On the practices of managing demand in the UK water industry management

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Introduction

Contemporary research criticises the limited capacity of existing demand management strategies to provide the systemic transformations necessary to address complex socio-environmental problems. In particular simplistic models of consumer behaviour (Sofoulis, 2011, Sharp *et al.*, 2015) and supply-demand systems (Van Vliet *et al.*, 2005, Sofoulis, 2014) have been shown to limit the contribution of demand management activities toward policy objectives such as sustainability and resilience. In response several authors have attempted to reimagine and reconceptualise management practices (e.g. Strengers, 2012, Spurling *et al.*, 2013, Browne *et al.*, 2014, Shove, 2014), yet in the main, demand management remains resolutely invested in a narrow range of activities designed to curb consumption (Shove, 2010).

This raises questions regarding the dynamics of professional practice and calls for attention to how demand management strategies are shaped and constrained while potentially valuable alternatives are suppressed. To this end, this paper examines the routines of water efficiency managers as a case study of the everyday practices involved in implementing policy objectives. Our aim is to shed light on the socio-technical elements that shape demand management, and affect the process and outcomes of management activity.

Characterising professional practices demand management

Social sciences' turn to practice represents a fundamental shift in how action, stability and change are accounted for (Schatzki *et al.*, 2001, Welch and Warde, 2014). Macro-social processes and the deliberative actions of individuals are deprioritised, with emphasis instead placed on the continual ordering and re-ordering of society through repetitious activity (Schatzki, 2001, 2011). Building on Schatzki (2002), we may distinguish between 'practices-as-entities' and 'practices-as-performances' (Hargreaves *et al.*, 2013, Kuijer, 2014). The former referring to the 'block' of relational elements that collectively structure action (Reckwitz, 2002, p. 250), the latter to "the moment of doing in which the elements are integrated by people in specific situations" (Kuijer, 2014, p. 28). This distinction serves to highlight the continual co-constitution of practice and enactment, revealing stability and obduracy as the product of repetitious everyday conduct (Shove and Pantzar, 2005, Warde, 2005, Hargreaves, 2011).

While social practice theories (SPT) have been extensively applied to themes relating to everyday domestic practices, professional practices are under-researched. In theories of practice (ToP) more broadly, 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)), yet these have seldom been applied to questions of demand management. Recent research within the SPT literature highlights the significance of these professional practices; for example Yolande Strengers observes that there are two sets of practices vital to those who wish to transform demand; "the practices of demand management [...] carried out by demand managers; and the [...] practices that demand managers seek to change" (Strengers, 2012, p. 232). Likewise Shove *et al.*, (2015) explore how professional and domestic practices and co-constitutive of one and other, emerging within shared socio-technical contexts. We seek to contribute to this discussion exploring how the professional practices of

demand management are shaped and constrained and the consequences for management outcomes.

This paper builds on the research findings from a qualitative study of the Water Industry in England and Wales. A mixed method approach was used to explore how water companies practice water efficiency, carried out between January 2014 and April 2015. Twenty-one in-depth interviews were conducted with representatives from six water companies, each regulatory body and a number of other partner organisations and professionals working alongside the industry. These were supplemented with analysis of online materials, industry documents and regulatory guidance to trace the historical and political precedence of current practices, and to understand future visions and obligations where applicable. In addition observational methods covering conferences, workshops and other industry activities were undertaken to understand the everyday actions and interactions taking place in the name of water efficiency.

Case Study: designing and implementing water efficiency

The southern regions of England are amongst the most water stressed areas in Europe (Environment Agency and Natural Resources Wales, 2013) and demand for water is gradually increasing, a result of growing populations and changing patterns of use, particularly in urban areas where demand is already high (Brooks *et al.*, 2009). Furthermore there are growing concerns regarding supply security due to aging infrastructure and the likelihood of climate change resulting in increasingly volatile operating conditions. Consequently in recent years demand management activities are increasingly deployed alongside supply-side management to deliver a balance that is economically, socially and ecologically sustainable (Chappells and Medd, 2008).

