

Consuming Water Smartly: the significance of socio-cultural differences to water saving initiatives.

Sophie Watson

Pre-print version. Forthcoming in *Local Environment*

Smart initiatives are now central to urban policy agendas across the globe where smart cities are conceived as sites of innovation, offering opportunities for people to invent, try out, and sell new products and systems (BIS 2103), and possibilities for addressing the current challenges of growing urbanisation through optimising resource consumption and improving services, particularly water, waste, energy, transport and assisted living (Batty 2013). There is, as yet, no overarching notion of the smart city, rather it is deployed to refer to an amalgam of smart technologies (Cosgrave et al. 2014, Carvalho 2015) embedded in the design and planning of new public and private initiatives for urban and economic development. One source of definition for the smart city comes from Giffinger et al. (2007) who distinguish the smart economy, smart mobility, smart governance, smart environment, smart living and smart people.

Smart cities are variously conceived. Though there is a tendency for much of the writing on smart cities to 'appear non-ideological, commonsensical and pragmatic' on the one hand, and a relative dearth of 'detailed genealogies of the concept and initiatives on the other' (Kitchin 2015), there is also an increasing body of work which reflects healthy skepticism and critique. One suggestion is that smart solutions may act to reproduce problems of inequality rather than assist in solving them (Shelton et al. 2015,p.13), while little is known as to how digital platforms might open up a channel of communication between citizens and local government (Cosgrave et al. 2014), or what assumptions about the users are embedded in the design of systems, and what motivates people to participate. As Offenhuber (2014) argues, such participation can be of equivocal value, particularly where short-term fixes supersede long- term planning. Batty (2013) points to the widespread assumption that new smart initiatives and diverse data systems can be easily integrated into our knowledge of how cities function and provide new answers, ignoring all that has gone before. Kitchin (2014) discusses similar emerging concerns around the production of such data from technocratic and corporate city governance referring to Townsend's (2013) description of smart cities as 'buggy, brittle and bugged'. Some analysts point to the linking of smart city discourses and initiatives with neo-liberal policies to attract investments, tourism and professional or knowledge sector workers (Hollands 2008, Jonas and While 2007). Others draw on Foucauldian notions of governmentality and power/knowledge relations (Vanolo (2013, p. 883-898) to suggest smart city discourse gives technicians, consultants and private companies a more powerful and legitimate role in managing and

governing cities, or to show how citizens 'become unwitting gatherers and providers of data' Gabrys (2014,p.34)

This paper considers one particular aspect of the smart city- smart water interventions which have been introduced to reduce household and business water consumption and which are now central to the smart agenda in many cities, having been established over a decade ago in some countries. Notably Australia has been at the forefront of water saving strategies and technologies, in the context of an environment persistently threatened by drought and water shortages. From 1995 Sydney Water set in train some of the largest water efficiency programs in the world, mobilising their customers to actively participate in water efficiency programs and to observe water restrictions and Water Wise Rules. It is from this country that some of the most insightful critical analysis has emerged (Allon and Sofoulis 2006, Randolph and Troy, 2008, 2008, Head 2008, Hawkins 2011, Sofoulis 2005, 2011,2013,Head and Muir 2007, Maller and Strengers 2013). So also in the context of South Africa Loftus (2006,1023) has drawn attention to the considerable power that water infrastructure is currently acquiring over the lives of residents in Durban now appearing ' able to regulate the rhythms of life itself, through ensuring what volume of water residents will receive, and at what times that water will be available'.

Access to water across the globe, particularly in Africa and Asia is increasingly threatened by growing competition over limited supplies and by the depletion or pollution of existing sources (Moench et al. 2003). In some cases this has led to the introduction of water metering with a variety of

strategic intentions and effects, and with different interests at stake. Such interventions are embedded in discourses, amongst others, of domestic water saving, cost reduction, matching supply and demand and water shortages. A long tradition of flat charges for water across many parts of the UK in contrast, has led to the majority of people being unaware of, or indifferent to, the cost of household water consumption (Walker, 2009). Some water companies charged a percentage of the property's ratable value, which varied across the UK, others used an assessed volume charge based on the size and type of the property or the number of occupants. Households could also request a water meter, though the minority pursued this strategy, even if it would have benefited them to do so. In the context of a climate where rainfall is often high, a dominant imaginary was of water abundance, leading to cultural practices of extensive water consumption for domestic purposes, despite regular bans on garden watering during hot and dry summers.

