A comparative study of attitudes and preferences for water efficiency in homes

Jean Balnave and Kemi Adeyeye

ABSTRACT

Water efficiency is the optimised use of water commensurate to need. Achieving water efficiency has, in the last decade, become an increasingly important part of policy programmes to ensure resource resilience and future supply. This study originated from a growing body of literature which purports differences in environmental behaviour in urban and rural residents. It presents initial findings from surveys conducted in two communities in Sussex, England. The objective of the study was to investigate and compare collective views on water efficiency by comparing users in different geographical contexts. The survey conducted in a rural and urban community started with the general assessment of basic household demographics and characteristics before investigating both water and energy use. Questions include factors that encourage or discourage water efficiency behaviour, views on information-led water efficiency interventions and limitations to the adoption of water efficient technologies. The paper concludes by discussing the differences and similarities found and the extent to which the findings are usable in water efficiency policies and processes, although it is worth highlighting that this study is the first set of a series of studies and is limited in its breadth.

Key words | attitudes and preferences, urban versus rural water users, user engagement, water efficiency in homes

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INTRODUCTION

Climate change and increasing resource costs are influencing individuals and businesses to explore ways to future-proof against risks associated with restricted availability of potable water supply and other valuable resources that contribute to their quality of life. This suggests an increasing affinity to be environmentally aware and make necessary adjustments. Nonetheless, this does not guarantee immediate success of water efficiency initiatives. Water efficiency policy, regulations and initiatives still need to address user concerns where it matters most as ignoring public sentiment may result in water-related initiatives not being implemented (Dolnicar & Hurlimann 2010). 'Local solutions for local communities' have been proposed as a possible approach to promoting water efficiency (Watef 2011). Engaging with neighbourhoods, communities, towns and cities to improve their environmental practices will make it possible to explore local solutions to local problems, and can help to improve their water and energy efficiency and, consequently, improve their resilience to resource shortages.

Previous studies show that the first step to an effective water efficiency initiative is to understand the attitudes, preferences and behaviour of water users (Graymore & Wallis 2010). Efficient water use can be achieved through behaviour, technology and infrastructure efficiency when there is an understanding of water customers and their needs (Adeyeye 2011). Behaviour change is a *response* to attitude change with individuals incorporating a personal view which directs behaviour through a sense of mastery and control which the individual attributes to the self rather than to an outside influence (McCalley 2006). Gatersleben *et al.* (2010) proposed that for acceptance to make change to occur, a degree of intermeshing is required to take place

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between people's values and lifestyle and the environmental cause.

Therefore, high public participation levels are required to meet efficiency goals (Mckenzie-Mohr 2000). However, this is not always easy and often requires significant investment in time and resources. In the case of this study, many hours were spent attending community meetings and events, neighbourhood planning meetings, etc., in order to achieve the desired level of engagement, interaction and understanding of the unique circumstances and context through which people perceive and interact with water.

This paper explores the collective water efficiency views of residents of a rural community and an urban town in Sussex. The objective was to investigate if perceptions and attitudes vary and, if yes, to what extent. This study is the first set of a series of studies and is limited in its breadth.

STUDY CONTEXT

The survey participants were residents in a village and town in Sussex. Water supply to each of the study areas are from two separate water utility companies, however, the sewerage services are provided to both by the larger of the utility companies. For this study, no data on the variability of water supply technologies, e.g. mains or local recycling, water pressures, pricing, were explored. This study lays the necessary foundation for these factors to be fully explored in subsequent study.

The village is located close to a river in an area of natural beauty and important for wildlife. Water for recreation is essential in this community, e.g. for anglers, nature walkers, etc. The river is highly valued by the community because it increases the affordability of things that add value to the community and influences their quality of life, such as leisure activities. In times of low rainfall or water shortages, the effect on the local environment due to lower water levels and lower rates of flow as well as the visible levels of the local reservoir are noticeable. The river is also an important abstraction source of water to this community and neighbouring areas. This village is close knit and quite forward thinking, with many residents embracing sustainable practices individually and collectively.

