).

However, there remain concerns regarding the depth and longevity of savings where further understanding may contribute. In particular, while public engagement with the initiative exceeded that of many Water Company activities (Humphreys and Gill, 2014), it fell short of achieving universal engagement, an observation that raises questions regarding how to extend demand management activities in meaningful ways. Secondly, relatively rapid developments in domestic technologies over time mean that water-using appliances are increasingly water efficient, thus the potential savings attainable from home retrofitting are reducing, altering the cost-benefit ratios that water companies rely on to justify activities (see Chapter 6). This raises a challenge to identify alternative forms of intervention that extend beyond technological efficiency to reduce demand.

Furthermore, activities such as *Save Water Swindon* are financially resource intensive, yet when viewed at regional and Water Company scales their contributions toward industry targets become less profound. Even rapid rollout of activities based on *Save Water Swindon's* blueprint is likely to only partially deliver industry visions at a Water Company level. For example, assuming 1 Ml/day reductions were to be achieved in 15 towns by 2030 (i.e. *Save Water Swindon*'s is successfully replicated at a rate of one town per annum), the resulting per capita demand in the Thames Water region would remain in the region of 158 litres per day (accounting for population growth, based on population and demand estimates contained in Thames Water (2015e)). This raises questions regarding the form future activities might take to deliver larger scale and longer lasting changes to domestic water use.

Despite these challenges, *Save Water Swindon* is recognised both in industry (Environment Agency and Waterwise, 2012a) and academia (Browne *et al*., 2014) as establishing an approach that surpasses conventional water efficiency activities. In Browne *et al.*'s observations of the initiative in its early stages, it was suggested the whole-town approach "appeal[s] to a collective sense of responsibility, highlighting the importance of the role of intermediaries, and is an approach to water efficiency that engages with a range of distributed actors" (2014, p. 78). Yet, *Save Water Swindon* has received limited empirical attention, thus the reality of these achievements is as yet unknown. Thus the objective of this chapter is to evaluate the extent to which *Save Water*

Swindon contributes to long-term sustainable water management via large-scale water efficiency activities.

The analysis that follows is based on qualitative data gathered from focus groups, interviews with initiative organisers, and documentary evidence of the initiatives progress (refer to Chapter 3.1.2 for Methodology). Section 4.2 presents focus group findings to develop an understanding of the collective elements that shape domestic water demand in Swindon. Section 4.3 reflects on the capacity of *Save Water Swindon* to reconfigure these elements in order to reduce domestic demand. The discussions presented are therefore based on unique empirical research and thereby stand to contribute both to the ongoing development of water efficiency activities and to academic conceptualisations of demand in the context of water in the UK and in other geographic and substantive fields.

4.2. What shapes domestic demand in Swindon?

The literature reviewed in Chapter 2 highlights the situated nature of demand, thus before *Save Water Swindon* can be evaluated it is necessary to develop an understanding of the collective elements that shape water use in Swindon. This study uses focus groups as a means to investigate the collective context of water demand in order to understand where intervention might be targeted and the effectiveness of *Save Water Swindon* in doing so. These findings identify three interlinking aspects that are significant to domestic water demand; expectations, experiences and materialities. These three themes demonstrate how domestic water use connects to social and material configurations that extend beyond individuals and their homes and thereby offer opportunities for demand management that are explored in the following sections. The findings resonate with existing literature on demand and consumption (see Chapter 2) yet provide an original exploration of how demand emerges in this local context.

4.2.1. Expectations

Chapter 2 outlines how the decline of Big Water in many western nations was synonymous with the repositioning of water users as active participants in water management, forming the basis for water efficiency activities founded in the logics of ecological modernisation (Bakker, 2005, Page and Bakker, 2005, Allon and Sofoulis, 2006). However existing research illustrates that such shifts have differentiated impacts

on consumer understandings of water in society and the delineation of responsibility for managing water (Haughton, 1998, Chappells *et al.*, 2001, Medd and Chappells, 2008, Taylor *et al.*, 2009). The findings presented here identify that even within Swindon, where the interactions between people, water supplies and the Water Company are relatively uniform, people have various expectations of what water is for, and how responsibility for managing water demand should be distributed. Three clusters of expectations are identified in the findings and are expanded in the following subsections:

Water for life (in all its guises)

Focus group discussions revealed an expectation that water will be available, as required, to cater for the needs created by everyday life. Respondents describe how particular lifestyles demand certain volumes and frequencies of water use, which were commonly referred to as needs. Individual needs vary substantially, for example the extract below illustrates how water use intersects with the various daily routines of different family members:

> *"Often my daughter and I can jump in muddy puddles three times a day or more! Two year olds are pretty messy in general, so she's often in the bath more than once a day. I work shifts so I might need to shower twice a day, also I'd need to wash my uniform which needs to go in a different wash to the rest because it needs a boil wash [to get chip fat out]. But I don't water the garden, so it's all relative I suppose! My mother-in-law does a lot of gardening, she waters the flowers every day regardless of whether they need it, but she worked hard all her life and that garden is her reward – and if it keeps her moving and keeps her happy then I see no problem with that." (F, 34)*

The extract demonstrates how water demand is entrenched in everyday practices of childcare, work and leisure that require certain forms of water use. Subsequently, water use is perceived to be a non-negotiable outcome of everyday life. The near endless variation in everyday routines, and the resulting variation in individual needs, was justified by participants as an ordinary outcome of different lifestyles. This was frequently accompanied by a sense of entitlement, for example in the above extract gardening was a hard earned reward for a lifetime of work, while others reflected on a more general principle regarding being free to do as one wishes with their life without judgement:

> *"You could say you don't need to shower every day, but that's just different peoples' priorities and you can't judge them based on your own" (F, 40)*

The expectations people have of water and water services have both direct and indirect consequences for water efficiency. On one level, water efficiency activities were seen to be something that people could elect to do if they wished, but not something that people should feel as necessary to conform to other people's expectations:

> *"That timer, no! Having a shower isn't exactly wasting water if you ask me, and if I'm going to be in there for a minute longer than I'm told to by that timer, then I'm going to be in there a minute longer!" (M, 51)*

On the other hand, participants reflected on how waters functional role in aspects such as leisure and work mean that reducing water use risks having to compromising on these aspects everyday life:

> *"I'd have to give up work – then I could do less washing!" (M, 31)*

The example relates to work, however others commented on how reducing water would require re-evaluation of things like vehicle safety, fitness regimes and looking after their children and consequently risk compromising on aspects of their life such as health, happiness and prosperity.

These findings support existing literature that challenges the concept of choice in relation to resource use (Shove, 2010), emphasising that water use is embedded in daily life. They also support research that suggests different lifestyles result in different patterns of water use (Spaargaren and Van Vliet, 2000, Barr and Gilg, 2006, Pullinger *et al., 2013*) and that resources such as energy and water play enabling roles that limits the capacity for conservation behaviour (Shove and Walker, 2014). However, they also illustrate a complex relationship between water use and notions of individual freedoms. This is a tricky issue for water efficiency. While on a day-to-day basis the findings suggest there is limited conscious reflection on water use, the implicit suggestion in conventional water efficiency interventions (see Chapter 2) that less water could be used, or that wasteful water use could be avoided, risks being interpreted as a challenge to personal freedoms and standards of living (Taylor *et al.*, 2009, Swaffield and Bell, 2012). Consequently, there is a need to understand how water efficiency initiatives might contribute to re-crafting expectations that better contribute to lower levels of demand.

Our water, their job

A related expectation is that in order that *water for life* is available, water companies will manage water on behalf of their consumers. This expectation is closely connected to the

issue of charging for water, as several respondents' perceived water billing to delineate responsibility for managing demand, permitting consumers to use as much water as they are prepared to pay for:

"You can't be told what water you can use, you're paying for it" (M, 41)

This should not be interpreted as consumers' lack of understanding, or dismissal, of the relationship between household water use and water stress, as several respondents registered concern regarding the negative impacts of domestic water use. Likewise, these findings do not support a return to supply driven planning, as participants were aware and generally supportive of the social and environmental case for reducing demand. However, many respondents view managing demand as an extension of Water Company activities and in several instances provided suggestions of actions that might be taken to reduce demand elsewhere in the supply chain prior to appeals for consumers to reduce water use in homes:

"Can't [the Water Company] just restrict the flow right from source? Then you don't have to worry about all that little stuff [water efficient devices and information]?" (M, 66)

Other suggestions included limiting housing development in water scarce locations, developing fit-for-purpose supply systems and placing greater restrictions on businesses that provide water services (e.g. window cleaning and car washing). Several of these suggestions are contrary to the non-interventionist, consumer-centric strategies typical of conventional water efficiency activities and suggest that individual action is not universally perceived to be the best option for demand management.

Thus, *Our water, their job* reveals a disparity in the positioning of responsibility for water management, echoing observations that the changing institutional landscape of water management is not necessarily synonymous with changing consumer perceptions (Haughton, 1999, Bakker, 2010, 2012b). Many respondents retain a traditional view of supplier-consumer relations consistent with Haughton's observation that following privatisation "the public still chose to view water as a public good, not a private commodity" (1998, p. 421). These findings suggest that contrary to policy and industry visions that suggest "everyone has a role to play in using water more efficiency" (Defra, 2011, p. 8), consumers understand their own contribution to reducing domestic demand to be secondary to that of water companies. Further, they identify a wide range of other

actors (including manufacturers, property developers and those who provide water services) who water companies might work with to reduce end-use demand without need for individual action. Again, these are complex issues for the water industry, however they highlight an opportunity to re-evaluate the framing of responsibility in demand management, and the role of an array of actors outside the supplier-consumer relationship that might contribute to managing domestic water demand (Browne *et al*., 2014).

Not here, not now

Finally, the focus group discussions illustrate how consumer expectations differ from the reality of water stress and, consequently, undermine water efficiency. For many participants, the notion of water scarcity implied in demand management contrasts with the embodied experience of water in the UK, leading to confusion regarding the need for water efficiency activities:

> *"This is what I don't understand. Here we have this really rainy country – last summer it rained constantly for six months – so we have all this water and yet we have droughts?" (F, 40)*

The focus groups reveal how tacit understandings of "British weather" (M, 41), synonymous with year-round rain and only infrequent, short-lived dry spells, result in a misconception that water is plentiful throughout the UK. These understandings contrast with scientific articulation of water stress as not only a product of rainfall but of population, demand and water management, yet they persist despite the range of information available to the contrary. In addition, disruptions to supply related to water stress are understood to be something that may occur in the indeterminate future as a result of population growth and future climate change, but is for the time being a phenomenon experienced only in the Global South.

As there is understood to be sufficient water to supply *Water for Life*, water efficiency is perceived to be an unnecessary but prudent step in a sustainable society. These understandings co-evolve with experiences of supply continuity that reinforce an understanding of abundance and security. Further, within the focus groups it was understood that were it necessary to rapidly curb demand, more extreme modes of water demand management would be implemented. Thus current supply-demand policy and management reinforces the expectation that demand will continue to be provided for by

the water companies, and small-scale water efficiency measures, and non-disruptive drought responses, were seen to convey a lack of urgency (Taylor *et al.*, 2009).

One consequence of this expectation is that when water scarcity becomes apparent, it is attributed to mismanagement rather than the broader combination of factors that result in water stress, with blame tending to be pointed at water companies as it is they who are seen to profit from water management:

> *"But see would the rivers have gone dry if [the Water Company] sorted the leaks out? Going back to the last drought, they brought the hosepipe ban in far too late, they knew there was a serious problem and they just left it!" (M, 56)*

Taking the view that droughts are the hybrid product of rainfall, water management and water use (Medd and Chappells, 2008, Bakker, 2012b), the discussions indicate a relative lack of appreciation for regional and temporal variation in water levels, or the notion of water stress as an indication of rainfall relative to population density. Further, the confidence in water supplies frames water efficiency as a symptom of the failure of water management, rather than the product of unsustainable supply-demand systems and something that water companies are able, and indeed responsible for overcoming (see previous section). These are perhaps misperceptions; however they are borne from everyday experiences and continue to undermine water demand management despite extensive efforts of water companies to raise awareness of the need to reduce demand.

Summary of Expectations

The focus group analysis illustrates a trio of expectations entangled in everyday water use that have implications for individuals' responses to water efficiency activities. Such observations echo research elsewhere that illustrates how shared and collective elements such as 'meanings' (Shove and Walker, 2010, Daniels *et al.*, 2012, Burningham *et al.*, 2014), 'understandings' (Askew and McGuirk, 2004, Gram-Hanssen, 2014, Sofoulis, 2015) and 'conventions' (Hand *et al.*, 2005, Evans, 2011a, Truninger, 2011) shape resource-consuming practices. In particular, the findings support existing research that discusses how resources are embedded in the pursuit of the "goodlife", whatever that is taken to mean for the individual (Spaargaren and Van Vliet, 2000, Shove, 2003, Kraftl, 2007). In addition, the findings demonstrate how water is embedded in notions of needs and entitlements, and that such expectations not only guide water use, but shape people's understanding of, and reaction to, certain demand management activities. Consequently

suggestions that less water could be used, either explicit or implied, risk inferring a challenge to people's ideas of freedom.

However, while the focus group discussions reveal a variety of individual differences, and strong defensive sentiments around individual determination, they also demonstrate that water use is entangled in everyday patterns of life and labour that are shared between multiple individuals (Sofoulis, 2011a, Fam and Sofoulis, 2015, Fam *et al.*, 2015). Consequently, while water use was understood to vary, this variation results from individual interaction with collective elements that shape everyday water use and inhibit individual capacity for action, a finding that supports the literature reviewed in Chapter 2. For water efficiency these findings suggest a need to evaluate how large-scale water efficiency activities engage consumers; to be alert to how activities are framed in terms of upholding, enabling and compromising expectations of water service and supply, and the positioning of responsibility and agency for reducing domestic demand.

4.2.2. Experiences

The previous section indicated that the expectations people have of water are the result of everyday experiences, a suggestion that echoes a growing body of literature that examines the co-evolution of demand within systems of provision (Van Vliet *et al.*, 2005, Spaargaren and Mol, 2008, Taylor *et al.*, 2009) and peoples' experience of socio-technical systems (Hand *et al.*, 2005, Taylor and Trentmann, 2011). The following section explores how intuitive understandings of normal and appropriate water use are derived from social experiences, while the section after examines the material aspects of demand. This division is stylistic as material elements embody and contribute to extensive social systems and vice versa. However, in Section 4.3 this division becomes useful for considering how different activities carried out as part of the *Save Water Swindon* approach reflect different collective aspects of demand. The following sections explore three social processes through which people glean an understanding of normal water use.

Social learning

Social relationships play a particular role in learning about new technologies and behaviours (Southerton *et al.*, 2011). Most apparent is the intergenerational exchange that shapes childhood understandings of how water is used and engrains in children the habits

and routines that continue into later life. The following extract illustrates how the appropriate flushing of toilets is passed on through family members.

> *Tia: I have to be honest our upstairs toilet isn't flushed after every use. Julie: My husband doesn't [flush the toilet] but I'm not a massive fan of that. Me: Is there any reason you don't flush all the time? Tia: I can't think of any reason why anyone wouldn't flush the toilet! I guess if that's what your parents did… Julie: He got it from his parents. I guess it's for saving water but they've always done it and so does he. (Extract from FG, 20 – 34)*

Seemingly, an intuitive understanding of whether or not to flush the toilet after every use is transferred between parents and their children. Furthermore this example suggests that specific actions arise through performance and mimicry, with children observing and repeating the habits of their parents such that the reason for doing so is lost. What is normal in this regard varies and these differences are moderated to suit different situations (for example, Tia goes on to describe how the downstairs bathroom is always flushed as it may be used by guests). However as much water use takes place in private domestic spaces there is limited capacity for such performance-based learning outside of the home.

In addition to such immediate observations, the focus groups illustrate the value of everyday discussion for sharing experiences of different technologies and practices. These discussions provide opportunities for questioning and reassurance that may potentially aid the diffusion of alternative technologies and practice. For example, the extract below reveals how discussions provide opportunities to air concerns regarding new products:

> *Paul: Could we use water free cleaners [to wash the car]? Paddy: Another bloody product! Does it cost a lot? Paul: No, they're quite cheap! Paddy: How do you get mud off? Paul: Just squirt it on, wipe it off and it just comes up. Nicole: Wipe it off with what? Paul: A cloth! Nicole: Any cloth? Paul: yeah, a micro-cloth ideally. Paddy: Bird poo? Paul: Yes! Verity: So is everybody happy with water free cleaners? Mary: No! Paddy: Why not, it sounds a good idea? (Extract from 50 + focus group)*

This extract illustrates that interactions with other water users present opportunities to explore alternative ways of doing and to receive responses based on personal experience. Therefore such interactions may lead to increased levels of acceptance of new technologies and practices (as is the case for Paddy), however participants noted such conversations were atypical of everyday exchange, as the minutia of washing bodies,

clothes and cars is rarely subject to discussion. The examples presented here illustrate how explicit forms of interaction influence domestic water use, but suggest that when it comes to water demand, these are exceptional circumstances. The following section turns to the everyday interactions through which intuitive understandings of how others use water are developed.

Experiential understandings

The focus groups reveal how people gain a tacit understanding of how water is used through interaction with others. The example below demonstrates the association between 'modern world', what everyone else is understood to be doing, and personal bathing practices:

> *"We live in a modern world, where everybody's over-washing, but we're used to showering everyday now" (F, 51)*

Despite not observing "over-washing" directly, nor it featuring heavily in everyday conversations, this extract echoes frequent utterances throughout the focus groups of understandings of normal water use. These are abstract and impersonal – referring to "we", "they" or "everyone" while maintaining a view that everybody is different as a result of their different priorities and lifestyles – yet they convey a tacit understanding of what is acceptable that is derived from personal experience of others, often in context specific settings:

> *"We don't have a uniform for work as such, but you have to be smart, clean, well presented, you might wear the same trousers a couple of times [before they're washed], but I change my top every day because that's what everyone else does, so they get washed more often" (F, 32)*

Thus laundry becomes less about how often clothes are washed, but how often clothes are changed to participate in the situated performances observed in the workplace. With little understanding of how others normally carry out laundry to achieve the observed outcome, washing occurs more regularly so that clean clothes are readily available. Similar conversations revolved around bathing, particularly with regards to the duration of showering where an intuition of normal practice is based on an understanding that one emerges from the shower with washed hair and shaven legs, as is the outcome witnessed in others around them, rather than any understanding of how long others take to achieve such an outcome. These examples illustrate how understandings of how water is used are

based on intuitive assumptions based on everyday observation of others, rather than explicit knowledge and exchange.

The media also plays an important part in this, portraying an idealised version of everyday life that subtly shapes understandings of what water is used for. For example, the notion of green lawns being a standard feature of gardens is attained from various sources. Participants in all groups remarked on the visibility of lawns both in public and private spaces, but also their ubiquity in everyday media. Several participants in the 25-35 focus group had recently bought first homes, in which the sales brochures of property companies uniformly portray lawns as standard. Other participants referred to TV programmes, particularly home design programmes, and adverts for garden products that frequently showed lawns and border configurations. These examples illustrate how personal experiences are reproduced and reinforced by media portrayal of everyday life.

Memories of water supply systems

In addition to ongoing experiences, discussions within the focus groups reveal how past experiences of water supply-demand arrangements had implications for how water was used. In some instances these were childhood memories. For example, Mary grew up in Ireland before the infrastructures for residential supply were developed:

> *"I was brought up in the Irish countryside in the fifties and had to walk a mile to a well for drinking water, and a mile home again. My grandparents washed their clothes in a stream by their house. I've always respected water." (F, 63)*

Mary goes on to describe how the experiences of water in this supply arrangement has led to her frugal use of water, particularly when gardening for which she uses surplus water from dishwashing and leftover glasses of water. In Mary's case the lack of domestic supply created alternative patterns of water use and contributed to different perceptions of the acceptability of fit-for-purpose use. During discussions, other respondents challenged the use of repurposed water, particularly washing-up water for plants, as potentially unhygienic and unsafe for the plants. For Mary, however, this was understood to be part of the normal circulation of water in the home, illustrating the lasting impact of memories on understandings of normality (Maller and Strengers, 2013).

Other memories were less distant, relating to short-term experiences of different water systems that reveal the lack of uniformity in the impact and obduracy of memory on water use. In some cases, a brief juxtaposition of alternative supply arrangements against

prevailing social experiences serves to reinforce the successes of modern engineering to meet demand for high intensity water use:

> *"We stayed with a family member in Spain and they're on a water meter, the water is really expensive too, and they don't have a lot of money. So we had to be so careful, when we came back from the seaside all covered in sand we were like "just quick! Just one minute each ok?! Just to wash the sand off" because we didn't want them to end up with a massive bill" (F, 40)*

In this case, appreciation for a different set of circumstances lead to temporary changes in the duration of showering, but does not affect understandings of the ordinary functionality of water. Consequently, showering practice reverts on return to Swindon, where the prevailing experience of water is to provide for these normal functions. In a similar example, a participant described a boiler breakdown that inhibited ordinary patterns of use:

> *"We had a boiler problem, lasting for eight months. It'd work for a week, then it wouldn't, but we often didn't have hot water at all. We didn't get used to it though, we found ways of working around it. I'd either go round the corner to shower at my mother-in-laws or boil kettles to mix with cold water in the sink and wash my hair there."(F, 40)*

In this case, the disruption to supply is not accompanied by a change in experiences of normality beyond the home and creative ways of maintaining participation in normal everyday conduct are found.

Disruption and exceptional events are sometimes framed as opportunities to change everyday consumption in the literature on intervention (Birtchnell, 2012, Marsden and Docherty, 2013). The findings in this research demonstrate the various outcomes of interaction with different supply systems that resonate with existing literature by highlighting their ability to espouse alternative understandings and patterns of use (Woelfle-Erskine, 2015a, 2015b) and equip users with experiences that may be drawn upon in the future (Maller and Strengers, 2013). However, the findings also illustrate that where these interactions go against the prevailing experiences of normality, for example on holiday or during a breakdown, the return to normal inhibits the creative capacity of such experience, and mitigates the impact on practice in the longer term (Medd and Chappells, 2008, Taylor *et al.*, 2009). Consequently, the findings presented here suggest that enduring changes to normal water use require interventions that engage with the

notions of normality embedded both in water systems and the everyday social experience.

Summary of Experiences

The focus group data reveals how understandings of normal water use are gleaned from everyday experiences. The findings resonate with the literature that describes how practical know-how and memories shape routines (Reckwitz, 2002, Shove and Walker, 2010, Strengers and Maller, 2012). Specific examples of the former are prolific with regards to practices such as mobility (Spinney, 2009, Watson, 2012, Chatterjee *et al.*, 2013, Pooley *et al.*, 2013) and exercise (Shove and Pantzar, 2005, Delamont and Stephens, 2008, Brown and Leledaki, 2010) where embodied know-how plays a much more tangible role. However, they have also been described as featuring in such mundane acts as making tea (Wilson and Chatterton, 2011) and showering (Hand *et al.*, 2005) where the ever-evolving performance of practice conveys and relies upon embodied knowledge. Memories have had less attention within resource use-related research, however Maller and Strengers (2013) argue that memories provide a powerful resource for practice performance. In many cases, how understandings of normal conduct are attained and how they changes is largely overlooked (Shove and Walker, 2010), something that the analysis presented here provides insights into.

Three experiential processes are identified that demonstrate how people come to understand normality. The findings demonstrate that while there are explicit forms of communication and learning that contribute to these understandings; these are a minor influence and inhibited by the privacy of water use. Further while they might be synthesised (as is the case in the focus groups), explicit discussions are continuously juxtaposed with everyday interactions with people, practices and systems of provision (both past and present) that pervade experiential understandings of normality. For management this raises a challenge; traditionally water management has focused on changing infrastructure and technologies of supply, however the findings illustrate that without complimentary changes to the social and performative aspects of demand such that alternative understandings of normality emerge, the impact of these is likely to be reduced (Gram-Hanssen, 2014, Macrorie *et al.*, 2014). Consequently, the findings in this section reveal both the importance of experiences, but also complexity and diversity that are likely to require multifaceted forms of intervention.

4.2.3. Materialities

The sections above highlight how consumer expectations of systems of provision and experiential understandings of normality shape water use in the home and mediate the efficacy of water efficiency in reducing domestic water demand. Throughout these discussions are references to bodies, clothes, technologies and infrastructures that are significant to water use. This section brings these into the spotlight to understand how various material aspects shape domestic water use.

Absences and redundancies in the home

Throughout water efficiency activities, emphasis is placed on 'reducing waste' either by increasing technological efficiency or by making small changes to behaviour. However the focus groups demonstrate how wasteful water use is materially choreographed by the technologies and spaces of the home. The following extract describes how the design of showers – particularly the network of pipes and boilers – and the spatial configuration of the home mean that hot water is not immediately accessible:

> *"In the mornings I turn the shower on and because it comes from the boiler maybe twenty feet away it's cold, so I have to wait for the water to warm up." (M, 51)*

Respondents describe how this lack of immediate hot water results in doing other things while 'waiting for water', such as brushing teeth or using the toilet. Sometimes hot water is lost as well as cold as the intermediate activity overruns the waiting period required to for hot water to be delivered. Thus this example illustrates how system redundancies create waste. Other examples demonstrate how the absence of certain technologies and spaces in the home create demand:

> *"I don't know where I'd put clothes I'd worn if I didn't wash them, not in the wardrobe – they're not dirty but not fresh either and everything would start to smell, but I don't want them on the floor … (F, 32) See I used to have clothes all over my floor, mum used to call it the floor-drobe, maybe I should have told her I was saving water, then she'd have got off my back!" (M, 31)*

The spatial and material conventions of homes incorporate objects such as linen baskets, washing machines, maidens and driers (Yates and Evans, 2016), but lack a space for the "not-dirty-but-not-fresh clothes" described in the quote. Consequently, for some people washing takes place more regularly than is considered necessary as part of keeping the home tidy. The extract also demonstrates the appropriation of space to manage such

intermediate materialities – linen chairs and "floor-drobes" – and the frictions this causes between family members with different feelings about how the home is kept.

One final example illustrates how objects in the home limit the options and possibilities for behaviour:

> *"I can flannel wash, but I can't wash my hair in the sink – it's too small!" (F, 52)*

In this instance the respondent had a small hand basin installed as part of recent renovations, replacing the older, larger, sink in the bathroom. This change reduces the potential ways that cleanliness might be achieved in the bathroom (the bath had also been removed during renovations) and reaffirms showering as normal practice. Consequently, these professional practices can be seen to reaffirm 'wasteful' uses of water by designing in-line with societal perceptions of normality and modern life. This finding echoes those of Kuijer (2014) and others (Hand *et al.*, 2005, Quitzau and Røpke, 2009) who illustrate how home design influences resource use, demonstrating how the material design of bathrooms shapes the possibilities for water use. Most strongly, they illustrate how specific spatial configurations create 'wasteful' use and inhibit less water-intensive forms of practice.

For water demand management these findings suggest a need to engage with the material spaces of the home, however the findings also suggest that respondents are reluctant to retrospectively engage with the design and construction of buildings:

> *"I don't want to put something up my tap. If it was supposed to be there then why didn't the tap manufacturer put it there in the first place?" (M, 50)*

Designers and manufacturers are positioned as specialists in delivering water to meet the standards everyday life creates, with many water users considering themselves to have little place in interfering with its supply. Consequently, these findings highlight a need to involve designers and manufacturers in water sensitive bathroom design so that homes and technologies are designed with sensitivity to the patterns of water use they create (Spurling *et al.*, 2013).

These findings do not suggest that demand is permanent or inflexible indeed existing research demonstrates the relatively dramatic shifts in the materiality of homes in recent history (Wright, 1960, Molotch, 2003, Hand *et al.*, 2005, Quitzau and Røpke, 2009, Taylor *et al.*, 2009, Taylor and Trentmann, 2011). Instead, the findings highlight the

importance of professional practices in industries that are party to shaping the material fabric of homes, such as design, manufacturing, construction and DIY. Whether intentionally or not, the professional practices of each of these industries have material consequences (Macrorie *et al.*, 2014), embedding specific understandings of water use, reaffirming expectations and creating experiences that sustain high intensity practice (Shove *et al.*, 2014). Consequently, the findings point to a wider range of professional practices with which to engage in order to bring about change and identify a range of potential avenues for future interventions

Demanding materials

Often neglected from discussions regarding resource use are mundane material elements of bodies and homes that require water for their upkeep. The focus groups reveal these to have substantial implications for water use. In the following example, the discussions around hair washing suggest that showering duration is at least partially determined by the scale of the tasks carried out in the shower:

> *"I have to wash my hair once a day, I couldn't not do that, no way, it just gets greasy, and there's no way I couldn't shower (F, 34) Yeah, I know, it takes time to wash hair, and to shave armpits – not that they need shaving every day, but to keep them under control I do them anyway" (F, 42)*

The extract illustrates how the physical properties of bodies, and their propensity to sweat and grow hair, create demand for water in order to evade smells and remove stubble. Some of this is stylistic, related to the modifications made to hair, bodies and clothing to display to others who we are (Hielscher *et al.*, 2009) and to participate in the fashions and situated conventions described previously. However, this extract demonstrates a material element that coalesces with such social processes to provoke domestic water use, that in order to participate in the social world we experience, we must engage with the material properties of bodies and those of manufactured objects and materials.

The discussion goes on to illustrate the connections between the body and the outside world, that render the site of water use a consequence of relations that flow through the boundaries of the home.

> *I work in an ice cream shop, there's a chippy attached and you just come home smelling of chips and feeling all greasy. It gets in your hair, your skin, your clothes. You can't not try to wash that off (F, 34) It's not even about being clean*

exactly, but just knowing that you're not sweaty if you've been to the gym or if its hot outside or whatever (F, 42)

In this case, the continued ability of hair, bodies and clothes to perform as desired is dependent on the physical properties of these materials in relation to the physical properties of the spaces and environments individuals find themselves in during everyday life. Consequently, the relative functionality of materials in relation to their environments becomes significant (e.g. length and style for hair and the materials, weight and function of clothes). The same is also true of gardens and homes, spaces in which material objects shape patterns of water use (Chappells *et al.*, 2011).

Outside of the practice literature, material aspects such as these are rarely considered and are typically absent from demand management activities. However, as styles and fashions are some of the more fluid and malleable aspects of material life (Entwistle, 2000), the findings identify an opportunity to engage with such material elements to reduce domestic water demand. To do so requires engaging with everyday practices that seem distant currently from the demand management agenda such as hair care (Hielscher *et al.*, 2009) and home making (Hand *et al.*, 2007, Maller *et al.*, 2012). Further, acknowledging the connections between water use and these other non-watery practices identifies other intermediary actors who shape water use and may be influential in steering change (e.g. designers and manufacturers in industries such as fashion and beauty, home and interior design).

Material worlds

Finally, building on the previous section, the findings suggest that the porous nature of homes means that domestic demand is intermediated by practices outside the conventional spaces of supply and demand. A powerful example of this is uniforms, a material element that the water user has little ability to alter. Rather than simply doing the laundry, respondents in focus groups described washing school and workplace uniforms.

"My uniform is quite a big deal for me. The geniuses at the top gave us white shirts to wear, and white overalls. It's not even our company directly, it's who we supply to, they have a policy – a brand thing – that says all suppliers must wear white, it's a quality control thing I guess, but for us it makes no sense. I work in a warehouse, which is dusty, with parts coming in from all over the world with all sorts of stuff on them. I mean people wear them in the office an that's fine, but as soon as you go on the shop floor you just get attacked by dust, so it all has to be washed every other day, or they just get manky and horrible. I

know loads of my associates wash theirs regularly, luckily I've an extra uniform, but still it's a lot to wash, and it can't really go in with other items else it doesn't come out as white." (M, 31)

The extract illustrate how the number of uniforms provided, their colour, and the nature of the work have considerable bearing on the frequency of washing and the volume of clothes washed in a single load. These are exactly the dimensions of laundry use that water efficiency managers seek to engage with (EST, 2013), however this example demonstrates the limited ability of the water user to affect change. It is not uncommon in manufacturing firms that white uniforms are associated with quality and precision, and for multinationals consistent dress codes symbolises the adherence to a shared corporate culture throughout the supply chain (see for example Honda, 2012, 2015). Thus not only does water use connect to practice of work, but also to professional practices far removed from resource management such as branding and procurement.

For demand management, these findings highlight a need to engage with an ever broader range of intermediary actors that, likely unintentionally, shape water use (for example employers and brand managers) (Spurling *et al.*, 2013, Shove and Walker, 2014). These findings highlight two opportunities for intervention: firstly, a call to redesign material objects such as clothes and uniforms to better suit the environments in which they function (Shove, 2014, 2016), and secondly, a more fundamental question regarding the spatial choreography of everyday routine that challenges the domestic nature of water use.

