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Assessing domestic water use habits for more effective water awareness campaigns during drought periods: a case study in Alicante, eastern Spain

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Abstract. The design of water awareness campaigns could benefit from knowledge of the specific characteristics of domestic water use and the factors that may influence certain water consumption habits. This paper investigates water use in 450 households in 10 municipalities of drought-prone Alicante (Spain). We aim to increase knowledge about existing domestic water behaviors and therefore help to improve the design and implementation of future water awareness campaigns and even to consolidate reductions in water use after drought periods. The survey suggests that awareness campaigns should revise their scope and their channels of diffusion on a regular basis. In a more specific way, for the Alicante case we propose policy-oriented recommendations on the scope of action for further reductions.

1 Introduction

Water awareness campaigns constitute one of the pillars of water conservation policies in urban environments, especially during drought periods (Baumann et al., 1998; Woltemade and Fuellhart, 2013). Campaigns need to ensure that, especially when droughts strike, awareness and conservation messages are tailored to dominant water behaviors. Furthermore, information about household water uses and behaviors may improve the efficacy of messages aimed at consolidating conservation beyond the duration of droughts, which is one of the major challenges faced by policy makers regarding this topic (Wang et al., 1999). This paper investigates water use in drought-prone Alicante, one of the fastest growing areas of Spain, combining one of the more important tourist centers in the western Mediterranean with a very productive agricultural sector based on irrigation (Gil and Rico, 2008; Juárez, 2008). Against this backdrop, relatively frequent periods of little precipitation (Juárez et al., 2010) have made drought a key issue for Alicante (Gil, 2010; Hernández et al., 2010). Moreover, drought management will become a critical issue in the future given the discouraging prospects of climate change and their impact on water availability in the area (Saurí et al., 2013).

Traditional water policy in Alicante has relied on the development of surface water through reservoirs and water transfers and the development of coastal groundwater sources (Olcina and Rico, 2006). However, dwindling and polluted water levels in aquifers and mounting economic, social and environmental costs of large surface water infrastructures have prompted a series of changes: above all, the development of integrated water demand approaches stimulated by the European Water Framework Directive of 2000. These approaches deal with droughts through a combination of economic, technological and behavioral measures including awareness campaigns targeting urban and tourist uses especially. We argue that in order for the latter to be successful the conservation messages and actions must be aligned with existing uses and acknowledge heterogeneity of water users and uneven territorial development. The objective of this paper is therefore to provide a more accurate understanding of the existing water uses and water use habits of urban

households in Alicante. We also aim to understand better how water campaign messages reach the population and how this bears a relation to the presence of water-saving devices and water-saving attitudes. The first working hypothesis is that water awareness campaigns do not take into account the evolution of water use and habits. The second is that water campaign messages do not reach all the population equally and this may have an impact on the presence of water-saving devices and water-saving attitudes. Acknowledging these two issues may help to design more effective water conservation campaigns during times of drought and even to consolidate reductions in water use after drought periods, as we will attempt to show for the Alicante case.

2 Water awareness campaigns during drought periods: strengths and weaknesses

Behavioral change regarding water consumption is perhaps one of the most sought-after objectives of water conservation policies, especially during times of drought (Hurlimann et al., 2009; Jorgensen et al., 2009; Fielding at al., 2012). To this end, water planning and management must consider awareness campaigns as a tool to reduce water demand and therefore ease drought impacts as well as the pressures on the development of new water supply sources (Michelsen et al., 1999). Water awareness campaigns, however, tend to produce mixed results, and for those experts who prefer economic instruments they are not very effective in curbing water consumption (Olmstead and Stavins, 2008). One problem is the temporal horizon. Since most water awareness campaigns are implemented during drought periods of a variable length, their effectiveness may be limited to the duration of what is often considered an exceptional and not a normal event (Syme et al., 2000). Reductions in water consumption may also be highly variable, from 5 to almost 20 % in certain cases (March et al., 2013). More positive effects appear to be related to the intensity of campaigns (Wang et al., 1999) or when awareness campaigns are implemented together with other measures such as pricing (Nieswiadomy, 1992; Roibas et al., 2007). Furthermore, the success of awareness campaigns, especially in the long run also appears to be strongly related to the frequency and severity of drought conditions (Wang et al., 1999). In areas where droughts are not perceived as a problem or, at most, are just seen as a temporary condition, awareness campaigns may be less successful than in areas where droughts are more frequent (Howarth and Butler, 2004).

Besides all these problems, water awareness campaigns need to reflect on the evolution of water use patterns, acknowledging both already existing water-saving behaviors and the structural factors that may influence these behaviors. In other cases, water conservation messages may lag behind existing urban realities, for example targeting indoor uses and ignoring outdoor uses or targeting populations with consumptions as low as 100 L per capita and day (henceforth lpd) or below, which is the minimum desirable quantity defined by the WHO (Howard and Bartram, 2003).