The case study town is situated on the edge of the South Downs National Park and is one of the fastest growing towns in the region. Further growth is projected with major housing developments proposed in the town's latest master plan. At present, compulsory metering is being implemented in the town and the impact of this on water bills, particularly for large households, have been a subject of debate in the area.

METHODOLOGY

A quantitative approach using questionnaires was employed for this study because it affords the opportunity to reach a wider range of people than would have been possible with any other research method. This method was used in both the selected town and village. Both case studies were sampled as part of a wider research partnership study in the county and are the first set of data to emerge from this exercise. Data from the survey were inputted into a spreadsheet and further analysed in SOFA statistics, an open source statistical package. The limitation of this study is its limited scope, range and sample. Although the same survey questions were applied in both contexts, this study is still a standalone piece of research and is limited in the amount and spread of responses received.

SUMMARY OF FINDINGS

This section presents a brief overview of comparative findings from the survey conducted in both the rural and town communities in Sussex, England. Both the town and rural community are situated within the South Downs area (Figure 1). One factor that defines, or even differentiates, towns and rural areas is the transport infrastructure. The town, being in a prime location on the main commuter road and rail link between London and Brighton, therefore continues to expand. It is now considered to be one of the fastest growing towns in Sussex. The population of the rural community was 1411, and the town just under 29,000 at the 2001 census.

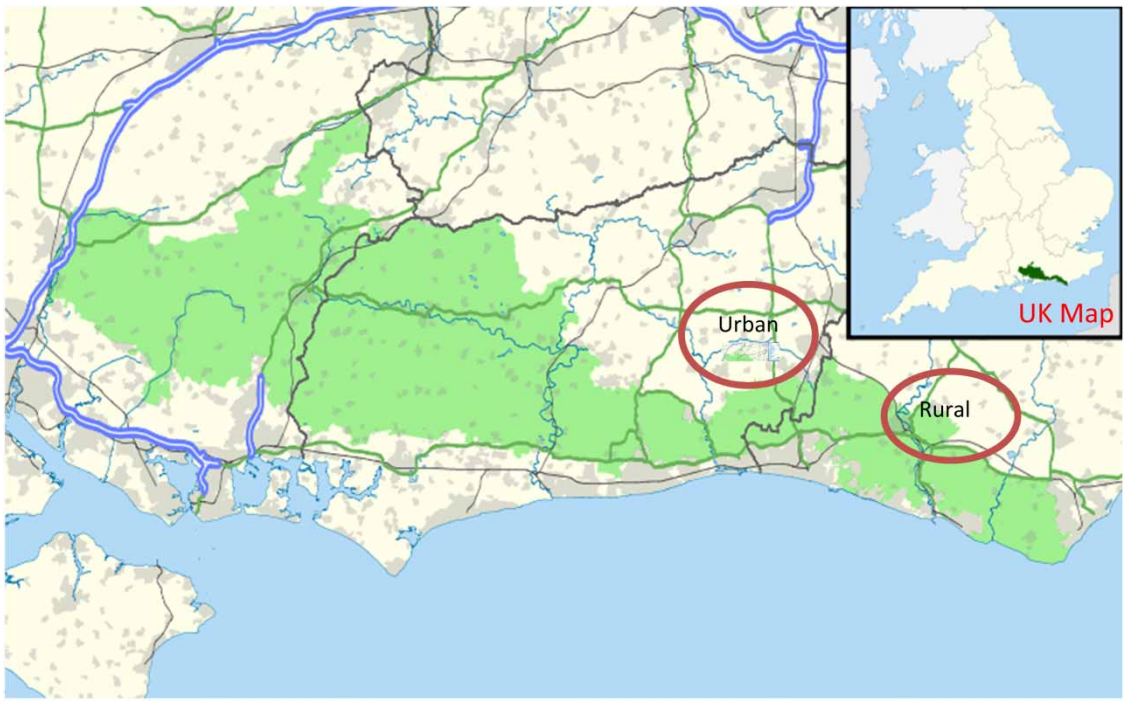

Figure 1 | Map of the South Downs highlighting study areas (attribution: By Nilfanion. Contains Ordnance Survey data © Crown copyright and database right).