Summary of Materialities

These final examples reveal the materiality of domestic water demand, demonstrating how technologies of demand (such as hair and clothing), domestic spaces, and the socio-material worlds beyond the home shape domestic water use and the traction of water efficiency initiatives. These findings support a growing body of literature that illustrate the materiality of demand (Quitzau and Røpke, 2009, Strengers and Maller, 2012, Evans, 2014, Shove *et al.*, 2014), but emphasise the extra-domestic nature of domestic demand. The findings presented here point to the existence of demand infrastructure that is currently beyond the scope of management activity – a distributed system of material objects that have consequences for how water is used. These findings demonstrate how domestic water use is connected to systems practices that are spatially distributed and embedded in professions far removed from the resource management agenda. This pushes discussion beyond conventional discussions of behaviour (Russell and Fielding,

2010), beyond technologies and their users (Gram-Hanssen, 2010, Vlasova and Gram-Hanssen, 2014), and beyond the home (Quitzau and Røpke, 2009, Yates and Evans, 2016) to understand how practices evolve within everyday ecologies that are distributed through both time and space (Watson, 2012, Macrorie *et al.*, 2014). This is novel even for theories of social practice that tend to sustain a focus on domestic practices (Macrorie *et al.*, 2014) and demonstrates the capacity of such research to identify connections between the home and broader socio-technical systems. Thus, both for water efficiency and for other agendas, the findings presented here contribute an understanding of how demand is produced in heterogeneous spaces of everyday life (e.g. work, built design, cities) and not only those that relate specifically to water use (e.g. bathrooms), and to identify the opportunities these present for intervention.

Recognition of the connections between domestic practices and these systems of practice is to recognise the ripple effects resulting from the ongoing churn of social practices (such as hair care and home making) and those of professions and industries (e.g. employers and designers) (Watson, 2012). Thus for intervention these findings identify new avenues for effecting change in the domestic sphere, identifying a web of intermediaries who – whether aware of it or not – are involved in orchestrating demand. The empirical work presented here provides a starting point to map the connections between domestic practices and the spatially and temporally distributed systems with which they connect. In a global society not all practices are contained at a local scale; people commute, hair products are developed and sold by multinationals, and fashion and textiles industries are quintessential global markets. However, the whole-town approach developed in *Save Water Swindon* presents an opportunity to divert attention from the immediate spaces of water use and to trace connections between domestic life and the wider socio-technical world.

4.3. Evaluation of Save Water Swindon

The whole-town approach developed in *Save Water Swindon* as a means of testing and delivering large-scale water efficiency is recognised by both industry (Environment Agency and Waterwise, 2012a) and academia (Browne *et al*., 2014) as providing opportunities for intervention that surpass conventional approaches (as described in Chapter 2). In particular by focusing on demand in the local context of Swindon, the whole-town approach offers greater sensitivity to the specific collective contingencies

that shape domestic demand. Such sensitivity poses opportunities to develop novel forms of intervention and valuable intermediary organizations able to facilitate changes in domestic demand. However, to date there has been limited critical discussion regarding the extent to which *Save Water Swindon* realises such potential, and how (if) such initiatives extend the remit of water efficiency beyond the constrained individualistic approaches that dominate the sustainable consumption agenda. The following sections attend to such questions, reflecting on the extent to which the initiative engages with residents' expectations, experiences and materialities in order to contribute to lower levels of domestic demand.

4.3.1. Managing expectations

The focus group analysis describes a trio of expectations entangled in everyday water use that has implications for both domestic water use and water efficiency activities. The following section examines the activities undertaken in *Save Water Swindon* in the context of these findings to explore the extent to which the initiative engaged with expectations to lower domestic demand. Ultimately, this discussion demonstrates that the persistence of conventional psycho-economic strategies embedded in the initiative's materials risks reinforcing expectations that obstruct demand management.

During October 2013, *Save Water Swindon* trialled an extensive multi-media campaign as a means of increasing consumer understanding of water resource management challenges in the area, publicising ongoing work of the Water Company beyond the scope of the initiative and emphasising how consumers could support such activities through participation in *Save Water Swindon.* Signage (including roadside billboards and bus-stop posters), adverts in local newspapers (including newspaper wraps and adverts), and radio adverts were used, many of which incorporated some form of call to action. This was accompanied by direct mailings and a series of articles (online and in print) to promote the environmental, personal and business case for managing water in the region.

On one hand, the strategy used in the media initiative appears to engage with some of the gaps in consumer understanding of water identified in the focus groups (namely why water scarcity arises in a wet country and where water in Swindon is supplied from). Further, the proliferation of the media initiative contributed to an air of "something happening" (M, 31) around water efficiency that participants were broadly supportive of. This is echoed by market research that suggests that, at its peak, 22% of Swindon's

population were reported to have heard of the initiative (Humphreys and Gill, 2014)[12]. However, participants within the focus groups considered the information too brief and too generalised to aid understanding. While there is potential to develop this information and to consider the mode of delivery to maximise impact (for example, live, ubiquitous, and/or 'smart' communication strategies were discussed), it should not be assumed that providing such information will lead to action that reduces water use in the home (Shove, 2010).

However, the analysis reveals familiar framings of consumers, agency and responsibility that conflict with the discussion of expectations presented in the previous section. Firstly, the style of the media campaign is consistent with the consumer-centric models critiqued in the sustainable consumption literature (Southerton *et al.*, 2008). Explicit marketing tools such as mail-shots and adverts sought to provide a picture of the cost and benefits of participation to support uptake, that were consistent with the psychological literature on water conservation (see Russell and Fielding (2010) for a review). These included emphasising the environmental impacts of current behaviour and how such actions need not "affect your daily routine" (see Figure 8). But the most persistent narrative was one of cost savings evolving over the duration of the initiative, from general statements about the opportunity to "save water, energy and money" to quantified estimates of £85 a year resulting from retrofitted devices that reduce water use (e.g. water efficient showerheads) and enable behaviour changes (e.g. shower timers) (compare for example Swindonweb.com, 2011, Heart.fm, 2013).

Free savings . . . No catch

Save water, energy and money every year with free water-saving products and fitting

Over 17,000 Swindon homes have already ordered free water saving products from us or arranged for us to come and fit them, to help them save up to £85 a year.

Swindon and Marlborough are currently the only areas where we offer **free home visits** where we will:

- Fit the latest water-saving technology around your home, including showerheads (worth £16.99 each), tap inserts and toilet cistern devices, which can cut the amount of water you use without affecting performance
- Audit your home to check for any leaks on taps and toilets
- Provide you with water and energy saving advice

As well as helping protect Swindon's local environment, this could help you **save up to £50** a year on your water bill if you're on a water meter, and **save up to £35** a year on your energy bill, because the less hot water you use, the less you have to heat.

Why Swindon?

Water supplies in Swindon are always stretched as there are no new local water sources available. That's why we got together with WWF, Waterwise, Swindon Borough Council and Action for the River Kennet to help everyone use less water so we can ease pressure on the river.

Our aim is to help Swindon reduce water use by one million litres per day by 2014 – but cutting down a bit really doesn't need to affect your daily routine.

Figure 8: Example messages

This emphasis on costs, particularly financial cost, is incongruous with the focus group findings. Respondents

[12] Including those who responded "heard of it but did not know much about it".

discuss an interest in saving water and money, findings corroborated by industry research (Waterwise, 2012), and demonstrate an understanding that water use incurs expense not only through water bills but also energy bills. Yet the decisions made around family finances are simultaneously more complex and less deliberative that is suggested in the behavioural models embedded in the initiative activities. Participants demonstrate intuitive systems to determine which money saving actions are worth taking. In the case of water, the relatively low financial cost meant that saving money was considered to be more easily achieved than via other means:

> *"It would have to be more than £20 a month, I'm not rich or anything but that's one takeaway for four and I'm thinking that I'd rather not have the take-away than worry about water." (F, 40)*

Here, the £85 a year saving resulting from water efficacy is considered insufficient to justify "worry", let alone action to reduce water demand at home. What's more the co-benefits of reducing spending in other areas (e.g. takeaways) are better aligned with the priorities people hold in life such as health and wellbeing.

In this way, decisions around family finances are more complex than those accounted for in water efficacy, and participants also describe how aspirations to save money are not usually at the forefront of the mind while actually using water:

> *"I don't sit there thinking 'I'm going to have a ten minute shower', I just shower. I like the hot water. I'm not thinking much really I just stand there, doing nothing." (F, 32)*

Consequently, even where cost saving does provide an incentive, its capacity to alter behaviour in the moment is reduced. While in situ metering and more creative forms of communication may offer benefits (Foulds *et al.*, 2014, Davies *et al.*, 2015), at a fundamental level the focus groups demonstrate that costs are to some degree an accepted outcome of the price paid to live life according to one's priorities and that aspects such as work and childcare limit the amount of control individuals have over water use:

> *"I don't really think about it. I just use the gas, electricity and water that I use because that is how I live. I think if you told me that I was like four or five times over what people in my situation should be I might feel a bit bad, but I still don't know that I'd be able to change much." (M, 31)*

These findings challenge *Save Water Swindon*'s framing of water efficiency and add to a more general critique of sustainable consumption by demonstrating the disparity between residents' expectations and their positioning as rational, responsible actors within the initiative. The focus group findings highlight the difficulty of disentangling the costs of water use (e.g. financial and environmental) from the services water provides (e.g. relaxing, caring, working, and entertaining). This fusion of water with physical and emotional functions creates needs for water that consumers expect will be provided for by water companies and while the case for demand management is appreciated by water users, the notion that "everyone" is responsible for management is contested. However, by continuing to rely upon messaging and marketing approaches that prioritise the financial value of water, *Save Water Swindon*'s 'whole-town' approach maintains an allegiance to 'ABC' models of change (Shove, 2010). These simplistic models of behaviour are, at best, ineffective as they fail to acknowledge the expectations and needs of water users and therefore do little to contribute toward alternative practices or garner support for more radical interventions into the social and built environment (Schatzki, 2015). At worst, a failure to engage with expectations that shape and sustain certain patterns of water demand risks legitimising expectations that are obstructive to water efficiency and inhibitive of less intensive patterns of use emerging (Shove and Walker, 2014).

4.3.2. Re-crafting experiences

The discussions above demonstrate that how water is used and what water is used for are derived not from conventional forms of education but through experiential processes embedded in routine interaction. In particular, the findings illustrate the importance of everyday interactions in providing an understanding of how water is used from the performative aspects of others (Schatzki, 2010, Pink and Leder Mackley, 2012). They also highlight that, in certain circumstances, discussion and personal exchange (Hitchings, 2012) and memories (Maller and Strengers, 2013) shape expectations and understandings of normality, social processes less commonly covered in the literature. The following paragraphs consider the extent to which *Save Water Swindon* supports the creation of alternative experiences that may enable the diffusion of less intensive practices. Ultimately, it is suggested that while the situated nature of the initiative provided potential to re-craft experiences, this was largely unrealised, instead tending

towards passive conveyance of normative understandings that poorly relate to individual experiences of what water is for.

Throughout *Save Water Swindon* activities were undertaken that engaged with residents' normative understanding of water use, aiming to make water efficient behaviour and retrofitting standard practice. The principal means of achieving this was again through media coverage of the initiative, particularly newspaper articles that used a range of local voices to showcase alternative technologies and practices. For example, one story covered Swindon Town (the local football team) meeting the owner of WOW^{TM}, a line of waterless cleaning products, and trialling the product at their training ground. A second featured Action for the River Kennet (ARK), a local campaign group, showcasing various ways of saving water including "put a jug of water in the fridge to keep it cool rather than running the tap" and "use dirty bath water in the toilet" (Mackley, 2013). Finally, a series of articles followed Gabby Hillier and her family as they received a home retrofit (Hillier, 2013a, 2013b, 2013c, 2013d). The reactions to these articles in the focus groups suggest they provide valuable personal testimonies and a means of instigating discussions around other people's experiences. However, the passive nature of printed media means the opportunity for such discussion to occur outside the focus group setting is limited. Alternative modes of communication could incorporate interactive qualities and facilitate discussions. Examples offered by participants included the use of online forums and social media, piggy-backing on existing 'everyday' scientific communications (such as weather forecasts) and smart technologies. However, even these remain a contrast to the embodied and performative nature of experience described in the focus groups.

Focus groups reveal how individuals' normative understandings of water use are continuously evolving through interaction with other people and technologies, although much (arguably the majority) of what is experienced in everyday life reinforces current levels of demand. *Save Water Swindon* provided an opportunity to develop alternative experiences; to experiment with active, participatory forms of intervention and identify means of working with the social context to aid diffusion. A successful example of such an approach is documented by Woelfle-Erskine (2009), where workshops are used to guide residents through the processes of rerouting bathtubs and washing machines to water gardens and turning plastic barrels into rainwater tanks (see also Berry *et al.* (2014) for a discussion related to open-home retrofitting for energy, and O'Neill and Forster (2008) for a discussion on interactive garden exhibitions). These workshops use social

networks and hands-on learning to disseminate new understandings and capabilities to support the dissemination of alternative material systems that, once a marginal part of Californian water management, are now widely supported by Californian water authorities. In some respects, *Save Water Swindon's* home-makeovers take steps toward this approach (which is returned to in the following section), with personalised home visits from qualified local plumbers. However, the open-house format described by Woelfle-Erskine (2009) enables others to participate, providing a platform for discussion, hands-on experience and skill-sharing to capitalise on the collective social structures to support change.

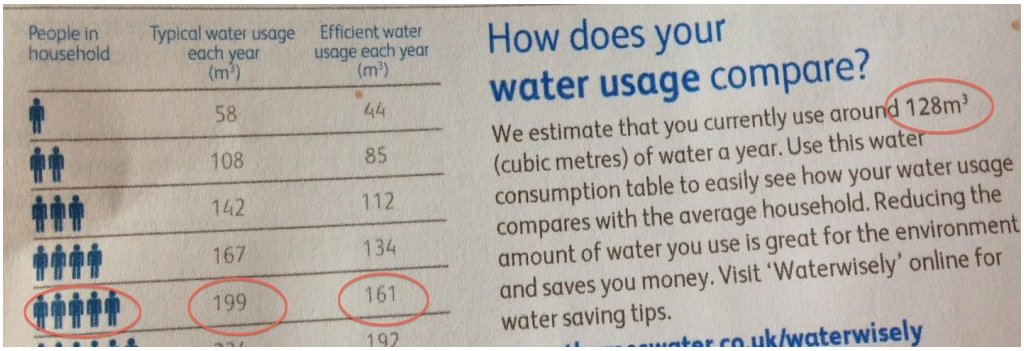

Figure 9: Comparative bill

The second observation of *Save Water Swindon* is a tendency towards a narrow representation of normal; one of average water use that arguably fails to represent anyone's personal experience. There are various examples of this embedded in the initiatives materials. For example, the £85 saving described in the previous section is an average saving offered through the installation of water efficient devices in an average property. Likewise, comparative bills compare homes to other households with similar occupancy rates (see Figure 9) based on an estimate of per capita consumption, with an adjustment applied to adjust for multiple occupancy homes. Such averages gloss over important differences both within and between households, and throughout the course of individual lives (Medd and Shove, 2006, Bhakta *et al.*, 2014, Browne, Pullinger, *et al.*, 2014, Burningham *et al.*, 2014). In contrast focus groups discussions illustrate how the various personal relationships with work, leisure and childcare, as well as personal health and ability, intersect with water use in ways that such averages fail to recognise. In addition participants described periods in their lives where their water use temporarily changed to fit new circumstances:

> *"My bill doubled at one point, mainly because I was pregnant and I would have a shower in the morning before going to work and then to relax at night I would*

have a bath. A lot of pregnant women probably do that. But it meant that I would have perhaps four or five baths a week and that really changed how much water I was using. It has come back down again since, it hasn't halved because I am at home most of the time now and there's a child around. But it just shows how life changes, and how water changes with it." (F, 32)

These are complex aspects of routine, yet throughout the materials used in *Save Water Swindon,* there is little to reflect such heterogeneity. Consequently, the impact of the messages contained within *Save Water Swindon* was reduced as they bore limited resemblance to the lived experience of water use by individual water users. Consequently, this observation highlights a worrying continuity in the use of averages in the water industry despite critical research (Ang, 2011, Sofoulis, 2011a, Fam *et al.*, 2015) and despite the development of alternative means to inform market segmentation without reiterating the fallacy of typical consumption (Browne *et al.*, 2013, Davies *et al.*, 2015).

Based on this evaluation *Save Water Swindon's* 'whole-town' approach presented an unrealised opportunity to experiment with ways of recrafting experiences, identifying meaningful opportunities to immerse consumers in alternative socio-technical interventions, and to work with the social structures that shape demand to elicit change. However, the findings presented here suggest that efforts to effect change were hampered by prevailing modes of communication. Such explicit forms of communication favour volumetric comparisons and quantitative data that skirt around the specifics of water use and the diversity of individual routine (Sofoulis, 2011a). In contrast efforts to communicate alternative forms of bodily conduct have been met with criticism (see for example the media uproar caused by Thames Water's suggestion that women could shave without running water (notably not suggesting that women could go without shaving) (Cohan, 2011, Hickman, 2011, The Telegraph, 2011)). These explicit forms of communication compete against expectations and the everyday experiences of how water is used rendering their messages controversial. Beyond *Save Water Swindon,* these findings challenge the way in which notions of normality are deployed in the sustainable consumption agendas, suggesting a need to find alternative forms of intervention that decrease the emphasis on messaging and enhance opportunities for people to encounter alternative practices.

4.3.3. Reconfiguring materialities

Finally, the focus group findings demonstrate that in addition to expectations and experiences, domestic demand emerges from the material strata of everyday life. The findings illustrate the importance of the material configuration of the home, particularly focusing on how redundancies and absences are built into homes that create demand. In addition, the analysis identifies water demand is created by technologies of demand (particularly clothes, hair and gardens) and (socio-)material worlds outside the home, thereby emphasising the porosity of the domestic practice. These findings join a growing body of research that highlights how domestic practices intersect with the world at large (Maller *et al.*, 2012, Karvonen, 2013, Bartiaux *et al.*, 2014, Judson and Maller, 2014) and the following section explores the extent to which *Save Water Swindon* engages with the material aspects of water use to reduce domestic demand. The findings demonstrate that while the initiative's retrofitting activities were arguably the best of its kind, more is needed to engage with the intersections between domestic water and the collective material configurations with which it co-evolves

In many respects *Save Water Swindon's* retrofitting activities have been highly successful, with final estimates suggesting that almost a third of homes in Swindon received water efficient devices (Thames Water, 2015f). This more than doubles the estimated uptake provided in the *Evidence Base* (10% for general water efficiency, 15% based on existing whole-town approaches (Waterwise, 2011, p. 66)). Throughout the initiative, various means of recruiting homeowners were trialled as were various forms of retrofitting activity, with a gradual progression from self-install models to professionally fitted home-makeovers. Home-makeover models were demonstrated to result in more devices being installed, the correct devices and a higher level of consumer confidence in the devices that resulted in greater retention (Waterwise, 2011). Consequently, *Save Water Swindon* has set a new precedence for water efficient retrofitting. However, despite these successes, more is needed to engage with the broader material context of domestic water demand.

Fundamentally, retrofitting focuses on a very specific part of the supply-demand picture, namely the technologies that supply water in homes (e.g. taps, toilets and showers). This has a number of effects. Firstly, it reduces water use to its technocratic performance, bracketing out the human elements of resource use and overlooking the routine practices in which resource use is entangled (Maller *et al.*, 2012, Judson and Maller, 2014).

Consequently, estimated savings from retrofitting are difficult to achieve in practice, or short-lived, as they fail to account for how inhabitants' practices change in parallel with changes in technologies (Gram-Hanssen, 2014). Bartiaux *et al.* (2014) raise particular caution regarding the association between retrofitting and comfort which is evident in the newspaper articles as the Hillier family describe reduced flow showers and taps as providing "nicer", "softer" water (Hillier, 2013c). The association with comfort risks resulting change in higher expectations that off-set the efficiency gains (resulting for example in longer showers) (Bartiaux *et al.*, 2014). At best, retrofitting activities do little to reconfigure the expectations and experiences derived from routine activity, and may therefore be seen to reaffirm existing modes of practice, potentially making further intervention in future more difficult.

Secondly, retrofitting distracts from a broader discussion of how the materiality of the home (Yates and Evans, 2016) and technologies of demand (such as hair, clothing and gardens) shape water use (Browne *et al*., 2014). Focus group discussions identified a range of elements such as the absence of space for "not-dirty-but-not-clean" clothes and the material inefficiencies of moving hot water around the house as contributors to domestic water demand. In any retrofitting initiative there is scope for much deeper changes to material fabric of homes and supply-demand systems, however this tends to be omitted in favour of simpler, universally applicable devices (Maller *et al.*, 2012, Vlasova and Gram-Hanssen, 2014). Examples within the energy retrofitting literature, particularly where retrofitting is a feature of broader renovation projects (Maller *et al.*, 2012, Fawcett, 2014, Judson and Maller, 2014), suggest a greater engagement with the built fabric of the home. However, even here the continued focus on the technologies of lighting, heating and cooling fails to leverage the diversity and complexity of everyday practice (Karvonen, 2013).

Finally, the focus on homes and the technologies therein inhibits a discussion of how broader socio-material systems configure water use in the home. Beyond the home, individual routines intersect with various material worlds through pursuits such as work, childcare and hobbies. A strong example of this is provided in the example of uniform washing where company ethos and the nature of work result in high volume, high frequency washing of items that cannot easily be combined with other laundry items in the home, resulting in regular partial laundry loads. The situated nature of *Save Water Swindon* posed opportunities to identify such hot-spots for water use and develop partnerships with intermediaries who may have capacity to engage with such material

systems (e.g. employers), extending intervention beyond the scope of the home (Moore and Karvonen, 2008). This discussion is largely absent in the literature, which tends to focus on the minutia of domestic practice (Watson, 2012). However, the focus groups provide an example of how consumer focused research may provide a means of mapping the socio-material context of demand within a defined geographic space, tracing the spaces through which residents move and thereby identifying opportunities for intervention (Browne *et al*., 2014).

The findings presented here suggest that as a result of these limitations, retrofitting currently offers limited potential to propagate widespread systemic changes (Maller *et al.*, 2012, Karvonen, 2013, Sharp *et al.*, 2015). Further, by failing to substantively engage with the intersections between routines and material systems, current retrofitting activities risk reaffirming unsustainable expectations and experiences (Bartiaux *et al.*, 2014, Dixon *et al.*, 2014). There remains potential for the water industry to develop a model of retrofitting that engages with the material configuration of homes and establish precedence for working with a range of intermediary actors such as designers and manufacturers. Before this could occur there is a need for practical ideation of how homes might be designed with water demand reductions in mind. Such developments may have potential applications beyond the water industry, particularly in reducing energy demand. By considering the potential for open-home retrofitting (Berry *et al.*, 2014), activities that introduce alternative supply-demand systems (Woelfle-Erskine, 2009, 2015b) and those that take a more radical approach to *Re-designing* the material systems endogenous to everyday practice (Spurling and Mcmeekin, 2015) there appears potential to make more substantive reductions to domestic water demand.

4.3.4. A story of stifled creativity

Various researchers have argued that spatially and temporally bound experiments are advantageous as they offer opportunities to catalyze rapid socio-technical change (Marres, 2009, Bulkeley and Castan Broto, 2013, Devaney *et al.*, 2014, Karvonen and Evans, 2014) and a means of producing evidence in discrete and/ or temporary space (Sanderson, 2002, Kivimaa *et al.*, 2015). However, the analysis presented in this chapter paints a less optimistic picture as despite *Save Water Swindon* pushing the boundaries of water efficiency in terms of scale and participation (Environment Agency and Waterwise, 2012a), the developments made to interventions throughout the course of the

initiative were incremental; sustaining emphasis on technical and economic measures at the expense of deep reconfigurative interventions into the collective context of demand. Some of the results of this experimentation have already been described in this chapter, for example the gradual shift from self-installation toward professionally fitted home-makeovers and the refining of the "Save Water, Save Money" mantra to the quantified estimate of £85 per annum. By staying within the scope of conventional techno-economic demand management measures, *Save Water Swindon* continues to risk reinforcing unsustainable patterns of water use rather than supporting transitions in systems and practices (Rijke *et al.*, 2013, Dixon *et al.*, 2014).

Chapter 2 makes the case for adaptive management, in which management remains flexible and experimental in order to respond to new knowledge and changing conditions (Pahl-Wostl *et al.*, 2012). Given the limitations of *Save Water Swindon* listed above and that the initiative was designed as a testbed, it is worth reflecting on the processes of experimentation used throughout the initiative. In order to develop effective interventions, *Save Water Swindon* established a number of District Metering Areas (DMAs); discrete areas in which the flow levels may be monitored and effect of interventions observed. Throughout the duration of the initiative interventions were implemented and the effected changes measured within these DMAs to inform their ongoing developments and contribute to the *Evidence Base for Large-scale Water Efficiency*, such that others may benefit from the findings. This impetus to generate measurable data is in-line with targets and guidance from water industry regulators (Ofwat, 2008, Environment Agency *et al.*, 2012b) and a growing policy discourse relating to evidence-based action (Spicer *et al.*, 2014). However, these modes of data collection favour the linear development of intervention and supress critical discussion of systemic uncertainties (Walker *et al.*, 2010).

This suppression of activities resonates with discussions regarding the institutionalisation of experimentation, where "an experiment is proposed and conducted, the generated data is collected and analyzed, and this is fed into urban policy, leading to further experimental activities" (Karvonen *et al.*, 2014, p. 107), a process that strongly echoes that taken in *Save Water Swindon*. This strategic process inhibits innovation; encouraging the linear development of interventions, rather than experimentation with novel ideas (Rotmans *et al.*, 2001, McFarlane, 2012). Thus, the pursuit of evidence-based action, while designed to limit surprise and guarantee impact, serves to reduce the scope of management activities and supress critical questions regarding systemic uncertainties

(Smith *et al.*, 2005, Gross, 2010). Reflecting on managing change in the face of uncertain climate change, Gibson *et al.* argue that "decision makers will have to 'hedge bets' knowing that some will turn out to be wrong" (2015, p. 418). This attitude is in keeping with adaptive management that favours the open-ended expansion of knowledge and the development of novel experiments based on a process of continuous learning (Pahl-Wostl *et al.*, 2012, Smith *et al.*, 2013). *Save Water Swindon* misses an opportunity for such open-ended experimentation. However these findings suggest that this is symptomatic of combining the aims of testing intervention and achieving impact in a policy environment that incentivises trial without error and thereby forecloses future development options.

In addition, while *Save Water Swindon* experiments with different interventions, there is limited experimentation with the coalitions of actors or governance structures involved in water efficiency (Kivimaa *et al.*, 2015). The findings in Section 4.2 point to an array of professions and industries that are involved in shaping everyday water use yet are not currently involved in developing or implementing demand management interventions. Instead water efficiency remains organised by water companies, targeted at consumers and with a small number of facilitative intermediary actors involved in activities such as information dissemination, recruitment for home retrofitting, and installation. Such closed networks are typical of water resource management, however disguise the extensive range of actors involved choreographing water use and water management (Moss *et al.*, 2009) and are contrary to the flexible, inclusive networks required for adaptive management in complex systems (Pahl-Wostl, 2009, Bos and Brown, 2012). Consequently partnership models such as those involved in *Save Water Swindon* appear to reduce critical reflection on existing water efficiency activities (Pahl-Wostl, 2009), and limit the options and possibilities for intervention.

The findings in this section suggest that water efficiency is constrained by the procedural practices involved in the development and implementation of initiatives, particularly around methods of evidence generation and the effect this has on framing water efficiency activities, and the partnership networks involved in development of interventions. Such constraints exacerbate long-term risk by reproducing unsustainable patterns of water use, and undermining forms of intervention that may lead to more substantive changes in how water is used, and what water is used for. Thus the implications of this observation extend beyond the immediate case study questioning the processes by which interventions are developed and tested in the water industry, and

potentially in demand management in other sectors and scales. This discussion is returned to in Chapter 6 as it reflects a broader process in demand management that is worthy of further expansion.

4.4. Conclusion: "Supersize my WEFF": On the upscaling of individualism, or downscaling of Big Water

To conclude, the early chapters of this thesis outline an urgent need to develop interventions capable of grappling with the "complex and diffuse" systems that sustain current patterns of domestic water demand (Browne *et al*., 2014, p. 75). The case study presented here analyses one initiative where the novel, 'whole-town', approach spoke to these aims by providing opportunities to engage with the collective context of demand in a manner that surpasses conventional activities. However, the analysis presented in this chapter supports more cautious conclusions. The findings suggest that current permutations of large-scale water efficiency risk perpetuating individualistic management activities of conventional initiatives rather than focusing on the collective elements and processes that sustain individual behaviour. Further, despite this focus on individuals, there is limited appreciation for diversity of circumstances in which demand emerges – a finding that echoes critical discussions elsewhere (Fam and Sofoulis, 2015, Sharp *et al.*, 2015) – and instead money is positioned as a universal incentive for water users to reduce demand. Thus, while responsibility is devolved to individuals, the uniformity of intervention echoes the one-size-fits-all management models of centralised water management (Fam *et al.*, 2015), suggestive of a hybrid water efficiency agenda that remains poorly equipped to engage in the collective elements that support current patterns of water use.

The value of initiatives like *Save Water Swindon* is they offer greater ability to comprehend demand by situating activities within a community, thereby have the capacity to develop sensitive measures and adaptive management approaches that attend to the circumstances surrounding everyday action (Karvonen and Evans, 2014). The research undertaken in this case study demonstrates how detailed empirical analysis enables the identification of collective aspects of everyday life that sustain high volumes of water use. These include elements within the home, but also extend in time and space according to individual routines, and are connected to global flows of products and services. Findings such as these identify alternative avenues for future intervention, and also point towards professional practices currently involved in orchestrating demand that

may aid future resource management. Thus research at this scale provides insights to inform policy and management practice but it seems that such insights are not, at present, used to guide water efficiency activities. Consequently further research might usefully extend our understanding of how experiments in large-scale water efficiency such as *Save Water Swindon* are constrained (a question addressed in Chapter 6), and how the insights gained from research such as presented in this chapter might be used to inform future management activity (responded to in Chapter 7). Before turning to these questions Chapter 5 presents the findings from a second case study, *Care for the Kennet*, a community-led project in towns along the river Kennet that is designed to reconnect water in the home to water in the river.

5. Case study 2: A critical evaluation of Care for the Kennet

5.1. Introduction

Abstraction from the river Kennet has been a source of dispute since the early stages of water industry privatisation in England (Moran, 1999, Bateman *et al.*, 2000, Lawson, 2008, BBC, 2014). As one of only 200 chalk streams in the world, the Kennet is of significant geological and ecological interest, as well as of broad recreational and aesthetic value to local residents and its upper reaches are designated a Site of Special Scientific Interest (SSSI) (WWF and Natural England, 2009). However, abstraction along the river's length redirects water from the Kennet, increasing the river's vulnerability to pollution and to changing patterns of rainfall. The Kennet supplies water to approximately 10,000 homes in the surrounding towns of Marlborough, Aldbourne, Ramsbury, Hungerford and a further 30,000 homes in the south of Swindon (WWF, 2009, Thames Water, 2015g). This is problematic as it is estimated that of the 10 Mega litres abstracted, only around 30-40% re-enters the river, the remainder being redirected to the Lea[13].

In December 2011, Thames Water entered into partnership with Action for the River Kennet (ARK) and with support from WWF-UK launched *Care for the Kennet*, an initiative that aimed to "reconnect water in people's homes to the water in the river" (Spokesperson at ARK AGM 2012). Local ARK representatives attended community events to talk to residents about the river that flows through town centres alongside various public buildings. Billboards were installed in prominent locations carrying the slogan "Your water comes from here" (accompanied by a photo of the Kennet) "the less we use, the more there'll be in the river". Finally, a project working with local schools sought to instil a deeper understanding of the interconnections between domestic water and river ecosystems in children and, through indirect communication, their parents. It was anticipated that shifting the social and cultural understands of water would in turn contribute to the reconfiguration of patterns of everyday water use in the home so as to reduce domestic demand and facilitate reduced abstraction.

[13] In recognition of this, at the end of 2014 Thames Water announced plans to build a pipeline connecting homes in the South of Swindon to the water source that supplies homes to the North, reducing abstraction on the Kennet by approximately 50%. However, this pipeline provides only a temporary solution, shifting demand into another already water stressed region and with supply-demand deficits forecast to increase (see Figure 3, Chapter 1), understanding how to reduce demand remains a critical issue.

These activities are a notable departure from conventional demand management activities (see Chapter 2), and also differ from the large-scale activities of *Save Water Swindon*. Firstly, *Care for the Kennet* deprioritises the dissemination of information and water efficient devices in favour of developing deeper connections between water in the home and the river. Further, the initiative rejects the mass marketing approaches being developed in initiatives like *Save Water Swindon,* instead relying on one-to-one interactions and hands-on activities to deliver the initiative objectives. Indeed, *Care for the Kennet* alludes to an entirely different framing of water demand that raises curious questions regarding how domestic water use relates to hydro-social relations. The initiative's aims suggest that encounters with water in the home, and with water in the river, espouse different relationships with water that have varying implications for domestic water use. The initiative also suggests that disconnections between these waters contribute to unsustainable patterns of demand, despite the obvious interdependencies between natural and domestic systems that result in water stress. Finally, the initiative infers that alternative interactions between people and water in the river may provoke lower levels of domestic demand.

These are curious propositions that this chapter investigates to develop an understanding of how non-conventional water efficiency activities contribute to long-term sustainable water management via attempts to develop connections between local water sources and domestic practices. The analysis draws on focus group data to explore the ideas embedded in *Care for the Kennet* and insights gained from following the initiative's progress between summer 2013 and winter 2014 to inform the evaluation (for full methodology refer to Chapter 3). During this time *Care for the Kennet* was focused on projects delivered in local schools that sought to involve children in ecological restoration of the river Kennet (further details are provided in Section 2.2.3). Subsequently, focus groups were held with parents of children involved in these projects to explore the heterogeneous relationships between people and water, the processes through which disconnections emerge, and how *Care for the Kennet* engages with these ideas to reconfigure domestic water use. The following sections analyse the findings from these focus groups with regards to the themes identified in *Care for the Kennet*; Section 1.1 explores how interactions with water contribute to the production and reproduction of everyday patterns of water use in the home; Section 1.2 explores how water in the river becomes disconnected from water in the home and Section 1.3 focuses

on *Care for the Kennet's* schools project to understand how alternative water efficiency activities can redevelop encounters with water that benefit demand management.

