Scaling Down:
Researching Household Water Practices

Dena Fam

Senior Research Consultant
Institute for Sustainable Futures
University of Technology Sydney
Dena.Fam@uts.edu.au

Kuntala Lahiri-Dutt

Senior Fellow, Resource, Environment and Development Group
Crawford School of Public Policy, College of Asia and the Pacific
Australian National University
kuntala.lahiri-dutt@anu.edu.au

Zoë Sofoulis

Adjunct Research Fellow
Institute for Culture and Society
University of Western Sydney
Z.Sofoulis@uws.edu.au

Why scale down: Researching household water practices

The thematic title of this special themed section of ACME — "Scaling Down: Researching household water practices" — is a corrective to the excessive

emphasis on "scaling up" frequently encountered in discourses on water management. Scaling up is a concept essentially derived from engineering procedure whereby small-scale models of designs are trialled before full-size working models are built. In positivist social science, the idea of scaling up seems now to have been accepted without much debate; researchers empirically study phenomena within a given context to develop theories that are then extrapolated. When technocrats think about and deal with water, they seem to accept scaling up as the only valid approach. When technocrats advise bureaucrats on water management, they tend to define this approach as the most rational, technically sound and economically efficient approach. Technological fixes are perceived to bypass entanglement with the messy and value-laden domains of society and politics. A technocratic approach treats social change as an engineering problem, where individuals within the society are provided expert opinions aimed at changing their attitudes to produce a more economically rationalist and efficient set of water consumption behaviours.

A demonstration of how the rationalist notion of scaling up can lead to irrationality was witnessed by one of the editors (Sofoulis, 2011, 40) at a national workshop on designing urban water sustainability. A speaker had outlined the delicate politics of implementing innovative Water Sensitive Urban Design (WSUD) projects in Sydney, which involved successfully negotiating cooperation between various people, sections, departments and infrastructure agencies, plus clearing pathways through various levels of government laws and by-laws. A water planner in the audience demanded in response that this process be documented and "systematised" so that it could be "scaled up". Scaled up from Australia's largest city to what or where, exactly? The planner had failed to grasp the speaker's central point about the site-specific, person-specific work needed to broker effective cross-sectoral and inter-departmental alliances in particular political, institutional, regulatory and environmental contexts. Scaling up expressed a technocratic fantasy of avoiding this complexity through a set of technical and administrative procedures.

Irrespective of substantial evidence from social scientists and humanities scholars about the social nature of water (e.g., Wagner, 2014), technocrats and bureaucrats who make decisions on water have been reluctant to accept water as anything but a purely physical resource, a resource that can be measured, quantified, and chemically analysed. The preoccupation with scaling up tends to go with a preference for psycho-demographic approaches to water demand management that aim to produce behavioural modifications in populations of consumers, such as through mass media campaigns pitched to an imagined "average" consumer. The perceived need for scaling up has probably been the key deterrent to the water industry's acceptance of the value of qualitative and household-based approaches to understanding the use and conservation of water. As one Australian water manager put it:

> [W]e get some very good research back that says the best way to do that is to […] engage people on a very one-on-one basis and to

> spend an hour with them and take them through the whole journey. I get that, I can understand that and I appreciate that. What no-one's ever been able to come back and give me is how do you take that model and apply it across South East Queensland where we've got 3 million residents. (Sofoulis, 2011, 40)

In short, the scaling up imperative is the central tenet of the methodology of positivist science. It generates a kind of knowledge that is general and universal, that is, not site-specific, and believes that the best evidence is in the form of large sets of quantitative data that can be statistically modelled and analysed. These preoccupations devalue small-scale, context-specific research and its application, and favour large-scale, one-size-fits-all solutions to the challenges of water-saving, sustainable development or climate change adaptation, such as big infrastructure, or whole-of-population behavioural engineering. The large scale approach carries political, methodological and epistemological risks as presented in the papers that make up this special issue.

