Towards A Sustainable Use of Water at Home:

Understanding How Much, Where and Why?

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Abstract

This paper presents the findings which have arisen from a literature review carried out at the beginning of a three year CONACYT sponsored PhD project, investigating water-related activities in the home and the growing need to understand user behaviour when consuming water. It illustrates how habits and routines emerge and develop. It then considers how perceptions of consumption and hygiene influence domestic water use, reflecting on how social, psychological and technological aspects influence domestic water use. The paper concludes by identifying a number of research questions which will be investigated through the remainder of the project.

Keywords: Water consumption, Household, User behaviour

1. Introduction

Clean, unpolluted water is essential to all kinds of life, and even though it is considered a renewable resource, pollution and over-usage are threatening the world supplies of this precious liquid. In many regions of the world groundwater has been extracted at a rate that exceeds natural precipitation back into the water cycle; this combined with pollution jeopardizes the availability and easy reuse of it (see Figure 1).

Water extracted from the ground has three main uses: agriculture, industry and urban consumption. While domestic water use accounts for only a low percentage of the overall use of water, it is an issue that every person can relate to –and act upon. It is therefore essential to carry out research to understand the behaviour related to water usage. Given the decreasing amount of fresh water available, making the most out of the water resources available to us should be taken as a personal goal for everyone. Consuming water sustainably should be amongst everyone's priorities: consuming responsibly, even if it means shifting one's consumption habits, and consuming less.

2. Factors behind water consumption in the home

Findings indicate that in some countries, such as the UK and USA people have, in general, a sound awareness of the environmental issues going on in the world (Barr, 2004). When enquired in surveys, they tend to respond in favour of environmental actions. Even when people express commitment or excitement about conservation plans, the actual change of behaviour/response is not evident (De Oliver, 1999; Jensen, 2008). Expressing support to conservation policies is often regarded as socially correct, it adds on to the social capital (Medd & Shove, 2005b) and it adheres to the social norms (Corral-Verdugo & Frías-Armenta, 2006). For one reason or another, this 'aesthetic' rightness struggles to go beyond the attitude into a real sustainable behaviour.

Figure 2 gives a simplified estimated view of the distribution of water consumed at home

People's choices concerning water usage are attached to many drivers apart from environmental concerns: comfort, convenience, cleanness, economy and design. According to a study carried out in Denmark, among the drivers for one's actions environmental qualities generally rank lower that the above marked ones (Jensen, 2008; Wiese, 2001). Ethnicity and religion are also two influential factors towards actions and consumption patterns, this though, has been less researched (Smith & Ali, 2006). Behavioural intentions, also referred to as attitudes, are just one of the aspects of actual behaviour. Situational and psychological circumstances also play a role and they all interrelate and act to finally produce one's actions (see Figure 3).

People, even when they feel they are responsible for their own actions (either pro or anti environmental), may assume that their actions have little or no weight on the whole global environment picture (Barr, 2004; Eden, 2000) resulting in a dismissal of the intention of behaving sustainably. This relates to Askew and McGuirk's (Askew & McGuirk, 2004) conclusions that people think about conservation in an impersonal way, disconnected to their own water practices. The sometimes inconspicuous consequences of environmentally damaging behaviours are beaten by the immediate results in comfort and convenience of many antisocial and unsustainable behaviours (Lehman & Geller, 2004). Lilley, Lofthouse *et al.* (Lilley, Lofthouse, & Bhamra, 2005) refer to the fact that people think in large scale, rather than local scale, causing them not to relate to the larger consequences of their actions, and thus behave unsustainably.

A large amount of the water consumed in the home happens in the bathroom, with showering and bathing accounting for 20-30% (Hand, Southerton, & Shove, 2003). Kitchen activities, mainly dishwashing, appear to have high water consumption. The use of dishwashers is becoming more and more common in western societies. Technologies are evolving, different sizes are being created to accommodate smaller households and prices are dropping, making such an appliance affordable to many. Some studies indicate that current electrical dishwashers are more efficient than manual dishwashing in terms of time, cleanness and water consumption (Stamminger, Elschenbroich, Rummler, & Broil, 2007); yet, surveys have shown that in the UK only 28% of the population owns a dishwasher (DEFRA, 2007).