5.2. Findings

Initial interviews with project organisers described a variety of different interactions between people and water. These included ordinary interactions with water in home, gardens and rivers, strong memories of recent drought during 2011 and 2012 and more recent experiences of flooding resulting from a period of 'record breaking weather' in winter 2013/14 (Slingo *et al.*, 2014). *Care for the Kennet* adds another layer of interaction into this mix. While the schools project remained principally confined to children and parents, the public arena in which activities took place and the extensive work of ARK within the community meant many residents were aware of the project if not directly involved in conservation activities. The framing of *Care for the Kennet* as a means of reconnecting water in the home to water in the river suggests that these various experiences of water are infused with different potential to influence everyday water use. The following discussion explores the various encounters described by participants in the focus groups. This eclectic collection is not exhaustive but serves to illustrate the multiplicity of peoples' interactions with water(s).

5.2.1. Water multiple: provocative encounters with water

> *Researcher: Can you tell me a little bit about the sorts of things you use water for and what influences that water use? Janet: Washing clothes, and bodies and stuff, playing … Charlotte: Playing! Give the kids a hosepipe and they will be happy for days! Katie: I had activities, but I was thinking more like the river, jumping in puddles and playing in the woods, getting covered in mud […] but maybe you didn't mean that kind of stuff?*

This extract from one of the focus groups illustrates the range of interactions people have with water. Many of these are functional, and most relate to water at home, however the discussion above ends in contemplative silence as Katie ponders how far to extend the notion of 'water use'. The question posed was open and deliberately vague, designed to allow participants to talk freely about whatever notions of water they considered appropriate. Yet Katie's uncertainty regarding the "kind of stuff" in question suggests a hesitance regarding extending this discussion beyond the home. This hesitance is indicative of a subtle distinction between different waters that are encountered during

everyday activity that echoes that of *Care for the Kennet's* 'water in the home' and 'water in the river'. The paragraphs that follow expand on these initial observations to explore different interactions with water, the experiences and expectations to which they contribute, and to consider how everyday demand is entangled in these diverse interactions with water.

Water(s) in the home

The first observation is that throughout the focus groups, water itself was rarely the subject of discussion, instead conversations oriented around the everyday services that water enables such as laundry, showering and gardening. This indirect referencing reveals that the prevailing experience of water is as a functional resource, a sanitised domestic product that contributes to the provision of services such as comfort, cleanliness and relaxation (Allon and Sofoulis, 2006). This finding echoes ongoing discussions in social theory and accentuates how continuation of everyday practice reaffirms anthropocentric expectation of what resources like energy and water are for (Shove and Walker, 2014). However, these were not the only interactions with water in the home that participants described and comparing these different accounts reveals the multiplicity of water in the home. For example, the following quote illustrates how water in the home takes two forms; a sanitised resource suitable for children's play and the floodwater in the cellar that fails to provide the functions of domestic water.

> *Trish: the kids have two tractors they like to wash and if I'm mindful of water then I'd limit how much they can have to play with, but when I've got a cellar full of water my kids can have as much as they like! Researcher: I assume you're not lifting that out of your cellar?! Trish: What? No. No! It's all stagnant and grubby – they've got to have clean water. Sarah: And warm!*

This distinction highlights that it is not so much the presence of water within the property that renders it useful, but the embodiment of a particular set of properties that enables its participation in certain domestic practices. The extract reveals that consumers expect domestic water to be clean, warm and flowing. Elsewhere, the discussions identified other characteristics, such as how water in the home materialises instantaneously in response to the turn of a tap or push of a button and is thermally regulated to suit its intended function. The uniformity and reliability of these qualities enables water to fulfil domestic functions.

Various researchers have discussed how the near universal connection of homes to a centralised water supply system in the twentieth century resulted in the abstraction of

water, physically and metaphysically, from its turbulent natural context (Gandy, 2004, Kaika, 2004, Trentmann and Taylor, 2005, Linton, 2010, Chilvers *et al.*, 2011, Taylor and Trentmann, 2011) (see Chapter 2 for further details). The findings here add to these, illustrating that interactions with water(s) in the home provide multiple forms of productive encounter. Most commonly, by behaving as expected and in participating in everyday routine, domestic water contributes to the expectations, experiences and materialities that reaffirm existing patterns of domestic water use (see Chapter 4). The technologies that enable this functionality, rather than being passive enablers of access, fortify domestic demand by reiterating modernist scripting that contains water, controls its unsanitary qualities and renders it a subordinate of large infrastructural planning (Kaika, 2004, Dicks, 2010).

In contrast, floodwater provides a different, disruptive form of encounter in which water's physical characteristics defy containment and resists modernity's casting. Floodwater is one of Kaika's (2004) 'bad waters', unregulated and uncontrolled waters, whose physical and social characteristics delineate them as potentially harmful. While the water in Trish's cellar *is* a potential hazard to human health, there are other examples that illustrate how disruptive encounters with no immediate threat to human health have the potential to unsettle domestic practices and thereby provide opportunities for alternative social and material configurations to arise:

> *Jane: "We've got a problem with our drains; they run slightly uphill and keep getting blocked. By process of elimination we've worked out that the chap that came round when we renovated– we've got these old fashioned loos that flush for hours –he put things in to stop that but it means there's just not enough water to clear the drains. Then the kids do 'if its yellow let it mellow' [a water efficiency action that results in less frequent flushing], so it really doesn't get flushed enough either! So our water butt gets emptied every couple of weeks – my husband takes the lid off the drain and uses the rainwater that to flush it through."*

Like the water in Trish's cellar, when water ceases to flow as designed – and expected – the disruption caused provides a site space for interaction that has different possibilities for the relationships between water and domestic water use. Disruptive encounters are revealing; they illuminate the redundancies and assumptions that are 'baked into' infrastructures and domestic technologies (Allon and Sofoulis, 2006). In this instance, it exposes the paternalistic notions of provision embedded in large-scale infrastructures that resist more recent decentralisation of water management in water efficiency interventions

(Van Vliet *et al.,* 2005, Sharp *et al.,* 2015). Jane's drains are inscribed with assumptions regarding continuity in flow level that are compromised by commonplace water efficiency activities such as cistern displacement devices and reduced frequency flushing. Consequently, these moments of disruption reveal that the centralised planning system that produces domestic water simultaneously reduces the adaptive capacity of the infrastructures of provision, creating material dependencies that require water in specific volumes and forms.

Disruptive encounters are also provocative, possessing capacity to inspire interactions with alternative supply systems to maintain the desired services. In this instance, Jane's husband enlists rainwater and its associated storage equipment to unblock drains. By provoking such ingenuity, disruptions pose opportunities for creative re-assembling of social and material elements that potentially benefit the water demand management agenda (Woelfle-Erskine, 2015a). In this instance, toilet flushing becomes temporarily reconnected to the ebbs and flows in local rainfall that determines the availability of water. Similar findings have been observed in research on rainwater tanks. For example, Woelfle-Erskine (2009) describes how the proximity of alternative water supplies – particularly their vulnerability to local fluctuation and the user-interaction required to keep the system functioning – contribute to different patterns of use as well as reconfiguring social and material elements.

These findings demonstrate that water in the home is not only multiple, but that such multiplicity creates various opportunities for encounter that offer different possibilities for the ongoing evolution of water demand. Domestic water, the quiet functional product of modern engineering, rests on boundaries of inclusion and exclusion that when breached provide moments of destabilisation in which reconfiguration of the collective contingencies of demand may occur. This section illustrates that these breaches take many forms, some more human-made (albeit unintentional) such as the water efficiency activities that render Jane's drains dysfunctional, some of more-than-human making like the floodwater in Trish's cellar. In these moments our encounters with water begin to undo the orthodoxies of modernity, unsettling routine performances that constitute everyday consumption and creating moments charged with potential for alternative patterns of demand to emerge. Yet the various waters described in this section are only part of the picture painted by *Care for the Kennet,* which also draws attention to 'water in the river' as an alternative site of encounter with potential benefits to domestic demand.

Water in the river

The river provides an alternative space for another series of interactions with water. Unlike domestic water, the services afforded by water in the river were less tangible and more emotional, sensory and corporeal:

> *Katie: "It's the sound of the water, you are often unaware of it, but there is that feeling of relaxation that you get from hearing water flowing over the stones in the river. It hits every sense somehow. I can't sleep when the river's really low, you hear the silence."*

Many participants described similar passive encounters that enhance the perception of water and its conditions in the river at a given time. The close proximity of the Kennet to the towns in which *Care for the Kennet* operates means that frequent crossings of the river on the way to school, shops or work are common. Several participants reflected in how passing by the river provided moments to stop and watch, to look for fish with their children or to observe the conditions of the river. Consequently, while modern engineering hides waterways (part of efforts to contain waterborne disease (Castro and Haller, 2009, Swyngedouw, 2009b)) interactions with the river rematerialise water and provide opportunities for observation, contemplation and interaction that do not feature in domestic water (Dicks, 2014).

In other cases, the river provides a space in which the processes by which water is disappeared in modern supply systems are visible:

> *Janet: "I wasn't really conscious of [abstraction] until we were canoeing on the Wye in summer last year. There were these huge pumps coming out of the river, you could hear them and see them draining the water all the way along the stretch we were paddling. It was quite shocking, you know like 'wow, if that's what's happening to the Kennet', it's really interesting."*

These encounters intersect with ethical sensitivities, challenging expectations of what water is for and contradicting the prevailing experience of supply systems in which water is abstracted from its landscape. Participants spoke of how encounters with the river provoke personal reflection on the ecologies of water giving rise to a greater appreciation of the more-than-human services water provides and challenging individualistic and anthropocentric ideas of need and demand:

> *Trish: I think you learn your place in the environment as well, you see all the different bits of that bigger picture that otherwise you don't see…Charlotte: … like how dependent we are and what damage we can do. Trish: It makes a big*

difference being able to observe it. Trish: and you can talk about these things more if you see them.

These findings chime with the literature that describes how embodied encounters with nature contribute to the ongoing development of affective connections that shape responses to sustainability initiatives as well as patterns of personal everyday conduct (Hinds and Sparks, 2008, Louv, 2008, Lloyd and Gray, 2014). For example, Lloyd and Gray (2014) suggest that greater access to natural resources contributes to a deeper understanding of the connections between humans and the environment. Pushing this further, more-than-human geographers, Hinchliffe and Whatmore (2006) describe how the presence of nonhuman life in urban spaces undoes modern engineering, which aspires to tame and contain natural resources for human use or else externalise their unruly properties. Bennett (2010) highlights how through encounters with more-than-human others (such as wildlife or in this instance rivers), we gain a sense of our incomplete commonality that is capable of inspiring new relational ontologies. This engenders an openness to a 'politics of conviviality' (Hinchliffe and Whatmore, 2006), an openness to living with others and a capacity to treat nonhuman commodities "more carefully, more strategically, more ecologically" (Bennett, 2010, p. 18).

There is evidence in the focus groups to support the view that interaction with the river calls typical water use into reflective consciousness and inspires modifications to reduce water use in the home:

Charlotte: I love walking over that bridge and just seeing what the river looks like that day. It makes you think about water at home, definitely. Katie: If I can see the river is low then I use less where I can … Charlotte: less washing, or at least making sure it's really full. Sally:… trying to get them to wear things more… Charlotte: not change clothes seven times a day

The visibility of the river means that when water levels are low, the assurance of water as an abundant resource for human consumption becomes unsettled, prompting temporary activity to modify water use. However the capacity of these encounters to provoke long-term reconfiguration of everyday practices appears limited. While the extract above illustrates how encounters with low water prompt short-term modifications to water use in the home, these are insufficient to provoke long-term reconfiguration of the social and material context water use emerges. Modifications made to water use remain within the scope of existing socio-material systems (i.e. reducing the duration of showering rather than deep changes to how the services showering provides are fulfilled or revised), on the

basis that these are temporary disruptions and behaviours revert once water levels return. Further, and as highlighted in the previous chapter, what individuals can do to modify water use when the river is low is limited through the normative and material scripting of behaviour.

High river levels, meanwhile, provide a further productive encounter as certain interactions are inhibited, others accentuated and new ones created. For example, parents describe how flood prevents children playing in or near the river as it becomes fast flowing and contaminated. Instead, water becomes a nuisance; muddying clothes, cars and shoes, springing up in homes and gardens and infiltrating the otherwise sanitary spaces of the home:

> *Lynn: "There were some people that weren't even aware of a well on their property until it started pouring into their front room. That was a surprise!"*

Such 'surprises' challenge modern water management; revealing historical disappearances and assumptions regarding the character and flow of water built into infrastructures, homes and towns. In exceeding the assumptions built into urban space, both low and high waters reveal the fallacies of water management – past and present. For example, droughts spurred concerns regarding the ongoing development of homes in areas that rely on abstraction from the river Kennet, while the emergency response to floods was seen to contrast against the increasing coverage of impermeable surfaces in the local area. Consequently, such surprises expose maladaptive management practices in conventional resource management and the limits of Water Company management in light of broader urban planning and construction (Barnett and O'Neill, 2010).

However in even the most extreme cases of drought and flood, participants expressed relief that the impacts for domestic supply were limited, and typical domestic practices continued as usual. While acknowledging the ecological impacts of such events, they remained confident in the supply system's capacity to mitigate disruption to domestic supply:

> *Janet: "with all the flooding […] the drains came up, and you could see all the loo roll and stuff washing up and erm, well it made me oh so conscious that everything you put down the drains can come back up again into the river."*

And while the limitations of the sewerage system were exposed during flood, participants continued to experience the removal of effluence from their homes (although this was not the case for all local residents). While systemic assumptions are exposed, the

infrastructure remains largely successful in ensuring domestic water continues to function, thereby reducing the need or circumstances to support the development of alternative water supply systems.

Summary

The focus group findings echo the suggestion that water in the river is somehow different to, and disconnected from, water in the home. The findings suggest that all interactions with water, however mundane, are productive, with implications for the ongoing evolution of domestic water use. Even within a single setting, interactions with water may reaffirm, unsettle or reconfigure the expectations, experiences and materialities in which domestic demand is embedded. In many cases, the contribution of water to domestic practice is barely perceivable, as water obligingly performs the role cast for it by modern infrastructural systems and thereby reinforces its functional value. In other circumstances encounters recharge ethical registers with sensitivity to more-than-human ecologies and risk. Moments of disruption become spaces in which the conventions of water supply systems are challenged and alternative meanings and materials might be created. For example, the creative remodelling of supply systems provoked by low flow in Jane's drains, or the revelations prompted by drought and flood that challenge the security of modern engineering. Consequently, water may be seen to be an active participant in everyday practice, charged with potential to change, or reaffirm, domestic demand.

These findings resonate with an extensive body of literature in political ecology where the contribution of water to water resource planning (Bakker and Bridge, 2006, Bakker, 2012a, Whatmore, 2013), homes (Kaika, 2004, 2005) and infrastructures (Heynen *et al.*, 2006, Swyngedouw, 2006) has been made explicit. These literatures reveal that water retains complex, multi-layered identities that are revealed in particular enactments despite the efforts of large-scale engineering to create a singular universal resource (Linton, 2010, Bakker, 2012a, Barnes and Alatout, 2012). The historically and geographically specific social values that revolve around water sustain its multiplicity even while the modern infrastructure seeks to render it a universal product (Strang, 2004, Swyngedouw, 2009b). Further, water's physical properties (e.g. its weight and bulk (Page, 2005)), its biophysical characteristics (e.g. its interrelationship with land, people and climate (Bakker, 2012a)), and its spatial characteristics (e.g. its uneven distribution (Barnes and Alatout, 2012)) render it an 'uncooperative' commodity that resists

reductionism. In these ways, water is shown to be a lively co-contributor to the hydro-social cycle, permeating the everyday practices it enables (Swyngedouw, 2006, Woelfle-Erskine, 2015b).

Post-humanist geographers (Hinchliffe and Whatmore, 2006, Hinchliffe and Bingham, 2008, Bennett, 2010), push these ideas further still by refocusing enquiry on the "capabilities and potentialities of all manner of […] objects and forces assembled through, and involved in, the co-fabrication of socio-material worlds" (Whatmore, 2006, p. 604). It is to describe this capacity of objects that Bennett coins the term 'thing-power'; described as "the lively energy and/or resistant pressure that issues from one material assemblage and is received by others [that is] is immanent in collectives that include humans[and] emphasizes the closeness, the intimacy, of humans and nonhumans" (Bennett, 2004, p. 365). Viewed in this way, the focus group discussions reveal how water contributes to the ongoing (re)assembly of hydro-social relations, variously resisting and/or reproducing the role expected of it. However, the literatures that discuss hydro-social relations rarely examine the implications for water use or demand, thus the discussion presented here provides a novel extension of these findings towards a pragmatic question of managing demand.

Thus in supporting *Care for the Kennet's* suggestion that our relationships with water matter to domestic demand, these findings make an interesting extension to the literature on demand management. While the practice turn (described in Chapter 2) has successfully challenged the mind as a centre for agency, there remains a tendency to focus on agency exerted by human designed technologies and infrastructures in and around the domestic sphere. This chapter extends these ideas to consider how the socio-natural world in which demand is situated contributes to the reproduction, modification or defection from existing practice that enable demand to persist (Shove *et al.*, 2012a). Further, the inclusion of more-than-humans in practice-based enquiry enables reflection on how changing geographies of encounter contribute to the configuration of domestic demand. There are tentative discussions on these themes emerging in relation to weather (de Vet, 2013, 2014), particularly where it extends to discussions regarding thermal comfort (Hitchings, 2007, 2011a, Maller and Strengers, 2013) (see Chapter 2). However, the capacity of other more-than-humans to exert agency remains under-conceptualised. Given the exposure to different water(s) that arise as a result of mobility and migration, and the likelihood that climate change will result in new and unpredictable encounters with water, this chapter makes a potentially useful connection, enabling an understanding

of how our embodied experiences of the natural world shape domestic demand. By bringing together disparate literatures this chapter also offers potential to inform our understanding of how more sustainable societies might be brought about and to contribute to ongoing theoretical development in these fields.

However, the findings also illustrate that productive encounters are uneven and unequal, mediated by the socio-material context of water use in different spaces. Consequently, the affective properties of some encounters are reduced while others are enhanced. Some are common, mundane and negligible, while others are brief but conspicuous and surprising. Moreover, these different encounters are part of the same, in perpetual competition in shaping tacit understandings of what water is for. *Care for the Kennet* cuts through this complexity by suggesting that water in the river is disconnected from water in the home and that the reverse would be advantageous for domestic demand reduction. Thus the question that follows is what are the processes through which these waters are disconnected and what are the implications of such disconnection for the affective properties of water on domestic life?

5.2.2. How does water in the home become disconnected from water in the river?

The findings above suggest that the prevailing experience of water in the home reaffirms conventional socio-technological arrangements that support current, water-intensive modes of practice. In contrast, experiences of water in rivers present moments in which the assumptions of modern engineering are revealed, alternative hydro-social sensitivities are awakened and routines become unsettled. Thus, experiences of water in river provide a space in which the elements of unsustainable practices are exposed and may be reconfigured. However, the productivity of these disturbances is limited and consequently experiences of waters outside the home have few implications for everyday water use. This section explores the notion of disconnection implicit in *Care for the Kennet's* objective to understand the processes that mediate everyday experiences of water(s). Amid the myriad of socio-technical processes that affect everyday experience, two discussions are identified as important in the focus groups; the first relates to spaces of entertainment, the second to a more general pattern of urban development. Each of these shapes the opportunities people have to experience different water(s), and mediate the possibilities that are embedded in these encounters.

Changing practices of leisure and entertainment

Firstly, water features in leisure and entertainment for both adults and children, yet the changing practices of leisure have implications for everyday interactions with water and the specific contribution these waters make to everyday water use in the home. Throughout discussions parents compared and contrasted their own childhood experiences of roaming and playing with those of their children. Several participants had grown up in or around Marlborough, or in similar rural towns and recounted time spent 'playing out' that posed various opportunities for encounter and interaction with water in the river:

> *Lyn: We had more freedom. Lynn: we did, I'd be off playing out on my bike up and down the canal from dawn 'til dusk. Sarah: We were always messing about in a river, like you say going swimming and things, we'd be down there having picnics and trying to catch bombees [sic]. Lynn: [We] used to go on the Kennet all the time on inner tubes and things for as far as you could go really, until we got fished out by people in their gardens [laughter]*

In contrast, parents described how their children's play was mostly spent indoors, with 'playing out' predominantly referring to playing in gardens or other designated spaces such as nearby playgrounds during the summer months. Consequently, there is evidence of the domestication of children's play; a movement away from spaces in which to encounter water in the river, to domestic spaces typically inhabited by water as a sanitised modern product.

This domestication of children's play was attributed to two principal trends. First was the expansion of media and gaming technologies aimed at children, which increases the range and diversity of indoor play options and presents new opportunities for exploration without leaving the house (e.g. via the internet and Google earth). While parents were generally critical of children "sitting in front of the Xbox" with concerns regarding how fulfilling such activities are, they reflected that this was an increasingly common feature of childhood leisure. The second relates to the safety of children in public spaces. Parents registered particular concern regarding the increasing volume and pace of traffic on local roads, some of which had been built since their childhood; however there was a more general concern regarding potential dangers to children in public spaces:

> *Sarah: "there is so much more publicity about the awful things that can happen to children, you hear all of these cases about a child being abducted or found dead and I think that is more common than it would have been for our parents"*

This fear is not necessarily connected to personal experience, but connected to the media which means "awful things" receive greater coverage. Consequently, parents in the focus groups suggest that they were uncomfortable allowing children to play out without supervision. As children's play becomes more confined, their opportunities to experience water outside the home is limited and where interactions with the river occur these are passive – on the way to school or the shops – rather than the immersive forms of interaction described by their parents.

These findings are supported by existing literature which points to a combination of fears regarding public safety and the replacement of play in public spaces with a growing range of organised sporting, culture and leisure opportunities (Holloway and Pimlott-Wilson, 2014). Adding to this, the increasing tendency towards indoor play attributed to the rise of gaming technologies (Chambers, 2012), the spatial geographies of children's play are becoming more confined (Holloway and Valentine, 2000, Alparone and Pacilli, 2012). Even in rural areas where the dangers of childhood roaming might be perceived to be lower, there is increased dependence on parents chauffeuring – also related to changing patterns of car use (Mattsson, 2002) – that decreases opportunities for playing outside. These studies point to a risk of institutionalisation of childhood, as play becomes more organised and instrumental; though the findings presented here show that even when play remains unorganised there is a shift toward to private spaces. In comparison, a growing body of work accentuates the value of purposeless play, and playing outdoors. These forms of play are associated with a range of health and psychological benefits (Bird, 2007, Bird, William *et al.*, 2011), but also that freeform play in the outdoors enables experiences that cultivate two-way relationships with the natural world (Louv, 2008, 2011, Moss, 2012a).

This movement of leisure into private spaces was not only applicable to children. Participants spoke of their gardens as spaces for the family to enjoy and to entertain friends, which they contrasted to their memories of childhood in which the garden provided a more functional role for growing plants or drying laundry. Existing research supports these findings, for example, Chappells *et al.* (2011) point out that for many people the garden is increasingly designed to accommodate leisure practices. Askew and McGuirk (2004) connect the increasing popularity of gardens as a private leisure space to the perceived decline in security of public spaces noted above. The garden, while physically outdoors, provides an extension of the sanitised space of the home (Hitchings,

2007), as consumers have control over the boundaries of inclusion and exclusion (from people to plants).

The implications of these changing practices of leisure for the ongoing evolution of everyday water use are twofold. First, the previous section describes how encounters with water in the river are creative of ethical registers sensitive to the more-than-human ecologies of water while, under ordinary circumstances, domestic encounters reaffirm water as a product for human use. Consequently, the increasing incidence of encounter with domestic water sustains the anthropocentric framing of what water is for, and a lack of sensitivity to other services provided by rivers. Second, encounters with the river provide moments to reflect and call into question modern supply systems, planning and water use; however these opportunities are marginalised by the accentuation of domestic water. Consequently, the prevailing experience of water is as a sanitised fluid that flows through taps, hoses and showers that reinforces current patterns of everyday water use.

Finding such evidence of disconnection in an area like Marlborough, with such close proximity to water in the river, is a disconcerting counter-narrative to research that suggests the presence of local greenspaces better facilitates sustainable lifestyles (Moss, 2012a). Instead the findings here indicate that the presence of greenspaces alone is insufficient, highlighting instead the importance of active engagement with rivers to provide the forms of embodied encounter that unsettle experiences of water in the home. Thus for water efficiency, and more generally for sustainable consumption, there is a need to consider how such opportunities are shaped and stymied by the development of practices far removed from the water efficiency agenda. Thus far research into changing leisure practices has had limited engagement with the sustainable consumption agenda beyond consideration of the transport implications and typically of conspicuous forms of leisure such as long-haul flying (see for example Watson (2012), or Cohen and Gössling (2015)). The findings here draw attention to the unintended consequences that changing patterns of everyday leisure and mobility have for embodied encounters of nature and for the consideration of what beneficial alternatives might look like.

Past and present urban planning

Aside from these changing patterns of leisure, the focus group discussions reveal how disconnections are produced and reproduced in the spatial configuration of towns, as a result of the practices of planning, construction and domestic design. In the previous section, one participant describes how canoeing down the river provided an opportunity

to see water being pumped, illustrating the rarity of such visibility. Large-scale engineering projects have historically taken water out of the urban landscape (Dicks, 2014). For most participants the only discernible signs of this production process were water meters and the bills they received from the Water Company, resulting in a separation of water in the home and water in the river:

> *Katie: I think about them [water in the home and in the river] very separately most of the time Trish: I didn't even know that the stuff that flows through that river is what we drink and stuff! Lisa: No I didn't either, until [I got involved with the initiative] I thought it came from some magical reservoir … Trish: I just thought it came from the Water Company or something. I had no idea!*

This reflects findings in existing literature, for example Allon and Sofoulis describe how water "manifests in the home through its clicking sentinel, the water meter" (2006, p. 48). These findings illustrate that water management not only abstracts water from the landscape but also metaphysically from consumer experience. Instead, the instruments and technologies that water companies use to measure and communicate to customers leave only an economic trace of water.

To add to this discussion, participants reflected on the uneven access to water in different geographic locations. Participants were aware that the Kennet provided a space that not all consumers have access to:

> *Lisa: "The river is a lovely resource that so many children don't get to play with"*

This extract highlights that proximity to rivers is not universal and comparing Marlborough and Swindon illustrates the realities of this. While there is some evidence of channelling and culverting in Marlborough and other towns along the Kennet the river is a prominent local feature flowing, through several centres and residential locations, through college grounds and past schools and with extensive access due to extensive path building. In contrast, there has been extensive channelling and culverting of water in Swindon, such that the only water features within the town centre are a small number of ponds in landscaped gardens. Where the river flows through residential areas to the east of the town, access is limited in most locations and visibility reduced due to housing density. This observation highlights the substantial variations between access to rivers and other waters outside the home. Again, these findings reflect discussions in the literature that highlight how historical urban planning has "severed urban water users from direct access to the source of their water as urban streams were turned into concrete

flood channels or put underground" (Woelfle-Erskine, 2015a, p. 581). Water is a geographically localised resource, and consequently the opportunity for encounter is spatially uneven, with design protocols in urban spaces reduce these opportunities further. While the bulk of the engineering work to disguise waterways may have taken place in the twentieth century, contemporary water management and the design of urban spaces, homes and technologies do little to counteract this disappearance.

The discussion in Section 5.2.1 illustrates the capabilities of water in the river to contribute to alternative understandings and expectations and to unsettle socio-material systems in ways that may aid the emergence of alternative patterns of water use. Consequently, by marginalising access to water in non-domestic spaces, practices of design and construction shape the future trajectories of demand. This observation brings the literature on practice closer to that of political ecology and particularly to that of water sensitive cities. While rarely pursuing a discussion of the consequences of the built environment for domestic practices, or demand, the water sensitive cities literature makes explicit how the relationships between water and the urban environment relate to sustainability. For example, Brown *et al.* (2009) identify six different city states. Three are historical in which urban development rests upon a notion of abundant water, and prioritises the social and economic value of water. Two are in progress, though yet to become commonplace, with the environmental value and limits of water come to feature in management encouraging efforts to mitigate pollution and conserve water. The final, the *water sensitive city*, is a vision of the future in which urban design fosters new hydro-social relations that reinforce a sustainable supply-demand balance (see also Ferguson *et al.*, 2013, Rijke *et al.*, 2013). While idealistic, the idea of water sensitive cities is based on a principle of access to a diversity of water sources in order to create new normative understandings of what water is for, embedded in material design of urban spaces and in water management models (Wong and Brown, 2008). These principles are seen to reinforce patterns of domestic water use that are beneficial for long-term sustainability, thus making an explicit connection between the urban environment, water and domestic life. However, the realities of these connections have as yet to be the subject of much research.

Summary

The previous section explores the multiplicity of water as it participates in different situations, and how such multiplicity resists, reproduces and reinforces the normative and

material conditions of domestic water. To add to this, the present section has explored the processes through which water in the home becomes disconnected from water in the river, how our encounters with water are mediated through the built environment, service contracts and changing patterns of leisure and entertainment. Consequently, these findings highlight how practices both closely related to water management (e.g. urban planning) and further removed (e.g. gaming and leisure industry) have implications for consumers' ongoing experience of water. Consequently if we accept the findings from the Section 5.2.1 – that different experiences give rise to different possibilities for the future trajectories of water demand by shaping understandings, expectations and socio-material systems – these practices have implications for demand.

In an effort to reconnect water in the home to water in the river, *Care for the Kennet* undertakes a variety of activities designed to strategically develop novel forms of encounter between the river and local residents. The following section focuses on one specific strand of activity, a project working with children and parents from local schools to contribute to ecological conservation efforts on the river Kennet. Focus group data are combined with observational analysis to understand the extent to which this initiative synthesises productive encounters that create embodied experiences to reconnect water in the home to water in the river.

5.2.3. Strategic reconnections: Care for the Kennet and new interactions with water

Given that interactions with water, both in the home and in the river, provide productive experiences and that people's opportunities for such experiences are shaped by social and material life, the question that remains is whether non-conventional water efficiency activities such as *Care for the Kennet* can redevelop connections that are advantageous to demand management. Introduced in 2012, *Care for the Kennet* developed a series of classroom projects that enable children and their parents to participate in ecological restoration of the river Kennet. Entitled 'trout in the classroom', 'mayfly in the classroom', or 'eel in the classroom', depending on the particular organism involved, the projects installed tanks in primary and secondary school classrooms in which to raise populations of the Kennet's key native species. Facilitated by ARK, pupils learned to care for eggs obtained from local farms, young European eels from the Sargasso Sea, or mayfly collected from the Kennet. After 8-10 weeks the class were accompanied on a river release, where the young organisms were introduced to the Kennet. The aim of this

project was to provide a space in which to foster and facilitate new forms of encounter with the local river in order to spark conversation, new understandings of river life and new appreciation for the connections between water in the home and in the river.

Figure 10: From eggs, to Alvins, to the river
(reproduced with permission from arktrout.blog.com)

The interactive teaching methods used throughout the initiative enabled children to gain intuitive understandings of river ecosystems and to learn about the challenges they face. For the youngest children the project was simply about learning what lives in the river, while for older pupils the project connected to local issues such as how land-use affects stream ecology, diversity and food-webs, and the impacts of over-abstraction. In the focus groups, their parents reflected on how these methods created immersive experiences through which children engaged with the river and developed a tacit understanding of the connections between river ecosystems and themselves:

> *Jane: They get a lot from books but when they're out seeing it and doing it, or looking at stuff in the river, it all becomes a bit more real. They get it, and get how it relates to real-life and the impact they can have. Trish: I think they learn to do something about it, or that something can be done about it. I don't know, but if there is ever any litter in the river then my kids are like 'mum we've got to get it!'*

These findings demonstrate that *Care for the Kennet* enables children to "get it"; developing deep personal understanding of more-than-human ecologies and relationships between water in the home and in the river. This supports existing research, for example Lloyd and Gray (2014) describe how "when children are provided with an opportunity to develop a sense of wonder, especially if nurtured by an attentive adult who facilitates and listens to the child's inner life and own world, then rapid advancements can be made in developing ecological understanding" (Lloyd and Gray, 2014, p. 3). *Care for the Kennet* provides such an opportunity and the personal one-to-one facilitation from ARK provides

the ‘attentive adult’ Lloyd and Gray describe, allowing children to situate themselves in their ecological understanding. Yet in addition to ecological understanding, Trish suggests that the project also develops precedence for ‘doing something about it’; practical embodied understanding that provokes immediate, if relatively minor, actions to care for freshly revealed others.