Critical cultural geographers and cultural researchers involved in studying the human dimensions of water policies, infrastructures, management and innovation can help overcome the impasses generated by the technocratic and positivist insistence on scaling up. Contributions include critiques of the discourse of water as a purely physical element devoid of history and context (Linton, 2010; Scott-Coe and Howard, 2006), and how this discourse gives rise to a political economy that favours large-scale management practices (Swyngedouw, 2009), and leads to the commodification of water (Bakker, 2004). These critical socio-cultural perspectives can help water managers and policymakers gain more nuanced and realistic views of the social structures, dynamics and socio-technical interactions that shape water consumption practices. However, these developments depend on acceptance of a wider range of social research methods than the positivist social sciences conventionally favoured by water authorities. It requires broadened criteria for what counts as evidence, and more value given to smaller-scale qualitative and interpretive studies.

This collection of papers aims to further the understanding and acceptance of such approaches by highlighting the notion of "scaling down". These papers reflect and expand upon a dialogue from the conference *Tapping the Turn: Water's Social Dimension,* held at the Australian National University, Canberra, in November 2012 and organised by a group of water researchers based in Australia[1]. Each paper offers critical reflections on approaches and methods for investigating how people relate to water in everyday domestic life. The authors provide a brief overview of their research project, and focus on discussing the methods they used in the research: the rationale for employing those methods, the strengths and limitations, difficulties and triumphs, and what aspects of water practices the

[1] This group included the guest editors (Dena Fam, Kuntala Lahiri-Dutt and Zoe Sofoulis), Kate Harriden (Principal, New Flows Research) and Michelle Greymore (University of Ballarat).

research methods best elucidated. The pieces cover a range of approaches: feminist methodologies; mixed methods combining smart metering, observation and open questioning; socio-cultural investigations of everyday rural life; photo journal and participant-led reflexive diaries; and ethnographic methods to explore everyday practices. While they all explore everyday water practices, there is variation in the contexts of this scaled down research, ranging from a specific middle-class neighbourhood in large metropolitan cities like Calcutta, London and Sydney (Lahiri-Dutt; Teh and Sofoulis), small communities in Victoria and California (Fam and Lopes; Woelfle-Erskine), to rural and semi-rural contexts (Lahiri-Dutt; Thornton and Reidy). Yet, overall, the collection captures and emphasises the importance of local information and on-the-ground interactions, as well as discursive processes and embodied knowledge, in researching everyday water practices in the sites of households and similar locales.

What are the implications of scaling down?

The foremost implication is scalar, or geographical: the household is not a mere building block of some larger social unit, nor a convenient site for accessing individuals and their psychologies, but is an entity worth studying in its own right. It exists at a unique scale, though its particular characteristics and dynamics are driven by logics of capital, class, gender, culture and resource distribution that also operate at other sites and on larger social scales. This is part of what makes the household a prime site for the transmission and reproduction – and potentially, for the abandonment, transformation or innovation – of social, technical and cultural norms and routine practices.

Scaling down has feminist implications, as highlighted in Lahiri-Dutt's opening paper. The water industry conventionally attributes water consumption patterns to individual attitudes and economic preferences, meanwhile picturing households as internally undifferentiated units of water supply and consumption. In contrast, a household-scale approach reveals that households are internally differentiated and include specialist domains of practice, often linked to the gender, ages and cultural backgrounds of its members, rather than unique psychologies and behavioural choices. Initiatives to change household resource consumption patterns would more likely succeed if they recognised and addressed these persistent divisions of labour within households.

Scaling up to a whole urban population generates a picture of an average or median consumer that obscures variance in consumption patterns; conversely, scaling down can reveal a great deal of diversity within and between households. The unique characteristics of households mean that close-up studies of where and how water is used can yield detailed knowledge about the complex cultural, social and technical realities inhabited by water consumers. Knowledge at the scale of the household and more generally, of everyday life (including workplaces), is vital to the development of policies and initiatives that could be more socially sustainable, because they are grounded in an appreciation of lived sociotechnical realities, seen from the bottom up, instead of simplified demographic categories or one-size-

[never]-fits-all solutions imposed from the top down. Moreover, unlike the statistics of averages and the predictable, the deviant and non-average practices revealed in smaller scale qualitative studies can indicate what scope there is for experimentation and innovation (Head, 2008, 68): what can be learned from those households who are already practicing a variety of water-saving techniques?