General

The rural community is situated in a single geo-political ward, under the jurisdiction of a parish council. There was more spread with the respondents from the urban respondents with representation from all six wards. A total of 245 respondents completed the survey in both locations. The rural survey was conducted as part of a bigger energy and water efficiency programme. This resulted in a higher contribution of about 85% of the respondents. The study in the urban area was part of a neighbourhood action plan exercise, conducted on a ward by ward basis. Water efficiency had little priority in this exercise, hence the lower rate of response. Due to the variance in the number of respondents from each community, it is difficult to conclusively deduce statistical significance from the data. However, the data provide a useful basis for understanding key differences in rural and urban areas which can be used to further understand and target water efficiency policy and strategies. The respondents profile is summarised in Table 1. These profile data were compared with published official figures as is available and found to be comparative; increasing the confidence of analysis.

Interestingly, there were similarities of note in the dataset. The main similarities are that the majority (37–43%) of the households in both the rural and urban community are two person households. These data are confirmed by the official figures. Similarly, the percentage of young people is significantly less when compared with figures from neighbouring towns or cities, e.g. Brighton. Similarly, there are higher levels of detached and semi-detached dwellings compared with the much lower levels of apartments/flats. The majority of the dwellings have three or four bedrooms. For the purposes of compliance with new building codes and standards, and retrofitting for water efficiency, it is also beneficial to note that the majority of the dwellings were built pre-1980. A significant majority of respondents stated that they had no children under the age of 18 in their household. The single occupancy household percentages and level of home ownership also compares positively, particularly with 24 and 84%, respectively, as examples from the town's official statistics.

Table 1 | General profile of respondents

		Rural (%)	Urban (%)
No of occupants	1	19	21
	2	37	43
	3	18	7
	4	18	11
	5	7	7
	6	1	11
Children (under 18)	No	70	93
	Yes	30	7
Building type	Apartment/flat	2	7
	Bungalow	11	14
	Detached house	40	29
	Semi-detached house	25	43
	Terraced house	21	7
Building age	1980–1995	9	4
	1996 or later	4	0
	Pre-1980	87	96
Number of bedrooms	0 (studio)	1	0
	1	6	4
	2	14	11
	3	36	44
	4	29	37
	5	11	4
	6	3	0
	7	1	0
	8	1	0
Ownership	Own	76	93
	Rent	24	7

The water user

It is important to understand the attitudes and perception of water users as well as their behavioural determinants, prior to the design and implementation of water efficiency interventions (EA 2008; Froehlich *et al.* 2010; Defra Water White Paper (HM Government 2011)). Questions adapted from Uzzell (2008) classification of those who would, could, can't, don't and won't was used to ask what the water user's response will be if asked to save water (Figure 2). The majority, 70%, of the respondents in the rural community stated that they already save water but could probably do more. Only 12% of the urban dwellers agreed to this statement. Comparatively, 56% of urban dwellers stated that they already save water and cannot do any more. Only 12% of the rural dwellers agreed to this statement, although it is worth highlighting that this formed the second highest response from this group. This is potentially interesting as it suggests a dichotomous trend which agrees with some literature (e.g. Uzzell 2008), i.e. those who will always want to do more and those who will always do nothing. Similarly, 22% of the same group stated that they could save water but do not due to lifestyle choices or other more important choices or matters. There is also a minor disparity between both groups when it comes to knowledge about