Water efficiency has emerged as a specific set of practices within the demand management agenda. In a water company context, these activities focus on designing and implementing interventions to curb water use in homes and businesses. Water efficiency has been an ongoing project in the water industry for over 15 years, following amendments to the Water Industry Act in 1991 which made such consumer oriented management activity an obligation for water companies. The 2010-2015 planning period (PR09) saw the instatement of the industry's first formal water efficiency targets designed to accelerate consumer oriented activity and deliver changes aligned with industry visions. While these targets have now lapsed, progress is generally considered a success, with activities advancing from those of "a few dedicated enthusiastic champions in the water industry and academia" (Waterwise, 2015, p. 3) to a prominent feature of every water company:

> "many water companies are fully engaged in working with customers to deliver water efficiency […] We have seen a huge up-scaling of water efficiency since the last review in 2010 and a transformational step change since Waterwise was established in 2005"
>
> (Waterwise, 2015, p. 28)

Yet there are a number of patterns in water efficiency that provide points of departure to explore how practices are formed. The following sections observe a number of patterns in water efficiency, and explore the context in which they are situated to identify elements and processes have implications for the framing of water efficiency, and the activities that are undertaken in order to reduce domestic demand.

Retrofitting with a side of behaviour change

Current industry best practice prioritises the dissemination of 'gadgets' such as showerheads, cistern displacement devices and tap inserts with complementary activity focussed on providing the rationale and incentive for behavioural change, for example through information on bill and social media (Waterwise, 2015). Many water companies have websites to distribute such products for self-installation, however increasingly water companies are shifting towards a home makeover model undertaken by a professional installer as an opportunity to ensure technologies are fitted, and to provide an opportunity for direct engagement with consumers. To support conservation behaviour some water companies are also involved in developing smart metering programmes, or the dissemination of more low-tech shower timers in order that consumers can visualise water use, and the acceleration of metering and pricing in order to send out clear economic signal to support household decision making (Russell and Fielding, 2010).

However both industry and academic observers remain sceptical of the scope of activities and their capacity to elicit deep changes to the everyday patterns of water demand (Sofoulis, 2011, Browne *et al.*, 2014). Per capita demand remains high, averaging 147 litres per person per day while industry visions aspire to 120-130 litres per day (HM Government and Defra, 2008, p. 22) and research points towards a much wider range of activities that might be undertaken by water companies to engage with distributed nature of water demand that are as yet marginalised from water company management agenda (Browne *et al.*, 2014). For example Davies *et al.*, (2013) explore the potential for large scale technological, social and cultural change to facilitate alternative patterns of washing, these include measures to re-attune demand to rainfall, water-less technologies and 'water quotas'. On a different scale, Kuijer (2011)explores how different forms of washing, facilitates by alternative bathroom design and bathing technologies may decouple personal bathing from running water, thereby offering the potential to reduce water use. Finally Woelfle-Erskine (2015) identifies how rain water tanks create a space for new patterns of water use to evolve as their proximity and intra-active properties disrupt existing behaviours and open up previous normative understandings of water supply. Given the prevalence of such conceptual advances, which are not only limited to academia but spread into industry dialogue (see Hoolohan, 2015), how is it that water efficiency becomes so uniform?

There is an increasing emphasis placed on "achieving measurable water savings and delivering quality customer engagement" within the UK water sector (Tucker, 2014, p. 199). These core values fundamentally frame the actions that are undertaken in the name of water efficiency. Firstly, activities undertaken must not challenge, and ideally must contribute to, the achievement of "quality customer service". Consumer information campaigns, retrofitting and metering are framed as measures to manage affordability, increasing customer satisfaction and reducing complaints while simultaneously offering brand and reputational benefits for water companies by providing consumers with new technologies that are often installed for free. Furthermore these are weak forms of interventions that sustain existing business and governance arrangements. In contrast measures such rain water tanks have potential to unsettle pre-existing socio-material configurations, as ongoing maintenance requirements and ambiguity of ownership challenge accepted supplier-consumer relationships (Fam and Sofoulis, 2015, Fam *et al.*, 2015).