Following the publication of the Department for Environment and Rural Affairs report (Walker, 2009), which concluded that there was a growing trend for increased demands for water, pressure on water supply – particularly in the South East - and climate change projections of drier summers and seasonal flooding, many UK water authorities introduced strategies to cut water consumption. Different rationales have been mobilised for these strategies such as the notion that a charging system could incentivise a more efficient use of water, that metering represented the fairest approach to charging particularly for those on low incomes, or that the installation of meters allowed household demand to be more closely matched to supply, through the collection of more up-to-date information on the occurrence of water

shortages. Such rationales articulated by the water authorities for the introduction of metering are, however, contested by critical theorists both in the UK and elsewhere. One problem is that much of the promotional material obscures the high consumption of water by business and agriculture, leading to the impression that domestic consumers are the prime water wasters.

While Loftus (2006) In the context of Durban has argued that smart meters are a regulatory device to reduce domestic water use which are connected to a wireless network so customers can view their water consumption online around the clock, gaining greater control of their usage and their bill.

In the UK water companies have sought to mobilise a sense of personal responsibility through deploying messages steeped in affect, such as Anglia Water's 'Love Every Drop' campaign which exhorted consumers to put 'water at the heart of a whole new way of living', where customers are exhorted to 'doing their bit' and where a greater understanding of water's role in carbon emissions is promoted through written material explaining: 'Where there's water, there's carbon – and quite a bit of it. Every bath, flush or glug has CO₂ built into it, thanks to all the processes it takes to get it to the tap. So using less water is good news for the planet' (Anglian water promotional material). Alongside regional interventions there has been a host of other government and voluntary sector initiatives which have enrolled water as a more prominent public matter of concern – including the Energy Savings Trust 'At Home With Water', with the objective of educating publics, also through a device to calculate household average use- the Water Energy Calculator, and Waterwise's 'water saving weeks'.

In recent years, there has been a shift towards smart metering in the UK,

although with considerable variability as to its adoption. As Pericili and Jenkins (2015,p. 5-7) point out, smart metering has been subject to differing and ambiguous definitions particularly where water authorities' communications to customers are concerned. Comparing smart meters to traditional meters in the domestic setting they suggest first, that data on water use is recorded in a different way, allowing 'more precise resolution in relation to time' and the possibility of gaining 'multiple measurements', second, that automated reading and communication of data is made possible, and third that they enable greater access and interaction with collected data.

Smart initiatives are increasingly entering into domestic life and 'becoming a field of social control that makes intrusion in a person's private life quite natural' (Vanolo 2013,p.894). Smart initiatives to reduce water consumption and shift everyday cultural practices represent a particularly interesting initiative since they enter the private sphere of the home, disrupting everyday routines and challenge embodied and cultural habits and practices in unusual ways. This study builds on research and theoretical debates developed, in particular, by Australian scholars ((Allon and Sofoulis 2006, Randolph and Troy 2008, Head 2008, Hawkins 2011, Strengers 2013,Sofoulis 2005, 2011, 2013) to argue that smart water initiatives in the UK remain somewhat blind to the complexity of cultural practices, subjectivities, dispositions and affective responses of its customers when faced with strategies to shift their attitudes and behaviours. As Strengers (2013) argues, smart visions operate with a notion of the ' resource man' who will make rational decisions on the part of his household to adjust everyday practices as advised, and adopt the new smart devices. Lying behind such a figure is an educated, able,

knowledgeable and technologically savvy subject who knowingly participates in the intervention.

In this context, Thames Water followed in 2014 with the launch of its smart metering programme aiming to install smart meters in 3.3 million properties by 2020. This study thus aims to explore and stimulate debate on the inherent assumptions about individual behaviours and cultural practices that go hand-in-hand with the introduction of smart meters, and how these might disrupt their effectiveness in controlling the demand side of water resource management. Based on research conducted in Bexley and Greenwich on the Thames Water strategy to roll out smart meters, it explores the intervention through three frames: affect, habit, and the meaning of home in constituting specific individual and cultural responses to the intervention. The notion of affect here draws upon Anderson's (2009, p.78) attention to collective affects that 'press upon' life and the idea of 'affective atmospheres: serene, homely, strange, stimulating, holy, melancholic, uplifting, depressing, pleasant, moving, inviting, erotic, collegial, open ...' which draw attention to the often unspoken responses to interventions imposed by others. Habit is another useful lens for focusing our attention on the often-unnoticed responses of individuals in everyday life. The meaning of home foregrounds a third terrain, again sometimes unnoticed, but central to highlighting how everyday practices emerge from understandings of private/public distinctions, which are culturally and historically specific. I suggest that these are further mediated, and co-produced in relations of difference, particularly economic, ethnic and gender differences.