Water consumption is usually not obvious to the eye or mind. People tend to use water unconsciously, not referring to the use of water as an activity by itself, but as a tool to accomplish other activities (Gram-Hanssen, 2008; Medd & Shove, 2005a), whether related to hygiene (brushing teeth or washing clothes) or home care (gardening or mopping the floor), for pampering and relaxation (a nice bath after a long day of work) or even as a daily practice (the morning shower to 'feel fresh and awake'). Most of the time in today's rushing life, people are not fully aware of the amounts of water consumed (Randolph & Patrick, 2008), nor in which activities they consume the most. Since water-related actions present no particular personal-significance, with the acceleration in modern life, referred by some as 'Time squeeze' (Hand et al., 2003), people often opt for the most convenient solution in terms of time and ease, rather than the best solution regarding performance or environmental consequences.

Population growth and change in lifestyle are two of the many factors that contribute in the rise of water use in households. People living in individual households (DEFRA, 2006), a growing trend today, increases the water consumption per capita by up to 40%. One two-person household consumes 300 litres of water per day, whereas a single occupancy household consumes 210 litres (DEFRA, 2006; DEFRA, 2007; Memon, Ton-That, & Butler, 2007). A study by Memon, Ton-That et al. (Memon et al., 2007) based on UK population, showed that indeed single occupancy has 'the highest consumption from taps and those with high occupancies have the lowest'.

3. Everyday practices

The majority of domestic water related activities such as laundering, washing dishes or working in the garden are often performed in time-space coordination with other activities: watching the children, rushing off for a social engagement, or trying to finish before the 3pm football match. Most of the water related actions at home are continuously performed as part of habits or routines that are more complex than one simple action. They are divided into little practices (Schatzky, 1996) that people do in 'auto-pilot' most of the time. Human behaviour is often composed of several routines and habits which are individually developed throughout time in order to feel in control.

Routines develop over time from childhood, with the influence of parents and the environment (Gram-Hanssen, 2008), evolving along with the circumstances that come along (Medd & Shove, 2005b). People stick to those routines to create a feel-safe environment (Guiddens, 1990). Krantz (Krantz, 2006) refers to this 'safe environment' as matter in place, which when disturbed changes into matter out of place (i.e. dirty dishes in sink). This triggers an action to re-establish the original state (wash and put them away). Many routines we learn and carry out without consciously thinking about them: we have a preconceived convenient technical arrangement of resources to revert the 'out of place' in short notice. People's perception of a matter out of place, along with the personal arrangement of available resources are individual and unique; while one might not mind the pile of dishes in the sink until it interferes with other activities; others might like to have the sink empty and clean at all times. That is one of the reasons for which activities are carried out at different times, with different actions in the processes.

Behavioural psychologists consider that the process of changing habits and routines into more sustainable (or unsustainable) ones happens in different stages (Pelletier, Lavergne, & Sharp, 2008): being aware of the problem, identifying the different possible solutions; choosing one and initiating a behaviour, and making the behaviour a long term habit, or in the worst case scenario, reverting to the original behaviour. Different approaches must be taken for each stage in order to succeed, as people will process the information in a more paused way and in the right time to make the best out of it. It is important to assess attitudes and behaviours and their evolution throughout time, since people tend to react favourably to sustainable or green campaigns in the beginning, but the interest seems to decline over time, as 'behaviour returns to baseline if the source of motivation is withdrawn' (Lehman & Geller, 2004).

4. Evolution of water routines

Shifting routines to make true long term changes is a long lasting process. New-more-sustainable habits might be well embraced in the beginning, but with time they tend to decline allowing the old routine to retake its place (Pelletier et al., 2008). It is an attitude-behaviour evolution through which user perception, lifestyle, technologies and infrastructure and social acceptance transform, and once people become comfortable and act almost automatically, it is harder to go back to previous behaviours.

An example of this 'evolution' given by some authors (Hand et al., 2003) is bathing and showering. During the Roman times bathing was seen as something luxurious and social; then in the middle ages it was felt to be as something dangerous; and later, as part of cleaning and personal hygiene habits, it became a status symbol, differentiating upper and lower classes (Ger & Yenicioglu, 2004). Nowadays daily showering has become part of most people's routine, probably due to changes in cleanness perception or to the 'time-squeeze' phenomenon. Thirty years ago a weekly bath was regarded as normal, sometimes even a bath a month. With time, hygiene perceptions changed, technology emerged and infrastructure became available to a majority of the population; these factors, along with the change in lifestyle towards a more rushed one, lead to the evermore common practice of daily showering (Hand et al., 2003).