Each of the papers deals with the methodological implications of scaling down in its own ways, and offers methods of researching household water practices that reveal normative conventions of water use in variant forms. How can household studies contribute to identifying the opportunities and obstacles of introducing new technologies and their associated practical innovations? Although water managers and policy makers may be interested in social sustainability as part of the so-called triple bottom line, they tend to be reluctant to deal with the diversity revealed by small scale studies. Instead of the comforting averages and statistical regularities found in large data sets that provide 'big pictures' about populations, there is fear of being plunged into a meaningless chaos of infinite individual differences, like going from the macro level of a newsprint photograph to the micro level of little dots of ink that comprise it, with nothing in between. Yet one advantage of household scale studies is that they concern a basic kind of meso-level social formation, and allow social complexity to be apprehended or "navigated" (Ang, 2011) in a manageable form. Each household has unique members and features, yet each shares characteristics with other households, such as common ways of life based on conventional divisions of domestic and paid labour (along age, gender, ethnic or racial lines), local housing designs and technological preferences and shared water, energy, transport and communications infrastructures. These commonalities limit the diversity exhibited across a sample of households, so that instead of infinite variation, a handful of main types may be distinguished. For example, in a relatively large sample of 1800 households studied qualitatively by Browne *et al*. (2013), half a dozen main "clusters" of household laundry practices, and similar numbers of personal washing variants and gardening practices were discernable.

The epistemological implications of scaling down are arguably a major source of resistance to the acceptance of small-scale studies by the water industry and other domains of resource management. As mentioned above, the positivist science predominant in the water industry values universal and replicable so-called objective knowledge and favours quantitative social science (such as demography) that generates data commensurate with scientific statistics and modelling. However nearly all contemporary social and cultural research is post-positivist and epistemologically pluralist, acknowledging that every knowledge framework, including positivist science, affords its own limited truth about reality. An important influence has been ethnographic approaches that value local and culturally specific perspectives, and appreciate material culture as both practical and symbolic. Contemporary social research is often site-specific, so that the positions of both researcher and research subjects are important to clarify (rather than disguise as objective); it is qualitative and interpretivist, relying on mixed

methods to gain knowledge in multiple modalities, alert to spotting underling patterns and systemic absences as well as what appears concretely and objectively present. Importantly, much of it is also empirical, gathering evidence through direct observation, in self-reports from research participants, as well as by quantitative means (e.g., Thornton and Reidy, this issue; Lahiri-Dutt and Harriden, 2008).

Cultural theory and cultural studies through its various turns—semiotic, textual, corporeal, material, more-than-human—has progressively become more able to address the complexities of water cultures and practices. For example, drawing on the Spinozan tradition rather than the dominant dualistic Cartesian understandings of mind, body and agency in Enlightenment philosophy for his sociology, Bourdieu's notions of doxa, field, disposition and habitus can provide a powerful vocabulary for describing the unspoken but deeply internalised societal or field-specific presuppositions about everyday actions (such as water use practices). These embedded assumptions "go without saying" and are not up for negotiation, though people can nevertheless make "strategic improvisations" to get around some of these strictures in practice. Likewise, Giddens' (1984) theories of structuration that challenge the dualism of structure and agency, and his typology of consciousness that distinguishes the verbalisable knowledge of *discursive consciousness* from the embodied and contextual knowledge of *practical consciousness,* are part of a suite of new conceptual approaches to think about different kinds and scales of practice, including household water practices.

Scaling down to the level of the household brings into focus the range of practices that comprise the daily activities at this site. This collection of articles is therefore, in a general sense, in conversation with practice theory, though only some authors in this special issue directly engage it (see Fam and Lopes; Reidy and Thornton). Practices are conceived of as elements of culture that bring together matter, action and meaning, in contrast to the technocrats' overly psychologised understandings of consumer behaviour as driven by individual attitudes. Theories of practice encompass a diverse, and sometimes contradictory, range of insights from social and cultural theory that are held together by the ontological position that the basic unit of social analysis ought not be individuals, social structures or discourses, but practices. Theories of practice therefore focus on the things that people do and view patterns of consumption as embedded in the social context in which they are done. Attention is paid to habits (in self-actuating a practice) and routines (the series of actions), the social relations (in communication and replication of a practice), material culture, socio-technical systems, cultural conventions, and shared understandings of cultural and technical competence (Evans *et al.*, 2012).