The Study

Several studies of water consumption helped inform this research. For example, Allon and Sofoulis's (2006) excellent study of everyday community attitudes and practices around water in Western Sydney revealed that water and water saving devices enrolled bodies in differentiated ways producing a diversity of domestic routines, practices and habits. As they suggested, demand and practices around water consumption derive from multiple human-cultural-natural-technological relations that produce and reproduce socio-cultural differences in a complex assemblage of factors that are distributed across space, time, and bodies. Other Australian research (Jenkins and Pericli 2014) (noted also by Adeyeye 2014) also revealed diversity in domestic uses of water across activities such as showering, bathing, washing, cooking, toilets and so on where class (defined through income and education), age and gender have also been central to explaining why some water consumers are willing to change their behavior and some are not. In another study, Randolph and Troy (2008) revealed the significance of housing tenure and internal domestic architectures on perception of water use. Robinson et al. (2014) reported how the warmth of a bathroom affects the length of time people spend in the shower.

In 2014 Thames Water in partnership with the environmental charity Groundwork initiated the Smarter Home Visit in two London Boroughs: Greenwich and Bexley. In advance of the introduction of the smart meter across the two boroughs, the aim was to provide household visits which were designed to give expert advice on reducing water consumption and to offer the fitting of free water saving devices. As the promotional material

announced: 'As we roll out smart meters our team will be on hand to help you save water and energy - better for you, your pocket and your local river' (Thames Water 2014). The intention was to help customers to get the most from their installed, or soon to be installed, smart meter, with the promise of a potential saving of one quarter off the current water bill. The visit of 30 - 60 minutes involved expert advice, the installation of devices and the checking for leaks on taps and toilets, and an explanation of how bills are calculated. Once the smart meters have been installed and connected to the data hub, households will be able to chart their appliance- by-appliance use of water on an hour -by- hour basis, (some meters are already in place but the data hub has not yet been constructed). This is a socio- technical assemblage of devices designed to shift household conduct which is being introduced in the context of a growing population and demand for water that is predicted to exceed existing sources of supply. During the visit the smart meter is introduced to the often-bemused consumer as it is pulled out of the bucket along with the appliances.

Insert Figure 1 Thames Water Smarter home visit promotion.

This article is based on research carried out on the smarter home visits conducted by Groundwork's Green Doctors from August 2014 to January 2015. The researchers shadowed 9 Green Doctors during 121 home visits to households in the two localities. Households who had been selected as higher than average water users were first contacted by letter from the water authority explaining the purpose of the visit that was followed up by a phone call from the Groundwork office to make the appointment.

The researchers recorded the same information collected by the Green Doctors and household data was anonymised. This was a limitation on the research that could not be avoided, since the agreement with Thames and Groundwork was for the researchers to shadow visits but not to ask their own questions. Recording comments made verbatim anonymously during the visit and field observation notes provided another route to exploring the responses in greater depth. An iPad application was used by the Green Doctors for the questionnaire that has been updated since the research to enable a virtual walk through each of the rooms with water appliances. The visit took 30-60 minutes including the questions, the Green Doctor's calculation of the estimated bills, and a discussion of recommended behaviour changes based on the householder's water use. Information was collected on: tenure, type of residence, the number of occupants, the age of the house/flat, and the make of toilets and boiler. This information enabled the Green Doctor to calculate a typical average bill for a household of that size, and this was reported to the householder. The researchers recorded socio-demographic information on a separate sheet. The Green Doctor then gathered information on household water consumption, asking the householder to estimate the amount of water they use in different appliances, and time spent, during different practices – dish and clothes washing, showers, tooth brushing, baths, toilets, watering the garden. This was then used to estimate the householder's current bill, which was compared to that of an average household of their size. What is being mobilized here is the figure of the average water consumer. But as Sofoulis (2011) points out the average water user, and such statistical norms, 'smooth out complexity', while at the same time obscuring internal

differences amongst householders and their practices, such that consumption is unequally distributed across generations, genders and ethnicities (Sofoulis and Williams 2008) as this research explores.

Once the questionnaire has been completed water saving devices, such as showerheads and tap aerators to restrict flow, and save-a-flush mechanisms are installed. The application also allows the Green Doctor to calculate how much water would be saved following the installation of the devices and the adoption of recommended changes in water consumption practices. In the final stage of the research, 20 in-depth follow up interviews were conducted with a random selection of households who had received a smarter home visit two months previously, and a further 25 telephone interviews were carried out. Notes were taken from the interviews and anonymised.