In addition, *Care for the Kennet* establishes new forms of ‘playing out’, that enable a longer-term reconfiguration of relationships between people, waters and public spaces. Several participants spoke of how after the project their children formed new ways of interacting with the river that sustained children’s engagement:

> *Sally: Thomas requested a set for Christmas– a turkey baster and a pot – so that he could go down to the river to do the same thing. Charlotte: It’s also quite competitive. They get given a list of things to see, so it automatically becomes a race to see who can see them first, or who can find the biggest cadis fly or the one in a case, they’re quite unusual. So they get quite competitive which sustains their interest. Jane: Up ‘til then I don’t think they’d considered it the river to be anyone’s home, or anything home, it was just his playground, whereas now when he does go in he’s very careful about what’s around.*

The “turkey baster and pot” are simple household objects used for macroinvertebrate sampling, allowing children to separate organisms from gravel and stones and handle them delicately. The use of such homemade kits in the projects enabled children to do their own river explorations in a way that avoided doing damage to the ecosystem, as well as providing them with skills and spatial awareness that encourage safety. Projects like these build bridges between outdoor play and indoor play; provoking questions that may be explored further online at home. In these ways, *Care for the Kennet* may be seen to not only provide an immediate opportunity for reconnections, but long-term interactions that existing literature suggests will benefit the development of a sense of connectedness that continues in adult life (Hinds and Sparks, 2008, Louv, 2011, Lloyd and Gray, 2014).

In addition to its immediate and longer-term effects, the impacts of *Care for the Kennet* extend beyond classrooms and children. The river visits provided an opportunity for parents and the general public to see children playing in the river, normalising these forms of play for local observers, as well as providing a point of contact for any concerns. In addition, the river visits provided opportunities for coverage in the local media (e.g. Gazette & Herald, 2014) that not only provided further detail and background

to the initiative but validated children's presence in the river. The previous section illustrates how children's play increasingly takes place in private, often indoor spaces or other predesignated spaces for children (e.g. playgrounds), potentially making playing in the river seem unusual. Thus *Care for the Kennet's* repopulation of public spaces, legitimised children's engagement in spaces that were not deliberately designed as such, shaping new normative understandings and experiences of what rivers are for.

Further, by instigating intrigue and provoke dialogue the projects extended into families and peer networks:

> *Katie: "you get a kind of running commentary when they're out and about, if they've learnt something about where you are they're like "the other day we did this…" or they're making a whole list of the animals and insects that they found in there. It's fascinating really, I know all sorts of things are in there!"*

In this way *Care for the Kennet* repopulated everyday encounters with water in the river with unseen others (Hinchliffe and Whatmore, 2006). Parents as well as children became reacquainted with the multispecies functionality of the river, enabling similar ecological sensitivities to develop in adults. It is these conversations that keep the relationship with the river alive; contributing to the ongoing development of intuitive understandings of what water is for that provides a potentially powerful counter-narrative to modern domestic water.

In summary, these findings suggest that through alternative modes of teaching and by establishing new practices of 'playing out', *Care for the Kennet* challenges the domestication of children's play and helps cultivate more empathic understandings of the river ecologies. In this way, *Care for the Kennet* may be seen to destabilise the anthropocentric framing of water embodied by domestic water by developing new embodied experiences of water in local rivers and ecological systems. In addition, the personal hands-on approach developed in *Care for the Kennet*'s schools initiative is a contrast to generic, passive forms of communication favoured in conventional water efficiency activities and in large-scale initiatives such as *Save Water Swindon*. Further, *Care for the Kennet's* endeavours to effect change in domestic water use through activities that take place in public spaces such as schools and rivers, a contrast to measures that target individual water users in their homes. These differences appear, at least at a local level to offer potential beneficial reconnections between water in the home and water in the river.

However, there are limitations to *Care for the Kennet*, particularly with regards to its capacity to reconfigure the materialities that separate water in the home from water in the river, and counter the prevailing experience of water as a resource. Section 5.2.1 illustrates how individual encounters with water are multiple, and also that they are entangled, contradictory and unequal. The encounters created by *Care for the Kennet* compete against the more common experience of everyday domestic water at home and in other spaces in which water is domesticated for functional purposes such as work, swimming baths and schools. Each of these reinforces an anthropocentric notion of what water is for and reaffirm the modernist scripting of water as an abundant natural resource for human consumption embedded in centralised supply systems (Chilvers *et al.*, 2011, Bakker, 2012a). This creates friction as children develop ecological sensitivities, but simultaneously retain the needs and expectations that sustain unsustainable patterns of water use:

> *Lisa: "they come back all moralistic because they've spoken about how you shouldn't chop down trees or how you conserve water and stuff, but the first sunny day its 'can we get the paddling pool out?'"*

Thus, while *Care for the Kennet* appears to enhance the capacities and possibilities afforded by encounters with wild water, its effect is subdued by the prevailing experience of domestic water that reaffirms and participates in the reproduction of intensive patterns of water use.

5.3. Discussion

The discussions in this chapter present a call for greater dialogue between the literature on sustainable cities (including more-than-human geographies) and social practices to think creatively about how interactions with the natural world shape water use and how alternative hydro-social systems might support more sustainable patterns of water use. The findings demonstrate the productivity of various encounters between people and water, some of which are more commonplace than others. The examples given are illustrative rather than exhaustive, and in different times and spaces these encounters are likely to vary. However foregrounding such variance, and acknowledging the different affective capacities of embodied experiences of water re-orientates enquiry as to how the relationship between people, practice and hydro-social relations are mediated, the implications of this for the ongoing evolution of demand, and the potential opportunities for demand management. Elsewhere, calls have been made to extend the boundaries of

demand management; for example Strengers (2012) calls for managers to look beyond barriers and drivers, Browne (2015) to let go of the resources in question – be it water or energy – and Shove *et al.* (2012a) to engage with distributed processes that are essentially uncontrollable, yet have implications for demand. The findings presented here position demand management as an opportunity to create embodied encounters with water that steer demand in directions that are beneficial to long-term sustainable water management (Bakker and Bridge, 2006).

Deliberately placing water, and the interactions between water and domestic practice, at the focal point of this chapter enables a discussion that extends beyond the domestic sphere and into a broader discussion of environmental governance. Theories of practice, and particularly social practice theory, have shifted conceptual emphasis from people to practices exploring how everyday demand emerges from socio-technical configurations rather than cognitive processes. However, recent discussions highlight a tendency to focus on the minutia of domestic routine that limits their capacity to envisage systemic transitions (Geels, 2010, Watson, 2012). This criticism is perhaps unfair (Strengers and Maller, 2015a) however within the empirical work that uses practice theories, individual habits and routines within domestic spaces are typically prioritised. By explicitly shifting focus beyond the home and speaking in terms of hydro-social systems, the connections between domestic practices and the changing geographies of everyday life and management are revealed. Further, it enables a discussion of how disparate practices such as urban design, leisure, education and water use affect domestic practices via embodied encounter.

These observations open up new lines of enquiry for how interventions in domestic demand might be designed and *Care for the Kennet* provides a novel example of how strategic activities might engage with the collective context of demand. While there are limitations to this initiative, particularly with regards to its engagement in the material context of hydro-social relations, the evaluation demonstrates promise in the personal delivery of the initiative as well as the immersive teaching methods and public arena in which the initiative is situated. The use of local representatives and personal interactive forms of engagement that extend throughout the schools project and broader initiative activities contrast with those of conventional water efficiency and of large-scale water efficiency projects, yet appear to have substantial benefits. Firstly, they facilitate and legitimise alternative forms of interaction between local communities and the river, which contribute a deeper appreciation for the more-than-human ecologies of river

systems and unsettle the assumptions of modern engineering. Secondly, they provoke discussions that sustain these interactions and potentially aid the dissemination of alternative practices and technologies. However the findings illustrate that the initiative is part of a much broader picture, and generally contrasts with the everyday experience of water in society, thereby limiting its impact on domestic water use.

Consequently, these findings call for a renewed effort to understand how leisure practices have implications, intended or otherwise, for demand and to consider what, if anything, water companies might be able to do to encourage more sustainable patterns of demand. One potential avenue is to consider how practices may become reacquainted with local socio-ecological characteristics. Rewilding has recently become a subject of discussion with regards to children's play and education and to a lesser degree that of adult lives (see for example Monbiot, 2014). These discussions explore how experiences of outdoor environments might be incorporated in education, leisure and holidays in an effort to counteract the domestication of leisure. Rewilding tends to be framed in terms of mental health and wellbeing or social and cognitive development (Moss, 2012a), however the findings here support the case for an environmental benefit as experiences contribute to a deeper understanding of the connections between society and ecology. The schools project in *Care for the Kennet* provides one such example of this, and demonstrates how interactive teaching methods and facilitated experiences of the water in rivers can contribute to enhanced ecological understanding and alter patterns of play. How to extend these activities to engage with other people and populations remains a question for demand management.

However, the findings also illustrate how activities such as *Care for the Kennet* risk being lost among the prevailing experiences of water in the home. Thus the discussion of rewilding might usefully be extended to consider how practices of water management, urban planning and design mediate the everyday experiences of water. This provides a useful reflection on water management practices. For example, water companies are increasingly deploying network management measures [14] in order to supplement local supplies, with limited consideration of other options such as alternative supply systems, or river restoration. Where they are discussed, focus is usually on flood management, ecological restoration and land management as opposed to efforts to balance supply and

[14] Network management refers to the development of connections and transfer schemes either within a single Water Company (e.g. the Farmoor pipeline which connects homes in south Swindon to the Farmoor reservoir) or between companies (e.g. Thames Water's export of water from the Lee Valley to Essex and Suffolk Water)(Thames Water, 2015c).

demand. When viewed in light of these findings, network management measures risk deepening disconnections between water in homes and in rivers that obstruct the emergence of alternative, sustainable domestic practices by limiting the diversity of encounter. In contrast management options that enhance the visibility and integration of rivers and other waters in urban space might present opportunities for alternative understandings and practices to emerge. Further, while there is tentative discussion regarding how decentralised supply technologies foreground the interdependencies between supply and demand (Chilvers *et al.*, 2011, Sofoulis, 2014, Woelfle-Erskine, 2015), this has yet to substantially infiltrate discussions regarding how such systems might contribute to alternative patterns of water use.

In addition to these practices of water management, the findings highlight how the practices of professionals not directly related to water management, such as leisure and urban planning, have implications for experience of water and therefore present opportunities to shape demand. This observation echoes those in the previous chapter that identify a network of professional practitioners who – whether aware of it or not – are involved in orchestrating demand by shaping technologies of demand (such as hair and clothing), domestic spaces, and the socio-material worlds in which water use emerges. The findings in this chapter add to these discussions by illustrating how various actors mediate the experiences water users have of socio-ecological systems and raises questions regarding how such actors might become involved in efforts to reduce domestic water demand.

5.4. Conclusion

Following Chapter 4, this chapter provides an alternative evaluation of how a recent water efficiency initiative furthers the contribution of demand management to long-term sustainable water management. In this instance a small, intensive programme of activities situated in towns along the river Kennet is shown to facilitate experiences of water in the river that contribute to alternative understandings of what water is for that have the potential to provoke alternative practices of water use. This is a unique empirical investigation that illustrates how relationships between domestic practices and socio-ecological systems are mediated by shared socio-material aspects of everyday life. In particular, the chapter reveals how diverse practices, such as those of entertainment and urban planning, are involved in the reproduction of an abstraction that began with

centralised water planning and management. These findings therefore illustrate a range of practices both of consumers and professionals involved in influencing patterns of water use, albeit in deliberately and often in the process of services largely unrelated to water use (e.g. safety, social connection, property value). Therein, this chapter provides a novel contribution to ongoing discussions regarding how resource-intensive patterns of everyday consumption are partly unintended consequences of contemporary life and raises questions as to how demand might be reacquainted with its socio-ecological context.

Despite this research indicating *Care for the Kennet's* value in this process, it remains difficult to understand and quantify the extent to which activities such as *Care for the Kennet* could reduce domestic water demand. Within the broader landscape of water efficiency, where emphasis is increasingly placed on both upscaling and quantitative evidence (Tucker, 2014), *Care for the Kennet* does not manifest typical characteristics of water efficiency. The initiative deprioritises the rapid diffusion of technologies in favour of intense, personal interactions that are sensitive to the needs of the local community and river. Consequently, the impact of the initiative is difficult to quantify, and the process for upscaling such an approach is unclear. However, this is more a methodological reflection than it is evidence of limited impact, revealing the limitations of conventional forms of quantitative monitoring and assessment (e.g. Waterwise, 2010b). Thus, this case study justifies further investigation into methods for monitoring and evaluation that might better comprehend change in complex systems. These themes are returned to in Chapter 7 and 8.

More immediately, and like Chapter 4, this case study presents a call to understand how the demand management agenda is formed. *Care for the Kennet* is a smaller component of Thames Water's water efficiency activities, yet shows promise in establishing a social and cultural appreciation for water in the local area, even if its implications for material systems are limited. Yet it seems almost inevitable that the water industry would consider activities supplementary to mainstream water efficiency measures, as the benefits are difficult to quantify, and therefore difficult to attribute to the costs. In many cases the potential value of initiatives such as *Care for the Kennet* appears to be in building relationships with water users, and partners such as ARK who are an unusual contrast to the partners involved in *Save Water Swindon*. These are interesting avenues for further research and are picked up again in the following chapter.

6. An enquiry into the practices of managing demand

6.1. Introduction

Chapter 2 demonstrates that the critique of what Shove (2010) refers to as 'ABC' approaches is becoming well developed, yet continue to hold and proliferate in the policies and practices of managing social change (Strengers and Maller, 2015a). The review presented in Chapter 2 illustrates the reliance of conventional approaches to water efficiency on such modes of thinking and Chapters 4 and 5 demonstrate how recent developments in water efficiency interventions are limited by continued allegiance to simplistic framings of water use. While successfully increasing participation in water efficiency initiatives, current permutations of large-scale water efficiency reiterate familiar psycho-economic discourses and continue to overemphasise the contribution of domestic technologies of water supply, management traits that are criticised in existing literature (see Chapter 4). Where strategic efforts to engage in the social and cultural aspects of demand are apparent, as in *Care for the Kennet*, these are as yet a marginal part of water efficiency and remain limited with regards to their engagement with the material aspects of demand (see Chapter 5). These findings are consistent with existing research that remains sceptical of the capacity of water efficiency to elicit deep and enduring changes in the everyday patterns of water demand (Sofoulis, 2011a, Browne *et al.*, 2014, Waterwise, 2015b).

Similar evidence is apparent throughout research on social and environmental policy and management (for example in energy demand management (Foulds *et al.*, 2014 and Walker, 2015); urban retrofitting (Gram-Hanssen, 2014, Judson and Maller, 2014a); food waste (Evans, 2011c); and transport (Shove and Walker, 2010, Watson, 2012)) and also relevant in different regional and national contexts. Thus, unless it is supposed that such synergies have developed independently across dispersed agendas and locations, it appears that conventional demand management practices are highly mobile and transferrable, and are resistant to advances made in social theory. However, while much has been written regarding how conventional demand management activities interact with patterns of domestic resource use (e.g. Shove *et al.*, 2012a, Spurling *et al.*, 2013), rather less has been written regarding how the practices of demand management are produced and sustained. While acknowledging that professional practices of demand management cannot be separated from everyday practices of consumption – indeed

interventions only materialise if enacted in the everyday practices that they target (Shove and Walker, 2010, Strengers, 2011) – this chapter considers how the pathways for intervention are shaped by the routines of those employed to manage demand.

6.2. Researching professional practices of managing demand

Recent research identifies two set of practices that are vital to those interested in steering demand; "the practices of demand management [...] carried out by demand managers; and the [...] practices that demand managers seek to change" (Strengers, 2012, p. 232). Recent attempts to conceptualise professional practices add to existing research by demonstrating how interventions depend upon professional routines. For example, Macrorie *et al.* (2014) demonstrate how the potential of low-carbon buildings depends as much on the skills and experiences of construction workers (such as bricklaying techniques) as on technological developments themselves. Similarly, Grandclément *et al.* (2015) and Janda and Parag (2013) illustrate the role of building managers in the energy performance of buildings by intermediating between energy efficiency and comfort such that compromises and modifications to user expectations might be made (see also Strebel (2011) on concierges). Likewise, Sharp *et al.* (2015) illustrate how shared understandings of users embedded in energy and water demand management infiltrate institutional objectives, practices and learning. Such observations apply the ideas of social practice theories beyond the traditional focus on the domestic sphere to contribute to our understanding the processes of governing social change.

However, for now these studies are in the minority and efforts to apply social practice theories in policy and management have yet to respond to such developments. Instead research has typically focused on reframing the questions, problems and models of everyday consumption that underpin demand management (e.g. Strengers, 2012, Spurling *et al.*, 2013, Shove, 2014). While providing an invaluable contribution to conceptual discussion, the limited attention paid to the social and material worlds in which demand managers inhabit, and the situated aspects of their daily routines, risks perpetuating an overly rational model of management (Nicolini *et al.*, 2003, Nicolini, 2011). Interventions are positioned as the outcomes of the decisions made by policy makers and demand managers to implement expert knowledge (Fernández, 2016), a manifestation of the ABC paradigm that does the demand literature a disservice. The examples above illustrate that practice-based enquiry has the potential to provide a

nuanced account of demand management that may stand to offer not only conceptual contributions, but also practical contributions by identifying avenues through which innovation in management practice might be facilitated.

Several authors have sought to emphasise how social practice theories are able to move beyond analyses of everyday consumption, to address broader questions of governing social change (Shove and Walker, 2010, Macrorie *et al.*, 2014, Strengers and Maller, 2015a). However, the continued preoccupation with the implications of policy and intervention for everyday life at the expense of critical discussion regarding the socio-materiality of professional practices inhibits a broader discussion regarding how the scope of intervention might be extended. The discussion of practices-as-entity versus practice-as-performance in Chapter 2 (see section 2.3.1) is again relevant here. Focusing on the effects and implications demand management has on the social world is parallel to discussions of practice-performances, the observable outcomes of everyday activity that have implications for everyday resource use (Spurling *et al.*, 2013). The parallel discussion that is lacking from research at present relates to the elements that collectively structure action in the policy and industry spaces within which demand management is designed.

These are expansive topics, however their conceptual and practical significance renders them worthy of consideration and to contribute to ongoing discussions within the demand literature, this chapter redirects attention to the professional practices of managing demand in the water industry. Specifically, using mixed methods (as detailed in Chapter 3), this chapter makes enquiries into the elements and processes that shape demand management and the implications of these for intervention. Based on documentary analysis, semi-structured interviews (n= 21) and observations of workshop proceedings, this chapter argues that the continual evolution of water efficiency is steered by shared and collective elements. This is not to deny the ability of individual demand managers to make strategic decisions to influence and resist policy changes, but to suggest that the outcomes of water efficiency are steered by social and material elements that support certain options at the expense of others (Stirling, 2007). In doing so, this research makes contributions that are both conceptually intriguing and vital if a more nuanced understanding of demand is to be implemented in management practice. Although focused on the English water industry, several aspects of this discussion bear

resemblance to proceedings in other resource sectors and regions therefore may offer insights beyond the water sector.

6.3. Findings: identifying elements of professional practice

The following paragraphs distil from the findings four aspects that illustrate how interventions into domestic water demand are shaped and constrained. Thus, the following discussion positions water efficiency as a practice-performance; the observable outcome of routine assembly of social and material elements (Kuijer and Bakker, 2015) and seeks to unravel the elements and processes that reproduce, maintain and stabilise certain forms of water efficiency while unsettling or creating friction for others. The equivalent empirical investigation into domestic practices is commonplace, and there are parallels with these findings in the present discussion, which identifies shared industry ideals, collaborative working, technologies such as those used to account and evidence impact of water efficiency, and socio-natural context as influential elements of management practice. In doing so, the case study presented in this chapter offers unique empirical observations of the professional practices of managing water demand in order to explore the applications of practice-based enquiry beyond the typical spaces of domestic practice, thereby responding to one of practice theories principal criticisms (for example, see Geels, 2010).

6.3.1. Industry values: Safe, reliable and good customer service

Firstly, the findings demonstrate how water efficiency is situated in a broader system of practices in the water industry with corresponding implications for how the services that water efficiency provides are framed. As opposed to the caricature of neoliberalism's de-regulated free-market, privatisation in the water industry resulted in extensive re-regulation that continues to have consequences for water management (Bakker, 2003). While water companies are the principal actors in developing and implementing initiatives; different articulations of what water is and what water is for are embedded in industry policy and guidance based on the various perspectives of the government organisations that contribute to these policies. These varying articulations have implications, intentional or otherwise, for all aspects of Water Company business, including water efficiency.

This system of practices is most easily examined in view of the high level aims of the water industry. While poorly defined and variously interpreted by the water companies, there are a trio of core principles that permeate throughout policy and guidance materials provided by regulators; safety, reliability and customer service (for example see Ofwat, 2010a, 2010b, Defra, 2011, Environment Agency *et al.*, 2012). Each of these aims is embedded in legislation or other incentive and penalty mechanism, and enforced by one or more regulators. For example, safety is ensured by the Wholesomeness Regulation that sets standards for water used for drinking, food preparation and washing (DWI, 2010) and is enforced by the Drinking Water Inspectorate (DWI), that oversee all aspects of water quality and monitoring on behalf of the Department of Environment, Food and Rural Affairs (Defra) and the National Assembly for Wales. Similarly, customer service and reliability are overseen by Ofwat, the economic regulator of the water and sewerage industry in England and Wales (Ofwat, 2015), captured in the Guaranteed Standards of Service (GSS), a compensation mechanism that covers issues including supply interruption and low pressure and the Service Incentive Mechanisms (SIM) that establishes incentives for water companies to manage complaints and enhance customer experiences.

These overarching aims have various legacies and action different understandings of what water is for. The Wholesomeness Regulation dates back to the nineteenth century Public Health Acts, and is aligned with European and global water quality strategy (e.g. WHO, 2012, UN, 2015a). Consequently, framing water management in terms of safety positions water management as part of the public health agenda and incorporated in measures to protect and promote health by providing access to drinking water and sewerage services. In contrast, the GSS emerge from early permutations of the Water Act (1973) that stipulates water authorities must "give an adequate supply of water, either as respects quantity or quality" without complaint (HMSO, 1973, p. 68). Following privatisation, the customer service elements of these obligations became more pronounced and, combined with the price review process[15], water management was positioned as a means of securing reliable supplies and high levels of service for consumers such that water services provide adequate value for money. Through these overarching aims various management practices interlock and while not entirely unrelated to sustainability, short planning horizons and precautionary principles

[15] The Price review is the process by which Ofwat sets the amount Water Companies are able to change their customers and thereby determines the finance available for water management over the corresponding planning period (Ofwat, 2013).

accentuate the short-term benefits of certain management options and the possible risks of others.

Situated within these multiple industry aims, water efficiency activities must not only reduce demand but must also not compromise, and ideally contribute to, the achievement of safety, reliability and good customer service. Education, water efficient devices and home retrofits are prioritised as they fulfil multiple objectives without creating any immediate risks to the achievement of these aims. In addition, as devices and retrofits are typically free to customers and marketing materials may incorporate messages regarding financial savings, these interventions are seen to contribute to the perception of value for money and towards managing complaints (Waterwise, 2010b). Alternative interventions, particularly those involving rainwater, present ambiguities in ownership and responsibility which problematize existing supplier-consumer relationships, and therefore customer service contracts; and expose water supplies to local rainfall variation, potentially compromising reliability (Sofoulis, 2014). Greywater substitution shares many of the same issues, and the additional risk of misconnection, which though unlikely, is seen to outweigh the potential benefits (Ward *et al.*, 2014, Bell, 2015). Thus, activities that stand to disturb the historical development of centralised water systems are marginalised from demand management (Anglian water, 2015, Cambridge Water, 2015), moreover the reality of these risks remains under-researched as the opportunity for testing such technologies is reduced.

These findings illustrate how the high level aims of the water industry have implications not only for the immediate practices involved in their achievement but all aspects of Water Company business. While likely unintentional, the industry pursuit of safety, reliability and customer service reduce the priority given to managing demand, and reduce the options and possibilities for management activity. Industry aims are constantly on the move and there is growing recognition of the need to reconsider how such services are attained in view of increasing water stress:

> *"There are fundamental assets we must preserve; high quality drinking water, secure supplies for households and businesses, effective removal of wastewater, and a nourishing water environment, but we need to think differently about how we deliver these outcomes."*
>
> (Defra, 2011, p. 11)

In view of enabling this to happen, the regulatory bodies are increasingly seeking a less intrusive approach to regulation (Ofwat, 2014). Yet commentators note that the scope of water efficiency activities remains constrained. Tompkins, founder of Waterwise, likens the regulatory reforms to the throwing open of "prison doors"; providing freedom by removing regulatory barriers to water efficiency. However he goes on to describe how many water companies remain "sitting in the prison waiting to be told what to do" (Jacob Tompkins in Utility Week, 2015). Discussions within the water industry are yet to seriously consider how these services might be achieved in a water sensitive manner (Ferguson *et al.*, 2013), and despite considerable developments in the demand management agenda there has been limited amount of discussion regarding the extended possibilities such a less intrusive approach might create space for (Waterwise, 2015a, 2015b). Thus a question remains regarding the other factors that restrict the scope of intervention.

6.3.2. Partnership working

In partial response to this question, the second theme identified throughout the fieldwork is partnership working; an increasingly prevalent feature of the global sustainable development movement that is echoed in water industry policy. Number 17 of the Sustainable Development Goals is 'partnerships for the goals' (UN, 2015b), a vision that resonates with early developments in Rio (1992) and Johannesburg (2002) (Glasbergen, 2007) and that is shared with the water industry:

> *"In general, water efficiency programmes can only be delivered effectively through water companies working in partnership with other organisations – joint action is crucial to success."*
>
> (Waterwise, 2008, p. 9)

water companies are increasingly collaborating with private partners, NGO's and government organisations (Moss *et al.*, 2009). These collaborations are often hailed a means of enabling a broader spectrum of knowledge to inform the process of managing change, and adding value to the process by ensuring effective and efficient procedures. However this analysis suggests that specifics of partnership relationships and roles that partner organisations play have implications for how water efficiency is framed and enacted. Before investigating these implications, it is worth briefly considering the literature on intermediaries.

The term intermediary describes "individuals or organisations that create bridges between producers and end-users" (Grandclément *et al.*, 2015, p. 215). There are many different forms of intermediation with no singular definition of who (or what (Moss, 2009)) might be described as an intermediary, or the role they might play (Moss and Wissen, 2005). One simple suggestion put forward by Moss *et al.* (2010) is that intermediaries make connections between different persons or things, thereby enabling more effective forms of interaction. From a governance perspective, intermediaries can be seen to redistribute the capacity to steer change beyond the traditional 'triad' of service providers, users and regulators (Moss, 2009, Moss *et al.*, 2009), blurring preconceived boundaries of agency and responsibility (Grandclément *et al.*, 2015). Consequently, intermediation is not neutral; despite often being described as hidden intermediary work is productive and has implications for implementation and development of intervention (Moss *et al.*, 2009, Strebel, 2011, Grandclément *et al.*, 2015). While partnerships by no means account for all forms of intermediation involved in water efficiency, as intermediaries often act outside of formal collaborations (Moss, 2012b), the emphasis placed on partnership working in the water industry and the variety of partnerships makes them interesting. Further, considering the intermediary role partner organisations play offers insights into how the practices of water efficiency are shaped and sustained.

Table 4 characterises three partnerships; two observed in the case study initiatives and a further example of the Collaborative Fund; a mechanism established during the 2010-2015 planning period to incentivise research collaborations between water companies[16]. Analysing these three partnerships reveals how the specific partner organisation(s) and their functions have implications for ongoing evolution of water efficiency.

Table 4: Summary of three partnerships

Example	Partnership model	Purpose
Collaborative Fund	A network of water companies and research partners (e.g. research consultants and market research companies)	Designed to address knowledge gaps, research novel interventions and evaluate progress in water efficiency cost effectively.
Save Water Swindon	Water Company led initiative that works with various public (e.g. housing associations) and private	To maximise the reach of the initiative and enable effective and efficient delivery by disseminating

[16] Introduced in 2012, the *Collaborative Fund* was initially supplemented by the Water Companies, who were then able to claim a credit towards their base level water efficiency targets, equivalent to 3% of the 2010-15 base volumetric targets at the assumed cost of £170,000 per Mega litre. Following the removal of the targets in 2015 there are ongoing discussions regarding the maintenance of the *Collaborative Fund.*

	organisations (e.g. plumbers & a renewable energy company), with support from NGO's but limited direct involvement.	information, recruiting households for home makeovers and installing devices.
Care for the Kennet	Water Company collaboration with a charity that campaign for local ecological issues with support from NGOs and connections to SWS, but limited direct involvement.	To develop relationship between partner organisations and to enhance the legitimacy of water efficiency activities in the local area.

If a principal feature of partnership working is to enhance pluralism in the pathways for future demand management activities, then who is involved and at what point in proceedings are important considerations (Bos and Brown, 2012). While the partners vary, in both the *Collaborative Fund* and *Save Water Swindon* the purpose of the partnership model is instrumental, with the principal aim of contributing to the delivery of effective water efficiency initiatives. The *Collaborative Fund* invites potential research partners to bid for projects designed to address knowledge gaps identified by water efficiency manager (Waterwise, 2015a). Similarly, *Save Water Swindon* employs public and private partners to implement the initiative's objectives. Partner organisations with pre-existing relationships with water users establish links with consumers to increase the uptake of home retrofitting while organisations experienced in retrofitting enable effective and efficient installation of devices. In neither of these examples are partners extensively involved in defining the problem or designing intervention but instead employed to accelerate water efficiency activities and maximise their effect. Consequently, the partnerships serve to support consensual development and implementation of water efficiency, reinforcing existing practices of demand management and generating the knowledge and social capital to sustain water efficiency.

In contrast, the partnership in *Care for the Kennet* evolved from a extended dialogue with local ecological action group Action for the River Kennet (ARK), who have traditionally been critical of Thames Water's planning and management of local water resources (e.g. RSPB, 2009). *Care for the Kennet* provided an opportunity for the two parties to collaborate on a shared interest; reducing abstraction on the river Kennet. Both parties were involved in designing the initiative; Thames Water providing funding and expertise directly related to water efficiency, ARK contributing extensive experience of working with local water users (both domestic and industrial) and connections to a network of conservation charities that connect water efficiency to a broader discussion of ecological sustainability. Bringing these different expertise together not only enhanced the delivery

of *Care for the Kennet*, but influenced the problem framing, highlighting the needs of both the river and local water users, and accentuating the role of hydro-social relations in shaping everyday water use. This alternative problem framing unsettled conventional assumptions and contributed towards an initiative that shows signs of moving beyond conventional activities (see Chapter 5). Consequently, the partnership arrangement in *Care for the Kennet* can be seen to contribute to an alternative set of demand management practices, that while not completely disconnected from conventional forms of water efficiency, deviates from the trajectories of mainstream activities.

The findings in this section describe how different partners, each with their own legacies, ideas, skills and networks have implications for the continuation of water efficiency. While the effects of the many and diverse processes of intermediation in the water sector are too broad to account for, this discussion illustrates the capacity of partnerships to reinforce, shape and disrupt the practices of water efficiency in various ways. At present, the partnership models of the *Collaborative Fund* and *Save Water Swindon* are more typical of those common in the water industry, indicating that partnership models uncritically aid the reproduction and validation of existing forms of management activity. The limited range of partner organisations is particularly notable, for example there is limited involvement of water users, or of professional actors who have a hand in shaping water use in the home (Browne *et al*., 2014). However, these are not the only forms of partnership working in the industry and others, as demonstrated here by *Care for the Kennet*, pose opportunities to unsettle water efficiency and establish elements and relations to support alternative practices of water management.

6.3.3. Evidence and evidencing action

The third theme apparent throughout the fieldwork was the increasing emphasis placed on evidence-based action, particularly following the introduction of the *Evidence Base for Large-scale Water Efficiency in Homes* (the Evidence Base) in 2008. This emphasis resonates throughout the guidance documents for water industry planning (Environment Agency *et al.*, 2012b) and is echoed in the water efficiency targets which require each Water Company "to improve the evidence base for water efficiency" (Ofwat, 2008, p. 3). The drive to develop evidence is in part to redress the historical emphasis placed on upstream management action by "support[ing] the development of water demand management measures as resource options in their own right" (Waterwise, 2008, p. 9)

(refer to Chapter 2 Section 1 for discussion). The Evidence Base in particular is designed to contribute to the improvement of water efficiency; assessing the impact of specific interventions to inform future activity (Waterwise, 2011). Consequently, evidence and practices of evidencing are never neutral, but purposeful, demanding and inventive (Latour and Woolgar, 1979, Stengers, 2005). Thus, they have implications for the ongoing trajectory of demand management; legitimising certain management pathways while casting doubt or creating friction for others. This section considers briefly the implications of evidence and accounting for water efficiency activities.

The first broad reflection is on what is constituted as evidence, prompted by the observed emphasis placed on quantitative data in both the Evidence Base and Water Company plans. This is not particularly surprising and reflects the prevalence of positivism that has been observed throughout the resource management agenda; however the consequences of this are important for how water efficiency is interpreted. Sharp *et al.* observe that positivist perspectives position water demand "as an essential feature of a society" (2011, p. 504) and seek to explain causal relation relationships and predict the behaviour of identifiable social and physical characteristics of demand to inform management (Connelly and Anderson, 2007). This reduction has various implications; in particular it contributes to a focus on domestic technologies (e.g. showers) and their use (i.e. the duration and frequency of showering) that ultimately disaggregates domestic demand by technology, rather than by the services water provides (e.g. cleanliness or comfort) (Shove, 2003). In addition, by accepting water use as an essential and external feature of society, positivist framings of demand ignore the role of distributed practices – e.g. from bathroom design to demand management – in shaping patterns of water use. Thus evidence renders certain aspects of demand important, and others invisible; thereby curtailing discussion regarding how the services provided by water might otherwise be achieved (Kuijer, 2014) or how intermediary actors might contribute to the emergence of alternative patterns of use (Browne *et al*., 2014). On the other hand, positivist approaches reinforce a focus on water users, homes and domestic technologies that sustain conventional modes of management.