Another transformation of common habits related to changes in time and hygiene standards happened in laundering activities. Clothes used to be regarded as protection of the body from dirt; whereas now, it is the body that seems to soil the clothes, as they are washed even if used only once and for a brief period of time and show no dirt, they are washed simply to get rid of the 'impurity' of the body (Shove, 2003). A curious fact related to convenience and 'time squeeze' appears when even if clothes are not really dirty, many people conveniently wash all clothes worn, from all members of the family, rather than separate dirty from clean (Randolph & Troy, 2008); and this of course increases the number of washes and resources wasted. This implies that the what (is washed), when and how, are not enough to understand the washing practice. The reasons behind it might have a strong influence in one's performance, therefore the importance of studying the activities in a wider context rather than in isolation.

Changing peoples' mindsets is not enough alone, adapting infrastructure and introducing technologies is also required. In an effort to reduce electricity consumption at home with little changes in behaviours, food and clothing superstores Asda and Marks and Spencer (UK) both launched campaigns for lowering garment washing temperatures from 40°C to 30°C in early 2007. "Think climate" was Marks and Spencer's attempt (Mark and Spencer's, 2007), displaying in most clothing labels a maximum washing temperature of 30°C (see Figure 4).

In late 2008, a new campaign in the UK 'cold is the new hot' (Ariel, 2008) was launched the Ariel laundry detergent brand (Proctor and Gamble), promoting the use of 15°C with a new washing media in the form of gel. This would make reasonable savings in energy, being better for the environment and for the pocket of consumers. Nevertheless most washing machines in current homes do not have the option of such a low temperature, and many of them, go only as low as 40°C. So even if people truly want to engage to the 15°C washing, there is a technological barrier that prevents them from doing so.

5. Encouraging water saving

From all of the activities at home that require water use, some of them can be considered as necessary and some as not-essential. Trying to change people's behaviour into a more sustainable one, either through replacing a technology to a more efficient one, through a conscious change of routines from the part of the user, or by changing behaviour through product design, has to take into account the situation-context of the activity in play. In terms of water, demand can be elastic or inelastic for different purposes (Martinez-Espineira & Nauges, 2004). There is a baseline of consumption or 'subsistence level' that satisfies essential uses such as personal hygiene, cooking and drinking. These appear to be inelastic to variation in pricing or campaigns. Such essential uses should be targeted with the aim of conservation, whereas water used in recreational or non-vital activities, where use is elastic and therefore sensitive to context, should be tackled towards reduction or even avoidance of use.

Geller *et al*., (1983) carried out a study on three different approaches for diminishing domestic water consumption: educational (pamphlets and handbooks), behavioural (written feedback of daily/weekly consumption and recommendations) and engineering (installation of water saving devices). The investigation indicated that with the

installation of water conservation devices (aerators, cistern displacement units, shut off shower control) the expected savings of water and energy were not achieved. The findings suggest this was because it was done along with the distribution of information regarding the savings, and people could justify using the toilet more times, or taking more time in the shower. This phenomenon is referred to as 'rebound effect' (Herring & Roy, 2006) in which energy efficient appliances and new technologies do not always achieve a lower energy consumption. Psychologically, people justify the over-use of the resource (energy, water, etc.) and end up consuming the same or even higher amounts. As an example, fitting light saving bulbs outside the house could justify leaving them on all night to improve 'security' (Herring & Roy, 2006). The study on water consumption by Geller et al. (1983) confirms the rebound effect as only the users unaware of the water devices being installed in their homes achieved the savings predicted from the laboratory testing on the water devices.

6. Reducing water consumption at home

Introducing new and more efficient products is one of the choices to reduce water consumption in the household. Some of them replace other appliances keeping the old routines while using less energy and water, while others are meant to push the user to behave more sustainable by giving no option but to change behaviour. Finally, others simply give feedback on the resource consumption and leave the user the choice of changing or maintaining behaviour (see Figure 5).

Some products available in the current market include systems that connect the hand basin or shower/bathtub with the toilet cistern, which accounts for a major part in water consumption in the bathroom; and shower systems that have the option of cycling the water to have a longer shower without huge wastes (see Figure 6).