Secondly, activities must have a direct, quantifiable impact on water demand. Evidencing such impact is difficult in the water sector as metering remains far from universal. In 2013, only 40% of households were metered (Ofwat, 2013) and this number is substantially lower in some areas (e.g. Thames Water estimate 25% metering penetration in the London water resource management zone (Thames Water, 2014a). Consequently evaluations rely on bottom-up calculations, such as the standardised values provided in the *Evidence Base for Large-Scale Water Efficiency in Homes* (Waterwise, 2011)(see Box 1). Such calculations derive from existing data and methods (e.g. survey data, micro-component water use, and financial data) to derive the relative cost-benefit of interventions. The prioritization of such methods have implications for water efficiency, in particular they require activities to have discrete, quantifiable impacts that may be associated with the costs and distinguishable from investments in other areas, such as network management, leakage reduction and metering. Gadgets such as showerheads, tap inserts and cistern displacement devices meet these criteria providing clear evidence, even if only as an average measured saving, in order to estimate the benefit of water efficiency activities.

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

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

Box 1: formula to estimate cost-benefits of water efficient devices (adapted from Waterwise, 2011).

Sharing

Along with the drive for evidence based water efficiency there is increasing emphasis placed on collaborative research between water companies, as a means of disseminating best practice and providing an efficient means of implementing initiatives. Despite many activities being carried out independently tools and expertise are shared through conferences, workshops and other knowledge exchange events as well as research joint activities. For example in 2012, the water companies established the 'collaborative fund', a means of collectively funding research that would benefit the water industry as a whole. In particular the funding was earmarked for research that improves the industry's knowledge of the impact of water efficiency interventions and fills knowledge gaps and feeds into Water Efficiency Database curated by Waterwise. Projects to date have included research exploring showering behaviours[1], assessments of 'leaky loos' and design of strategies for their repair, and a review of the existing evidence base for water efficiency.

The circulation of meanings, experiences, skills and resources within these collaborative groups engenders uniformity in management practice, supporting accepted understandings of best practice and undermining alternatives. For example, there is a near universal application of the 'ABC' approach (Shove, 2010) in water companies' consumer facing communications, evident in the pervasive use of phrases such as "using water wisely" (e.g. Thames Water, n.d.) and the prevalence of 'top-tips' on websites (Wessex Water, 2015) and in planning documents (Yorkshire Water, 2014). This rhetoric reinforces certain forms of management practice at the expense of others, prioritising actions such as raising awareness of water scarcity to justify behaviour change, providing information regarding water efficient devices as ease their uptake, and providing shower timers and comparative bills to incentivise change (see Table 1). Such notions are infused with discourses

[1] https://www.unilever.co.uk/news/press-releases/2011/uk-sustainable-shower-study.html

around consumer sovereignty and rational action, assumptions which derive from pro-environmental models of consumer behaviour and while demand managers understand the imperfections in these notions they are engrained in water efficiency, rendering the activities undertaken by different water companies uniform (see Table 2).

Table 1: Comparative of water company water efficiency activities 2010-2015

Water efficiency in 2010 Adapted from (Waterwise, 2010)	**Progress in 2015** (Fieldwork observation)
Water company websites have water efficiency sections where they customers tips and facts on water efficiency.	Websites remain a key source of information now incorporate self-auditing tools in the form of interactive calculators and surveys.
Water companies offer free-of-charge cistern displacement devices and other water-efficient products [...] promoted through company magazines, inserts in bills and both company and partner websites.	All water companies now offer a range of water efficient devices promoted through mailing, websites and the media. Most companies are moving away from self-install models toward professional home-makeovers delivered by a partner organisation.
Most water companies offer schools information about water efficiency. Some have education centres whereby local schools can plan a visit.	Several water companies are involved in edu-tainment initiatives (e.g. Little green riding hood) while others engage children in monitoring of school water use.