The second consideration relates to what evidence is designed to be used for, a line of enquiry that identifies two important functions of data that influence how demand management is understood and practiced. Firstly, as described above, evidence is used to establish a case for water efficiency and validate its contribution to balancing supply and

demand. In order that this might be achieved, water efficiency must offer demonstrable impacts that correspond with water resource management planning timelines and are discernible from investments in areas such as network management, leakage reduction and metering. This combination of features allows the cost-benefit ratio of water efficiency interventions to be understood (see Box 7), and compared alongside other management options. However by simplifying and aligning demand management activities in financial terms these criteria accelerate certain interventions while creating friction for others. Options such as rainwater harvesting and water sensitive urban design fall beyond the scope of management practice as their benefits are distributed and may not be realised in the short-term. In contrast, despite retaining considerable uncertainties regarding the in-use phase of such technologies (Gram-Hanssen, 2014), activities such as showerheads, trigger hoses and cistern displacement devices have immediate quantifiable impacts on water flow that provide convenient contributions to evidencing water efficiency.

$$£ / \text{Ml day}^{-1} = \left(\frac{N \times I \times S}{1000}\right) / £ \text{ cost}$$

Where: N = properties targeted; I = installation rate (%) and S = Saving (litres property^{-1} day^{-1})

Box 7: formula to estimate cost-benefits of water efficient devices (adapted from Waterwise, 2011)

The second service evidence provides is to support the upscaling of management activities, an objective echoed in a rhetoric around 'supersizing' that is apparent throughout the fieldwork. Supersizing involved the scaling-up and rolling-out of tried and tested measures to larger populations:

> *"Within our water efficiency team, words and terms like bigger, better, streamlined, creative, and innovative and "let's aim big and get on with it", are becoming engrained throughout all our plans and discussions"*
>
> *(Tucker, 2014, p. 199)*

While the aim of this upscaling is to maximise the efficacy and efficiency of demand management, there are concerns regarding the streamlining process required to enable systematic replication of activities in other regions and contexts. Supersizing relies on finding generically applicable interventions; encouraging a focus on social and technological aspects of demand that are ubiquitous (such as domestic technologies) over those that are connected to specific practices and places. This enables them to be applied in other situations, but also an approach that may be replicated in other resource sectors

(e.g. energy retrofitting). Secondly, streamlining the rollout of large-scale initiatives depends upon the identification of generic partner organisations; the expansive geographic reach of partners such as housing associations and schools pose opportunities to reproduce initiatives in other regions, particularly if their intermediary role (e.g. as knowledge intermediaries or installers) might be adapted to different resource management agendas. However, the situated nature of demand is vital to the ongoing evolution of water use, and this abstraction of intervention obscures the complexity of domestic demand (Sofoulis, 2011a, Fam and Lopes, 2015). Water use, as outlined in Chapters 4 and 5, is connected to various collective elements and processes, and to various intermediary actors. Some of these are more generic (e.g. construction, clothing and beauty products) some less so (e.g. uniforms and local rivers), but each pose avenues to shape domestic water use. Fam *et al.* raises concerns that upscaling fails to acknowledge the "delicate politics of implementation", reducing the process of managing demand to "a set of technical and administrative procedures" (2015, p. 640) that underestimates the work required to identify potential partners, to broker and maintain meaningful partnerships, and to develop management activities that address water use in specific socio-material contexts. Similar discussions on upscaling are ongoing in other policy space, for example see Spicer *et al.* (2014) for a discussion on health care innovations.

The risk of such standardisation is that interventions fail to have the anticipated effect (Macrorie *et al.*, 2014). For example, H2Eco, a successful whole-town retrofitting scheme organised by Essex and Suffolk Water, reported significantly "surprisingly low" (Lunn *et al.*, 2015, p. 23) water savings during the ninth phase of the initiative[17]. By following the same multi-method means of recruitment tested in previous phases, the ninth phase succeeded in an exceptional level of household uptake (20.3% compared to the 15% based on Waterwise's (2011) estimate for whole-town initiatives). However, plumbers installing the retrofits observed higher frequency of modern bathrooms and kitchens than was common in previous phases, likely due to the affluence of households in the local area, which subsequently reduces the impact of water efficient devices. This example illustrates the risk of supersizing without consideration of local variance; however this effect is compounded when considering using successful initiatives as a blueprint for future management activity. The changing context of water demand

[17] 6.1 l/prop/day compared to an 21.5 l/prop/day in phase 10 (24.9 where retrofitting was accompanied by advice given by plumbers (Lunn *et al.*, 2015).

management (for example, as a result of changing climate and population), and persistent shifting of patterns of everyday consumption mean that the assumption that results may be replicated from one case to another is compromised (Nair and Howlett, 2015).

Fundamentally, the positivist methods that form the primary tools in the water industry's quest for evidence are seductive in their simplicity. Their promise of a neat and knowable world allows water efficiency to be compared with other demand management options, and offers potential for systematic application. However they embed specific understandings of social change with limited explicit recognition of their assumptions and caveats. Consequently in seeking to aid the acceleration and upscaling of water efficiency, methods of evidencing action disguise important variations that might provide the grounds to develop a broader range of options for water efficiency, with the possibility of identifying avenues to more substantially alter patterns of water use. Further, by stripping demand of its context, and emphasising specific social and technological aspects of water use, existing practices of evidencing demand management sustain a focus on individuals and domestic technologies that endorses conventional water efficiency measures. There is lively debate over whether alternative modes of enquiry might be employed alongside positivist methodologies, with Sharp *et al.* (2011) identifying researchers that highlight the importance of interdisciplinary working and others who argue such approaches are likely to be "neither cumulative nor complementary" (Evans and Marvin, 2006, p. 1013). This research holds that different forms of evidence contribute to different forms of research enquiry (refer to Chapter 3). However, observing the practices of evidencing water efficiency highlights how evidence helps mobilise different futures (Browne *et al.*, 2015), suggesting a need to remain alert to what is created (and what is silenced) by evidence.

6.3.4. Affective environments: droughts, water efficiency and return to normality

Finally, the fourth theme apparent in the findings is the contribution of water itself to the practices of water management that is most apparent during high impact events such as drought and flooding. The final section briefly illustrates this, drawing on the example of the succession of droughts that occurred in the years prior to the fieldwork and the observed consequences for water efficiency in the 2010-2015 planning period. This section illustrates how high impact events, such as drought, entwine with policy and practice; shaping the ongoing evolution of the situational, social and technological

context of demand management and instigating lasting socio-material configurations. However, while droughts are oft hailed provocateurs of water efficiency, an immediate visual cue that provokes public and political will, this section reveals that the opportunity for transformational change in demand management is inhibited by the political and practical schism between drought management and longitudinal demand management practices (Taylor *et al.*, 2009). 'Affective environments', a term used by Whatmore to examine how disturbances such as flooding "'force thought' among the people affected by them and, thereby, occasion new political associations and opportunities" (2013, p. 35), is used here to explore the associations and opportunities created by droughts, and how these are implicated in professional practices.

In the UK, droughts are socio-natural occurrences as while they have natural properties, "their course, size and distribution is also the result of an interplay between governance, social norms and everyday practices" (Taylor *et al.*, 2009, p. 568). Taylor *et al.* (2009) describe how droughts have historically sparked discussion in water governance and water management, a finding that chimes with Whatmore's proposition that such disturbances create opportunities for policy development. However, droughts also instigate periods of intense demand management activity as public and political support for demand management is enhanced and the urgent need for action becomes apparent through interactions with dry riverbeds and reservoirs. Consequently, droughts provide moments that not only provoke discussion but also activity and, as a result, have social and material legacies that contribute to future options and possibilities for management.

Contemporary Water Company drought management is based on the *Code of Practice* (hereby referred to as the Code). Established in 2009 and revised in 2014, the Code builds on the industry's collective experience of managing the 2005/6 and 2011/12 droughts, providing an illustrative example of the co-evolution of policy and planning processes with management practice (see Table 5). 2005/6 saw the implementation of the first coordinated drought management initiative; *Beat the Drought*. Unlike previous drought responses (see Taylor *et al.* (2009) for a synopsis), *Beat the Drought* favoured a co-ordinated approach to communications and temporary use bans (TUBs). However, this was criticised in areas where supply levels remained sufficient to avoid restrictions (Taylor *et al.*, 2009), and for failing to adequately engage with the diversity of everyday water-using practices (Medd and Chappells, 2008). The 2011/12 drought provided the first opportunity to implement the Code and respond to critique. Emphasis remained on

regional coordination however a locally sensitive approach was favoured, allowing companies to determine appropriate actions with regards to local conditions. The resulting variation in communication, timing and scale of TUBs lead to confusion, particularly in areas served by multiple companies and the subsequent revisions to *the Code* reinforced a coordinated approach to drought communications, TUB's and promoting good practice to customers (UKWIR, 2014).

Table 5: Overview of two droughts and evolution of the Code of Practice (Source: Marsh, 2007, Kendon *et al.*, 2013)

	2005-06	2011-2012
Characteristics	Localised to southern regions but some areas of the south-east remain largely unaffected. Long duration low rainfall, two consecutive dry winters. Average rainfall resumed August 2006 with most regions replenished by December.	Extensive, affecting much of the UK, concentrated on areas of existing water stress. 24 months of below average rainfall, two consecutive dry winters. Highest rainfall on record during April – June '12 resulting in flooding.
Management	Regional co-ordination. *Beat the Drought*; a coordinated initiative ran by eight water companies and the Environment Agency provided sustained messaging throughout summer and winter. Coordinated implementation of temporary use bans in all Southern regions.	Locally sensitive initiatives. Activities arranged according to water companies plans e.g. Thames Water included plans to distribute water efficient devices to 200,000 homes by the end of '12 (Nickson *et al.*, 2011). Temporary use bans established by seven water companies in April.
The Code	The Code (UKWIR, 2009) was established centered around 4 key principles: • Ensure a consistent and transparent approach • Ensure that water use restrictions are proportionate • Communicate clearly with customers and the wider public/users • Consider representations in a fair way	5 actions added to the Code (UKWIR, 2014): • Companies, regulators and government to work together • Coordinate communications • Adopt a common phased approach, considering socio-economic factors • Adopt a common approach to exceptions • Promote understanding and good practice

This example demonstrates that despite the relatively brevity of droughts, they possess the capacity to instigate lasting socio-material configurations. *Beat the Drought* set a precedence for inter-regional collaboration and set "a new benchmark for cooperation between companies and the [regulators]" (Waterwise, 2010a). Consequently, the drought helped create new social conditions for management. Building on these social relations, the intensity of the 2011/12 drought combined with the impending 2012 Olympic Games that placed additional demand on London's already depleted resources, triggered large-scale emergency water efficiency measures to reduce demand. Thames Water, in partnership with the Greater London Authority and a host of intermediary gatekeepers and installers developed plans to distribute water efficient devices to 200,000 homes in the Thames Water region (Nickson *et al.*, 2011). However, with the "abrupt and dramatic termination" of the drought (Kendon *et al.*, 2013), the anticipated demand for these

devices failed to materialise, leaving behind an investment the benefits of which were yet to be realised as political will diverted to alleviating floods at the end of the summer of 2012 (Kendon *et al.*, 2013).

These examples illustrate that drought is not only shaped by water efficiency, but also contributes to the ongoing evolution of interventions. In this instance an abundance of water efficient devices and precedence for co-ordinated, collaborative activity provides a driving force to find the means for their dissemination, thus shaping water efficiency beyond the duration of the drought. However, the example also suggests that while droughts provide the impetus to accelerate water efficiency activities, their capacity to bring about transformational change is limited. The binary classification of drought management activities from routine practices of managing water demand inhibits integration, ensuring the circulation and evolution of management activities within different situational, social and technological contexts. Framing droughts as emergencies necessitates rapid reductions in demand and therefore favours measures such as hosepipe bans over measures to bring about systemic changes to patterns of water use in society. Recent developments that aim to avoid disruptive intervention (e.g. standpipes and rota-cuts) in favour of voluntary conservation and promote network management over TUBs are no less problematic as they fail to acknowledge the co-evolution of supply and demand, and the adaptability of everyday activity to temporary hindrance. Consequently, management actions do not engage with the historical, social and technical context of water use in the home (Chappells *et al.*, 2011).

Conceptualising the intersections between affective environments and practices of demand management reveals a creative, if limited, capacity to influence management processes and outcomes. Presenting findings that resonate with existing research into flooding and other extreme events (e.g. Whitmarsh, 2008, Whatmore, 2013, Anderson, 2014), this analysis illustrates the provocative and creative role of droughts in stimulating demand management. This stimulus is shown to provide a space for learning with the potential to challenge existing practice and forge new socio-technical configurations that contribute to the ongoing evolution of demand management. A growing number of researchers are becoming interested in the integration of practices and politics with more-than-human elements such as ecologies, weathers and climates, particularly in view of climate change which is set to make existing conditions more turbulent and unpredictable (Committee on Climate Change, 2012). However these findings also illustrate that the

momentum created by such events should not be over emphasised, particularly as the urgency creates haste that reduces the opportunity for critical reflection.

6.4. Discussion

The introduction to this chapter suggests that there is value in seeking to understand demand management as a set of professional practices and to unravelling the elements and processes that contribute to current activity. In following this line of reasoning, this chapter responds to the second objective of this thesis; to investigate how demand management is shaped, sustained and suppressed by routine professional practices. The findings presented demonstrate how the actions of those employed to manage demand within the water companies are connected to broader systems of practice within and beyond the water industry. In this way, interventions are created and maintained by processes that are spatially and temporally dispersed. The examples provided are illustrative rather than exhaustive, yet they highlight several aspects of routine management activity that sustain particular forms of intervention at the expense of others. These include: industry values, partnership models, systems of accounting and evidencing, and socio-natural disturbances. Each of these elements is shown to shape the options and possibilities for demand management as they support certain forms of intervention and undermine others.

In drawing these aspects of demand management into the spotlight, the findings resonate with discussions elsewhere in the practice literature that reinforce an understanding of demand management as a routine practice, rather than the outcome of policy and professional decision making. In organisation and policy studies practice-based approaches are used to develop an action-centred approach to knowledge and learning that demonstrate how knowledge is secondary to routine activity (Latour, 2005, Chia and Holt, 2006, Cook and Wagenaar, 2012). In these literatures, routine managerial processes are viewed as an integral part of translating and implementing policy visions (for example in medicine (Mol, 2002, Nicolini, 2010, 2011), agriculture (Law, 2006, Hinchliffe and Bingham, 2008, Porter, 2012) and organisational research (Nicolini *et al.*, 2003, Wagenaar and Cook, 2011, Wagenaar and Wilkinson, 2013)). For example, Nicolini describes knowledge as “rooted in an extended pattern of interconnected activities that only when taken in its living and pulsating entirety constitutes the site of knowing” (2011, p. 602). This description reveals knowledge to be emergent

(Engestrom, 2000, Latour, 2005), situated (Lave and Wenger, 1991, Suchman, 2007) and embodied (Bourdieu, 1990). Building on this action-oriented approach, Nicolini proposes the concept of 'the site' as a means of conceptualising how organisational knowledge is situated in "translocal ("macro") phenomena" as they come into being through localised "("micro") real-time practices" (2011, p. 617), thereby tracing the intersections between what is known and done and the distributed socio-material elements that contribute to professional practices (see also Nicolini *et al.*, 2003, Nicolini, 2010). The findings presented in this chapter support such a claim and suggest that the practices professionals engage in throughout the course of demand management – from implementing interventions, to more mundane processes of organising and evidencing – contribute to how demand (and demand management) is understood.

Other bodies of research demonstrate this point also and again may provide further insights into demand management. For example the communities of practice literature (Lave and Wenger, 1991) refer to the symbiotic evolution of practice and community around collaborative exchange in a shared domain of interest (Wenger, 2010). By working together in communities of practice, which may or may not be geographically proximate (Bradbury and Middlemiss, 2015), practitioners develop competencies and skills, establish tools and form conventions to guide their application. Communities of practice are often seen as beneficial to the creation of knowledge and action, however Brown and Duguid argue that they "can easily be blinkered by limitations of their own world view" (2002, p. 26) as tacit assumptions blind practitioners to 'outsider' perspectives (Koliba and Gajda, 2009). Further communities of practice literature emphasise how working together aids the development, transfer and diffusion of practical knowledge (Zorn and Taylor, 2004, Wenger, 2010). Communities of practices are increasingly suggested as a strategy for organisational change and professional development (Koliba and Gajda, 2009). However, the findings presented in this chapter suggest that where this is the case for organisational practices designed to effect change in everyday practice, potential for innovation is shaped by boundaries of inclusion and exclusion, and modes of participation in the design of interventions. By tending toward consensual partnerships and limiting the participation of outsiders in early stages of demand management planning, the water industry risks suppressing activities that might create space for alternative forms of knowledge to emerge.

Finally, researchers in a variety of social science disciplines recognise the role of technologies, methods and 'apparatus' in shaping and constraining everyday practice. For example, in science and technology studies various authors illustrate the effect of elements such as accounting systems, tools, and documents in aligning and stabilising specific modes of practice (Law, 1992, Suchman, 2000, Bennett, 2005, Nicolini, 2009, Fenwick, 2012) sometimes superseding the people and situational contexts in which they were devised (Latour, 2005, Prior, 2008). These themes have been analysed in topics that include research methods (e.g. Law, 2009), resource management (Li, 2007, Verran, 2011) and urban planning (Larsen and Hansen, 2008) to reveal how everyday technologies shape and stymie ways of knowing and doing. In resource management, Li (2007) uses Deleuze and Guattari's concept of assemblage to examine how heterogeneous elements – including scientific knowledge, measures and procedures – simplify the complexity of forests and forest management. There are several parallels between Li's (2007) analysis and the one that is presented here, particularly in her illustration of how the assembling of these elements in management practice contribute to authorising knowledge, simplifying the social world and managing contradictions such that progress may proceed without fundamental reframing of the management practices. Verran (2011) also works with Deleuze, this time expanding on the notion of control mechanisms to understand how measures and values contribute to knowledge and management practice. Verran's (2011) analysis illustrates the role of 'enumerated entities' in processes of ordering and validating ways of knowing and doing by reducing the complexity of the socio-natural world such that it is operationalised and controllable. This chapter contributes to discussions such as these by highlighting the implications of data and evidence for the management agenda; editing options and possibilities for management and aiding the replication of certain activities in alternative sites, scales and contexts.

Thus, like these literatures, the principal contribution of this chapter is to illustrate that demand management is less the intentional application of policy and research, and more a product of routine professional activity. Typically, discussions regarding the governance of global change discuss the implications of policy and management practice. At its best, this research makes recommendations as to how the sustainability agenda might be reframed, reconceptualised and reconfigured in an effort to develop a management agenda that might support the emergence of less intensive patterns of resource use (e.g. Strengers, 2012, Spurling *et al.*, 2013, Shove, 2014, Browne, 2015),

but lacks specific detail on the elements of professional practices that influence the application and diffusion of such concepts. Following an analytical processes that has valuably expanded our understanding of domestic practices and those of inconspicuous consumption (Shove and Warde, 2002), this chapter offers an expansion of professional practices that identifies how conventional demand management activities – those based on 'narrow' concepts (Shove, 2010) that 'tinker at the edges' (Browne *et al*., 2014) – are stabilised at the expense of potentially valuable alternatives. In taking such an approach, this chapter illuminates various elements and processes that inhibit experimentation and innovation in demand management, and thus might provide strategic opportunity for change. Among these practices, evidencing and partnerships appear to provide immediate opportunities raising questions regarding the alternative forms of evaluation that might contribute to broadening the options and possibilities for management activity and how different forms of partnership working might expedite change. These themes are returned to in the following chapter

6.5. Conclusion

This chapter responds to a gap in the literature regarding the professional practices of managing demand with a case study on the demand management practices in the water industry. To date, professional practices have received limited empirical attention from within the literature on social practices, though early studies indicate their importance (Sofoulis, 2011a, 2011b, Macrorie *et al.,* 2014, Sharp *et al.,* 2015). Thus, in moving outside the domestic sphere, this paper makes an original empirical contribution to demand literature; advancing our understanding of the practices of demand management and the implications for realising policy objectives such as sustainability and resilience. This is currently a neglected area of research, yet the tenacity of demand management activities constrained in their ability to deliver sustainable and resilient solutions calls for a renewed attempt to articulate stability and change in management practice. While there are synergies between the approach taken here and other theoretical accounts of management, particularly the literature on transitions and adaptation (e.g. Elzen *et al.,* 2004), the primacy granted to routine activity illuminates questions regarding *how* demand management is sustained and suppressed, and provides a means of exploring the process of translating policy to action. These are articulated through the case study of water efficiency in England.

7. Reimagining water efficiency: reconfiguring shared and collective aspects of water demand

This chapter develops findings from a pair of 'practice innovation workshops' carried out in spring 2015 (for details see Chapter 3). Some of the discussions also appear in an industry-facing report (Hoolohan and Browne, 2014).

7.1. Introduction

water companies have been involved in managing demand since privatisation but the emphasis on reducing end-use demand is a recent development provoked by changes to the *Water Industry Act* in 1991 (for more details refer to Chapter 2 section 1). Despite the longevity of demand management, existing critique finds current practice lacking, calling for a 'step change' (Waterwise, 2015c) in water activities and an extended effort to engage in the complex socio-material systems from which existing patterns of water use emerge (Browne *et al*., 2014). Chapters 4 and 5 provide two detailed empirical analyses that demonstrate how, despite making progress, recent developments in water efficiency activities remain limited in various respects. In particular, the reproduction of familiar psychological and economic models of consumer behaviour inhibit the conceptual departures of these initiatives from conventional activities, thereby limiting their capacity to make further contributions to long-term sustainable water management. Chapter 6 builds on these findings to investigate the collective elements that reinforce and suppress practices of managing demand, blunting critical developments and accelerating conventional interventions.

Subsequently, this thesis supports a growing call for more sophisticated forms of management activity. However, while each of the preceding chapters provides insights that might support the development of alternative water efficiency activities, as Shove *et al.* observe of social theory, they "do not lead directly to prescriptions for action" (2012a, p. 141). Yet the growing appetite for practical recommendations from policy makers and resource managers (see for example Box 4 in Chapter 3) emphasises the need for social theorists to participate in what Davies *et al.* describe as the "anticipatory-utopian dimensions [of research] that are necessary for genuinely critical geographic enquiry" (2012, p. 58). To this end, this chapter presents the findings from a pair of practice innovation workshops and in doing so responds to the third objective of this thesis; to gain a practical understanding of how water efficiency might be reimagined in light of

the findings of critical research to facilitate lower levels of domestic water use (see Chapter 3).

In spring 2015, two workshops invited professionals employed within UK water companies in various aspects of demand management (hereby referred to as demand managers) to develop alternative approaches to water efficiency. The aim was to use the findings of Chapter 4-6 as points of departure from which to develop initiatives that go beyond the techno-economic approaches of conventional water efficiency measures to engage with the collective elements of demand. Specifically, the following provocations provided starting points for the workshops[18]:

1. ***How might water efficiency activities engage with the shared and collective elements of water demand?*** *Research highlights the need for demand management activities that extend beyond efficiency measures and simple behaviour change to engage with the collective context of everyday water use that shape everyday behaviour. What such activities might look like is as yet poorly understood, so the principal question is what might alternative water efficiency activities look like?*

2. ***How might consumer engagement be re-imagined?*** *The evaluation of Save Water Swindon (Chapter 4) and Care for the Kennet (Chapter 5) demonstrate the limitations of messaging in altering the expectations, experiences and materialities that sustain high intensity patterns of water use. How might interventions into the world around water users support the emergence of more sustainable patterns of water use?*

3. ***How might water efficiency engage with elements outside the home?*** *The findings also demonstrate how domestic water use emerges from routine activity so that while water is used at home, it intersects with places, people and practice beyond the household (e.g. leisure and work) and experiences of water in natural and built settings. How might water efficiency activities work with these aspects of everyday life to reduce water use in the home?*

4. ***How might water efficiency activities unsettle routines?*** *Implicitly or explicitly, all water management activities have implications for the ongoing evolution of routine, and consequently for demand. By failing to engage with the social and material context of demand many water efficiency activities risk reaffirming the water-intensive habits they*

[18] These were presented in a 10 minute introduction to each workshop.

aspire to change. How might future initiatives break from current trends to unsettle unsustainable patterns of water use?

5. ***On what scale, might water efficiency activities be implemented?*** *The findings presented in Chapters 4 and 5 highlight the potential opportunities of initiatives situated in towns and communities to identify specific situations where water-intensive practices emerge. At what scale might water efficiency activities be implemented and how will this be used to maximise impact?*

6. ***Who are the actors in a position to steer domestic water use?*** *The findings demonstrate the variety of personal (e.g. leisure and work) and professional (e.g. fashion and home design) practices far removed from water management that have implications for water demand, each connecting domestic water use to a web of actors capable of steering change. What partnerships might be developed to maximise the potential of these actors to steer domestic demand?*

7. ***How might progress be monitored?*** *Initiatives in line with the above contain considerable uncertainties and are likely to have slow, diffuse impacts on demand. Consequently, existing research raises concerns regarding existing methods of monitoring and evaluation, and the risk that typical procedures stifle innovation. How might new forms of intervention be evaluated, what data might be collected and how might it be used?*

These conjectures were introduced not to be prescriptive, but to facilitate a discussion of what might be achieved if demand management is reframed in light of critical research (for discussion see Section 3.2.3).

Following this introduction, an initial mapping exercise encouraged teams to explore their experiences of using water and managing demand to map the collective context of water use. The format proposes that demand managers are themselves water users, and the workshops encouraged participants to ground discussions in their own everyday experience of water use, as well as their professional experiences of managing change. Thus the mapping exercise provided an exploratory space for workshop participants to interrogate an alternative problem framing in view of their own personal and professional experiences. Building on the resulting maps, the second task challenged teams to design initiatives capable of engaging with the collective elements they identified. Again,

participants were encouraged to test ideas against their own personal experience of water use and of managing water demand to develop a critical yet solution-oriented discussion.

7.2. Six imagined initiatives

The following sections describe the outputs from the two workshops. In each workshop, one of three teams was tasked with developing an intervention into gardening, bathing or laundry. The sections that follow draw together the discussions from the mapping exercise in each workshop, describe the imagined initiatives[19], and add a critical commentary that reconnects these findings with existing literature. This commentary examines how the initiatives reimagine intervention, probing the collective elements the initiatives aspire to change and the coalition of actors engaging in steering demand.

7.2.1. Imagining strategies for water efficient gardening

Mapping the collective context of gardening

Demand mangers identified the material features of gardens and the associated technologies of water storage and supply as the principal influence on how much water is used for gardening. A range of watering technologies were identified, including sprinklers, hosepipes, buckets and watering cans, along with enabling technologies such as water butts and external taps that facilitate specific forms of garden watering. In addition, demand managers identified gardens as having implications for water demand; as their size, design (particularly whether lawns and water features were incorporated in the garden) and fit with the hydrological characteristics of the local area (e.g. rainfall and soil water retention) were seen to be significant. Both groups discussed various garden configurations and both identified gardens with lawns and borders as pervasive and problematic garden designs as typically they were seen to require water to maintain yet incorporate limited opportunities for water collection and recycling.

Gardens, more so than the technologies for garden watering, were seen to connect to a web of social and cultural elements. Gardens were seen to be coveted features of property ownership yet so commonplace they are often taken for granted. Consequently, it was felt that consumers view gardens as a privilege of property ownership and expect water

[19] These initiatives are hypothetical, providing an example of what *could be* grounded in the experiences of those in a position to implement such initiatives, but not (at the time of writing) a depiction of initiatives in progress. In some cases, similar initiatives already exist, often not within the water industry and where relevant the discussions point to these.

companies to ensure that water is supplied so that individuals may maintain them in the way they want. In addition, demand managers discussed a level of quiet competition surrounding gardens, as publicly visible displays of identity and social status. This was seen to be intrinsically motivated but also socially driven within peer networks and neighbourhoods (particularly in areas where gardening features in local identity e.g. Britain in Bloom contestants). Further, garden design connects strongly to the media (especially magazines, but also television, advertising and retail marketing). Finally, family life was seen to have implications on what gardens were used for that in turn has consequences for garden design and water use. Demand managers discussed the extensive variations between their own gardens and how that connected to leisure and entertainment, particularly for their children. In addition, they recognised that others prioritise growing flowers and vegetables. Yet despite such variation, the material configuration of gardens was considered relatively standardised, incorporating lawns and borders to varying degrees.

The combination of these social and material factors were seen to have implications for water use; effecting garden design (i.e. whether or not lawns are a priority); the extent to which they are maintained (i.e. whether lawns are kept green); and the extent to which watering was seasonally appropriate (i.e. whether or not water restrictions were adhered to). However, for the most part, participants felt that while consumers may tolerate short-term restrictions, such as hosepipe bans, they expect that gardens, gardening, and the everyday life practices in which gardens feature will not be compromised by water demand management in the long-term.

The observations of demand managers reverberate with the discussions presented in Chapters 4 and 5, and with existing academic research. They reflect research that identifies the relationship between garden design and garden watering (Chappells and Medd, 2008, Chappells *et al.*, 2011) that is also reflected the discussions in Chapter 4 and 5 that identify the broader significance of material configurations in the home in creating different water needs. In addition, the discussions resonate with literature that demonstrates the heterogeneity of gardens and gardening practices that has implications for water use in these spaces. For example, Pullinger *et al.* (2013) identify a range of consumer clusters, from hands-off gardeners who allow gardens to look after themselves and casual gardeners who maintain gardens to a basic functional and aesthetic standard through low-tech means, to amateur enthusiasts and green-fingered gardeners who

exercise more regular and complex gardening practices. To have the greatest effect, interventions must be sensitive to these differences and engage with the diverse contexts in which gardening practices emerge.

These discussions contain numerous potential avenues to reduce water demand related to gardening and what follows is a description of the two initiatives designed by workshop participants.

Initiative 1: Down with the grass!

Initiative 1 aims to increase the visibility of water sensitive gardens in public spaces, making immediate reductions in non-residential water use with the long-term goal being to undermine the popularity of grass lawns in domestic spaces. The initiative aims to establish a range of less water-intensive alternatives to the conventional grass lawn in public spaces, working with local councils and business owners who maintain visible gardens. Options include wild flower meadows, edible gardens, artificial lawns, moss gardens among others, designed to appeal to water users who have different functional uses for their garden space. Sales data, combined with observational research of changing garden designs and data from water meters would be gathered in an effort to understand the proliferation of alternatives and the impacts on domestic demand.

Specific plans include a pilot project in a local authority, one identified as having high garden ownership and existing water scarcity in order to deliver immediate benefits. Partner organisations such as the National Trust and the Royal Horticultural Society were seen as having a positive relationships with gardeners and thereby offer opportunities to disseminate knowledge and skills to aid the diffusion of alternatives into domestic spaces (and potentially to drive an initiative to develop abandoned greenspaces such as roundabouts and roadsides to increase the coverage of these alternatives and garner media attention). Large-scale exposure through gardening programmes and magazines were seen to be effective means of making alternatives ‘trendy’ and ‘desirable’ for wider diffusion, while DIY stores were seen as key partners to enable access to alternatives in the domestic retail market.

Initiative 2: Stop sprinkling

Designed to eliminate the use of sprinklers, Initiative 2 develops a regionally sensitive garden design strategy, incorporating three tiers of activity to propagate alternative technologies that are better suited to local supply-demand characteristics. For regions that

are forecast to have limited water stress, the first tier of activity continues existing efforts to disseminate water butts. For areas with forecasted water stress but currently within acceptable levels, tier 2 focuses on the diffusion of less water-intensive garden designs, similar to the processes described in Initiative 1. For areas with existing water stress and forecast increases, tier 3 prioritises the diffusion of sustainable urban drainage systems and small-scale grey/rainwater harvesting to provide non-potable water for gardening. In addition, demand managers also discussed an overarching project to revitalise community gardens, aiming in the long term to reduce the number of private gardens, however concerns regarding how to remove such a prolific feature of suburban living prevented this discussion developing further.

The specific plans were similar to Initiative 1. Local authorities, hotels and businesses with publicly visible gardens, along with garden centres and DIY stores were seen as well positioned to enhance the visibility and availability of alternatives. In addition, there was seen to be benefit in having celebrity gardeners champion the initiative and organisers of campaigns such as 'Britain in Bloom' to include incentives and information on how to incorporate such infrastructures into the design of entries. To monitor change, the team sought to combine existing micro-component methodologies with DMA (District Meter Area) reads and triangulate these against sales data from retailers and suppliers of alternative technologies.