Simpler solutions include feedback gadgets (see Figure 5) and shower timers that help keeping track of the water used. Communicating intrinsic motives for environmental behaviours is one of the possible solutions or paths to take when trying to stimulate interest on sustainable/responsible actions/behaviour (O'Brien, 2008; Pelletier et al., 2008).

New products and technologies are only effective if the consumer embraces them and uses them in the way they were designed to be used. That is a great challenge for designers.

7. Conclusions and further research

Concerning reducing water consumption at home, it appears that it must be tackled by changing user behaviour. In order to do so, approaches must focus on the factors behind the various water-related activities that take place in the household. Policies, methods and campaigns must be designed in view of the local cultural and social background, alongside financial and technological accessibility (current or possible in the near future). In addition, the approaches must be multi-staged, in the sense that they must change behaviour in a gradual manner and must interconnect various means, from informing the user and providing feedback to making the use of new products be embraced by users and updating legislation accordingly – not necessarily in that order.

The next stage of this project is designing a tactic to assess water consumption in households consisting of carrying out observational research into different lifestyle backgrounds in Anglo and Hispanic communities (Mexico and the UK). It will develop knowledge and experience with regards to how different methodologies may or may not apply in distinct cultures, and in how they are best applied. It will also enable the development of a more detailed understanding of user behaviour in terms or 'water use' in two distinct cultural contexts. Even though routines and habits are unique for each individual, similar situations can be recognized and can be regarded as widespread amongst people. The study will aim to identify similar patterns and analyse the differences in terms of cultural background; perceived value of water; perception of hygiene and comfort; technologies available; and infrastructure. A cross-cultural comparative analysis will be carried out in order to produce a series of conclusions on factors that influence peoples' attitudes and trigger sustainable behaviours on water usage at home.

Everything in life, both actions and things, take time and occupy space. Projects in life are formed by several little activities that interrelate in the 'time-geography' (Krantz, 2006) and at certain time coexist in a particular context. Water and humans interact when one takes a shower, then their link diverts again as the water and the person move on from that activity. Constraints and resources available at the time of the activity are unique for each occasion, and it is those along with the individual's aims that indicate what practices are within reach and how they will be carried out (Krantz, 2006). Therefore activities and routines must be studied within a bigger context and not as isolated activities. In order to achieve a more sustainable level of water consumption there has to be a merge of the technologies available, product design and consumer demands, which all have a strong influence in behavioural evolution from traditional patterns towards sustainable practices (Nash, 2009).

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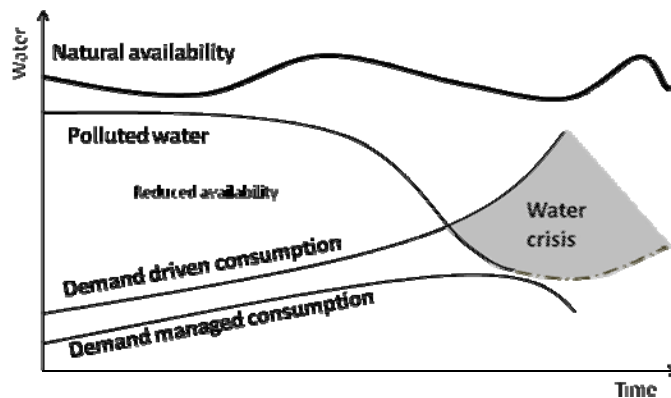
Figures

Figure 1. Water availability according to management. Adapted from (Butler, 2006)
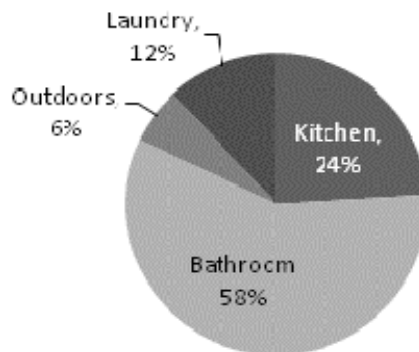