With the exception of the follow-up interviews, we had no access to information concerning the changes in household bills following the visits, though this would have been illuminating data to gather. The effects of the intervention in terms of behaviour change were thus not our concern. Other studies have however investigated similar programmes to consider behaviour change. For example, in their study of 252 households in South-East Queensland Beal, Stewart et al. (2013, p.116) reported that 'householders' perceptions of their water use are often not well matched with their actual water use ' and that 'attitudes and behaviour towards potable water supplies have changed due to greater social awareness and increasingly widespread exposure to drought conditions; people are beginning to genuinely value water as a precious resource'. Instead, through the material collected we hoped to explore the different ways in which such initiatives were mediated

by socio-cultural factors which I suggest affect the 'success' of the programme's stated objective to reduce household water consumption. My focus here also was in how the specific differences were constituted and articulated through the intervention.

The households visited during the research period were spread across the two boroughs, with the largest proportion conducted in Thamesmead, an estate built initially by the Greater London Council for families who were rehoused from overcrowded Victorian terrace housing in inner London, and which now has a concentration of African households. The ethnic composition of 121 households visited was: 51 White British, 20 African, 6 Afro-Caribbean, 5 Asian (including originally from India or Pakistan) 9 South East Asian (including Chinese and Filipino), 8 European, and 3 from the Middle East (with the ethnicity of the remaining not recorded). Just over one third of those visited were homeowners, 35 households lived in housing association or council housing, and the remainder was in the private rental sector. Employment status was recorded for 84 of the 121 respondents, of which 9 were skilled, 19 were unskilled, 41 were in employment requiring higher education (including nurses, teachers, IT analysts, finance sector workers), and 15 were on some form of benefits (including disability, unemployment and pensions). Through thematic coding of the field notes taken during and after the visit, which recorded the willingness to have new devices installed, and the level of interest in the visit and the water saving advice given, two broad patterns of response were identified - engagement and resistance/indifference, where this might be seen as an 'ambiguous and potentially productive process, rather than a deficient state of subjective

failing' (Hynes 2016, p.24). The responses were thus interrogated to explore the significance of cultural practices, rituals, gender/age/ethnicity, agencies, technologies and housing.

Insert Figure 2. Fitting a water saving device on the garden hose.

Affect.

An analysis of discourses deployed by the Water Companies in the promotion of water saving programmes, reveals explicit strategies to elicit an affective response. Customers are called upon to 'love every drop' (Anglian Water), 'love your river' (Thames Water), and 'care for the environment' and 'act responsibly', in attempts to mobilise environmental concern, awareness, and an ethics of care (Gilligan 1982). What is often not recognized however, are the complexities inherent in any response to these messages, mediated, as they are by social and cultural differences and histories. Most salient in this respect were income and education, gender, age, ethnicity and earlier experiences of Thames Water. None of these differences are homogenous, and some differences themselves are produced through the smarter home visit rather than existing pre- formed to be mobilized by the intervention.

Ethnicity offers the clearest illustration of this. As we shall see, experiences of living with water scarcity or abundance, or unreliable or expensive water supply in other countries translates into different household practices in London.

Concern about the environment was more prevalent amongst households with higher levels of education, and amongst those in professional employment as other studies have found also (Gilg and Barr 2006). Many of these respondents already knew some aspects of water conservation and

were keen to learn more, and take the advice of the Green Doctors on water saving practices, and the use of devices. Respondents were typically expecting the smarter home visit, welcoming at the door, happy to answer the questions in the survey, asked questions themselves and were interested in how much water was saved by the installation of water saving devices. Concern was thus expressed in a willingness to change water use practices, a curiosity about water conservation and the reduction of water consumption. One householder for instance, said: '*it is interesting to find out the various things you can do*', reporting in the follow up interview that she found the visit both 'useful' and 'instructional' commenting: '*It did make me slightly more aware after the event of just general consumption and what you're doing during your day. But there's a minimum amount that goes on in the house that doesn't change.*' (Chinese businesswoman).

Several of the Green Doctors reported finding that some people with lower levels of education (as noted by Gilg and Barr 2006) were more reluctant to being educated about water use. A dominant trope here was a sense of marginality and powerlessness, which itself produces and reproduces new forms of marginalization where daily routines of survival become the limits of possibility. Green doctors mentioned the demoralising effect of living in poor accommodation that worked against making changes, even if they did enable a reduction in expenditure. Lower income households, particularly those in private rented accommodation, were sometimes disengaged with the visit particularly where tenants were seemingly disempowered by their lack of rental security or permanence, or an apparently marginal relationship to their housing which militated against being invested in the advice that was of little

personal relevance. Where tenants were not responsible for the water bills, or bills were paid on direct debit, there was a particular lack of concern about whether the devices could be fitted, or whether they helped save water. Equally in dwellings with a large number of occupants (often unrecorded), where secure tenure was precarious, there was a reluctance to discuss the bills or practices of the inhabitants.