The flip-side to collaboration is that without critical reflection, consensual knowledge and skills risks closing down valuable discussions regarding the potential scope of water efficiency activities, endorsing investment in incremental improvement at the expense of innovative developments. Table 1 illustrates how water efficiency has accelerated over the last 5 years without significant alteration of the fundamental framing of management practice, despite the growing body of research calling for change. Research illustrates how divergent, playful experimentation throws open assumptions that underpin existing practice, and extends the boundaries of possible management activity, as well as creating the potential space to develop new tools and methodologies. Methods such as action research (e.g. Jack, 2013) and participatory design (e.g. Davies *et al.*, 2012, Kuijer and de Jong, 2012), and design workshops (Hoolohan, 2015) provide such opportunities however have limited application at present in the water industry. The lack of such creative, critical space and the limited engagement with intermediaries and consumers leads to the permeation of a narrow range of demand management practices and marginalises potentially valuable alternatives.

"Supersizing"

A further trend apparent in water efficiency is a discourse of 'supersizing'; a 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)

This process, derived from engineering, involves developing 'pilot' initiatives in which to develop actions and implementation processes in order that an initiative may be scaled-up to a larger population. One popular permutation of this is the whole-town approach, e.g. Save Water Swindon (Browne *et al.*, 2014), a process that targets a geographically defined region for home retro-fitting

for a defined period of time. The purpose of this is to develop the most efficient and effective process for delivery, for example by testing messages that maximise uptake of home makeover requests, and to reduce resource intensity of installation by concentrating activities.

Again, academics are critical of this trend, for example Fam et al. (2015) describe scaling up as a "technocratic fantasy" that avoids the site-specific and person-specific complexity of demand management. The core critique is two-fold. Firstly scaling-up obscures the individual complexity of domestic demand – disguising it as a series of average behaviours that fails to elucidate the context specific nature of domestic practice (Sofoulis, 2011). Despite research that reveals the extensive heterogeneity of individual patterns of water use (e.g. Chappells *et al.*, 2011, Browne *et al.*, 2013), scaling up relies on a flattening of variation in order to provide universal, generic messages to an "imagined average consumer" (Fam *et al.*, 2015). Secondly 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). This underestimates the amount of work undertaken to identify potential partners and intermediaries, to broker connections and to develop responses fit for specific institutional and environmental arrangements.

For water efficiency scaling up also reduces the scope for management activities that are attuned to the specific supply-demand characteristics of different cities and regions. By focussing exclusively on the household, water efficiency activities are inhibited from attending to the distributed infrastructures (Makropoulos and Butler, 2010) and technologies of demand (Browne *et al.*, 2014) that shape the circulation of water in society, and thereby reduced in their potential for reconfiguring everyday practices of water use. The literature on water sensitive cities demonstrates the potential approaches that fit with the specific supply-demand context, for example by re-using seawater or greywater (either domestic or industrial) for non-potable functions (Ferguson *et al.*, 2013, Bell, 2015). These alternative water systems require bespoke management activity. In an alternative example, Hoolohan and Browne (2016) describe how management agenda expands with benefits to demand reduction when considering the broader context to water use. An example of a uniformed worker is offered, whose work environment and dress codes combined with the assumption that uniform washing will occur at home necessitate large volumes of on-demand washing in order that the workforce are turned out to their employers expectations on a daily basis. There are numerous potential ways to intervene in this ranging from changing the colour of uniforms, relaxing aesthetic standards, or installing workplace laundry facilities such that the high volumes of uniform may be laundered effectively. The scaling-up of management is insensitive to these heterogeneous socio-material conditions and poorly equipped to intervene, thus the opportunity for water saving is reduced. Instead generic messages regarding filling washing machines are used in the hope of changing laundry practices.

Reacting

A final critique of water efficiency is its propensity to react to drought rather than prepare for it which has implications for water efficiency:

"We tend only to change policy in a crisis even though we know another drought will come" (Turton, 2015)

Droughts are oft hailed provocateurs of water efficiency; an immediate visual cue that provokes public and political will and supports the acceleration of water efficiency activities. However, this section briefly considers how droughts are creative of social and material conditions that permeate water efficiency long after the drought itself has passed, by examining the consequences of two large-scale droughts.