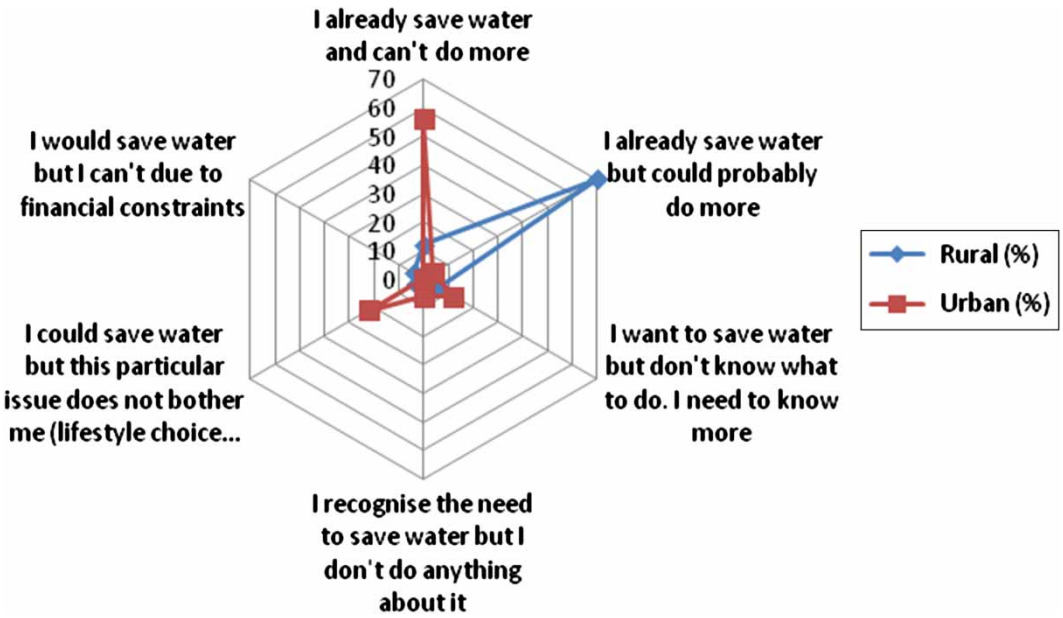

Figure 2 | Water users' response to saving water.

how to save water; 12% urban dwellers said they needed to know more compared to 6% of rural dwellers.

Water supply and impact

Water availability, and scarcity, is a fundamental driver for water efficiency in buildings. It was therefore essential to ask respondents which supply factor was critical to their use of water. The options provided were: high water quality for all purposes, high quality water for potable uses only, the reliability of water supply (always available), reducing the environmental impact of water supply and lastly, the price of water (Figure 3). Respondents were allowed to select more than one answer in order to explore the dependency of these factors.

As expected, there is a wide spread in the answers provided. However, the price of water was the least selected option by both groups. The majority of the urban dwellers selected all the options available, with a slight variation for high quality water for potable uses only. For the majority of the rural dwellers, the reliability of water was their main concern and would therefore accept high quality water for potable use only. Although, similar to the rural group that would do nothing, there was also 12% of rural respondents that would prefer high quality water for all purposes.

Metering and billing information

A minority of properties are metered in England; the exception being some parts of the South East of England, where near universal metering has been permitted. Metering and improved consumption information on water bills is increasingly proposed as the means to encourage positive water behaviour from customers (Darby 2010; Adeyeye & Church 2012). Even though there are some constraints to the implementation of a universal metering programme in England and Wales (Walker 2009). In addition, feedback using bills may not be effective due to the frequency; common practice is twice per year. Ideally, feedback is given immediately after the behaviour occurs (Geller 2002). Therefore, rural and urban respondents were asked if they would be motivated to save water if meters were installed or their water bills included detailed and targeted consumption information. Tables 2(a) and 2(b) present the results based on the following dependencies: the number of occupants in the household, whether they have children or not,