Negative affect- expressed in indifference, resistance and lack of engagement with the initiative (60 % of the recorded responses) was particularly notable amongst those who perceived Thames Water as an organization whose prime motivation was the accumulation of profits. These householders were suspicious of the motivations behind persuading customers to reduce their water consumption or change their practices:

I don't think water should be for profit, obviously they have got to make some money to cover costs, but they shouldn't be making large profits for their shareholders. I tried to find out what profits they were making and they claimed crown immunity'. (White middle-aged man).

And:

If the devices did save water there would be benefits but then they push the prices up. I am concerned about the motives. I don't think it's a waste of time necessarily but I am concerned about the motives. (Older white man).

Previous negative encounters with the corporation or agencies of the local state for some householders also produced hostility or indifference to any external intervention. Herzfeld's (1992) book '*The Social Production of Indifference*' throws some light on this, where he mobilises Weber's concept of "secular theodicy" to refer to "the idiom of grumbling against the state",

which, he suggests, is deployed to justify earlier humiliation by the bureaucrats (1992.p.127). In his view, although bureaucracy was intended to assure accountability, in reality it produces the opposite: indifference. A similar trend was identified by (Browne, Medd et al.2014,p.66) who suggested: 'if consumers regard their water provider to be untrustworthy, they are more likely to be unreceptive to proposed water conservation or efficiency initiatives, and thus these individuals (or households) are unlikely to be responsive to potential behaviour changes'. Suspicion underpinned other reactions where households assumed the Green Doctors were collecting information that could influence their bill. Where households were comprised of migrants who spoke little English, or felt threatened by strangers appearing at the door, household visits were declined or barely engaged with.

Habits

The smart meter initiative involves both education and the installation of new devices to reduce water consumption. Underlying such a strategy is the assumption that former habits and cultural practices enacted around domestic water can be changed. Such a notion, implicitly perhaps, involves an ABC framework of social change, where 'values and attitudes (the A) are believed to drive the kinds of behaviour (the B) that individuals choose (the C) to adopt (Shove 2010,p.174), or an understanding of the 'nudgeable' human subject, who can be persuaded to change their behavior (Thaler and Sustein 2009, Leggett 2014). It is more useful, I suggest, to draw on the recent literatures on habit, on the one hand, and on the interrelations between materials and objects as they constitute our ways of doing things.

In their special issue of *Body and Society*, Bennett et al (2013) argue for the centrality of habit in the formation of human capacities, and for understanding how particular behaviours and conduct are brought under the direction of both secular and religious authorities (2013, p.4). As they put it: 'habit has more typically constituted a point of leverage for regulatory practices that seek to effect some realignment of the relations between different components of personhood – will, character, memory and instinct, for example – in order to bring about a specific end. Habit is always figured in relation to these other coordinates of personhood, caught up with them in processes of habituation, dis-habituation and re-habituation' (2013, p.5). More recently, as they argue, there has been a move to understanding the formation and re-formation of habits in their entanglement with socio-material environments. In Bourdieu, habit or rather habitus as a set of dispositions has been central to his accounts of how people relate to social worlds, but takes little account of how material devices affect behavior, which has led some Bourdieusian scholars to consider how physical environments and specific materials actively shape how fields are constituted (Silva 2016).

Strengers' (2013) exploration of smart technologies in everyday life and what happens when they encounter the household and the limitations and possibilities of smart strategies and materials in transforming and shifting everyday practices and routines, (following Shove et al. 2012) and reducing energy consumption, is very useful in opening up an understanding of everyday life as messy and disorderly (2013,p.53). In relation to the willingness of people to adopt water saving devices, Marres (2012,p.8-9) asks question how 'things acquire the capacities to organize publics by particular

means ‘, which encouraged my particular attention during the smarter home visits to the how the objects enrolled- or not- the householders in new cultural practices.

The devices appeared to be differently effective in challenging existing habits, which themselves were differentiated by ethnicity, age and gender. Mothers described the resistance of young women to the installation of the shower head to reduce time spent in the shower, since showering, and particularly the use of a plethora of body essences and creams, shampoos and conditioners, was seen as crucial to their daily routine to perform their bodies in ways that fit in with their peers. As Robbie (2009) argues, cultural expectations around beauty, body care, and hair washing, proliferate through the media, which seems to translate into longer showers amongst teenage girls, some of who reported showers of up to half an hour as common practice. As a consequence, the Green Doctors highlighted the benefits of a strategy which focused the smarter home visit on women with children: *‘they are high water users- if we could hit them- then that is jack pot- that is my impression..... girls do wash their hair every day – do their shaving- also enjoy the shower-... pampering.. Definitely the teenagers – but also the 30 somethings are heavier users’* (John).