Figure 2. Domestic water use distribution by house-area. Adapted from (Butler, 2005)
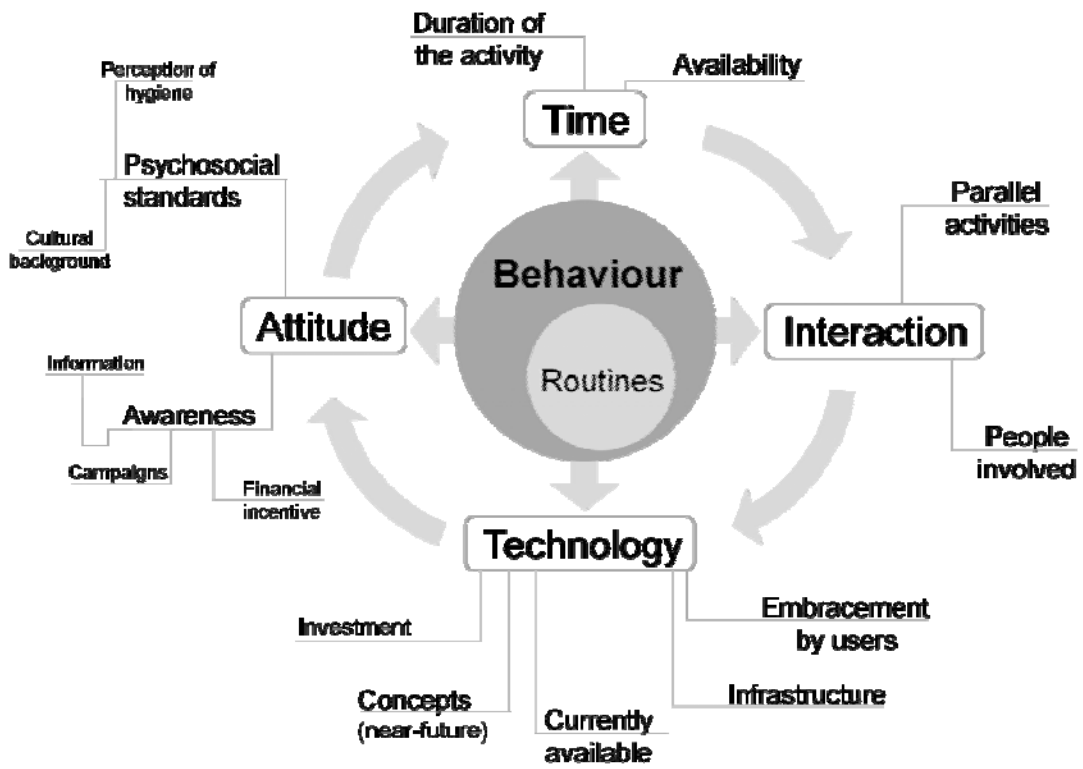
Figure 3. Factors influencing the creation of patterns and routines

Figure 4. Marks and Spencer's labelling– *Think Climate* - Wash at 30°C

Figure 5. Products in the market: *Sinkpositive*, *Autotap*s' retrofit infrared sensor and *faucet buddy*
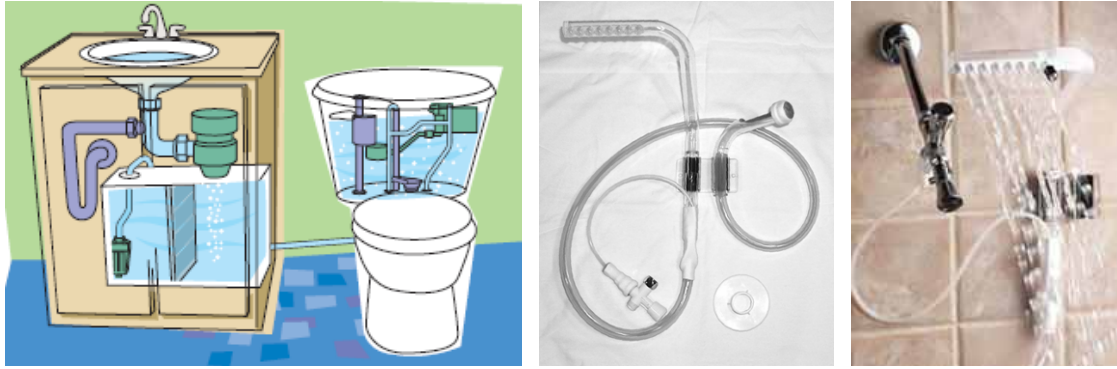
Figure 6. *Aqus* connects sink with toilet. *Wow shower* cycles the water.