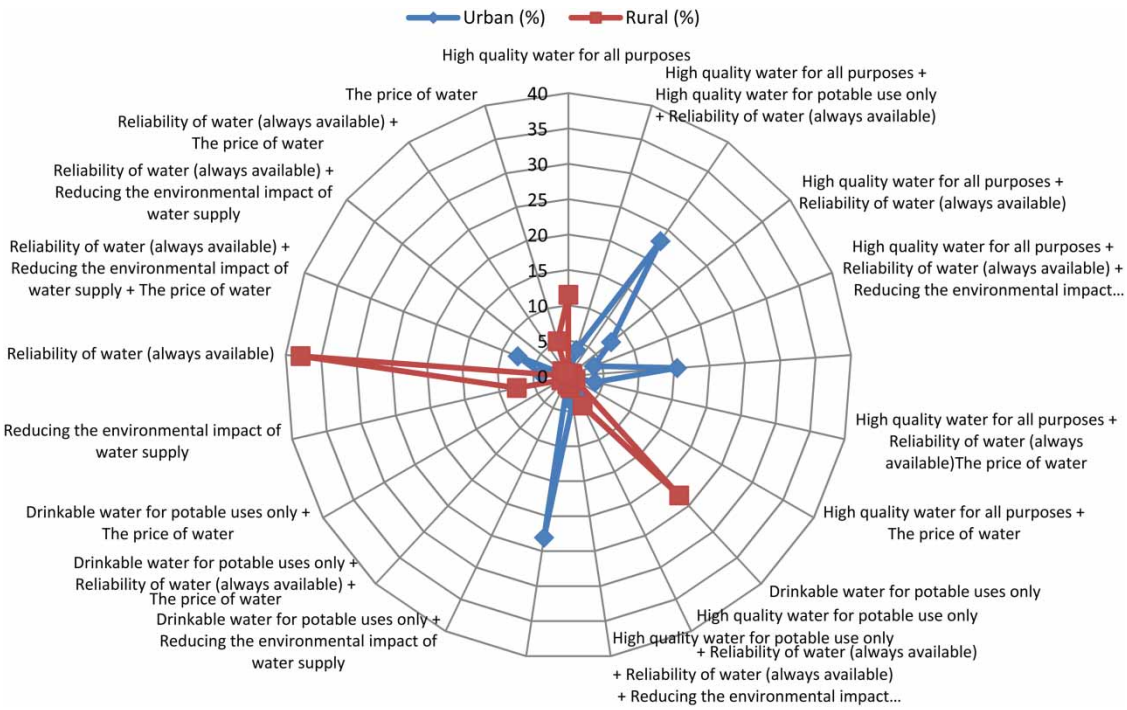

Figure 3 | Water supply preferences.

Table 2(a) | Metering and bills to save water (urban)

Urban

No of occupants	Children (under 18)	Ownership	Have concerns about bill affordability	Having a water meter installed (%)	Having a water meter installed + More consumption info on water bills (%)	More consumption info on water bills (%)
1	No	Own	No	0	0	100
			Yes	33	67	0
2	No	Own	No	50	50	0
			Yes	50	50	0
3	No	Own	No	0	0	100
			Yes	0	0	100
4	No	Own	No	33	67	0
5	No	Own	Yes	0	100	0
		Rent	Yes	100	0	0
6	Yes	Rent	Yes	0	100	0

Table 2(b) | Mapping dependencies for motivation to save water (rural)

Rural

No of occupants	Children (under 18)	Ownership	Have concerns about bill affordability	No response (%)	Having a water meter installed (%)	Having a water meter installed + More consumption info on water bills (%)	More consumption info on water bills (%)
1	No	Own	No	0	100	0	0
			Yes	0	17	17	67
		Rent	Yes	50	0	0	50
2	No	Own	No	0	50	0	50
			Yes	6	56	6	31
		Rent	Yes	0	67	0	33
3	No	Own	Yes	0	25	0	75
		Rent	Yes	0	100	0	0
	Yes	Own	Yes	0	33	33	33
		Rent	No	0	0	100	0
4	No	Own	Yes	25	50	25	0
	Yes	Own	Yes	0	27	36	36
		Rent	No	0	100	0	0
5	No	Own	Yes	0	0	100	0
	Yes	Own	No	0	0	0	100
			Yes	0	0	0	100
		Rent	Yes	0	0	0	100
6	Yes	Rent	Yes	0	0	0	100

whether they are owner-occupiers or rent and lastly, if they already have concerns about being able to afford their water bills.