Gendered and embodied habits translated into resistant responses to the intervention in diverse ways. Everyday water use for many of the lower income and single parent households was high, but the willingness to engage with new practices and use water saving devices was constrained by the stresses and pressures associated with running a home single-handed. Single parents living in poor standard accommodation on benefits, on whom

the pressures of bringing up children on often-limited incomes, not surprisingly, had little energy or time to engage with the visits. The lack of affordability of new washing machines or dishwashers with eco settings further militated against their purchase. The use of washing machines was also similarly imbricated in cultural expectations, often gendered, around wearing clean clothes at work for example, and changing outfits daily. While women appeared to take pride in sending their children to school, or social and sporting events in freshly laundered outfits. One woman in a follow up interview said: *'I'm not going to use my washing machine any less- my boys play football every day and I wash their clothes every time they come home.'*

The water flows of the region from which people migrated, and their prior experiences of water availability, management, governance and infrastructures, themselves seem to shape their water habits and practices of water consumption, according to the different ethnicities and countries of origin where these habits and practices were constituted. Migration from countries where there was a shortage of fresh water, or where water was used in very different ways, or managed differently, led to a strong interest in sharing their experience with water overseas and reflections on national and cultural differences. For instance, one man from the Democratic Republic of Congo commented that 'in England, people are more careless with water. In Kinshasa they already have water meters so 'people are more careful'.

A young woman from a mixed Afro-Caribbean and white British family described a background where water conservation was paramount. She made the point that her mother (a nurse) had been very insistent that they considered the environment when they were growing up. Keith, a computer

whose parents migrated from Jamaica where concerns over the availability of fresh water have been expressed for over 30 years with a growing of its increasing vulnerability due to extremes of climate change (Cashman et al. 2010), similarly reported being brought up not to be wasteful:

'I had my first trip to Jamaica when I was 21 and it was a bit of an eye opener- You had to pay for water there- to have the tank filled- so there you don't flush the toilet there unless you did no. 2- so it gave me a whole new look. We are a lot better off than most of my family out there. ...I don't take it for granted any more'.

In Thamesmead, where there is a concentration of African (particularly Nigerian) households, there was a pattern of using water sparingly, such as washing in the bath with a bucket (13 people in the research), or using mugs to brush teeth, practices even passed on to the next generation. A woman who had grown up in West Africa where water was scarce, after arriving in England, described carrying on the traditions from home, and was very enthusiastic about the devices, commenting on the timer: 'That will be good for my boys!'

As Tony, a Green Doctor, explained: *Africans have had to walk to get water where they come from so they are not wasting it.* This kind of understanding was not only restricted to people from less developed parts of the world: *'My parents are in Australia and awareness of water consumption is very high there and so if you run a bath and there's cold water at the beginning you put a bucket underneath and save the cold water till it gets hot. You use it for something else - you don't just waste it. Behaviour is very much shaped by*

that awareness there and we don't have any of that in this country'. (White woman, 30s).

Religion also featured with sections of the Muslim community who articulated a cultural and religious based respect for water, and a tendency to conserve water, learnt from childhood. As Mohammed, a Bengali man explained: *'Islam taught me from an early age – when you go to Saudi-and you are on a pilgrimage and you use unnecessary water- you are told God won't be happy - even from childhood... Our religion says if you use more water for unnecessary reasons- it is seen as a sin....It is common sense'*.

The installation of the swivel tap in the kitchen sink or suggested use of washing up bowl was resisted by several ethnic groups. One Nepalese man described the difficulty of persuading the women in his household to wash their vegetables and dishes in a bowl in the sink, since in his country fresh running water was abundant in the many rivers that descended from the Himalayas, and the notion of washing things in water that was not flowing was thus seen as dirty and unhealthy. Such a view, however, reflected a rural experience, since women in Kathmandu, where water resources are limited are highly aware of conservation issues, given the significant amount of time and energy required to obtain sufficient supplies (Moench et al. 2003). Some of the Asian women interviewed considered washing vegetables or dishes in static water to be unhygienic. As one woman in a large suburban house explained to me: *' the dirt just gets recycled and absorbed into the vegetables- it's a horrid idea'*. Others came from countries where water was free, such as in Turkey, which meant that they had little awareness of its cost, even thinking it was free, with the result that they were not mindful of taking

care to avoid high water bills. The enactment of such differences underlines the significance of taking account of the wider socio-cultural context.

It is clear from these responses individuals were not easily enrolled into the initiative for a diverse array of reasons, produced within a complex assemblage of factors (as Jenkins and Pericli 2014,p.58 also found) which were not reducible to lack of motivation or other negative accounts of individual behaviours.