While theories of practice acknowledge individuals as the *carriers* of practices, it is not the qualities of an individual but rather the "elements and qualities of a practice in which the single individual participates" (Reckwitz, 2002) that are of greater interest. In Reckwitz's (2002, 249) off-cited definition, a practice is "a routinized type of behavior which consists of several elements, interconnected to one other: 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." This definition of practice, simplified by Shove into an assemblage of "material, competence and meaning" (Shove *et al*., 2012), or "stuff, image and skill" (Shove, 2005), has informed her and her colleagues' microsociological studies of water and energy consumption in routine practices around cleanliness, thermal comfort, convenience and so on. How we go about researching the seemingly "inconsequential, inconspicuous and mundane" (Strengers, 2010) practices of everyday household water use in which individuals and communities participate is thus the thematic focus of this collection of papers.

Note that a focus on practice does not abolish concern with individual motivation, but reduces individual psychology to just one of many social, technological and habitual factors that go to shape a practice and that are enacted in it. The individual is viewed as a practitioner positioned at the intersection of practices. Household water consumption practices are units of empirical observation, but not units of conceptual explanation (see Evans *et al.*, 2012). For example, a focus on patterns of consumption can yield insights into the social ordering of practices as well as changing performances of practices over space and time. Similarly, examining time allocated to particular practices provides some indication of variations of the commitment, diversification or decline of a practice (see Fam and Lopes and Lahiri-Dutt in this issue).

The Papers

The articles in this collection represent some of the post-positivist methodologies and epistemological positions that have emerged to address human aspects of water and infrastructure which are usually ignored by — or remain baffling to — technocratic and positivist approaches. Swyngedouw (2004) argues that urban water supply can be seen as being co-produced through interactive assemblages of natures, cultures and technologies that include non-human as well as human elements. Likewise, as Teh explores in this issue, sanitation is a network in which technological, human and practical elements shape each other and co-evolve into new arrangements.

Opening this collection, Kuntala Lahiri-Dutt tackles head-on the technocratic emphasis on quantitative data in water management by calling for an expansion from counting data alone to asking "hydro-feminist" questions of "who counts?", "where does the counting take place?" and "what purpose is the counting for?". She finds these questions particularly salient for researching water consumption in the household, which is typically counted as a whole unit, leaving the gender differentiated character of household water use unexamined. She outlines two "counting exercises" based in robust feminist praxis and with qualitative dimensions, both aimed at correcting the gender-blindness and bias in order to generate new kinds of gender-disaggregated data. Both conceive households as political economic entities where there are negotiations around the control of household resources and authority. Both tools are essentially

participatory and transformative research methods that illuminate the commonalities of unequal gender relations within households around the world.

A mixed methods approach has become a hallmark of qualitative or 'post-positivist' research, where combinations of observation, interview, questionnaire, journal making, mapping or photography can generate rich knowledge about the performers and the performance of household practices. In the second paper of this collection, Nicole Thornton and Chris Reidy outline their mixed methods research in Gosford, a small coastal city in eastern Australia. Although efforts to integrate positivist and post-positivist approaches to demand management research are not always successful (Sharp *et al.,* 2011), these researchers found it powerful to gain "qualitative insights into the motivations and reasons for household water use" from participatory contributions from householders, and combine these with "the accuracy and reliability of quantitative data on water consumption", mostly provided in a trial of smart meters. This study has some commonalities with Lahiri-Dutt and Harriden's Canberra water diary exercise (Lahiri-Dutt and Harriden, 2008), but differs notably on the question of "who counts?". For Thornton and Reidy, working partly within a positivist paradigm, the smart meter has the advantage of unobtrusively gathering detailed objective data about water practices without users' awareness, which could result in changed practices. But for the Canberra water diarists, who manually recorded comparable data themselves, the potential of such counting activity to alter practices is valued as part of a broader transformative process.