Discussion

The two initiatives are similar in many ways. Both make direct intervention into the material systems that surround water use; Initiative 1 into garden designs, Initiative 2 into the water supply systems related to gardening. This is an immediate departure from the messaging and marketing mechanisms used in conventional water efficiency initiatives that aim to persuade individual water users to alter behaviour as each initiative makes a direct and tangible intervention into water use from the outset. However, in both cases the direct impacts are on non-residential demand, so to complement these activities and extend change into domestic gardens, both initiatives aspire to alter people's experiences of garden spaces, creating alternative everyday experiences that Chapters 4 and 5 suggest are vital foundations of people's understandings of what water is for (Kaika, 2004, Allon and Sofoulis, 2006). In this way, the initiatives aim to build momentum for a systemic shift in garden design that supports the emergence of less water-intensive gardening practices.

In order to facilitate these changes, both initiatives are sensitive to variations in garden watering, which conventional activities tend to gloss over (Fam *et al.*, 2015). Initiative 1 recognises different functional roles of the garden space (e.g. as a space to play, grow flowers, or relax) similar to that illustrated by Pullinger *et al.* (2013). Based on this heterogeneity, the initiative explores ways in which such functionality might be achieved in water sensitive ways and proposes garden variants that provide the desired functions over and above grass lawns. This form of intervention is described by Spurling and McMeekin (2015) as substitution; creating alternative practice elements such that existing needs and desires may be met while reducing the resource intensity of achieving them. However, the ultimate aim of Initiative 1 is to degrade the perceived value of grass lawns and the initiative incorporates activities so that people may see, touch and experience alternatives in order to unsettle longstanding material conventions so different configurations of elements and practices might emerge (Shove *et al.*, 2012b). Working with partner organisations expedites this emergence by enhancing access and availability which existing literature identifies as fundamental obstacles to the diffusion of alternative practices (Shove *et al.*, 2012a), and mobilising the competencies and ideas that allow alternative garden designs to be replicated in domestic gardens.

In contrast, Initiative 2 provides an alternative perspective on water sensitivity, by tailoring activities to suit the specific supply-demand characteristics of local areas. This initiative has a distinctly practical objective; targeting areas where there is greater need and opportunity for demand reduction to enhance the cost-benefit ratio of intervention and enable a proof of concept that justifies water industry involvement. However, it also recognises that interventions are supported and resisted by their hydro-social context. Chapter 5 demonstrates how everyday interactions with water shape public support for demand management. In areas where water is plentiful, embodied understandings of water as an abundant resource complement modern supply systems and create friction for alternatives (Taylor *et al.*, 2009). In contrast, where water scarcity is apparent – e.g. manifest in dry rivers, hosepipe bans and droughts – embodied experiences of water unsettle the assurances of modern infrastructural systems and are supportive of, and sometimes create, innovations in supply-demand systems (Woelfle-Erskine, 2015b). Thus Initiative 2 capitalises on the social licence created by water scarcity to establish alternative garden watering systems in a supportive context. In the long term Initiative 2 aims to introduce socio-technical systems that provide opportunities for new forms of

interaction with water that emphasise the interdependence between people and water that may inspire alternative practices of water use.

By engaging in the experiences and materialities of garden design the initiatives reduce reliance on mains water supply, but also create new interactions with water that support less intensive watering practices and thereby provide deep reconfigurative approaches to managing domestic water use. Both projects might be further developed through critical appraisal of existing initiatives[20] and consideration of the potential co-benefits of interventions such as biodiversity, flood protection or health and wellbeing. For example, the initiatives have parallels with RSPB's 'Give nature a home' or the RHS and The Wildlife Trust's 'Wild about gardens', and water sensitive gardens have been displayed at prestigious events such as the RHS's Chelsea Flower Show (O'Neill and Forster, 2008) and in public gardens such as the London Wetland Centre (Dunnet and Claydon, 2007, Dunnet, 2016). Each of these initiatives provides interactive opportunities for water users and identifies a range of partner organisations that may usefully propagate such activity. However, the imagined initiatives re-envisage the role of such partners such that they are no longer involved in incentivising consumer choice and implementing their decisions, but actively participating in the propagation of less water-intensive practices (Farrelly and Brown, 2014, Shove and Walker, 2014). For example partner roles include activity to contribute to everyday experiences, diffuse ideas, disseminate practical knowledge and skills, and enable access to alternative technologies and objects.

7.2.2. Imagining strategies for water efficient bathing

Mapping the collective context of bathing

Demand managers understand bathing to provide all kinds of services – to relax, to get ready for work, to get clean – however suspect that underlying many of these is some sort of effort to align oneself with conventions around personal hygiene and aesthetics. This effort to align was understood to result in bathing needs that are currently (and increasingly) met by showering. Consequently, unlike gardening, which was generally considered a taken for granted luxury, bathing was deemed to have limited room for renegotiation. Personal needs were seen to vary with regards to aspects such as employment and daily activities, which in turn connected to age, medical condition, religious practices, childcare duties as much as personal preference. However, the teams

[20] The workshops provided insufficient time to discuss this and priority was given to developing novel ideas from alternative starting points rather than reviewing and discussing existing initiatives.

did not aspire to challenge such needs, instead finding alternative practices that may be substituted to reduce water use.

While participants saw social learning throughout the course of life as one way people come to understand ‘normal’ bathing, tacit experiences of what others do in similar situations was seen to lend to an intuitive and reflexive understanding of what is appropriate. One participant described how in the first few days of her new job, she not only learned about the procedures of the workplace and what was expected in terms of professional responsibilities, but also modes of personal conduct appropriate for the workplace that included personal presentation. This in turn was seen to have implications for bathing frequency and duration (e.g. to ensure hair was appropriately managed to fit with others in the workplace). Both groups described how, in addition to these immediate experiences, bathing connected to fashions and was shaped by media including TV programmes, magazines and marketing (particularly related to the health and beauty industry).

Participants identified various technologies that intersect with bathing. These included domestic supply technologies such as showers, baths and taps that were familiar targets for water efficiency interventions as most water companies are already engaged in activities to enhance the material efficiencies of some or all of these. In addition, both teams identified various material products that affect the water intensity of bathing including products such as shampoos whose characteristics are important (e.g. their ‘rinse-ability’) and water-free alternatives such as dry shampoo and antibacterial gels. Further, the teams recognised the implications of hair itself and hairstyles in creating demand for bathing. In particular high-maintenance hair – that requiring regular washing – was seen to be more water-intensive that low-maintenance hairstyles that require less frequent washing. Demand side technologies were seen to offer avenues to elicit changes in personal water use that extend beyond the home, as people wash bodies and hair in different spaces (e.g. gyms and hotels), but also as a means to effect change beyond individuals as contributing to outcomes that may be seen (and smelled) by others.

These observations resonate with the findings presented in Chapter 4, showing how patterns of bathing are organised around daily activities, such as working and socialising, and are embedded in material systems. In particular, the discussions relating to products and hairstyles extend the scope of demand management, identifying the influence of these material features on water use and therefore highlighting the potential opportunities

they pose for demand management. These discussions echo existing research that explores the assemblage of elements incorporated in hair and beauty routines and their implications for environmental sustainability. For example, Holmes (2014) illustrates the malleability of hair styling, and Hielscher *et al.* (2009) how styles emerge from shifting network of elements such as cultural knowledge and meaning (such as how shifting notions of cleanliness, 'smelliness' or grease are embedded in hair care), embodied skill (how to manage these properties in line with convention) and products (such as the introduction and diversification of hair and beauty products). This research identifies these aspects as opportunities to shape routines and thereby reduce resource use, a finding that resonates with developments in industry where suppliers are increasingly interested in the downstream environmental impacts of their products. For example companies such as Boots (Hielscher *et al.*, 2007, Hielscher, 2011) and Unilever (Unilever, 2016) are both involved in research to understand how products are incorporated in daily routines and the opportunities this poses for sustainable design to reduce downstream environmental impacts without 'telling people what to do' (Green Futures, 2007).

These discussions identify various lines of enquiry to inform intervention, and the following sections describe and discuss the two initiatives designed by workshop participants.

Initiative 3: Three-day blow out

Initiative 3 is a hair-care regime designed to provide a convenient way of fulfilling individuals' desires for healthy, shiny, presentable hair (that also reduces water demand). The initiative aims to introduce a routine in which hair would be washed only once every three days. On the second day, hair is worn in an 'up-do' so it is 'fiddled with less', therefore becoming less greasy and tired looking, and on day three, dry shampoo is used to freshen hair. The initiative was seen to offer an alternative form of hair washing that allows less frequent and/or reduced duration showering and in the long-term may stand to change showering routines.

The initiative itself would work in partnership with a haircare company and follow their protocols for product development to design and launch a box set consisting of a 'stay-fresh shampoo'; a guide to 'up-do's' and a dry-shampoo. A parallel social media campaign sponsored by the partner company would be designed to increase exposure, focusing particularly on 'up-doing'. In addition, the team proposed to attain celebrity

endorsement to promote the regime and provide a hook for media coverage. 'The Kardashians' were seen as the preferred celebrities to launch the product, as they receive extensive media coverage, but are also understood to be popular with consumers who are likely to practice high frequency hair washing and, therefore, could generate the greatest potential savings. Alternatively, programmes such as 'The Only Way Is Essex' were seen as opportunities to have in-situ demonstration the products and hairstyles. Finally, the group's intention was to monitor sales of the product to gauge success, accompanied by social media analysis, qualitative consumer research and micro-component metering to better understand the relationship between of product sales, hair care and water use.

Initiative 4: Anti-wrinkle showering

Initiative 4 aims to reduce shower length by promoting the benefits of shorter showers for skin hydration and, in turn, beauty and anti-ageing. Showering was seen to intersect with ideas and images of health and beauty and potential was identified to use these channels to shift the meanings associated with showering, such that long showers were associated with rapid ageing. The initiative was compared with two-minute tooth brushing, endorsed for health reasons, but offering added benefits for water use. However, the first step was to review the evidence and potentially to fund research into the relationship between showering and wrinkles, as participants were uncertain regarding the validity of this claim. Assuming that a connection between shorter showers and anti-aging was established, there was a need to disseminate information in an accessible way, gain endorsement and measure effects. Partnership was seen to be the most effective way of managing each of these, working with health care professionals ('sexy doctors') to promote the initiative in media and product manufacturers to style easy-rinse products that fit with the initiative aims.

Discussion

In some regards, these two initiatives are similar. Both view showering as providing services (such as cleanliness, comfort, relaxation) and a means of achieving certain conventions and standards in health and beauty (Shove, 2003, Davies *et al.*, 2015). Both initiatives aim to substitute existing practices with alternatives that disassociate the services bathing provides from long showers (Kuijer and de Jong, 2011, Spurling and Mcmeekin, 2015). In doing so, both initiatives move beyond the emphasis placed on saving water and money commonly embedded in conventional activities as incentives to modify behaviour. Instead, they aim to consider the health and beauty aspects of bathing

and the opportunities these pose for intervention. However, beyond these similarities, the two initiatives are distinctly different in their approaches.

Initiative 3 identifies hair washing as a specific water-intensive practice resulting in long and frequent showering. Recognising that this practice is predominantly (though not exclusively) related to female hairstyles, the initiative presents a strategic effort to develop an alternative hair care routine that fulfils desires for healthy, clean and fresh hair without the associated water use. By working with an assumption that hair might be managed in a more convenient, low-maintenance way, the initiative does not directly discuss water use, but focuses on establishing an alternative practice and facilitating the diffusion of social and material elements to enable its success. In addition, the initiative recognises the everyday performative aspects of demand as a means of disseminating practice and develops 'up-doing' as a means to extend the reach of the initiative both online and in peer networks. In this way, the initiative operationalises many of the insights developed in existing academic literature, recognising that hair styles and styling practices contribute to environmental impacts (Hielscher *et al.*, 2009, Holmes, 2014) and seeking to contribute to the emergence of alternative practice and socio-material configurations. Like the gardening initiatives, Initiative 4 identifies a web of other actors that might participate in water demand management. The initiative is designed to be led by the health and beauty industry and supported by retailers and the media that are seen influence trends and mediate access to the images, know-how and objects that enable them to proliferate (Shove *et al.*, 2012b).

In contrast, Initiative 4 remains reliant on communications and marketing to persuade individuals to alter showering habits. Though moving away from financial cost incentives, these direct forms of engagement perpetuate familiar psycho-economic rationale by prioritising the voices of experts to disseminate information and provoke behaviour change. The findings in Chapter 4 demonstrate the limited role of choice in determining shower duration, instead illustrating that consumers have long showers because they "just stand there", or showers are their "only quiet space", or simply because they like to be in the water. These findings support existing research that suggest that such marketing approaches do little to effect habits and calls for stronger, more sophisticated forms of intervention (Shove, 2010, Sharp *et al.*, 2015). Further, the initiative described does not engage with the specific types of showering identified in existing research (Browne *et al.*, 2013, Davies *et al.*, 2015) and as not all of these relate

to health or beauty, this lack of sensitivity risks reducing the scope of intervention (Sharp *et al.*, 2015).

Past and existing activities provide useful reflections on these imagined initiatives. Water companies have followed the line of intervention presented in Initiative 4 before and have been met with significant criticism. For example, an initiative that identified shaving in the shower as a potential opportunity to turn of the tap and save water (Thames Water, 2011) was reinterpreted by mainstream media as "How women waste 50 BILLION litres of water a year shaving their legs in the shower" (Cohan, 2011 emphasis original, The Telegraph, 2011). While perhaps not the intended interpretation, the headline reveals how marketing initiatives commonly employed in sustainable consumption initiatives implicitly blame users (Evans, 2011b) without contributing to the creation of alternative elements that might promote less water-intensive practices. By making a more direct yet less educational intervention, Initiative 3 avoids such accusation and instead seeks to develop and make desirable an alternative routine in which water users might partake and thereby reduce water use. Again, there are existing examples along these lines. Batiste – one of the leading manufacturers of dry shampoo – markets its product as "the perfect quick fix for gorgeous looking hair" (Batiste, 2016). Like Initiative 3, Batiste's emphasis on convenience, style and beauty aligns with the desires of consumers and images in the media and Batiste also incorporate online hair styling guides (including 'up-do's') and celebrity endorsement. In this way, Initiative 3 acts upon a more evolutionary understanding of change, a view of the world that sees water use as a product of continually evolving configurations of social, material and natural elements (Reckwitz, 2002), while Initiative 4 retains a focus on consumer perceptions to drive decisions. Importantly, by contributing to this evolution rather than appealing for water users to change behaviour, the initiatives avoid pointing blame, despite making a strong normative intervention into everyday life.

7.2.3. Imagining strategies for water efficient laundry

Mapping the collective context of laundry

Like bathing, demand managers view laundry as a necessary water use and mapped out how laundry intersects with different goings on throughout the week that shape laundry. Discussions focused on work and leisure, which were seen to have implications for the clothes worn, how clean and presentable one was required to be, the amount of dirt

encountered and how much time people have for washing. Clothes themselves were identified as a particularly significant feature of laundry. Participants described how different materials get smelly or dirty faster and different clothes co-evolve with different social norms that result in different patterns of washing. For example, pyjamas, comfy sweaters and jeans were identified as items worn for comfort rather than appearance, therefore requiring less frequent washing than lightweight garments such as shirts that require washing after every wear.

Washing habits were also seen to connect to intuitive understandings of what needs washing and when. Demand managers discussed the variation in their own laundry habits and what influenced these. As described in Chapter 4 laundry varied extensively, some demand managers would wear the same work shirt for more than one day a week and others would wash all clothes after every wear. Yet, like focus group participants, all perceived this level of variation to be within acceptable limits and expected that people should not be judged for how much (or how little) washing they do. The minimum standard was seen to be that which maintains the visual appearance and neutral odour of clothing in keeping with the situation it is worn. Participants described how they washed work clothes impulsively to maintain appearances and neutral odours, but that 'weekend clothes' were tested by sight and smell to determine when they were washed, generally resulting in less frequent washing.

In addition to clothes, other technologies and objects were also considered significant. Compared to bathing and gardening, the technologies associated with laundry were perceived to be relatively standardised throughout much of the population. There was understood to be near universal access to washing machines plumbed to mains water and few alternatives to this with practices such as handwashing and laundrettes relatively uncommon. Demand managers considered that most consumers would only replace a washing machine either during home renovations or following a breakdown. Consequently while there were thought to be efficiency benefits to be gained by upgrading appliances – a result of their relatively slow turnover and rapid technological advances – there was seen to be limited potential to accelerate their replacement. In addition, existing universal supplies of drinking water was considered a significant obstacle to making more significant reductions to the water intensity of laundry, a function that could be fulfilled using non-potable water.

These findings reflect those of both the focus groups in Chapters 4 and 5 and of existing research. In the focus groups, participants discussed extensive variations in laundry practice, despite common technological arrangements. These habits were affected by the clothes people wore, which in turn connected to the everyday activities people engaged in, a finding supported by the *Patterns of Water* project (Pullinger *et al.*, 2013). *Patterns of Water* also emphasises that despite weekly washing being the most common routine, there is extensive variation between the laundry frequencies of different garments. Survey responses demonstrate that most people only wear t-shirts, shirts and blouses once (sometimes twice) before washing, while jeans tend to be worn two or three times (although responses indicating once and four or five times were not uncommon) and jumpers and cardigans commonly worn more than five times between washes (Pullinger *et al.*, 2013).

The discussions also reflect those in Chapter 4 that illustrate how conventions around clothes washing are inferred from the general appearance of peers and colleagues and reinforced by the media in which clean, fresh, frequently changed clothes appear as the norm. This finding is supported in existing research that provides insights to how clothes are designated dirty or clean, for example Jack (2013a, 2013b) describes how, for many people, respect for others, community censoring and self-auditing are ambiguous yet powerful reasons for washing clothes that result in precautious washing practices to avoid offense, without any clear understanding of what constitutes offensive behaviour or to whom. In addition, Chapter 4 highlights how the frequency of laundry is shaped by the space and design of homes, which often preclude a space for "not-so-dirty" clothes (see Chapter 4 for discussion). Again, this has parallels with existing research, for example Yates and Evans (2016) describe how laundry is entangled in practices of sorting, airing, drying and storing all of which are connected to the material design and construction of homes. These material aspects were not discussed in the workshops, however participants did extend consideration to alternative practices such as laundrettes and hand-washing, noting the decline of these practices that have been replaced by a ubiquitous practice of domestic laundry (Pullinger *et al.*, 2013 found that both laundrettes and handwashing continue to feature in laundry, albeit to a lesser extend than domestic machine washing). Technologies and infrastructures of laundry were discussed with regards to the universal supply of potable water to homes, a historical project that has a strong legacy for contemporary water use (Trentmann and Taylor, 2005).

These discussions identify numerous avenues for water demand management related to laundry and what follows is a description of the two initiatives designed by workshop participants.

Initiative 5: 3 Day weekend (wardrobe)

Initiative 5 aims to extend the duration of the 'weekend wardrobe'; focusing on extending the wear of clothing seen to require less frequent washing such as jeans and jumpers. The team proposed to work with local employers to introduce a variation on 'dress-down Friday' that encourages employees to attend work in weekend attire, stipulating an expectation that these clothes do not then need washing after the day's work. To circulate this expectation and instigate wider discussion regarding laundry practices, it was suggested that ambassadors (potentially with branded t-shirts e.g. "let's talk about dirt") could facilitate conversations, offer sniff tests and generally provide light-hearted encouragement of a more natural approach to body odour.

It was proposed that water companies could implement the initiative in-house to explore ways of sensitively engaging employees, gather data to understand laundry practices and to generate evidence to support continuation of such activities (particularly as the initiative was seen to have potential for a rebound effect whereby the weekend wardrobe became subject to work wardrobe washing routines). Once established in Water Company offices, the scheme could be extended to affiliated partners and suppliers as part of the brand image, showing leadership in low-intensity laundry routines. Such leadership was seen to provide a living example of how large office-based employers could facilitate change in laundry practices, enabling wider diffusion.

Initiative 6: Non-potable water for non-potable purposes

Initiative 6 aims to limit the demand for mains water for non-potable uses, such as washing clothes and cars in water scarce regions by rolling out dual plumbing accompanied by rising block tariffs[21]. The team proposed a trail project in a proposed new development in a water scarce area to test dual-plumbing systems and community-scale substitution options. Discussions regarding how to extend this activity into the retrofitting market raised questions regarding funding mechanisms. Universal metering was deemed a necessary pre-requisite to establish a market for alternative supply systems

[21] Rising block tariffs charge a low (or zero) price for a fixed volume of water, and then increasing price in increments thereafter, designed to distinguish between essential water use while providing a mechanism for charging more for higher volumetric use. Durban, South Africa, provides an example of such a scheme in practice, offering 25 liters a day free to every consumer and steep price increases thereafter.

and the initiative sought to work with the DIY industry to propagate a retrofitting market for rainwater harvesting and grey water recycling systems.

In order for the initiative to achieve maximum benefits, the team imagined collaboration between the Water Industry, Planning Authorities and the Construction Industry as vital to develop the appropriate incentive structure and regulation to support activities. Without this support there were concerns that property developers would simply identify alternative places to develop (although this was discussed as a potential signal of success, that water companies were taken seriously in their efforts to manage water stress). In addition, value was identified in working with the media and potential owner-occupiers to build support for the proposals and designers, architects and builders so that the developments would be seen as desirable to future house buyers.

Discussion

These two initiatives pursue very different avenues to reduce water demand associated with laundry. Both depart from convention by moving beyond the washing machine (Yates and Evans, 2016) to engage with the collective social and material elements that sustain current modes of clothes washing. In doing so, both initiatives aim to disrupt existing practices; the former by challenging social conventions, the latter by challenging design conventions of homes and buildings. This is a contrast to conventional activities that seek to effect change without fundamentally altering routines or technologies by appealing to consumers to reduce the number and frequency of washes or use eco-settings. The initiatives presented here each seek to displace water-intensive aspects of laundry routines – Initiative 5 replacing workplace clothes for alternatives that are washed less frequently and Initiative 6 replacing potable water for lower grade water that reduces supply-chain demand – and in doing so offer a substantive alternative to which people might defect (Shove *et al.*, 2012b, Spurling and Mcmeekin, 2015).

In the longer-term, both initiatives aim to shape people's experiences and expectations in ways which support less water-intensive forms of laundry; Initiative 5 endeavouring to alter workplace dress codes, while Initiative 6 focuses on the specific versions of what water is, and what water is for, embedded in supply systems (Kaika, 2004, Shove and Walker, 2014). In doing so, each aims to reconfigure to socio-material context of domestic water use in order to steer the ongoing evolution of domestic demand (Shove *et al.*, 2012a). In the first instance, Initiative 5 identifies laundry as a practice that "bump up against the taboo" (Browne, 2016, p. 198). To counter such taboos, the initiative

establishes a light-hearted approach to instigate discussions and overcome social awkwardness with the intention to support alternative understandings and conventions. Existing research illustrates that employee support the opportunity to alter dress codes, but highlights the need for an institutionalisation of smart-casual dress codes to engender a sense of appropriateness (Hitchings, 2011b). By altering workplace dress codes, Initiative 5 attempts to extend the weekend wardrobe to three days and, in doing so, to replace one day a week's worth of frequently washed garments with a low-wash alternative.

Initiative 6 also challenges conventions, but in this instance focuses on conventions in design and construction that mean potable water is used for functions that could be provided by non-potable sources. The initiative supposes that decentralised supply systems are not only better attuned to the hydrological characteristics of the area in which they are situated, but better support the development of understandings and ingenuity that provoke the emergence of alternative domestic practices (Woelfle-Erskine, 2015a). Existing research, supported by the findings in Chapter 5, suggests that decentralised supply systems reconnect water users to ecological systems as they embody the natural variations in water supplies, and consequently encourage sensitivity to the more-than-human context of water. However, existing research also highlights the importance of user participation for these sensitivities to be developed, or else these technologies risk being appropriated to fit with existing patterns of water use (Sofoulis, 2014). Initiative 6 contains limited discussion regarding user participation as it focuses on a new development, however there are opportunities for activities such as open-home retrofitting to propagate similar changes in existing housing stock (see Woelfle-Erskine, 2009 for a discussion)

An outstanding question for both initiatives, and one recognised by the professionals involved in their design, is recruitment – how do you facilitate the uptake of alternatives? – for without practitioners, alternative forms of practice are unlikely to proliferate (Shove *et al.*, 2012a). While both initiatives describe a clear vision for a future in which alternative dress codes and laundry systems are commonplace, there is less detail regarding *how* these will be achieved. Initiative 5 is in many ways similar to Cool Biz, an intervention in Japan that successfully introduced new workplace dress codes in an effort to reduce air-conditioning in offices (for a full discussion see Chapter 2 or Shove, 2016). Cool Biz received widespread government support and had extensive buy-in from the

fashion industry, an extension which exceeds the scope of activities described in Initiative 5. The processes of recruitment for Initiative 6 are even less clear, assuming that that early adoption in new builds will propagate change in the retrofitting market by enhancing the images and meanings associated with alternative supply systems, rendering them the new normal. In both cases, clarity is needed regarding the actors that might facilitate change, how to foster collaborations with these partners particularly as both step away from familiar spaces of the home and involve unfamiliar industries.

7.3. Discussion: On reimagining water efficiency

Introducing the notion of collectives in the workshop setting created a space in which an extended range of options and possibilities for demand management could be considered. Schatzki describes how "bundles [of practices] are too varied and tied to particulars, circumstances and happenstance" (2015, p.17) for any single line of intervention to have universal success. Thus, perhaps the greatest achievement in the resulting initiatives is the scope and variety of activities portrayed, as by identifying multifaceted strategies to engage with domestic water use, the imagined initiatives leverage the potential of such diversity to reduce domestic demand. Consequently, though the programme of activities described may appear fragmented in their approach, they stand to offer greater opportunity of intervention to steer change in the various practices they address than conventional forms.

Such variety is achieved by grounding initiatives in demand manager's lived experience of using and managing water. While stylised conceptual perspectives on intervention struggle to accommodate the complexity of the real world (Geels *et al.*, 2015), by combining insights from the social sciences with their everyday experience, demand managers are able to identify specific, situated aspects of water use that provide lines of intervention. While practices such as gardening, showering and laundry are widespread and increasingly open to global flows of images, competencies and objects (Spaargaren and Oosterveer, 2010), they are also connected to individuals' everyday routines and the actors, spaces and practices with which this leads them to interact. Identifying these context-specific conditions of demand enables the creation of initiatives designed to reinforce water sensitive behaviours. This is a notable departure from the top-down planning approaches that dominate resource management (Fam *et al.*, 2015) that enables

demand managers to identify the specific elements and processes that sustain high levels of domestic water use.

Thus, while the imagined initiatives do not set out a comprehensive management agenda, each imagined initiative – with the exception perhaps of Initiative 4 – develops the means of engaging with the collective elements and processes that structure routine (Reckwitz, 2002) and in doing so propose to make deep changes to everyday practice of water use. Several propose to degrade and devalue existing technologies or practices by facilitating the diffusion of alternative means of accessing the services that water provides (Shove *et al.*, 2012b, Dixon *et al.*, 2014). In this manner the imagined initiatives contrast with weak conventional demand management activities (refer to Chapter 2 Section 3.3). Unlike marketing mechanisms that portray idealised normal behaviours in the hope of eliciting change, the initiatives here target the performative aspects of water use to make alternatives visible and desirable. Instead of relying on information, the initiatives engage with social actors and processes through which know-how and meanings circulate to facilitate the diffusion of alternatives (Shove *et al.*, 2012b). And where the initiatives propose to engage with materialities they do so in a manner that exceeds tinkering with technologies of supply and domestic retrofitting (Marres, 2012, Strengers and Maller, 2012, Browne *et al*., 2014), aiming instead to reconfigure material design and expedite access to alternatives. In this way, the imagined initiatives propose to make deep changes to the social and material fabric of everyday water use (Allon and Sofoulis, 2006).

In addition to imagining what alternative initiatives might look like, embedding these discussions in the expertise that demand managers have in organising and implementing demand management initiatives gives the discussions a strategic element that provides a valuable critical reflection on who might be involved in managing domestic water use and what role they might play. The imagined initiatives identify a web of professions and industries who, intentionally or not, shape water demand (Jelsma, 2003) and might therefore contribute to crafting alternative future patterns of water use. Collaboration and partnership working already are already common features of Water Company activities (see Chapter 6 Section 6.3.2); however the imagined initiatives extend the register of possible partner organisations and re-envisage the roles they might play in managing demand.

There are three forms of partnerships detectable within these discussions. Firstly, there are actors in the immediate locale who might implement alternative technologies and

practices to set an observable precedence and thus shape the embodied experiences of domestic water users (e.g. hoteliers, local authorities). Secondly, there are webs of actors with both online and personal connections to consumers that might diffuse alternative ideas and know-how (e.g. the hair and beauty industry, or National Trust, the Royal Horticultural Society and Britain in Bloom). Thirdly, there are those who mediate access both to objects and technologies, but also to the social images and meanings that enable alternatives to flourish (e.g. media, designers, marketing and retailers). These partners are more diverse than is typical of water industry activities and their role is in shaping experiences and expectations of water users to expedite the uptake of water sensitive technologies and practices rather than the implementation of retrofitting and behaviour change initiatives.

This reimagining of participation in demand management also has consequences for the role envisaged for water companies. Over the last decade, water companies have been at the centre of water efficiency activities and the industry celebrates the extensive developments that have been made (Waterwise, 2015a), however the imagined initiatives point towards deeper, more complex forms of intervention which require different governance arrangements. This does not, in all cases, involve water companies stepping back from water demand management; for example Initiative 5 sees water companies in a role of leadership, setting a standard for other workplaces to follow, while Initiative 6 sees water companies having a stronger role in urban planning. However, in some cases the role of water companies becomes less direct, for example, Initiative 3 sees responsibility distributed to the health and beauty industry (along with potential profit). These are significant departures from conventional water efficiency measures that provide a critical reflection on the practices of governing social change, redistributing power and agency for demand management beyond the triad of providers, consumers, and regulators (Moss, 2009) embedded in conventional approaches, to a distributed web of actors who presently – whether intentionally or not – participate in steering change in patterns of domestic water use.

Finally, a notable absence from the workshop discussions is any engagement with the spatial geographies of water services. Such discussions are not unrelated to questions of agency and responsibility; however they provide a further lens through which intervention might be understood. For example in Chapter 4, uniform washing illustrated how domestic water use is the result of specific intersections between workplace

practices and domestic life, a feature in common with many water uses. The particular combination of uniform design and allocation, the nature of the profession and the lack of workplace laundry services render domestic uniform washing an intensive feature of everyday life. The imagined initiatives describe various approaches to intervening in such a challenge however they sustain familiar geographies of responsibility in which domestic practices are the predominant mode of accessing services water offers. While demand managers discussed laundrettes in the mapping exercise (and a similar conversation was had regarding the decline of public green spaces in favour of private), there was limited discussion regarding how these changing spatial geographies might provide opportunities to reduce water demand. Considering the options and possibilities for relocating such services outside of the home (e.g. in public provisioning (laundrettes) or professional practice (workplace laundry services)) opens a further line of enquiry that might benefit demand management.

7.4. Conclusion

The discussions presented in this chapter illustrate how design methods might be used to create a supportive environment for critical reflection that enables the development of ideas that radically differ from existing practices (Bakker *et al.*, 2010, Davies *et al.*, 2012). The brief introduction of the research findings from the earlier chapters of this thesis encouraged demand managers to explore their own understandings and experiences of the problem at hand, facilitating consideration of the complex, messy challenge in which they are dealing rather than the hyper-rationalised accounts that are typical starting points for resource management (Sharp *et al.*, 2015). In turn, these explorations supported a broad and open-ended discussion of the processes that influence domestic water use and how these might be used to steer demand in the future, a discussion that led to the development of an eclectic mix of possible interventions. Each imagined initiative resulting from this discussion proposes a mode of intervention, identifying new sites, spaces and scales in which to intervene and various coalitions of actors that might contribute to demand management. Thus these findings support existing research that suggests design-thinking methods aid the develop solutions to complex socio-environmental problems (Bakker *et al.*, 2010, Kimbell, 2011, Davies *et al.*, 2012).

Yet in addition to discussions in the literature, this chapter reveals that engaging industry partners in such creative dialogue offers insights to inform ongoing theoretical

development. In particular, the extensive critical reflection on who might be involved in implementation and the roles that they might play, along with the practical consideration of how such novel forms of intervention might be implemented, pushes beyond discussions of agency and responsibility in the literature to consider the distributed network of organisations and intermediaries that might be involved in reconfiguring the collective elements of water demand. Thus these imagined initiatives provide a novel perspective on governing social change that is derived from the experience of those who strategically aim to shape domestic water use. Chapter 8 seeks to develop this reflection further, bringing the insights derived from the workshops into dialogue with the academic literature to consider how these examples inform conceptual understandings of the actors and processes involved in managing social change.

8. Discussion: reconceptualising water demand management

The research within this thesis supports the assertion that practice-based research provides the grounds to reconceptualise demand management (Shove and Walker, 2010, Shove, 2014, Spurling and Mcmeekin, 2015, Strengers and Maller, 2015b). However, there are concerns from both within theories of practice and beyond that the rich descriptive understandings of everyday action that are one of the practice literature's strengths also cloud the contributions they offer to conceptual understandings of governing social change (Geels, 2010, Watson, 2012). Indeed, Strengers and Maller go as far to suggest that social practice researchers have yet to address this challenge:

> *"Despite significant intellectual investment in articulating how social practice theories can reframe the sustainability agenda, scholars of social practice have so far had little to say about what it means to intervene in social life; how to go about effecting, steering or governing change; and if this is possible or desirable"*
>
> (Strengers and Maller, 2015b, p. 2)

This is perhaps unfair, as a growing number of authors are involved in visualising alternative forms of intervention (e.g. Davies *et al.*, 2013, Doyle, 2013, Kuijer, 2014, Spurling and Mcmeekin, 2015). However, while these authors provide alternative visions of the future, less is said regarding the means by which these visions might be achieved. By comparison, the imagined initiatives in Chapter 7 provide more than a vision of the future; each also clarifies the processes by which these visions might be accomplished and the range of professional practices that might be involved. Therefore it is possible to distil from these imagined initiatives a range of possibilities regarding the processes of governing change to contribute to ongoing conceptual developments.