Some older people who appeared to be more careful with resources and better at conserving energy and water, as other studies have found, typically embraced devices. The generation who grew up during the Second World War and post war period remains imbued with a sense of responsibility for scarce resources and an abhorrence of waste, particularly women, whose primary domestic responsibility brought heightened awareness. As Miles, a Green Doctor, pointed out:

The older people particularly are very conscious of these things. Taking water saving advice to people who are 50 plus they can tell you what to do. The younger generation much less so. Older people who grew up in the war pass on advice to the baby boomers- it's the next generation who are spoilt with everything.

But this was by no means universal. Age intersected with established habits perceived as not amenable to change. Resistance to instructions determining their personal habits echoed the responses of the participants in the Everyday Water research in Sydney (Allon and Sofoulis 2006,p. 53), who were 'highly critical of the kinds of scripts that some technologies in the home dictate for users to follow'. As one older white couple put it: 'we are too old to

change our behaviour now and why should we be told to do so', or as Bob, one of the Green Doctor said, *'it was difficult to teach old dogs new tricks- an older person who has always had baths- not going to change them- I like my bath- younger person might be up for a two minute showers.*

Faulty devices were a matter of concern. In the follow up interviews where devices had been installed, if they had functioned well, householders were more likely to have been successfully enrolled in the initiative. While rising costs of water also mobilized antagonism and annoyance as one older white man explained:

'I used to keep koi carp – which I gave up 6 years ago when I had a serious accident and also when the neighbour poisoned my fish- and at that time I used 6 cubic meters of water. But now I get even higher bills even though I am using much less water obviously. 6 years ago my bill was £85 per half year, now it is £186 per half year. So clearly they have put the prices up.

And- another middle aged white man: *'I think it is all about PR. Water should not be provided by profit-based organisations. Also I am a technical person and this aerator they put on the kitchen tap- it is failing already. It is leaking- letting water through. And it has only been on for two months. It is also getting furred up as we have soft water here. So I am thinking of taking it off....They put in the saving device in the cistern. I think they could more usefully do a simple conversion to dual flush – it would cost £20- and that would work far better. You then use 3 or 1 gallon'.*

Domestic architectures and housing tenures of households intersected with devices. Where houses were large and luxurious, saving money was not a great concern, or wealthy owners were not interested in unsettling their carefully thought through domestic design with objects not of their choice. These householders acknowledged their high water bills, often deriving from several bathrooms and facilities (one house had 7 bathrooms, 9 taps and 2 dishwashers), but had little motivation to reduce their bills. As one Green doctor Bill described it:

I went to a man who didn't care that much. He had a nice home- I offered a shower timer- he said "no don't bother- if I want a 10 minute shower I'll have one"- so saving £50 on shower is meaningless to them'.

Meaning of the home

In this final section, I suggest that water authorities fail to take account of the specificity of meanings of home, in particular the notion of home as private and free from regulation and intervention- a space of personal control. What is not recognized is that the smarter home initiative disrupts and reconfigures the meaning of the home in particular ways. The point here is that domestic water consumption is integrally connected to particular practices deemed appropriate to the 'home' or to assumptions, beliefs and values about cleanliness, comfort and convenience- Shove's 3 Cs' (2003,p.3) which encompass the environmental hot spots of consumption'. These everyday practices (washing, going to the toilet, showering), which are embodied, saturated in affect, habitual and entrenched over time, are difficult to shift. They play an important role also in maintaining social and familial relations,

and are implicated in notions of the home that are contested, shifting and contextual (Allon and Sofoulis 2006). Nevertheless, in advanced capitalist societies they are typically seen as private, as spaces of belonging, the familial, and personal control, though these attributes are also highly mediated by tenure and gender (Watson 2010).

Feminist writers have long articulated private/public boundaries as shifting, contextual and complex, where activities associated with the public sphere are enacted privately, and vice versa. That said, private- public boundaries retain some force, both imaginary and symbolic, as a respite from the troubled and hectic world outside, and material- the door can be locked to keep outsiders at bay- particularly for residents of gated communities. Arguably, then, the smarter home visit, in its material practices enacted, reconfigures the public/private boundary by making the home a space of public intervention and by bringing normally private embodied matters into public discourse and regulation: tooth brushing, time spent in the shower, and practices of defecation. This is not normally the talk or terrain of strangers. The research confirmed this point. In the household visits we witnessed awkwardness and embarrassment at questions relating to personal habits, some of which were part of the questionnaire administered by the Green Doctors.