Despite the difficulties of adapting the water diary method for relatively illiterate participants, Stephanie Bishop found it useful in elucidating the significance of water practices in women's everyday lives in Lusaka, Zambia. A challenge for feminists is to adapt research methods that can work in cities like this, where social privilege as well as water services and technologies (like washing machines) are unevenly distributed, and scarcity coexists with abundance. The value and challenges associated with using water diaries for qualitative household water research are investigated by Bishop who explores how mothers and domestic workers develop alternative relational tactics, aesthetics and ethics around water, in specific technical water environments. Water diaries provided insight into the diversity, stability, and significance of urban water practices in Africa today.

The behavioural approach is generally applied by technocrats to encourage a change in consumer preferences toward the uptake of more efficient technologies (low flow showers, dual flush toilets) that reduce water consumption without requiring change in the cultures or the infrastructures of consumption. However, most cultural researchers and sociologists understand that people's water practices have co-evolved in relation to domestic routines, societal norms and interactions with water fittings and infrastructures. The relations between personal and household practices and changing infrastructures and services are the concern of the next two papers, by Kuntala Lahiri-Dutt and Tse-Hui Teh, respectively.

As we have noted above, the household is an entity at its own scale but is of interest as a site where many broader social and cultural patterns and forces intersect. Lahiri-Dutt here surveys the changing practical, political, social, cultural and material-technical contexts for water practices in the recent history of metropolitan Calcutta (which is now called Kolkata), with the aim of helping us understand how the worlds inside and outside the household interact, and how household water practices reference belief systems and other cultural norms. Brought into particular focus are the divisions of class, and how new water practices and technologies are implicated in the self-definitions of the burgeoning Indian middle class.

If changes in society and changes in technology inevitably entail each other, how then might researchers investigate the potential for changing practices in relation to prospective changes in contexts and technologies for water services? This is a methodological challenge taken on by Teh, from the theoretical perspective of actor-network theory and a notion of co-evolution. Her investigation of the capacity for co-evolution of new sewage management techniques and new waste and water practices in the megalopolis of London was pursued through empirical research (such as logging water interactions, photographic diaries) as well as interviews, group discussions, and exercises in design and co-design that together aimed at probing hypothetical scenarios and speculative responses amongst a variety of users and experts.

Somewhere between the micro-scale household and the macro- or mega-scale metropolis is the small community, the meso-scale setting for two papers that deal with local infrastructures in non-urban settlements. More readily than a single household, a community can reveal local complexities in water services and the nuances of water governance that involves multiple stakeholders and relationships. This is relevant to sustainability and adaptive change, as technological innovations are unlikely to become embedded in everyday practice unless the relationships and interactions amongst the various agents also change.

Some of these relationships only become evident when water governance is decentralised to the local community and household, according to Cleo Woelfle-Erskine, who draws on ethnographic techniques and Karen Barad's notion of intra-action (phenomena arising in the mutually shaping interactions between human and non-human agents and apparatus) to tease out some of the complex relationships amongst actors, technologies, animals and the environment in relation to water systems and water practices in a small Californian community with a nascent sense of a water "commons". Like Thornton and Reidy, Woelfle-Erskine is careful to avoid research techniques that might encourage participants to change their current water practices. But over long term engagement with the community, which in this case includes scientists and environmental experts, the researcher becomes something of a knowledge broker with the role of mediating and translating between different types of knowledge generated by diverse agents and apparatus.

Scaling down to the household level provides a way of accessing information and producing useful knowledge about how to help change socio-

technical systems and support sustainable innovation. In contrast to a technocratic approach that relies on the fiction of an imagined average water consumer and one-size-fits all solutions, a scaled-down approach to investigating household water practices reveals that not all end-users are created equal. Social research on water has often been used as a tool to determine how the technology functions *after* it is installed, but Dena Fam and Abby Mellick-Lopes argue that studying existing water use habits within a particular community can help determine what kinds of water technologies are most appropriate for that group of users *before* the technologies or systems are selected. Social research is particularly valuable at the early stages of adapting to new technologies, when learning is still taking place, practice has not yet been automated into a routine, and technologies have not yet retreated into the background of awareness. Studying households in a trial of urine-diverting toilets, the researchers found inter-household communications were a crucial component of practice: practical knowledge and experiences are shared amongst community members to support the adoption of innovation and the embedding of new technologies and practices in everyday routines.