The 2005/6 drought saw the implementation of the first coordinated management initiative in the water industry; *Beat the Drought*. Unlike previous drought responses (see Taylor *et al.* (2009) for a synopsis) *Beat the Drought* aimed to provide a harmonised approach to communications and temporary use bans (TUBs). *Beat the Drought* brought water companies into collaboration and while criticised in areas where supply levels remained sufficient to avoid restrictions (Taylor *et al.*, 2009) set "a new benchmark for cooperation between companies and the [regulators]" (Waterwise, 2010, p. 15). This model for working together continues to permeate in water company activities. Similarly in 2011/12 the intensity of the drought triggered plans to distribute water efficient devices to 200,000 homes in the Greater London Authority, in order to reduce demand and ensure sufficient water availability for the 2012 Olympic games (Nickson *et al.*, 2011). However the "abrupt and dramatic termination" (Met Office, 2013, p. 5) of the drought, which ended with wide spread flooding at the end of Summer 2012 (Kendon *et al.*, 2013) meant the anticipated demand for these devices failed to materialise. Consequently the droughts left a material legacy in the form of undistributed water efficient devices, an investment whose benefits were yet to be realised as political will diverted to alleviating floods. These examples illustrate the social and material legacies of drought that filter into water efficiency practice. 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.

Conclusion: Emerging ideas and further questions

This paper presents a unique exploration of the professional practices of managing water demand in which we explore water efficiency activities as a continually evolving outcome of routine practices. This section concludes with some brief reflections on these findings and the implications for further research. Fundamentally this paper advances our understanding of demand management as an emergent practice. Demand management is often tacitly framed as something we can inject new conceptual understandings in order to elicit change. However these findings demonstrate the complexity of demand management revealing it to be situated in business and regulatory practices; shaped by data, metric and methods; emergent from consensual collaboration; and accelerated by extreme events.

The findings illustrate how core values of the water industry are unconducive to the alternative forms of management activity posed by social scientists. The emphasis on evidence based action, customer service and reduce the scope for activities that have distributed and/or longitudinal effects on the socio-technical systems from which domestic practices emerge. This is particularly apparent when discussion turns to up-scaling as which is coproduced with generic data sets, universal in their application yet insensitive to the context specific dynamics of everyday resource use. This offers a critical reflection on data and data gathering that is applicable across various substantive contexts. For example considering metering and smart metering, the precision and granularity of data available on domestic demand is increasingly readily-available and accessible to both industry and

academic researchers. The convenience of this data is invaluable to those seeking to quantify impact, however it presents a sanitised account of the socio-material world in which current patterns of demand emerge and sustain, thus reinforces psycho-economic management activities. The question for both research and industry is how do we redress this balance and what potential is there for other methods to feed into managerial practices?

A further observation may be made regarding the modes of collaboration, and potentially wider participation in resource management. At present the specific format and processes of collaboration drive consensus, not least due to the regulatory imperative for water companies to work together to reduce the cost of research that is ultimately bourn by consumers. These consensual dialogues reinforce best practice, and by doing actively inhibit the development of creative, innovative alternatives. Alternatively methods that facilitate divergent thinking blow open previously accepted understandings and demand fresh approaches – the question is where do such methods fit in management practice and how are they most appropriately facilitated? Again there are parallels in other sectors where "behaviour change" interventions circulate without critique of reflection (e.g. energy, transport, diet and sustainable consumption).

Additionally the findings emphasise that extreme events potentially pose an opportunity to shake up demand management and reconfigure the various social and material elements that shape its outcomes. However they also show that at present reactive management and the push to return to business as usual results in a panicked acceleration of conventional activities and suppression of the creative potential of such disruptions. This connects to discussions regarding adaptive capacities, and the ability of systems to evolve within the context of emerging socio-environmental conditions. Extreme events present a brief opportunity (Whatmore, 2013, Bache *et al.*, 2014) – the question for researchers and managers is what are the mechanisms by which we can utilise these opportunities to develop more robust management activities.