First, it is useful to establish how theories of practice approach the subject of governance, one of the quintessential concepts in social theory. The term 'governance' signals a deliberate attempt to look beyond top-down actions of state and market to understand the poly-centric processes and structures that contribute to shaping everyday life (Moss, 2009). Writing from a practice perspective, Schatzki defines governance as "intentional shaping, directing or influencing" (2015, p. 19), a definition that accounts for the effect that an actor, or indeed element (Schatzki, 2011), exerts on the continuous emergence of everyday routine. This definition also accounts for influences that are not intended to impact upon water use directly, but intentionally shape or influence routines in other

ways, a distinction that resonates with the findings throughout this thesis. Thus, products and services designed with the intention of catering for existing standards of cleanliness participate in the governance of sustainability through their unintended consequences (i.e. those that reinforce and reproduce the status quo) (Marres, 2011).

Schatzki goes on to outline four features of governance processes: *goals,* the intended outcomes of intervention; *targets,* that which acts of governance seek to change; *avenues of intervention,* chains of action and connections between settings; and *means*, the ways in which act of governance are enacted (e.g. design, publicity, regulation or physical force). It is in clarifying these features of governance that the discussions in Chapter 7 offer conceptual contributions. On the one hand, the discussions as they stand are too specific to generalise beyond the immediate examples provided. On the other, unlike retrospective analyses of existing interventions or stylised conceptual accounts of reframed interventions, the workshops elicit intricate details on how alternative interventions might be implemented, building on rich empirical data from the case studies and the diverse experiences of demand managers. Further, they are unconstrained by the need to be realised on any planning timescale or to be based on existing evidence, thus each idea specifies a range of aspirational outcomes and associated targets for intervention, outlines the actions that might be taken to achieve these and the actors who might be involved.

It remains uncertain what such practice-based interventions might stand to achieve, as they engage with indeterminate processes that are essentially uncontrollable (Shove and Walker, 2010). However, this does not inhibit these imagined initiatives contributing to a discussion of the governance arrangements and experimental procedures we might infer from practice-based research. Thus, to complete the response to objective three, this chapter reflects on what the research contained within this thesis offers to conceptual discussions of the processes of governing social change. Before this discussion commences, Section 8.1 pauses to reflect on what the findings add to existing critique of conventional activities. Much of this is covered within the previous chapters however it provides a useful starting point to consider how the literature presented in Chapter 2 has been progressed in the present research. Following Section 8.1, Section 8.2 considers three avenues of intervention based on the developments made in this thesis and reflects on the distributed government arrangements they entail.

8.1. Characterising conventional approaches to demand management

Throughout this thesis, the term conventional has been used to refer to interventions that are critiqued in the social science literature yet are common practice in demand management. Such interventions provide universal measures that fail to engage with the socio-technical context of demand and are therefore limited with regards to deliver industry visions for sustainable water management (see Chapter 2.3.3). That said it has also been shown that conventional demand management interventions are not uniform, neither with respect to the activities undertaken, nor their embedded notions of agency and responsibility. Thus it is useful to consider how these various different forms of demand management arrive at similar end-points. This section sets out three approaches identified within this thesis and how the strategic goals and targets of each, along with their implicit framing of agency and responsibility, limit the capacity of these approaches to reconfigure patterns of water use.

The first of these approaches are recognisable in the discussions presented Chapter 2 and describe two strands of activity common in demand management: those that intervene in the supply infrastructure in order to balance demand (hereby referred to as *Upstream Balancing*); and those that aim to reduce water use in homes and businesses (hereby referred to as *Water Efficiency*). In addition, Chapter 4 points toward an emerging hybrid; a systematic upscaling of activities that risks embedding the limitations of both centralised resource management and individualistic approaches to sustainable consumption (hereby referred to as *Big Water Efficiency*) (see **Error! Reference source not found.** over page). While some of these approaches have a longer history in the water sector, all are evident in contemporary demand management activities.

These three approaches share a common goal; to reduce the resource intensity of current patterns of everyday water use. Their targets differ, and notably so does the size of the target that affects the means by which this goal is to be achieved (Schatzki, 2015), yet they sustain a traditional dichotomy of centralised versus individualistic demand management. *Upstream Balancing* focuses on infrastructures; while the scale of intervention varies, planning is undertaken at a Water Company level, dependent on a process of cost-benefit appraisal that identifies the most effective options within the Water Company region (Walker, 2013). *Water efficiency* is also centrally co-ordinated,

Table 6: Summary of three conventional approaches to water efficiency

	Principles	**Existing examples**
Upstream balancing	Upstream activities are used to manage supply-demand systems such that the water continues to be supplied to meet the expectations of a growing population whilst limiting negative environmental impacts. In the current policy climate, this is balanced against economic expense to avoid costs that will ultimately be charged to consumers in the privatised system.	Development of leak detection devices and the repair of leaks (Standard practice for all water companies). Pump control equipment to regulate diurnal and seasonal pressure fluctuations (Portsmouth Water, 2013). Inter-basin transfers, bulk transfers and cross-connections (Thames Water, 2015c).
Water efficiency	Activities are led by water companies but devolve responsibility to consumers to make the most efficient use of water to meet their needs. Interventions are based on assumption that demand reductions may be brought about by fine-tuning individual decisions and disseminating water efficiency devices.	Top tips online, on social media and on water bills. Feedback mechanisms (e.g. smart meters and shower timers). Water efficient devices (e.g. showerhead, tap inserts and cistern displacement devices). (All standard practice for water companies (Waterwise, 2010a, 2015a))
Big Water efficiency	The 'Supersizing' of water efficiency in order to find an approach that can deliver measurable savings and be replicated in different social and geographic contexts. *Big Water Efficiency* echoes the sentiments of centralised (Big) water management (see Chapter 2 Section 2.3.3) Water Resource Zones and the users therein are treated as homogenous in the pursuit of blueprints that may be systematically applied in other areas. Yet unlike Big Water, responsibility and agency are devolved to consumers through interventions described in the *Water Efficiency* approach.	The whole-town approach (Essex and Suffolk Water, 2012, Thames Water, 2015f). Housing Association schemes (Environment Agency and Waterwise, 2012b). Water efficiency retrofitting in schools (Omambala, 2010) The Evidence Base for Large-scale Water Efficiency (Waterwise, 2008, 2011).

however interventions are devolved, consistently targeting the decisions made by individual water users and the technologies in their homes. Finally, *Big Water efficiency* continues this decentralised mode of intervention, but aspires to effect change amidst clusters of water users, focusing on geographically situated communities and ubiquitous organisations such as schools and housing associations in order to accelerate change. Thus, despite their differences, these three approaches over-invest in governance of macro technological and economic contexts of domestic water use and micro psycho-economic drivers of behaviour.

With regards to responsibility and agency, there are again differences between these three approaches, yet they sustain an understanding that the locus for change remains within the common triad of providers, consumers, and regulators (Moss, 2009). *Upstream Balancing* positions water companies as the principal responsible actors for demand management and consumers the passive recipients. This delineation of responsibility is typical of twentieth century water management models (Bakker, 2003, Sofoulis, 2005, Walker, 2013), yet sustained in policies and activities that aim to optimise supply systems rather than manage water use. The second approach, *Water Efficiency*, positions water companies as facilitators of demand management, yet responsibility falls to consumers to use water efficiently to maintain their desired standards of living. *Big Water Efficiency* maintains this position; however the Water Company role is increasingly collaborative in order that activities are streamlined across the industry, and that implementation is efficient and scalable (see Chapter 6). Thus each approach assumes the capacity for change lies within the provider-consumer-regulator network (Moss, 2009), and distinct from the wider network of professional practices that shape domestic resource use.

Thus, the framings of targets and actors that are embedded in these three approaches provide two forms of misdirection; diverting attention from the meso-scale elements and processes that sustain everyday actions, and from the professional practices that might participate in influencing demand. Subsequently, interventions are weak with regards to delivering socio-technical change, instead participating in the reproduction of "a more resource-efficient version of contemporary forms of the status quo" (Geels *et al*., 2015, p. 3) that perpetuates existing social-technical-ecological assemblages and supports unsustainable patterns of water use (Browne *et al*., 2014). For example, by preserving the assumptions of modern engineering *Upstream Balancing* extends the material legacy of centralised infrastructures (Shove *et al.*, 2015). Likewise, in seeking to engender voluntary conservation behaviour at the expense of participating in the production of alternative socio-technical systems, *Water Efficiency* and *Big Water Efficiency* perpetuate the unsustainable systems of domestic practice (Shove *et al.*, 2012a).

Each of these approaches are, to at least some degree, insensitive to the specific supply-demand characteristics of the areas in which they are implemented (Fam and Sofoulis, 2015). *Upstream Balancing* mobilises a traditional supply-led management ethos to manage demand on behalf of consumers, ensuring the continued security of a singular

resource to homes and businesses despite the heterogeneity of different areas. *Water Efficiency* and *Big Water Efficiency* rely upon a devolved yet standardised package of interventions to engender action thereby failing to account for the diversity of individual consumption. The latter in particular seeks generic blueprints that may be applied in different geographic regions, thereby masking the diversity of demand. Various authors critique such universal approaches to demand management as they are blind to the diverse socio-ecological context in which demand arises (Makropoulos and Butler, 2010), disguise the variation that exists within and between different households (Sofoulis, 2011a, Pullinger *et al.*, 2013), and are therefore overcome by the complexity of everyday consumption (Fam and Sofoulis, 2015, Fam *et al.*, 2015).

This is not to say that providers, consumers, and regulators do not influence demand, or that interventions targeting the macro- and micro- have no effect, in both instances they do. However, their influence is variously complemented and opposed by a myriad of other practices that shape the ongoing emergence of demand (Rip, 2006, Shove and Walker, 2010). The notion of collectives used throughout this thesis has led to a discussion regarding the opportunities for management interventions focused on intermediate scales of consumption that may stand to reconfigure the socio-technical context of water use. The initiatives imagined in Chapter 7 extend the register of possibilities for demand management and begin a discussion regarding the distribution of agency and responsibility for achieving these alternatives, providing a valuable counter-narrative to the conventional approaches described here. The following section reconnects these imagined initiatives with discussions in the literature to develop an understanding of the processes of steering or governing change in domestic demand.

8.2. Characterising engagements with collective contingencies of demand

In contrast to conventional approaches, various authors frame demand management as a means of strategically disrupting practice, altering the trajectories of everyday patterns of water use such that intensive practices subside and more sustainable ones emerge (Chappells *et al.*, 2011, Shove *et al.*, 2012a, 2015). This is a markedly different starting point to conventional approaches and one that positions demand management as an intentional effort to steer the indeterminate emergence of demand (Geels *et al.*, 2015). However, unlike conventional approaches that are associated with specific actors and have recognisable pathways avenues for intervention, the processes involved in practice-

based intervention have so far remained ambiguous. The workshop proceedings address this ambiguity and the following section expands on the discussions presented in Chapter 7 to outline three perspectives on governing social change; *Re-designing*, *Re-attuning* and *Re-locating*. Each perspective specifies the targets of demand management, the means by which these targets are approached and the coalitions of actors involved in their achievement, echoing Schatzki's (2015) features of governance. Table 7 summarises the characteristics of these three approaches:

Table 7: Summary of three alternative approaches to demand management

	Objective	**Means**	**Coalition of actors**
Re-design	Demand management aims to replace problematic technologies (of supply and demand) with alternative, less resource intensive elements or practices.	- Designing alternative material elements. - Altering the experiences and expectations of water users such that these might propagate. - Enhancing the availability and access of alternatives.	- Distributed array of actors involved in the design, manufacture, retail and publicity of objects and material systems.
Re-attune	Demand management aims to reconnect practices of water use with the socio-ecological characteristics of the areas in which they take place.	- Identifying the options and possibilities for supply-demand systems. - Redesigning material systems (see previous) - Facilitating the diffusion of practical understanding and competencies. - Facilitating the renegotiation of user expectations.	- Actors involved in developing alternative supply-systems (as above). - Actors involved in negotiation of water service expectations. - Actors who might facilitate the diffusion of skills and interactions between users, technologies and water.
Re-locate	Demand management aims to reconfigure how water services are provided, and by whom, challenging the domestication of water use, and unlocking systems of practice.	- Identifying intensive sub-practices and opportunities for outsourcing. - Facilitating innovation in service delivery - Altering the meaning and expectations of water users such that these might propagate.	- Actors involved in the provision of water related services (e.g. businesses and entrepreneurs). - Actors who contribute to the popularisation of new routines (e.g. media) - Actors who might facilitate connections between providers and consumers (e.g. mobile app industry)

8.2.1. Re-designing elements and practices

Re-designing entails the identification of problematic material elements, both technologies of supply and demand, and their replacement with alternatives that facilitate less resource intensive patterns of water use. Consequently the target of intervention

shifts from infrastructures, homes and people to the distributed web of material elements involved the production of everyday routine. *Re-designing* orientates attention to how objects and material systems shape water use, however recognises there are experiences and expectations with which these elements co-evolve that are as important targets for intervention (Spurling and Mcmeekin, 2015).

Re-designing is potentially the most familiar reconceptualisation of intervention and similar activities have been described in the literature. For example, Spurling and McMeekin (2015) discuss 'recrafting' as a framing of intervention in transport policy that focuses on cars and driving. However, the authors report that existing transport policy interventions aim to enhance the efficiency of driving, rather than to recraft patterns of mobility, an observation with parallels in the description of conventional water demand management approaches. Descriptions of more radical redesign interventions also exist in the literature. For example the CONSENSUS project's 'Future Wash' scenario incorporates wet-rooms that recycle water for non-potable uses, waterless cleaning products, de-odorising clothing materials, and "nano steam cleaners" that provide freshness with minimal water use (see Doyle, 2013). Such technologies, if in existence at all, remain unusual and limited in distribution, however they demonstrate various options and possibilities for *Re-design* in the context of water demand management.

Several of the imagined initiatives presented in Chapter 7 incorporate elements of *Re-design*. For example, Initiative 3, the *Three Day Blowout*, seeks to alter hair-washing routines by *Re-designing* hair cleansing products and practices (e.g. moving towards dry shampoos) and hairstyles (e.g. popularising "up-do's"). In addition to re-designing products, this initiative uses social media and advertising measures to propagate alternative products and styles, and circulate practical knowledge that enables their application. Similarly, the gardening initiatives (Initiatives 1 and 2) seek to influence garden design and planting to reduce domestic water use. Each describes possible forms of public exhibition (e.g. in businesses and public spaces) as a means of shaping experiences, and measures to work with retailers to enhance access. In addition, local intermediaries such as garden centre staff and the horticulture sector are seen to be involved in the diffusion of practical knowledge that enables their replication. Thus, these discussions offer insights as to how demand managers envisage *Re-designing* to be realised and the distributed coalition of actors involved.

Firstly, *Re-designing* recognises that design is a routine occurrence in a range of professions, and therefore looks to reconfigure design practices to support the emergence of less intensive patterns of water use. In particular the imagined initiatives highlight how the images and understandings of technologies and their users that designers embed in their products shape the ongoing evolution of domestic water demand, and thus require sensitivity to the future patterns of water use that they create and inhibit. There are examples in the literature of experimental design practices that enable this sensitivity. For example, Kuijer's (2014) 'splash' describes the process involved in designing bathroom technologies that decouple bathing from flowing water. Her methods include a multi-national investigation of bathing practices, and participatory experiments that encourage would be users of these technologies to devise alternative bathing practices. These inclusive methods expand on many user-centred design processes by challenging basic assumptions regarding consumer behaviour, thereby infusing design methods with theories of practice (see also Vihalemm *et al.*, 2015). Thus Kuijer's research (2014) provides an example of not only the value of distributed governance models that incorporate actors involved in the design and production of goods, but also the benefits of inclusive and experimental design practices.

Secondly, *Re-designing* recognises the importance of enhancing the availability and access of alternatives to support their diffusion (Shove *et al.*, 2012b). In the imagined initiatives demand managers identify retailers as the principal actors involved in governing access, though the focus groups discussions in Chapter 4 illustrate the role of the media in advertising the availability of alternative products. Retail and advertising practices not only govern access, but also shape the expectations and experiences people have regarding what is normal with regards to homes, bodies, clothes and hair styles, and thereby have implications for water use. They also provide a critical reflection on the distribution model of conventional *Water Efficiency* approaches, which tend to offer water efficient technologies free to customers. By integrating alternative products and technologies, demand managers hope to disrupt and devalue water-intensive variants, leading to a broader shift in the marketplace. This is a simplistic understanding of marketplaces and innovation processes (discussions elsewhere provide greater nuance Geels, 2002, Green *et al.*, 2002), yet serves to illustrate how the potential of conventional demand management approaches to effect wider change is reduced by their detachment from the marketplace.

Thirdly, *Re-designing* recognises that, if unaccompanied by complementary social meanings and practical understandings, re-designed material elements are unlikely to become commonplace (Shove, 2014, Spurling and Mcmeekin, 2015). While it is not simply the case that demand for alternative products may be created, supporting the emergence of alternative expectations and experiences may encourage the diffusion of material elements (Harvey, 2002, Mylan, 2015). Chapters 4 and 5 outline how intuitive understandings of normality are gleaned from everyday experiences. These experiences are embodied and observed, though may be informed through discussions that facilitate personal reflection and allow water users to make sense of alternatives (see Chapter 4 Section 4.2.2). The imagined initiatives describe a suite of processes designed to aid the integration of re-designed technologies in these systems of social elements; including the use of public exhibits to shape experiences, garden centre staff sharing expertise and social media to share styles and skills. Each of these measures is associated with actors who already participate in the production and reproduction of images, expectations and practical skills and it is these professional practices with which the initiatives engage.

Thus *Re-designing* recognises the multifaceted professional practices involved in producing and reproducing water demand, positioning agency and responsibility amid a web of actors and intermediaries. This poly-centric governance model spans multiple spaces and scales; from global (e.g. designers and manufacturers) to local (e.g. staff in garden centres, and businesses with publicly visible gardens), and also virtual spaces populated by water users (e.g. online communities). However, by focusing on meso-scale practices, the actions of different strategic partners are connected in both space and time. While water users might participate in design processes to inform the material outcomes, they are not positioned as responsible for demand themselves. Similarly, while water companies may instigate, propagate and evaluate the design process, they are unlikely to lead it. Thus, this perspective signals a departure from the consumer-producer-regulator triad that is typical of conventional demand management activities (Moss, 2009).

8.2.2. Re-attuning practices to socio-ecological systems

Re-attuning aspires to reconnect patterns of water use to the socio-ecological characteristics of the area in which water is supplied. A history of centralised infrastructural development has produced a socio-technical system that is ignorant to the specific challenges and opportunities local variations in water supply and demand gives

rise to. Further, modern urban planning disguises water in the built environment, not only physically but culturally, contributing to anthropogenic understandings of water (see Chapter 5). Thus, *Re-attuning* targets the hydro-social contracts embedded in the built environment and anthropocentric expectations of what water is for, therefore, like *Re-attuning* there is emphasis on both the material systems and the social elements that shape everyday water use.

Re-attuning poses more radical interventions in the socio-technical fabric of urban spaces. Nonetheless existing research illustrates various lines of intervention compatible with the notion of *Re-attuning*. For example, Ferguson *et al.* (2013) outline how water sensitive cities reconfigure hydro-social contracts by harmonising water and urban planning; developing adaptive multi-functional infrastructures; and orchestrating collaborations between scientists, planners and local communities (see also Wong and Brown, 2008, Brown *et al.*, 2009, Rijke *et al.*, 2013). While the water sensitive city is a vision yet to be implemented anywhere in the world, existing examples reported in the literature share similar features. These include urban daylighting – a practice of restoring previously hidden water courses (Wild *et al.*, 2011, Dicks, 2014); decentralised supply-demand systems (Bell, 2013); and small-scale substitution technologies (Sofoulis, 2014, Woelfle-Erskine, 2015a). Further, despite contradicting some of the central tenants of conventional demand management approaches, *Re-attuning* was not beyond the scope of the imagined initiatives. Initiative 2 (gardening) and 6 (laundry), both incorporate decentralised supply technologies that offer greater sensitivity to the variable socio-ecological characteristics in which they are implemented (Wong and Brown, 2008). Such activities go against the historical grain, contradicting the paternalistic notions embedded in *Upstream Balancing* (Linton, 2010), yet resist devolving responsibility and agency to individuals as is the case in *Water Efficiency* and *Big Water efficiency*, and thus rest on and require alternative governance arrangements.

The first aspect of the governance arrangements implied in *Re-attuning* is the reconfiguration of technologies and infrastructures of water supply. This is essentially *Re-designing* at a larger scale and involves similar practices and coalitions of actors as are described in the previous section. However in addition, the imagined initiatives highlight the opportunities decentralised systems create for different interactions with water that may contribute to towards alternative practices and systems of meaning (Dicks, 2014, Sofoulis, 2014, Woelfle-Erskine, 2015b). These interactions are multiple,

but particularly important are the participatory spaces created by decentralised technologies that enables reflexive learning (Woelfle-Erskine, 2009) and the physical connection such systems create between water and water users that enables the emergence of alternative expectations of what water is for (Woelfle-Erskine, 2015a). To maximise the opportunity for such learning, *Re-attuning* also creates space for strategic practices of intermediation that facilitate interactions between users, technologies and waters and aid the renegotiation of hydro-social contracts.

Existing research demonstrates the value of facilitated interactions in circulating competencies that enable such systems to be maintained and shaping user expectations such that alternative technologies function effectively (Sofoulis, 2014). With regards to rainwater tanks, Woelfle-Erskine (2015) describes open-home retrofitting as a means of not only sourcing the manpower [sic] to enable installation, but for potential users of such technologies to gain the skills required for their upkeep and develop a precedence for interaction with supply systems that modern large-scale engineering has undermined. In the energy retrofitting literature research highlights how intermediary actors, such as building managers (Grandclément *et al.*, 2015) and installers (Macrorie *et al.*, 2014), can maximise the potential of alternative technologies by assisting the renegotiation of user expectations. These practices position technology use as pliable, suggesting that sensitive intermediation – rather than technical instruction – may contribute to the reconfiguration of expectations, competencies and meanings. On the contrary, where alternative technologies are supplied without the participation of potential users (e.g. in new developments) they risk becoming "background infrastructures" (Sofoulis, 2014, p. 7), with limited potential to effect patterns of water use and may be appropriated by users to facilitate the continuation of intensive practices.

Parallel discussions are ongoing with regards to daylighting and other ecological restoration projects where Light describes their importance as a conduit for public participation such that not only ecologies are restored, "but also the human cultural relationship with nature" (2001, p. 31). The evaluation of *Care for the Kennet* supports Light's assertion, and the schools project analysed is part of a much broader programme of riparian restoration work that relies upon the participation of local residents. Like the schools project, such activities pose opportunities for immersive learning and renewed understanding of the connections between society and nature. In turn the findings in Chapter 5 suggest these learning practices contribute to new sensitivities and

expectations regarding what water is for, which resist the anthropocentrism of modernity's hydro-social contract. There are outstanding questions regarding how to facilitate such interactions in communities at greater distance from their water sources. Findings reported within the CONSENSUS project suggest there may be potential to mobilise forms of everyday communication and ubiquitous technology in these spaces, including the use of smart technologies and weather forecasting to convey water supply levels (Doyle, 2013). However the extent to which media can replace personal interaction remains a question that would benefit from further research.

The interactive modes of learning incorporated in *Re-attuning* differ from the education-oriented activities included in *Water efficiency* and *Big Water Efficiency* (see Chapter 2 Section 2.2 for examples). Thus, *Re-attuning* depends on a distributed and eclectic mix of actors, such that the interactions between users, technologies and waters might be most effective in reconfiguring patterns of water use. Thus like *Re-designing*, the governance structures associated with *Re-attuning* deviate from the top-down models embedded in conventional demand management. The specific actors involved are less clearly defined, however existing research points towards an array of intermediaries; from professions including building, home renovation, plumbing; to strategic individuals such as land-lord and concierges (Strebel, 2011); activists (Woelfle-Erskine, 2009); and community organisations (Middlemiss and Parrish, 2010). The potential co-benefits of *Re-attuning* for wellbeing, environmental education, biodiversity, and flood risk management (for a review Wild *et al.*, 2011, Moss, 2012a) suggest lines along which the range of organisations involved might be extended. However, some level of co-ordination is likely to be required, suggesting a continued role for water companies. Water users shift from being the focus of demand management, to participants in the renegotiation of hydro-social contracts.

8.2.3. Re-locating water services

Re-locating introduces a critical narrative that challenges the domestication of water use, and questions how the services that water provides (e.g. cleanliness, comfort, entertainment) are supplied and obtained. Domestic demand is, by definition, that which occurs in the home, however the intersections between domestic practices and those of professions that take place in other locations extend the possibilities for demand management to consider the possibilities for outsourcing domestic water use. Therefore,

the target of *Re-locating*, as a strategy for intervention, are the socio-technical systems that sustain domestic practices as the predominant means of accessing water services.

There are few examples of these sorts of discussions within the academic literature and this is not a line of enquiry reflected in the imagined initiatives in Chapter 7. This absence of discussion is unsurprising given that supply-demand systems are established in such a way that domestic water use is so normal it evades critique (Kaika, 2004, Sofoulis, 2005). However, there are findings both within this thesis and existing literature that support *Re-locating* as a possibility for demand management. Firstly, two poignant examples stand out in the focus group discussions as to where the domestication of water-related practices results in insensitive routines. The first, described in Chapter 4 (p. 106), is a pattern of uniform washing where the nature of the work combined with uniform allocations and design result in high frequency, low volume domestic laundry. The second, described in Chapter 5, relates to the domestication of leisure that creates additional demand for domestic water to fill paddling pools and maintain garden spaces. Both examples pose opportunities for *Re-designing* and *Re-attuning*; however they also raise questions over how water services are accessed and provided and whether *Re-locating* practices outside of the home might reduce demand.

Secondly, existing literature suggests that *Re-locating* water practices is not beyond the scope of existing everyday routine. In *Patterns of Water*, Pullinger *et al.* include a dimension called 'outsourcing' that pertains to the frequency that "the purpose for which the practice is performed [is] achieved outside the home" (2013, p. 20). They identify clusters of the population who regularly access the services that water provides outside of the home. For example, 'Simple Outsourcing' is the third most common variant of laundry practice with 16% of the population regularly using non-domestic service providers such as laundrettes and drycleaners (there is also an 'On-demand Outsourcing' category with a further 11% of the population occasionally using these services). Similarly, there is evidence of a substantial cluster of the population that shower away from home and whose eating habits mean domestic dishwashing is reduced (either limited by take-away meals, or displaced to restaurants). In all cases, outsourcing occurs as well as domestic water use, illustrating the multiplicity of practices carried out by individual water users. However these findings suggest *Re-locating* is a possibility for demand management that extends beyond current water efficiency activities in the water industry.

In this instance, research appears to be trailing behind reality where examples of reconfigured service provision are becoming common. An example that is increasingly being discussed is 'Uber', a disruptive innovation in the transport sector that relies on crowdsourcing mobile technologies to connect would-be-passengers to a database of willing drivers (Martin, 2016). The Uber model is a substantial departure from previous models of service provision in the transport sector, stepping outside of conventional regulated marketplaces with a new market entrant leading the development of a peer-to-peer service network. The role of regulators and conventional service providers is diminished in favour of a large-scale commercial enterprise (Uber), entrepreneurial individuals (drivers), and passengers. As with other peer-to-peer services (Martin, 2016), the functionality of this network relies heavily on ICT (Information Communication Technologies), particularly mobile apps, and the media (Martin, 2016). In five years, Uber has evolved from a localised innovation to a mainstream alternative to other private transport services and while not without its controversies, other sectors are beginning to consider what their 'Uber moment' might be.

Arguably, the water supply system is less flexible than the transport sector given the expansive infrastructure involved and subsequent large-scale investments. However there are opportunities to reconfigure the systems of provision around the services water provides (e.g. cleanliness), and there is existing evidence of *Re-located* water services in the commercial sector. For example, in hospitality and manufacturing it is commonplace to outsource laundry to a service provider (for example see Box 8). These arrangements involve commercial actors outside the provider-regulator-consumer triad where demand management is re-cast as a means of reducing operational overheads and meeting Corporate Social Responsibility goals. Consequently, *Re-locating* services provides opportunities for large-scale efficiency improvements and substitution options that reduce water demand. In addition, such models of service provision disrupt routines that may offer potential to unlock systems of practices. For example, for employers to outsource uniform washing, employees must leave uniform in the workplace. Focus group participants described how showering connects to changing clothes and existing research suggests that a commonly reported barrier to cycle commuting relates to clothing and getting changed in the work place (van Bekkum *et al.*, 2011a, 2011b), thus changing routines at the end of the working day may provoke changes to commuting and showering practices.

Box 8: Existing example of Re-locating in the industrial section (source: Carbon Trust, 2015, Berendsen, 2016)

Berendsen provides laundry services to hospitality, healthcare, food and workwear customers. Their business model manufactures and supplies uniforms, removes them for laundering, and returns them clean, repaired as necessary and ready-to-wear. This closed loop process reduces the embodied resources in uniform, and also the full life-cycle impacts of their maintenance.

In 2007, the company required approximately 20 litres of water per kilogram of laundry, and substantial energy input to heat water and power machines. Consequently there stood to be substantial financial and environmental benefits to reducing the amount of energy and water used, and the volume of water outflow.

By 2012, water use had been reduced to approximately only 2 litres per kilogram through reclamation technologies, monitoring systems, and a highly efficient wash processes. In total water use has been reduced by over 50 per cent, savings of over one billion litres per annum, with complementary cost and energy savings.

Waterwise concluded their 2015 review of water efficiency activities with a question: "when is water's Uber moment and will it be delivered by incumbent water companies or new entrants?" (2015a, p. 28). Their discussion of water's Uber moment is relatively limited, speaking in broad terms about tariff structures, customer engagement and water services. Given the significant investment sunk into the present infrastructure and the current regulatory climate, it seems unlikely that such a moment will come from the supply side. Yet the findings throughout this thesis suggest it is feasible that water's Uber moment might be a demand-side innovation that reconfigures how water services are accessed and provided. *Re-locating* has less clearly defined actors than *Re-designing* and *Re-attuning,* however the examples provided illustrate how governance again shifts outside the provider-regulator-consumer triad. In the examples provided commercial

actors are particularly important, in Uber's case a new entrant, in Berendsen's a company with over 100 years' history, though examples elsewhere illustrate that service innovations could also come from not-for-profit organisations and social enterprises (Martin, 2016).

There remain questions regarding how such innovative modes of service provision become the norm, the examples above highlight the role of the media and mobile applications to provide exposure for these services, and the infrastructure to connect consumers to local service providers. There are also questions regarding the impact *Re-locating* might have on water demand that highlight an ongoing role for water companies. For example, Pullinger *et al*. (2013) found that outsourcing occurred in parallel with domestic water use thus there are questions regarding whether outsourcing reduces, displaces, or adds additional demand for water services that are as yet poorly understood. Water companies are well positioned to gather data on such patterns of water use, and academics to analyse with regards to complex and dynamic social practices, suggesting further avenues for collaborative research. However there is also a role for the regulators to create space for such research, as the findings in Chapter 6 suggest this is atypical of research undertaken in the water sector at present.

8.3. Discussion

This chapter completes the response to the third objective of this thesis; developing conceptual understandings of how water efficiency might otherwise be designed to reduce domestic water use and thereby reflects on what the findings from this thesis offer to conceptual discussions of governing social change. The initial discussions identify that conventional demand management is complex and multifaceted, incorporating diverse and sometimes contradictory accounts of agency and responsibility, and various targets for intervention. Three perspectives on governance are identified: *Upstream Balancing*, interventions in the supply infrastructure designed to counter rising demand; *Water Efficiency*, those that aim to reduce water use in homes and businesses; and *Big Water Efficiency*, a hybrid of the previous two that risks embedding the limitations of both. Collectively, these three perspectives emphasise traditional dichotomies which inhibit discussion regarding the governance arrangements that might be involved in influencing the "collectively shared elements" (Gram-Hanssen, 2011, p. 75) to support sustainable patterns of water use. Moreover, these perspectives on demand management treat

demand as an inevitable feature of the water management puzzle and ultimately risk reaffirming social-technical-ecological assemblage that supports unsustainable demand (Geels *et al.*, 2015).

Observations similar to these have been made of policy and intervention in other sectors, including transport (Watson, 2012, Spurling and Mcmeekin, 2015) and energy demand (Strengers, 2012, Shove, 2014), and in each case have been used to develop alternative avenues for intervention. Yet to date, such research has had little to say about the governance arrangements through which these might be achieved (Strengers and Maller, 2015b). This chapter uses the empirical findings from research in the water industry to contribute to such a discussion, outlining three alternative perspectives on the process involved in steering demand: *Re-designing*, which seeks to replace existing elements and practice with those that support less intensive patterns of water use; *Re-attuning*, which seeks to reconnect patterns of water use to local socio-ecological characteristics; and *Re-locating*, which challenges the domestication of water services. The discussion elaborates on the goals and targets of intervention, the means by which they may be achieved and the coalition of actors that might be involved in such processes.