All the owner-occupier urban dwellers in single occupancy households with no bill affordability concerns preferred better consumption information on their bills compared to those with bill affordability concerns who prefer to have a meter as well as improved consumption information on their bills. For two person households, the data were split evenly between metering and having more information.

Three person households, irrespective of their bill concerns, did not want meters but would prefer improved consumption information on their water bills. Sixty-seven percent of the four person household respondents would like both options, the same was found for 100% of urban respondents in five or six person households with the exception of those who live in rented properties and have concerns about bill affordability.

The results differ for the rural dwellers. The owner-occupier urban dwellers in single occupancy households with no bill affordability concerns preferred to have a water meter installed, whilst those with bill affordability concerns appear to perceive a bill increase with metering and would prefer better consumption information on their bills. The latter also applies to 50% of the same group who rent and have bills affordability concerns.

Rural dwellers in two person households with bill affordability concerns, whether they own or rent, prefer better consumption information on their bills, whilst those with no affordability concerns prefer to have a water meter installed. The disparity between those who own and rent is apparent in the three person households. Owner-occupiers without children of 18 years and under with bill affordability concerns, prefer the better consumption information on their bills option, whilst those who rent will go for a water meter. Those with children, whether they own or rent or have bill affordability concerns or not, were indifferent. Slightly different results, and more spread, was found for the four person households, with the majority opting for a water meter irrespective of whether they own or rent, or have children or not. The majority of the larger households, with five or six people, with or without children under the age of 18 and with or without bill affordability concerns, unanimously decided for the better consumption information option. This may be due to the risk of higher bills if a water meter was installed (Ofwat 2009; Walker 2009).

Adoption of technologies to save water

Water efficiency in building can be achieved through the use of technology and efficient products as well as behaviour change (e.g. Darby 2006). Understanding customer behaviour, activities and how this relates to water needs will make it possible to reduce wasteful behaviour by increasing the knowledge and adaptive capacity of water users (Adeyeye & Piroozfar 2012). Gilg & Barr (2006) also observed that behaviour is difficult to influence with better results being achieved through engagement and participation, improving the individual's adaptive capacity, thereby enabling them to make the choice to change.

The respondents were asked which factors affect their ability to implement water saving technologies in their dwellings. The options included the cost of the retrofit, the age of the building – too old to adapt, lack of space, lack of ownership – the landlord's responsibility, the technologies are disruptive, the property was recently renovated, lack of time to implement and lack of awareness of the available options or technologies. The majority of 34% of rural dwellers stated that cost was the main delimiting factor, compared to 15% of urban dwellers. Forty percent of the urban dwellers stated lack of awareness of available options and technologies as the problem, none of the rural respondents selected this option. However, 17% of the rural dwellers stated that this was the landlord's responsibility. Twenty-four percent of the rural dwellers live in rented property compared to only 7% of the urban dwellers.

DISCUSSION

Physical, technological, socio-economic, cultural and even religious practices influence water use and water use behaviour in buildings. These factors influence the outcome of any demand management programmes which rely as much on changes in attitudes toward water use as well as technological adoption. Similarly, demographics and population concentration in urban areas has an impact on the demand and supply of water. The increase in population and the creation of urban conurbations and agglomerations due to the expansion of cities and commuter belts places a substantial amount of stress on water resources, which in turn requires special considerations for water resource management (Williams *et al*. 2010). The increasing trend of low occupancy households (Mitchell 2001) has also been highlighted as an important factor for the management of water resources. Single occupancy households appear to consume more water per person than larger households with two or more occupants (Ofwat 2009). This places

additional stress on housing supply and has consequences for energy and water consumption.