Finally, having highlighted some of the possible synergies between this case study and wider discussions there is something to be said about the specificities of different managerial agendas. This research highlights a familiar blend of elements and relations that shape and sustain demand management practices previously identified as problematic (e.g. Shove, 2010). Further it extends these findings to consider how the ongoing churn of the practices of managing demand actively constrains the scope of management activity, supressing potentially valuable alternatives. However between different substantive fields and geographical contexts are there tensions and departures worthy of further exploration? Are the elements of demand management similar – for example while there is a research agenda on metering in both energy and water, are the histories, technologies and politics of metering not different in each? Are the elements and relations that shape everyday practices of demand in these different sites and scales the same? What are the implications of these similarities and difference? And what about the nexus? Perhaps thinking, researching and theorising in divergent ways within academia might allow us to learn something deeper about the processes of change.

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References

Bache, I., Reardon, L., Bartle, I., Flinders, M., and Marsden, G., 2014. Symbolic meta-policy: (not) tackling climate change in the transport sector. *Political Studies*.

Bell, S., 2015. The socio-technology of alternative water systems. *In*: W.S. Memon FA, ed. *Alternative Water Supply Systems*. London: IWA Publishing, 441–457.

Brooks, D.B., Brandes, O.M., and Gurman, S., 2009. *Making the most of the water we have: the soft path approach to water management*. London: Earthscan.

Browne, A., Pullinger, M., Medd, W., and Anderson, B., 2013. Patterns of Water: laundry, bathroom and gardening practices of households in the South East of England.

Browne, A.L., Medd, W., Pullinger, M., and Anderson, B., 2014. Distributed demand and the sociology of water efficiency. *In*: K. Adeyeye, ed. *Water efficiency in buildings: Theory and practice*. UK: John Wiley & Sons, 74–84.

Chappells, H. and Medd, W., 2008. From Big Solutions to Small Practices. *Social Alternatives*, 27 (3), 44 – 49.

Chappells, H., Medd, W., and Shove, E., 2011. Disruption and change: drought and the inconspicuous dynamics of garden lives. *Social & Cultural Geography*, 12 (7), 701–715.

Davies, A., Fahy, F., Rau, H., Devaney, L., Doyle, R., Heisserer, B., Hynes, M., Lavelle, M.J., and Pape, J., 2013. *CONSENSUS: Consumption Environment and Sustainability*. Dublin, Ireland: Environmental Protection Agency.

Davies, A.R., Doyle, R., and Pape, J., 2012. Future visioning for sustainable household practices: Spaces for sustainability learning? *Area*, 44 (1), 54–60.

Environment Agency and Natural Resources Wales, 2013. *Water stressed areas: final classification*. Bristol and Cardiff: Environment Agency & Natural Resources Wales.

Fam, D., Lahiri-Dutt, K., and Sofoulis, Z., 2015. Scaling Down : Researching Household Water Practices. *ACME*, 14 (3), 639–651.

Fam, D. and Sofoulis, Z., 2015. Local adaptations in a changing water climate: small-scale infrastructures. *Local Environment : The International Journal of Justice and Sustainability*, 20 (5), 525–528.

Ferguson, B.C., Frantzeskaki, N., and Brown, R.R., 2013. A strategic program for transitioning to a Water Sensitive City. *Landscape and Urban Planning*, 117, 32–45.

Hargreaves, T., 2011. Practice-ing behaviour change: Applying social practice theory to pro-environmental behaviour change. *Journal of Consumer Culture*, 11 (1), 79–99.

Hargreaves, T., Longhurst, N., and Seyfang, G., 2013. Up, down, round and round: connecting regimes and practices in innovation for sustainability. *Environment and Planning A*, 45 (2), 402–

420.

Hinchliffe, S. and Bingham, N., 2008. Securing life: the emerging practices of biosecurity. *Environment and Planning A*, 40 (7), 1534–1551.

HM Government and Defra, 2008. *Future Water*. Norwich: TSO (The Stationery Office.

Hoolohan, C., 2015. Innovative behaviour change strategies for water efficiency in the UK. *In*: *Water Efficiency Network proceedings*.

Hoolohan, C. and Browne, A., 2016. Reframing water efficiency: Determining collective approaches to change water use in the home. *British Journal of Environment & Climate Change*, xx (X), xx.