These studies by Woelfle-Erskine, and Fam and Mellick-Lopes are clearly not about average individuals (though individuals remain prime sources of information) but about the niche practices of distinctive communities, and about shared and emergent value systems. Engaging with small communities has the potential to reveal the role people have in innovation, including through cultural processes such as storytelling, co-learning and communication about water practices, technologies, non-humans and the environment. These discursive processes are crucial aspects of innovation and the social dimension of sustainability, as they provide a medium or platform where new technologies and knowledges are processed through the mill of (more or less) shared value systems. One intriguing question raised by such studies is the extent to which they might be conducted in much larger settlements. The notions of a sample that represents diverse households, that duplicates in miniature the socio-economic and other status markers of the whole population, or the idea of a community being defined by a postcode, may be less relevant than the idea of social networks of people who meet and converse with each other, or so-called clusters of distinctive kinds of practitioners, households of people who are not necessarily geographically adjacent nor classifiable by similar socio-demographic variables, but who share value systems and express them in similar arrays of practices (Pullinger *et al.*, 2013; Brown *et al.,* 2013).

All of these papers dealing with scaled down or household studies offer alternatives to conventional technocratic approaches that target either individual psychologies or whole populations. The final paper in the collection by Zoë Sofoulis reflects on the relative status of these different knowledges: which have cachet with policymakers and water managers? Which knowledges count most for whom? Arguing that the model of "integration" of interdisciplinary knowledges is not working due to the incompatibility of positivist science and epistemologically pluralist humanities and social science paradigms, Sofoulis mobilises the metaphor

of an ecosystem of knowledges to examine the relationships between different kinds of knowledges of household water in metropolitan Australia. Worrying features include the dismissal of non-quantitative knowledge and small data sets as non-evidence, the tendency of Science Technology Engineering Mathematics (STEM) experts to do their own social research as an add-on to a science or engineering project, instead of bringing in cultural and social researchers, and the drastic under-resourcing of these latter compared to science and engineering fields.

From within a positivist paradigm, the scaled down studies sampled here may be dismissed for dealing with data sets of insignificant size, insufficient universality and inadequate objectivity. Similarly, proponents of the unobtrusive and unreactive[2] new techniques of so-called big data analysis (based on digital traces left by users of communication and information technologies) might see the papers below as yet more examples of "ancient social science approaches for milking meaning out of small and under-powered datasets" (Dunleavy *et al*., 2014). Yet in the ecosystem of knowledges about household water, the scaled down studies here have potentially invaluable contributions to make to the development of societal and political agendas for innovation, sustainability and climate change adaptation. For example, many water planners envision that sustainable urban water services in future will not rely on one-size-fits-all Big Water solutions but will involve a heterogeneous mix of small and medium-scale infrastructures. The complexity of practices and the diversity within and between households and small communities disclosed by small-scale qualitative methods can show divergences from the imagined average consumption practices, and presumed value systems; these divergences indicate some of the capacities communities have to adapt their practices and experiment with innovations. Metadata collection techniques may be favoured by positivists as "unreactive" as they do not risk altering the behaviour or attitudes of the research participants, who in most cases are totally unaware of the trackable digital footprints they have unwittingly consented to share when activating their phone contract or signing up for some website or app. The smart meters used in Thornton and Reidy's study were valued for their unobtrusiveness, while in other cases "reactive" methodologies like surveys, and more highly participatory techniques like water diaries or usage logs that provoked reflections and responses, raised awareness or induced changes in practice were valued for their potentially transformative power. Householders' participation in the research, or (as in Woelfle-Erskine), the presence of researchers, and interactions with them inevitably changes the scene under study. A crucial factor is for the participants to articulate those values, knowledges and practices that are meaningful for them *for themselves*, and with others in their communities. In contrast to the metadata miners, the researchers here all value the participatory dimensions of their research and the knowledge contributions of household water users. Scaling down to the

[2] 'Unreactive' is used in the sense that unlike surveys or water diaries, metadata collection techniques do not risk altering the behaviour or attitudes of the research participants. They are unobtrusive, and in most cases undertaken without the awareness or knowing consent of users.

household level brings into focus a water management resource usually neglected in top-down approaches to managing water consumption and consumers: the householders themselves, their ethics and intelligence, their understandings of the relations between household economies and larger social structures, and their adaptive and creative capacities to make practical responses to a changing world.