The knowledge of the water user, their behaviour and external context can be used to target policy and regulatory instruments or strategies. Therefore, this study asks if the attitudes and perceptions of water users vary depending on their geographical context: rural or urban. Consumption practices in (sub)urban areas is receiving increasing research focus. After all, consumer perceptions, actions and experiences have a role to play in urban social life, and consumption has been considered as a fundamental focus for social expression (Miles & Paddison 1998). On one hand, urban dwellers are seen to consume more (water, energy, etc.) due to the affluence and influence of luxury affordability or simply due to demography (Domene & Sauri 2006). On the other hand, rural residents are assumed to be more attuned to environmental issues, being 'closer to nature' than urban dwellers. This suggests that as a result, they have a higher propensity for embracing positive environmental behaviours. This study explores this to a limited extent, with more detailed studies to follow.

The data from this study revealed similarities in the profile of the respondents from both the urban and rural communities, which increased confidence in the analysis. The similarities include; household size with the majority in low occupancy households, low percentage of children under the age of 18. There was also a majority of owner-occupiers in pre-1980 detached or semi-detached houses in both groups. Beyond this, some differences were found in the dataset; rural dwellers who felt they were already doing a great deal to conserve water but were still willing to do more. The majority of those in the urban areas felt that they were already doing enough and were unable to do more. Those in the rural area were also more concerned about the reliability of water and were more willing to accept recycled or reused water for non-potable uses. The other major response from the urban dwellers was that their lifestyle choice and other more important matters affect their willingness to do more to save water.

The key factor that affects the adoption of water saving technology in rural areas was cost whilst the majority of the urban respondents stated lack of awareness of available options as the main factor. On metering and billing information, it was generally found that low occupancy households of one or two persons, who do not have concerns about their bills, are not likely to opt for a water meter, compared to their rural counterparts who will. Urban and rural respondents who have bill affordability concerns in this category are more likely to opt for a meter. This, to a limited extent, supports the claim that lifestyle choice and preferences of low occupancy households inform their high water consumption levels. There were differences with respondents in households of three persons or more. Their willingness to adopt a meter or choose improved billing information varied depending on bill affordability concerns, whether they had children or not, or if they owned or rented their home. The limited number of responses, particularly from high occupancy households, limits the conclusion that can be derived from this part of the data.

Retrofitting costs for water efficient products and technologies were considered the landlord's responsibility for the majority of those renting their homes, and costs influenced the homeowners' choices. Users replacing devices consider the quality and performance of the product as important as well as the cost. Purchasing water efficient domestic goods, e.g. a water-efficient washing machine, would be considered by users when a replacement is required.

CONCLUSION

Many researchers have emphasised the need for better knowledge of the water user in order to better target water efficiency policy as well as water efficiency interventions. An increasing body of knowledge is also highlighting the need to target information and interventions based on the socio-geographical context of the water user. This is due to the increasing realisation that external factors such as affluence, lifestyle choice, environmental connections and relationships, knowledge and the visibility of water supply processes, etc., influence the water user's behaviour as well as their response to efficiency messages to change behaviour or adopt technology.

This study confirms that factors such as occupancy numbers and risks of increased water costs discourages some water users from embracing certain policy measures, e.g. metering, but improves their willingness to respond to

information prompts, such as more consumption data on their water bills. It was also found that those in rural and urban areas have differing views on the extent of what they will, or can do to save water. Similarly, different views were also expressed on their ability to make the necessary change, either behavioural or technological, to improve their water consumption practices. However, further in-depth studies are required to provide further evidence on these trends.

Future surveys will measure the users' responses to water efficiency interventions and metering costs due to the widespread installation of water meters in this geographical area. This allows for the possibility to expand on the responsibility of costs to be borne by the user and that of the water company. The cost and benefits of long-term water conservation awareness by the users, for both urban and rural residents, will be examined to the extent to which it encourages efficiency and the extent to which prevailing factors such as excessive rainfall and drought influences such decisions. The relationship between the water user and provider will be considered, taking into account the variability of water supply technologies with water metering providing a more transparent billing system. The acceptance of responsibility by those renting their homes through usage behaviour rather than through retrofitting costs will empower users to be more water efficient. Similarly, the balance between societal requirements and user responsibilities will be determined in future studies.

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