Each of the three perspectives describe distributed forms of governance and alternative targets for intervention; "a situation of diverse multiple governors [that] does not exclude large-scale government action, but it includes and emphasises diverse agents and activities aimed at different domains" (Schatzki, 2015, p. 28). *Re-designing* emphasises the practices of designers, manufactures, retailers and the media – all of whom are presently involved in bringing products to market that shape water use – and considers how they might contribute to producing less water-intensive futures. *Re-attuning* emphasises a similar array of professional practices involved in the design of decentralised water supply systems, but also those who might be involved in renegotiating consumer expectations, such that these systems are not simply incorporated into existing practice, and those who might facilitate interactions between water, water systems and water users that enhance sensitivity to socio-ecological needs. *Re-locating* emphasises businesses and entrepreneurial practices that might deliver innovative models of water service provision and the network of professions involved in supporting and popularising new service systems. This is a diverse and eclectic mix of new participants in the water demand management agenda and a distinct departure from the common provider-regulator-consumer triad (Moss, 2009).

Whether deliberately or not, these actors are already involved in producing and reproducing patterns of water demand, but their movement into the demand management arena does not signal an exit for conventional actors. Thus perhaps what this research suggests is that it is the water industries turn to intermediate rather than govern; to broker connections and initiate dialogues; to facilitate the distribution of understandings and skills; to aid the negotiation of different interests; and to support innovations. These are complex processes, particularly in the context of increasingly rapid change and extensive uncertainty, and are likely to require co-ordination to be most effective (particularly given local variance in hydro-social characteristics). However the findings in Chapter 4 emphasise a need for co-ordination to remain sensitive to diversity and to promote rather than stifle creative development of interventions. The water companies are also well positioned to observe change over time, though Chapter 6 highlights a need for more diverse systems of evidence and appraisal. Thus, there are various roles for both water companies and regulators incorporated within these reconfigured governance arrangements.

Further, suggesting that consumers are not the principle possessors of responsibility and agency does not mean there is no space for them in demand management. Indeed, for any intervention to be successful it must be integrated in everyday practice and that requires the involvement of water users (Van Vliet *et al.*, 2005). Each of the discussions above implicitly suggest a role for water users; *Re-designing* highlights a need for inclusive and experimental design procedures in which user feedback is crucial for the development of robust alternatives; *Re-attuning* describes a participatory process where practices are reacquainted with water via interaction with socio-technical and socio-ecological systems; and for interventions under *Re-locating* to succeed they are must rely on the patronage of water users, and like *Re-designing* require services to be designed with users in mind. These processes of participation are essential yet differ from conventional models in which consumers feature in the development process through consumer research (Browne *et al.*, 2013) and in the imaginations of policy- and decision-makers (Sharp *et al.*, 2015).

There is no guarantee that these alternative governance arrangements will contribute to the reduction of domestic demand. However, as each approach is deliberately designed to unsettle existing patterns of demand, it seems reasonable to suggest that continuation at least becomes less likely. In the short-term, we might speculate that such changes will

introduce alternative practices of water use to exist alongside existing practices, as each line of intervention aspires to recreate the systems of socio-material elements that shape water use. Over time, these alternative practices might become commonplace, particularly as each process describes efforts to accelerate their propagation and to degrade and devalue existing configurations of collective elements. Consequently, while such interventions are unlikely to result in momentous disruption of existing patterns of water use (and none of the approaches described suggest infringing on water supply), they stand to reduce domestic demand by creating new normalities and reconfiguring experiences, expectations and materialities to support these.

8.4. Conclusion

This chapter concludes the research undertaken in this thesis, reflecting on what the findings contribute to a discussion of managing social change that has both academic and practical applications. While largely speculative, the discussions in this chapter are grounded in the empirical research carried out for this thesis and resonate with progress in the critical literature. The three perspectives on intervention described are not intended to be prescriptive, but to encourage open-ended discussion regarding what future interventions might look like and how they might be achieved to sustain a critical conversation ongoing in both academia (Browne, Medd, *et al.*, 2014) and industry (Waterwise, 2015a). Throughout this thesis, parallels have been drawn with other sustainability agendas, from energy demand management and retrofitting, to transport, sustainable food and renewables. Research from these fields has contributed to that undertaken in this thesis and, therefore, developments inform the discussions presented in this chapter. Consequently, there are potentially transferrable understandings for management agendas in other regions and substantive contexts, both in the critique of conventional initiatives and the suggested alternatives.

The principal contribution of this chapter is to demonstrate how reframing demand management as a way to engage in the collective context from which existing patterns of resource use emerge extends the options and possibilities for intervention. With this extension of the demand management agenda come questions regarding the systems of governance that might contribute to shaping everyday life that have as yet received limited attention within the practice literature. In response to such questions, each of the three avenues for intervention described in this chapter depict a distributed mode of

governance through which these forms of intervention might be enacted. All three require the participation of an array of professions and industries, many of whom are already involved in shaping demand at present – albeit largely unintentionally – and therefore these discussions present an effort to deepen our understand of how these various actors might be incorporated in strategic management activity. In addition each alternative perspective considers the ongoing contribution of water companies, water users and the water industry in these governance systems, as while each distributes responsibility and agency further than conventional management approaches, this does not exclude the involvement of conventional actors, and indeed depends on their participation. Thus, this chapter provides a perspective on governance that supposes the capacity for social change lies within the ongoing reproduction of collective elements and practices and considers the processes and practices entailed in reducing domestic demand.

9. Conclusion

Amid concerns regarding climate change, population growth and changing patterns of ordinary consumption, decision makers are increasingly looking for approaches to manage patterns of resource use, in order to balance supply and demand. This is the case in the water industry, but it describes a familiar trend in sectors such as energy, transport and food. In response, a growing body of literature seeks to contribute an understanding of the social world that might inform policy and management practices. This research joins these discussions; using the notion of 'collective' throughout to break from the individual-centric framings of demand and draw attention to the more-than-individual elements and processes that shape patterns of everyday water use and water management. Two original case studies evaluate the extent to which non-conventional water efficiency initiatives engage with the collective elements of everyday consumption in the areas they target. A further case study investigates how demand management activities are shaped, sustained and suppressed by the routine practices within the water industry, providing a unique insight into collective elements that structure professional practices of managing demand. Finally, the findings from these three case studies are used to initiate a dialogue between critical research and demand management practitioners to identify approaches for future intervention and outline the processes and coalitions of actors involved in their achievement. To conclude this thesis, this final chapter returns to the objectives presented in Chapter 1 to summarise the key contributions, implications and limitations of this research and identify avenues for future enquiry.

9.1. Addressing objective 1

To evaluate the extent to which recent developments in water efficiency further the contribution of demand management to long-term sustainable water management.

In response to the first objective of this research, Chapters 4 and 5 present two original case studies. They differ in style and approach, and the specific research implications are discussed in each chapter, yet between them there are two important implications to highlight. Firstly, these case studies contribute to the understanding of the collective context of everyday water use, identifying opportunities and possibilities for demand management. Chapter 4 focuses on Swindon – the location of the UK's first 'whole-town' approach to water efficiency – and unravels how *expectations*, tacit notions of the services water provides in everyday life and the distribution of responsibility for

achieving these services; *experiences*, how people come to understand these services through everyday interaction with people and water supply systems; and *materialities*, the physical manifestations of socio-material systems in bodies, homes and worlds, shape domestic water use. Each of these shape water demand, influencing how, when and for what purpose water is used yet are beyond the immediate control of water users. Chapter 5 pushes these ideas further, focusing on a small-scale initiative in towns along the river Kennet to explore how people's everyday experiences of water, both in the home but also in the river, shape expectations, and are sculpted by the socio-material systems in which demand participates.

These are substantive empirical contributions to the literature that illustrate how demand is produced and sustained throughout everyday life, emerging from social, material and natural elements over which individual water users have limited control (Shove, 2010). In particular, the case studies push beyond the conventional study of the home; demonstrating how demand co-evolves with patterns of employment, childcare and leisure. Chapter 4 highlights how demand is produced in these relational spaces; revealing the implications of the ongoing churn of social practices (such as hair care and home making) and those of professions and industries (e.g. employers and designers), for how water is used. The *Care for the Kennet* case study (Chapter 5) reveals how the relationships between domestic practices and socio-ecological systems are mediated by the actions of a diverse web of professions involved in catering for individual lifestyles (from urban planners to the entertainment and leisure industry). Thus the findings reveal a diverse range of actors whose professional practices, intentionally or not, have consequences for domestic water use.

These findings have important implications for both theory and practice. First they call for an extended discussion regarding the implications of professional practices beyond the typical consumer-supplier-regulatory triad, not only for intermediating policy objectives (Moss, 2009), but for shaping patterns of everyday consumption. Second, they suggest these professions have a role to play in managing demand and that there remains a challenge as to how these professions might be engaged in water demand management, such that they might contribute to governing sustainable consumption. These are complex interdisciplinary challenges that seem likely to benefit from academic-industry collaborations.

In addition to these investigations, Chapters 4 and 5 include an evaluation that seeks to understand the extent to which the case study initiatives engage with the identified collective elements of demand to reduce domestic water use. The two case studies illustrate the diversity of water efficiency; and show how advances are being made that extend the reach of initiatives to engage larger populations and the depth of initiatives to bring about social and cultural change. However, the findings also demonstrate that there is a tendency to replicate conventional forms of demand management activity in otherwise innovative interventions. This is particularly the case for *Save Water Swindon*, which, despite making remarkable advances in engaging consumers, continues to prioritise domestic retrofitting and attempts to incentivise behaviour change at the expense of efforts to engage with the collective context of water use. Where substantively different interventions are made (such as is the case in *Care for the Kennet*), they are peripheral features of the demand management agenda, complementing conventional water efficiency measures rather than offering an alternative.

This should be a concern to the water industry in particular as these findings also suggest that conventional demand management activities risk reaffirming expectations, experiences and materialities that pose obstacles to water efficiency and therefore sustain intensive patterns of water use. These findings complement a now extensive critique of conventional demand management activities that illustrates the limited opposition posed to the prevailing social and material influences on domestic water use (Chappells and Medd, 2008, Shove, 2010, Browne, Medd, *et al.*, 2014). Consequently, such activities fall short of delivering the anticipated savings (Macrorie *et al.*, 2014) and fail to substantially alter the trajectories of demand (Marres, 2011). Further, while some have argued that there is a place alongside conventional activities for practice-based interventions (Strengers and Maller, 2015b), the risk of reaffirming unsustainable practices suggests that this may not be the case and more radical forms of demand management activity are urgently required. This is perhaps less true of retrofitting, where extending activities to include deeper interventions into the material design of homes may unsettle unsustainable domestic practices.

While the findings in these chapters support the considerable body of research that illustrates how collective elements structure everyday action, the conclusions are arrived at from a novel angle. This research has refrained from following a pre-existing framework, instead using the broader notion of collectives to guide the analysis. Despite

there being numerous practice-inspired frameworks (Gram-Hanssen, 2010), each of these emphasises slightly different aspects of everyday life and thereby disguises others. In both case studies, the initial findings are used to frame the evaluation; an interpretive approach that allows the insights from existing research to be sensitively grounded in empirical research. This approach was considered best suited to the research objectives as even though practice theories have been applied to questions of water demand (e.g. Browne *et al.*, 2012, Strengers and Maller, 2012, Browne, 2015, Sharp *et al.*, 2015), they have a longer history in energy and mobility studies that potentially limit their transferability. Further, the other literatures that contribute to this research accentuate elements in the case studies that are less present in practice-based discussions (most evidently the more-than-human)(Kaika, 2005, Lane *et al.*, 2013, Whatmore, 2013). Thus, the interpretative approach taken presents a more open-ended investigation into the collective elements of water use, allowing themes from within the data to guide the analysis and therein assists ongoing theoretical interrogation and development.

These are two case studies and therein lies one potential limitation of this research, as generalisability in the positivist sense is not a principle quality of case study research (Flyvbjerg, 2006a). These studies were selected as they are major components of one of the UK's largest water companies' water efficiency measures and they are recognised both in the academic and industry literature as pushing the boundaries of demand management. The interviews carried out in the latter stages of this research served to validate the analysis and provide a broad understanding of ongoing projects across the water industry. Further, the resonance with existing research strengthens the empirical observations. That said, one possible avenue for future research would be to situate these findings in a review of water industry activities or demand management activities in different sectors and regions. This would enable an understanding of the extent to which these findings represent progress further afield. It would also be interesting to understand if, and how, management practices travel across sectors and regions and a study with a broader scope may provide the basis for such an analysis.

9.2. Addressing objective 2

To investigate how demand management activities are shaped, sustained and suppressed by the routine practices of water management.

Chapter 6 responds to the second objective of this thesis, providing a unique empirical investigation of the professional practices involved in managing demand, following the findings in Chapter 4 and 5 that raise important questions about how certain modes of intervention are popularised and how they persist. Questions such as these have received limited research or discussion within the literature, yet are vital to understanding how to unlock practices of governing and managing change. The discussions presented challenge the typification of demand managers as decision-makers, which is as common in practice theory as any other, instead suggesting that demand managers are strategic actors involved in the assembling of heterogeneous elements in the course of their professional routines. Thus, 'demand managers' are arguably an analytical construct that, while useful in certain discussions, disguises the complex processes involved in translating and implementing policy.

The findings presented in Chapter 6 are consistent with Gram-Hanssen's definition of practices as "collection[s] of sayings and doings performed by individuals but formed and sustained by collectively shared elements" (2011, p. 75) presented in the literature review. They illustrate how various socio-technical aspects shape the outcomes of water management both in the Water Company setting, the water industry and in society. Thus, these discussions provide an extension of practice-based research beyond the domestic sphere to understand policy and management practices. Such an extension is potentially useful not only for discussions related to water, but for broader considerations of the governance of social change, with applications in any industry or sector involved in sustainable consumption. Specifically, the discussions draw attention to a range of socio-technical elements that constrain the range of possible options for interventions. Such elements include industry values, systems of evidence and appraisal, partnership models, and the hydro-social context in which demand management is situated.

The implications of these findings for subsequent research are profound, as they suggest that simply offering alternative framings of demand and demand management is insufficient to elicit change. Subsequently, for policy makers, demand managers and academics, the findings suggest a need to develop more inclusive processes of collaborative working that favour open-ended experimentation. The findings also suggest a need for further research to understand how the processes of evidencing and accounting for water demand management might better accommodate complex interventions. These are not simple tasks and outline the basis of a research agenda to understand how the

collective elements of professional practice might be redesigned to facilitate the diffusion of alternative forms of demand management. These are rich interdisciplinary areas of research that seem likely to benefit from academic-industry collaboration. Consequently, these discussions add weight to the call for industry-academic collaboration presented in Chapter 3, and suggest various problems this research might address in order to provide the "realistic, context-specific pathways to a sustainable future" (De Fries *et al.*, 2012, p. 603) that are sought.

A final reflection in this section is on methodologies and how this research might have been done differently. The fieldwork behind Chapter 6 uses mixed methods including interviews, documentary analysis, and observation at industry events and proceedings. This was an invaluable opportunity to investigate a novel research question that was more a proof of concept than a comprehensive investigation. However research elsewhere highlights the value of ethnographic methods, observation and augmented talk-based methods (such as walking interviews or narrated performances) in accessing such complex questions (Nicolini *et al.*, 2003, Wagenaar and Cook, 2011, Wagenaar and Wilkinson, 2013). There was limited opportunity for such methods and they would likely have been highly resource-intensive given that water companies are spread across the country. Alternatively, it may have been possible within a single company, however this would have presented a very narrow case study. The chosen research design allowed a broad analysis encompassing various people involved in water demand management within and beyond the water companies. The research undertaken thereby establishes a case for considering the practices of managing demand, and a strategy to inform further research – either in the water industry or elsewhere – were it to be undertaken. Thus, a potential avenue for future research would be to extend the present study to gain a deeper understanding of the nuances of each element identified and the similarities and differences between water companies, given their different regional hydro-social characteristics and departmental structures.

9.3. Addressing objective 3

To develop both practical and conceptual understandings of how water efficiency might otherwise be designed to facilitate lower levels of domestic water use.

Chapters 7 and 8 build on the findings of the previous chapters to respond to the third and final objective of this thesis. The previous chapters each contribute to an

understanding of how future interventions might improve upon conventional demand management activities to reconfigure unsustainable practices. Thus the latter chapters of this thesis shift from critical evaluation to solution-orientated discussion that considers the practical and conceptual implications of the research.

Chapter 7 describes and analyses the proceedings from a pair of 'practice innovation workshops' (refer to Chapter 3) that aim to develop a practical understanding of what interventions in the collective context of demand might look like with those who might be involved in their implementation. The analysis demonstrates how invoking a creative space enables the reframing of intervention to identify a series of options and possibilities that radically differ from existing water efficiency activities. Each imagined initiative reframes the targets of intervention in order to influence emerging versions of normality in an effort to unsettle unsustainable practices (Spurling and Mcmeekin, 2015). Rational decisions of consumers and household technologies fade into the background as attention shifts to the various social, material and natural elements that contribute towards domestic water use. Interventions shift from passive appeals for behaviour change and tweaks to material efficiencies towards active efforts to contribute to deep reconfiguration of routines. This is an original contribution to the literature on demand that visualises alternative forms of intervention. In addition, these workshops provide a supportive space for learning and collaboration, in which demand managers might reflect on existing management practices and possible futures (Davies *et al.*, 2012) and researchers might develop new avenues to explore. For instance, throughout the workshop discussions, there developed a critical reflection on the processes of governing change and roles and responsibilities of professionals implicated in future demand management that extended beyond the generalised accounts present in the literature.

Building on these findings Chapter 8 consolidates the developments made throughout this thesis to contribute to a discussion regarding the processes of steering change in patterns of water use. Spurling and McMeekin (2015) argue that bridging the gap between policy, practice and theory is difficult, but vital for their mutual development. Very recently researchers have sought to elucidate what practice theories offer to conceptual understandings of governing social change (Strengers and Maller, 2015b, Vihalemm *et al.*, 2015) and Chapter 8 reflects on how the findings within this research contribute to such a discussion. Three new perspectives on intervention are proposed that reconceptualise the processes of governance, reframe the goals and targets of

intervention and describe the means by which these might be achieved and the coalitions of actors involved. These are not the stylistic conceptual discussions common in social theory, as the analysis undertaken throughout this research leads these discussions to be centred on nuanced practical details. Nonetheless, these provide rich insights based on in-depth empirical research with consumers and demand managers and thus incorporate elements of both concept and messy reality to consider what the future of water efficiency might look like.

Recent evaluations of transdisciplinary research suggest that the inclusion of stakeholders in critical research benefits both research and application (Panda and Gupta, 2014). For example involving stakeholders in visualising future scenarios enhances the acceptability of research outcomes (Schmitt Olabisi *et al.*, 2010), aids the development of participants' capacity for nexus thinking (Davies *et al.*, 2012), and can provide orientation and guidance for intervention (Quist *et al.*, 2011). Further collaboration between academic and non-academic partners adds critical nuance to the research, providing an opportunity for testing and developing critical theory whilst also enhancing the application of research (Mauser *et al.*, 2013). The research contained within this thesis supports these observations. Chapter 3 outlines a methodology that incorporates Thames Water, the CASE partner, and other stakeholders in the research design to ground concepts and ideas from a range of social science disciplines in empirical data. This methodology aids the investigation, elucidating the social, economic and geographic conditions that influence the design and implementation of interventions in the water sector. Further extending participation beyond the immediate CASE partner enhanced the application of the research findings; pushing the analysis beyond critique to identify and interrogate possible avenues for intervention situated in consumer-focussed empirical research.

In order to develop this research further, future studies might replicate similar workshops with a broader network of collaborators. In this instance, focusing on water companies enabled an unconstrained discussion to take place in a supportive environment and allowed participants to situate their discussions in their diverse experiences within the Water Company setting, consistent with the research undertaken in Chapter 6. Further permutations of these workshops could involve partners such as those described in the imagined initiatives (e.g. designers, the home improvement sector, the media, the hair and beauty industry) to continue these discussions and, potentially, to develop actionable interventions. Alternatively, they could incorporate policy makers and regulators as such

workshops could generate an empathic space in which the policy mechanisms to support such activities might be designed. Finally, they could also be used with stakeholders in other sectors to explore parallel questions in other regions and substantive contexts.

9.4. Concluding remarks

Overall, this thesis contributes to ongoing discussions regarding how resource intensive patterns of demand are produced and reproduced by shared and collective elements. The research extends these discussions to respond to questions regarding how the water industry might develop mechanisms to steer demand. The approach taken demonstrates the vitality of practice-based enquiry in providing deep analytical detail to expand upon complex processes that sustain everyday consumption and identify avenues for intervention. Supplementing the analysis with ideas from a variety of social science disciplines and working alongside the water industry, facilitated by the CASE studentship, extends considerations beyond the confines of domestic practices typical of practice-based research. Subsequently this research offers contributions to policy, practice and theoretical developments as it explores the intersections between demand and professional practices and local environments, evaluates interventions, examines practices of demand management, and unravels the possibilities for future intervention.

The principle contribution of this thesis is to propose the notion of collective as a transdisciplinary tool to unravel the context of domestic demand and to inform intervention. The research undertaken demonstrates the application of this term to interpret empirical findings from consumer- and industry-oriented fieldwork related to water demand, and draw together concepts and ideas from various social science disciplines to understand their implications. It is thought likely that ideas within this thesis would contribute to understanding socio-environmental challenges in other resource sectors or geographic regions. However critical examination of the themes identified in this research would be needed to identify synergies and inconsistencies across these different contexts. For example, the discussion of more-than-human landscapes (Chapter 6) is likely to take on different qualities when considering energy systems, particularly renewables where the themes identified in this research might offer a means of unravelling issues of public acceptability and patterns of energy use as they relate to everyday experiences of socio-technical systems. Further, the notion of collective provides a lens for evaluating interventions that better reflects the complexity

of socio-technical life than conventional methods of appraisal (see Chapter 6). This research shows that moving beyond the scope of existing water efficiency activities is challenging in the water industry, as the risks associated with failure stymie experimentation. Therefore, thinking in terms of collective aspects of everyday water use offers a broader evaluative lens, providing a structured approach to learning-by-doing considered a necessary feature of transition experiments (Farrelly and Brown, 2011). Thus, there are various avenues for future research where the transdisciplinary approach contained within this thesis could usefully contribute, both within academia and industry.

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Appendix A: Sample focus group transcript with coding

Appendix B: Focus Group information and consent sheet

Further Information

This information sheet is designed to provide further information and answer any questions you might have about attending discussion groups. Your participation is entirely voluntary and before you decide whether or not you would like to take part, we appreciate that it is important for you to understand why the research is being done and what it will involve. The following information will give you a brief overview of the project, hopefully providing you with everything you need to know to decide whether or not to take part in the research. If you would like to take part, or if you have any questions, please get in touch with the researcher, Claire Hoolohan on +44 (0)161 2754330 or by email claire.hoolohan@postgrad.manchester.ac.uk.

Kind regards,
Claire Hoolohan

Who is running this research?
This research is organised by a researcher, Claire Hoolohan, from the University of Manchester as part of a doctoral project titled 'Evaluating initiatives for sustainable water consumption'.

What is the purpose of the study?
To how different activities around water engage communities and to understand whether participation impacts upon the value and use of water in everyday life.

What would I be asked to do if I took part?
This research is based on group discussions carried out in an informal session at a local pub, drinks and snacks will be provided. The session will last for two hours timed to fit in with you day in order to make the session as convenient as possible.

You will not need to have any prior knowledge of the discussion topics in order to participate as they will be organised around simple, entertaining activities designed to help you think about the way water is valued and used in everyday life and how participation in various activites might have altered this.

Who else will be there?
This invite has been sent to all members of ARK's volunteer network. Once we have gauged interest and number of responses a group of 6 - 8 volunteers will be selected to attend each discussion group.

This Project has been approved by:
University of Manchester Committee of the Ethics of Research on Human Beings

Will my taking part be kept confidential?

The discussion groups are carried out in accordance with the Data Protection Act 1998 and have been approved by the University of Manchester's committee on the ethics of research on human beings. The session will be recorded and later transcribed for analysis but your name will not be attached to anything that you say.

What's in it for me?

Drinks, snacks and lively conversation plus an opportunity to learn more about and contribute toward a stimulating and informative debate about the impacts of sustainable water initiatives taking place in your local area. Oh, and a £20 shopping voucher as a thank you for your time.

Do I have to take part?

No, it is up to you whether or not you take part. If you do decide to take part you will be asked to sign a consent form and are free to withdraw from the focus group at any time. However it is worth noting that, as the data is transcribed anonymously in order to protect your confidentiality, it is not possible to withdraw your contribution after the focus group is complete.

What next?

Hopefully this information sheet will provide you with everything you need to know to decide whether or not to take part. If you would like to go ahead, or if you have any further questions, please get in touch with Claire Hoolohan on +44 (0)161 2754330 or by email claire.hoolohan@postgrad.manchester.ac.uk.

Other useful contact details:

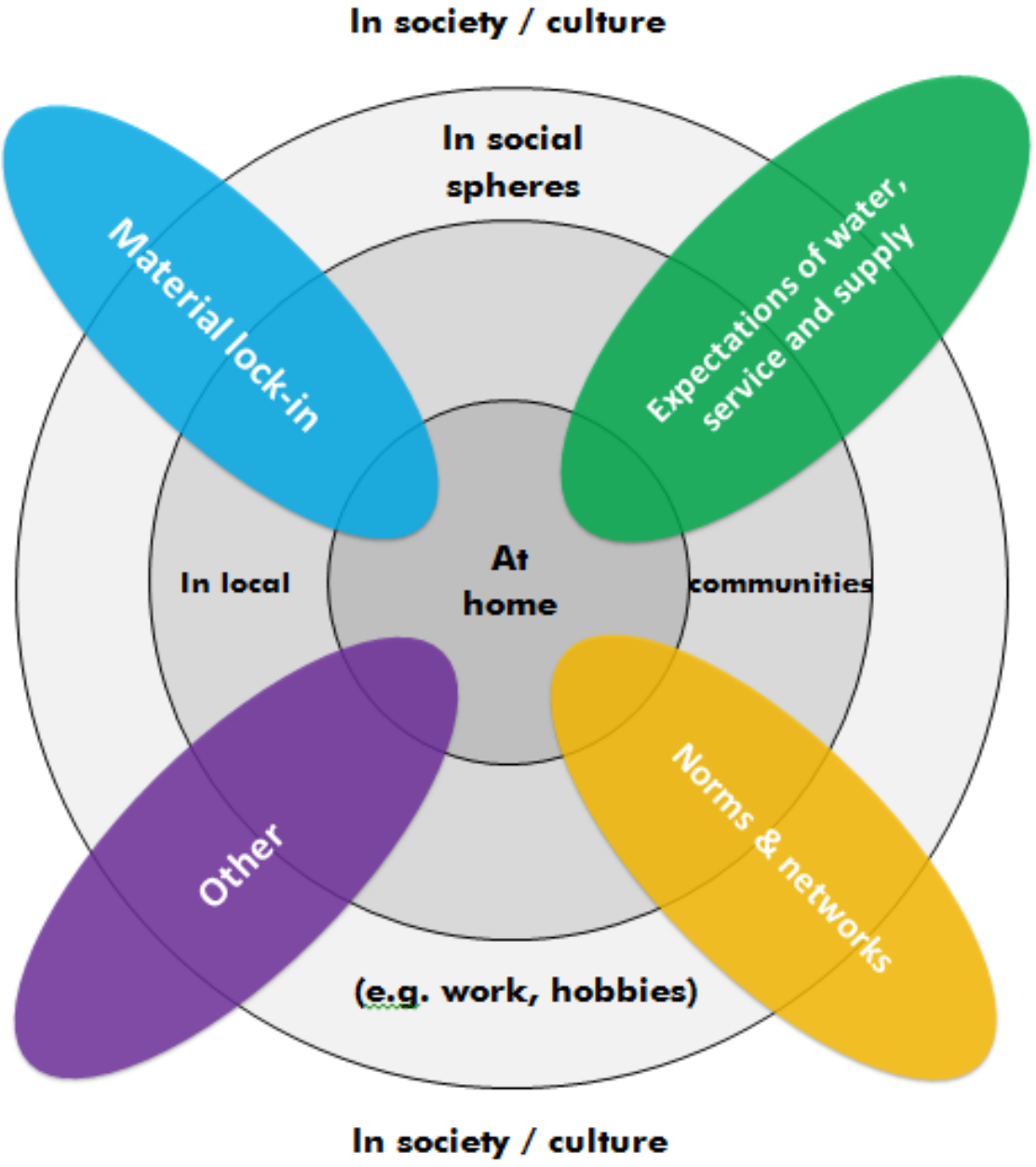
Dr Alice Bows (Primary supervisor)
Senior Research Fellow at the Tyndall Centre for Climate Change Research,
Pariser Building, University of Manchester, M13 9PL
Tel: +44 (0)161 306 3737
E-mail: alice.bows@manchester.ac.uk

At any stage, if there are issues that you would prefer not to discuss with members of the research team, please contact the Research Governance and Integrity Team by either writing to 'The Research Governance and Integrity Manager, Research Office, Christie Building, The University of Manchester, Oxford Road, Manchester M13 9PL'; telephoning 0161 275 7583 or 2758093 or emailing research.complaints@manchester.ac.uk

This Project has been approved by:
University of Manchester Committee of the Ethics of Research on Human Beings

Appendix C: Practice innovation workshop worksheet 1/3

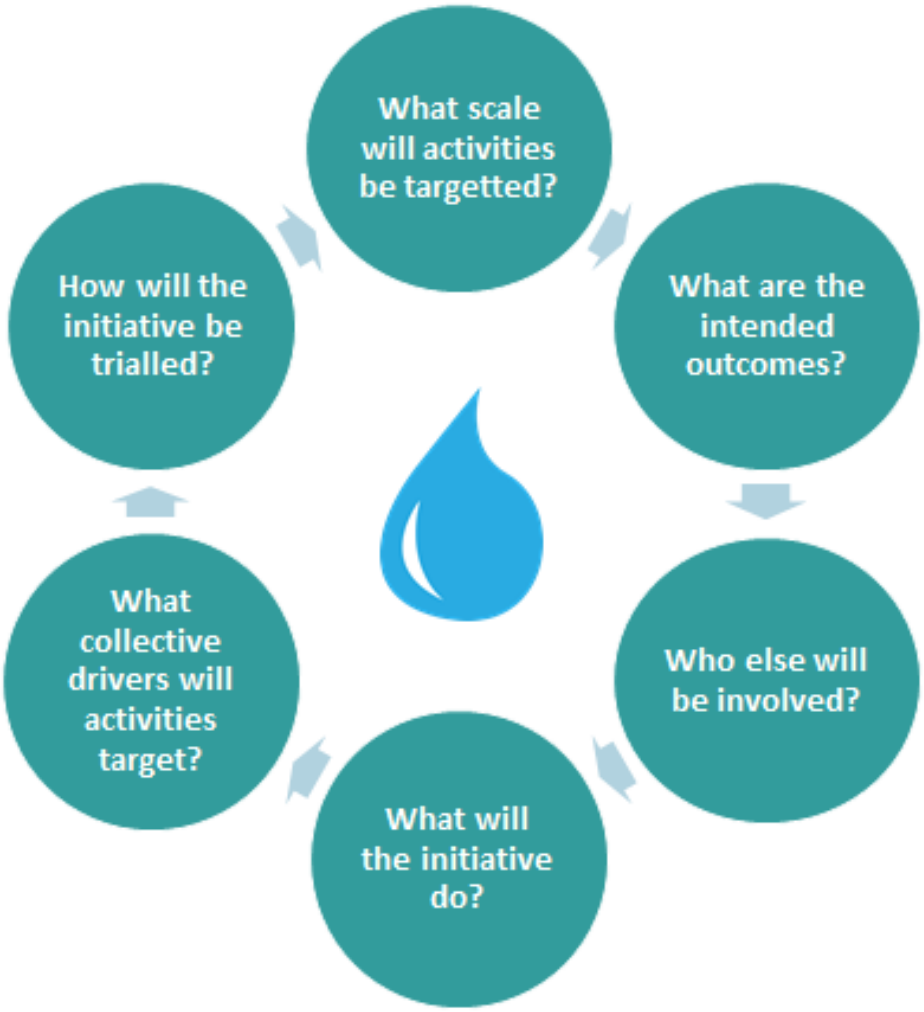
Mapping the drivers of behaviour



Tyndall Centre for Climate Change Research
Designed and facilitated by Claire Hoolohan, PhD researcher at the Tyndall Centre for Climate Change Research, University of Manchester with support from ESRC and Thames Water. Email: claire.hoolohan@manchester.ac.uk Tweet: @ClaireHoolohan

Appendix D: Practice innovation workshop worksheet 2/3

Design an initiative to reduce domestic demand



Appendix E: Practice innovation workshop worksheet 3/3

Evaluating the initiative

Tyndall Centre for Climate Change Research

Designed and facilitated by Claire Hoolohan, PhD researcher at the Tyndall Centre for Climate Change Research, University of Manchester with support from ESRC and Thames Water. Email: claire.hoolohan@manchester.ac.uk Tweet: @ClaireHoolohan