Jack, T., 2013. Nobody was dirty: Intervening in inconspicuous consumption of laundry routines. *Journal of Consumer Culture*, 13 (3), 406–421.

Kendon, M., Marsh, T., and Parry, S., 2013. The 2010 – 2012 drought in England and Wales. *Weather*, 68 (4), 88–95.

Kuijer, L., 2014. Implications of Social Practice Theory for Sustainable Design. PhD Thesis. de Technische Universiteit Delft.

Kuijer, L. and de Jong, A., 2011. Practice theory and human-centered design: A sustainable bathing example. *In*: I. Koskinen, T. Härkäsalmi, R. Mazé, B. Matthews, and J.J. Lee, eds. *4th Nordic Design Research Conference: Making Design Matter 29th-31st May 2011*. Helsinki, Finland: School of Art and Design, Aalto University.

Kuijer, L. and de Jong, A., 2012. Identifying design opportunities for reduced household resource consumption : exploring practices of thermal comfort. *Journal of design research*, 10 (1/2), 67–85.

Law, J., 2006. Disaster in agriculture: or foot and mouth mobilities. *Environment and Planning A*, 38 (2), 227–239.

Makropoulos, C.K. and Butler, D., 2010. Distributed water infrastructure for sustainable communities. *Water Resources Management*, 24 (11), 2795–2816.

Met Office, 2013. England and Wales drought 2010 to 2012 [online]. Available from: www.metoffice.gov.uk/climate/uk/interesting/2012-drought [Accessed 15 Sep 2015].

Mol, A., 2002. *The Body Multiple: Ontology in Medical Practice*. Duke University Press.

Nickson, A., Tucker, A., Liszka, C., Gorzelany, D., Hutchinson, D., Dedring, I., Reid, K., Ranger, K., Clancy, L., Greaves, M., and Wyse, N., 2011. *Securing London's water future: The Mayor's water stratgey*. London: Greater London Authority.

Nicolini, D., 2010. Medical Innovation as a Process of Translation: a Case from the Field of Telemedicine. *British Journal of Management*, 21 (4), 1011–1026.

Nicolini, D., 2011. Practice as the Site of Knowing: Insights from the Field of Telemedicine. *Organization Science*, 22 (3), 602–620.

Nicolini, D., Gherardi, S., and Yanow, D., 2003. *Knowing in organizations: a practice-based approach*.

New York: M. E. Sharpe Inc.

Ofwat, 2013. *Water meters: your questions answered*. Birmingham: Ofwat.

Porter, N., 2012. Risky Zoographies: The Limits of Place in Avian Flu Management. *Environmental Humanities*, 1 (1), 103–121.

Reckwitz, A., 2002. Toward a Theory of Social Practices: A Development in Culturalist Theorizing. *European Journal of Social Theory*, 5 (2), 243–263.

Russell, S. and Fielding, K., 2010. Water demand management research: A psychological perspective. *Water Resources Research*, 46 (5), 1–12.

Schatzki, T.R., 2001. Introduction. *In*: T.R. Schatzki, K.K. Cetina, and E. von Savigny, eds. *The Practice Turn in Contemporary Theory*. London and New York: Routledge, 10–23.

Schatzki, T.R., 2002. *The Site of the Social: A Philosophical Account of the Constitution of Social Life and Change*. Pennsylvania: Penn State University Press.

Schatzki, T.R., 2011. *Working Paper 1: Where the Action Is (On large social phenomena such as sociotechnical regimes)*. Sustainable Practices Research Group.

Schatzki, T.R., Knorr-Cetina, K., and von Savigny, E., 2001. *The Practice Turn in Contemporary Theory*. London and New York: Routledge.

Sharp, L., Macrorie, R., and Turner, A., 2015. Resource efficiency and the imagined public: insights from cultural theory. *Global Environmental Change*, 34, 196–206.

Shove, E., 2010. Beyond the ABC: climate change policy and theories of social change. *Environment and Planning A*, 42 (6), 1273–1285.