References

Ang, Ien. 2011. Navigating complexity: From cultural critique to cultural intelligence. *Continuum* 25(6), 779-794.

Bakker, Karen. 2004. *Water: An Uncooperative Commodity*. Oxford: Oxford University Press.

Brown, Alison, Will Medd and Ben Anderson. 2013. Developing novel approaches to tracking domestic water demand under uncertainty - A reflection on the "up scaling" of social science approaches in the United Kingdom. *Water Resources Management* 27(4), 1013-1035.

Dunleavy, Patrick, Simon Bastow and Jane Tinkler. 2014. *The contemporary social sciences are now converging strongly with STEM disciplines in the study of "human-dominated systems" and "human-influenced systems".* http://blogs.lse.ac.uk/impactofsocialsciences/2014/01/20/social-sciences-converging-with-stem-disciplines/

Evans, David, Andrew McMeekin and Dale Southerton. 2012. Sustainable consumption, behaviour change policies and theories of practice. *Collegium: Studies across Disciplines in the Humanities and Social Sciences* 12, 113-29.

Giddens, Anthony. 1984. *The Constitution of Society: Outline of the Theory of Structuration*. Cambridge: The Polity Press.

Head, Leslie. 2008. Nature, networks and desire: Changing cultures of water in Australia. In, Troy Patrick (ed.), *Troubled Waters: Confronting the Water Crisis in Australia's Cities. Canberra: Australian National University E-Press,* pp. 67-80.

Lahiri-Dutt, Kuntala. and Harriden, Kate. 2008. Act on gender: A peep into intra-household water use in the Australian Capital Territory (ACT) Region. *Rural Society* 18(3), 230-243.

Linton, Jamie. 2010. *What is Water? The History of a Modern Abstraction*. Vancouver: UBC Press.

Pullinger, Martin, Alison Browne, Ben Anderson and Will Medd. 2013. *Patterns of Water: The Water Related Practices of Households in Southern England, and their Influence on Water Consumption and Demand Management.* Lancaster: Lancaster University. Downloadable from https://www.escholar.manchester.ac.uk/uk-ac-man-scw:187780

Reckwitz, Andreas. 2002. Toward a theory of social practices: A development in culturalist theorizing. *European Journal of Social Theory* 5(2), 243-63.

Sharp, Liz, Adrian McDonald, Patrick Sim, Kathy Knamiller, Christine Sefton and Sam Wong. 2011. Positivism, post-positivism and domestic water demand:

interrelating science across the paradigmatic divide. *Transactions of the Institute of British Geographers* NS 36: 501-515.

Scott-Coe, Justin and W. Scott Howard. 2006. Writing on water: Resources, discourses, reflections. *Reconstruction: Studies in Contemporary Culture* 6(3): 1-15.

Shove, Elizabeth. 2005. Stuff, Image and Skill : Towards an Integrative Theory of Practice. *Designing and Consuming: Objects, Practices and Processes Workshop*, Durham University, UK, 11 January 2005. Downloadable from http://www.lancaster.ac.uk/fass/projects/dnc/wkshpsjan06/papers/11th/shove.pdf

Shove, Elizabeth, Mika Pantzar and Matt Watson. 2012. *The Dynamics of Social Practice: Everyday Life and How it Changes.* London: Sage Publications

Strengers, Yolande. 2010. *Conceptualising Everyday Practices: Composition, Reproduction and Change*. RMIT, Melbourne, Australia.

Sofoulis, Zoë. 2011. Cross-Connections: Linking urban water managers with humanities, arts and social sciences researchers. *Waterlines Report 60.* Canberra: National Water.

Swyngedouw, Erik. 2009. The political economy and political ecology of the hydro-social cycle. *Journal of Contemporary Water Research and Education* 142(1): 56-60.

Swyngedouw, Erik. 2004. *Social Power and the Urbanization of Water-Flows of Power*. Oxford: Oxford University Press.

Wagner J. R. 2014. *The Social Life of Water.* New York: Berghahn.