Similarly, the fitting of the smart devices disrupts notions of the home as a site of individual choices over objects like taps, showers and washing machines. In a culture where homes and the objects within them are key expressions of self, ' a space of belonging and alienation, intimacy and violence, desire and fear, ... invested with meanings, emotions, experiences

and relationships that lie at the heart of human life' (Blunt and Varley 2004; p. 3), such interventions are similarly imbued affectively. In the research several respondents said they had chosen their fitting to suit their taste and could not be persuaded to adopt alternatives even if they saved water. The smarter home intervention thus disrupts and reconfigures private- public boundaries exposing private behaviours to public scrutiny, and intervening to reconfigure domestic bodies as responsible subjects who are required to shift habitual and desired habits to conform to wider public objectives. The devices are also actors which reconfigure the private as a space where water users are enrolled in new ways of relating to water, over which they have limited control. For example, the saver flush inserted into the cistern reduces the amount of water in the toilet, which militates against large organic or inorganic objects being washed away. The new showerheads reduce water flow from the more typical 15 and 20 litres flow per minute to 8 litres per minute, diminishing the pleasures of reveling in an abundant shower. Though environmentally practical these socio-technical assemblages are thus constitutive of new embodied practices re-figuring homes as sites of intervention.

What is ignored therefore in smarter water initiatives is that the particular meanings of home, which vary across cultures, time and place, act to configure particular responses of households and the individuals within them, and social differences. What these interventions do is take control away from the households in ways that are challenging and liable to be resisted. Such resistance was revealed in some of the follow up interviews. One of the women described throwing away many of the devices since she considered it

her business to run the household in the way she wanted to and resented the intervention of outsiders telling her how to run her home. This was a particularly gendered response, most evident when women took the major responsibility for domestic life.

Conclusion

This paper set out to explore how strategies to encourage households to consume less water, through education and the installation of smart meters, play out in actual social worlds where the texture and complexity of households, and the individuals within them, has a tendency to be simplified to average or statistical norms. Sofoulis (2005) argues that 'Big Water' organisations- the large authorities that dominate the water industry through centralized provision and control- have typically ignored social elements such as gender and cultural orientations operating with notions of the rational consumer – Strenger's (2013) 'resource man'. Such an approach fails to recognize the diversity of cultures and everyday practices, and the complex ways in which devices enrol individuals constituting new practices or reproducing traditional patterns, which are not knowable in advance of the intervention.

Building on research and critical analysis from earlier studies, this research set out to explore Thames Water's Smarter Home initiative deploying three frames- affect, habit, and the meaning of home- for thinking through the different responses of householders to the intervention. Differences were articulated across income, education, gender, age and ethnicity- not as

homogenous or fixed categories, but rather as categories which emerged through the smart metering intervention.

The notion of affect drew attention to the significance of an ethics of care for the environment on the part of some householders who saw water conservation as important. Education and/ or income emerged as a key difference, where lower levels of education and income produced a sense of powerlessness or lack of concern. Householders who saw Thames Water as an organisation primarily motivated by profit also expressed negative affect, while others had had previous negative encounters with the corporation of the local state. The frame of habit highlighted the different gendered and embodied practices which constituted an obstacle to the intervention, for example, amongst young women for whom showers constituted a necessary start to the day, or to an evening event. Older people had developed water conserving habits during the war, or post war, period of austerity. A focus on the notion of habit also revealed that the water flows of the region from which people migrated, and their prior experiences of water availability, management, governance and infrastructures, themselves seem to shape their water habits and practices of water consumption, according to the different ethnicities and countries of origin where these habits and practices were constituted. Paying attention to the meaning of home as a frame for understanding household water practices provided a lens for understanding how different conceptions of private and public, and embodied practices seen appropriate to these different spaces, also made sense of the diversity of responses to the smarter home intervention and installation of devices. The extent to which the devices were incorporated into households disrupting

everyday practices thus emerged as highly differentiated and embedded in a multiplicity of experiences and histories.

In conclusion, then, the research demonstrates how demand management interventions like the smarter home visits, conceived as a relatively simple technology-driven behavioural change strategy, are more complex and nuanced in their reception and effects, especially on the user-provider relationship, in the constitution of social differences, and in the definitions of public and private spaces and practices. Acceptance or resistance of these programmes is not knowable in advance of their dissemination. For such interventions to be successful, water companies thus need to recognise the differentiated social, cultural and economic environments in which their strategies are enacted. A failure to do so can only limit their stated objectives of reducing household water consumption.

With special thanks to Kellie Payne for her research on the project, and to the Green Doctors and Groundwork for allowing me to shadow their smarter home visits. Also my thanks to the reviewers for their insightful comments.

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