Shove, E., 2014. Putting practice into policy: reconfiguring questions of consumption and climate change. *Contemporary Social Science: Journal of the Academy of Social Sciences*, 9 (4), 415–429.

Shove, E. and Pantzar, M., 2005. Consumers, Producers and Practices: Understanding the invention and reinvention of Nordic walking. *Journal of Consumer Culture*, 5 (1), 43–64.

Shove, E., Watson, M., and Spurling, N., 2015. Conceptualizing connections: Energy demand, infrastructures and social practices. *European Journal of Social Theory*, 18 (3), 274–287.

Sofoulis, Z., 2011. Skirting complexity: The retarding quest for the average water user. *Continuum: Journal of Media & Cultural Studies*, 25 (6), 795–810.

Sofoulis, Z., 2014. The trouble with tanks: unsettling dominant Australian urban water management paradigms. *Local Environment*, 20 (5), 529–547.

Spurling, N., Mcmeekin, A., Shove, E., Southerton, D., and Welch, D., 2013. *Interventions in practice: re-framing policy approaches to consumer behaviour*. Sustainable Practices Research Group Report.

Strengers, Y., 2012. Peak electricity demand and social practice theories: Reframing the role of change agents in the energy sector. *Energy Policy*, 44 (1), 226–234.

Taylor, V., Chappells, H., Medd, W., and Trentmann, F., 2009. Drought is normal: the socio-technical evolution of drought and water demand in England and Wales, 1893–2006. *Journal of Historical Geography*, 35 (3), 568–591.

Thames Water, 2014a. Thames Water Revised Draft Water Resources Management Plan 2015 - 2040.

Thames Water, 2014b. Waterwisely [online]. Available from: http://secure.thameswater.co.uk/waterwisely.htm [Accessed 20 Feb 2015].

Tucker, A., 2014. Thames Water - Supersize my WEFF! *In*: B. Smyth and J. Jenkins, eds. *Proceedings of the Water Efficiency Conference 9-11 September, 2014*. Brighton, UK: WATEF Network/University of Brighton, 199 – 204.

Turton, P., 2015. Water Efficiency: Past, Present and Future. *In*: *10th Waterwise Conference RSA House London 19th March 2015*. London, 1–5.

Van Vliet, B., Shove, E., and Chappells, H., 2005. *Infrastructures of consumption: Environmental innovation in the utility industries*. London: Earthscan.

Wagenaar, H. and Cook, S.D.N., 2011. The push and pull of the world: how experience animates practice. *Evidence & Policy: A Journal of Research, Debate and Practice*, 7 (2), 193–212.

Wagenaar, H. and Wilkinson, C., 2013. Enacting Resilience: A Performative Account of Governing for Urban Resilience. *Urban Studies*, 52 (x), 1205–1217.

Warde, A., 2005. Consumption and Theories of Practice. *Journal of Consumer Culture*, 5 (2), 131–153.

Waterwise, 2010. *Water Efficiency and the Water Companies: a 2010 review*.

Waterwise, 2011. *Evidence Base for Large-scale Water Efficiency Phase II Final Report April 2011*.

Waterwise, 2015. *Water Efficiency Today: A 2015 UK Review*. London.

Welch, D. and Warde, A., 2014. Theories of Practice and Sustainable Consumption. *In*: J. Reisch, L. and Thøgersen, ed. *Handbook of Research on Sustainable Consumption*. Cheltenham, UK: Edward Elgar Publishing, 84–100.

Wessex Water, 2015. Top tips [online]. Available from: http://www2.wessexwater.co.uk/saving-water/toptips/default.aspx [Accessed 4 Jun 2015].

Whatmore, S.J., 2013. Earthly Powers and Affective Environments: An Ontological Politics of Flood Risk. *Theory, Culture & Society*, 30 (7-8), 33–50.

Woelfle-Erskine, C., 2015. Rain tanks, springs, and broken pipes as emerging water commons along Salmon Creek, CA, USA. *Acme*, 14 (3), 735–750.

Yorkshire Water, 2014. *Water Resources Management Plan*.