All in all, the success of water awareness campaigns depends on a wide variety of factors, some related to natural conditions and other related to sociodemographic and predominantly urban land uses (for an overview see Saurí, 2013). In the latter case, we argue that water awareness campaigns could benefit from more accurate knowledge of uses and especially habits of use of water in the areas targeted for the implementation of such campaigns. By more accurate knowledge we mean information both on the success of past awareness campaign messages in arriving to different users and on the evolution of water use habits, acknowledging that habits from the past may have disappeared while others that did not previously exist or were marginal have emerged. The information gathered could be useful in designing better campaigns especially regarding the development and phasing of certain water conservation messages. Hence the objective of effectively engaging citizens in conserving water and, more importantly, making this engagement durable and less dependent on the occasional occurrence of drought periods could be more feasible. On a more abstract level, we want to contribute to scientific debates on water conservation by showing that water awareness campaigns should keep track of the evolution of uses and be subject to periodic revisions in order to improve their scope and effectiveness.

3 The study area

Our study area includes 10 coastal (or located near the coast) municipalities in the province of Alicante (Spain) (see Fig. 1). The province of Alicante experienced the first important urbanization wave in the 1960s and the 1970s and a much more intense residential development process during the late 1990s and especially from 2001 until the collapse of the building sector in 2008 (Hernández, 2013). In the past, urbanization has followed a low-density pattern with houses and condominiums gaining presence over the more common apartment blocks (Morote and Hernández, 2014). One peculiar characteristic of urbanization in this area has been its orientation towards international markets and particularly the segment of European retirees (Vera, 1987; Romero et al., 2012) attracted by prices and comfortable climatic conditions as well as by increasing accessibility provided by low-cost flying. As a matter of fact in some municipalities of our case study area the percentage of foreigners went from 35 % in 2001 to more than 70 % in 2011 (Morote and Hernández, 2014).

Domestic water consumption in this area faces a number of important challenges. First of all, precipitation is relatively low and subject to the vagaries of Mediterranean climatic conditions. It tends to decrease from north (some 550 mm per year) to south (300 mm per year) and observes large inter-

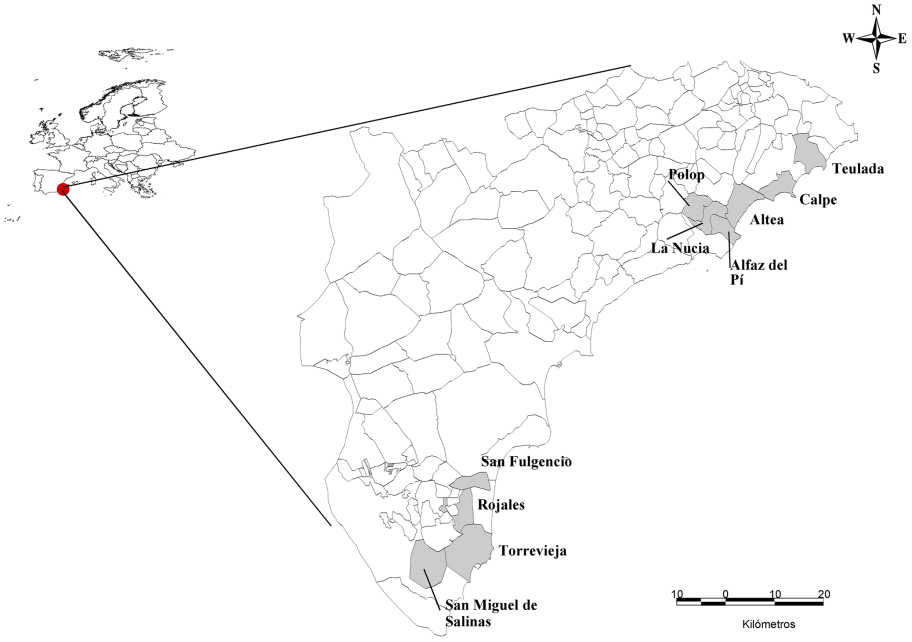

Figure 1. Study area.

Table 1. Sample of municipalities, population, number of surveys and domestic water consumption.

Municipality	Population (1 January 2011) (INE, 2012)	Number of surveys	Water consumption (lpd) (2012)
Alfàs del Pi	21 332	38	326
Altea	24 006	42	179
Calp	29 909	53	NA
La Núcia	18 225	32	220
Polop	4294	8	283
Rojales	20 953	37	215
San Fulgencio	12 144	21	182
San Miguel de Salinas	8057	14	199
Teulada	14 778	26	NA
Torrevieja	101 091	179	218
Total	254 789	450	

Sources: population data from INE (2012); domestic water consumption data from Mancomunidad de los Canales del Taibilla (2012), Hidraqua (2013) and Consorcio de Aguas de la Marina Baja websites (2012).

and intra-annual variations with long periods of drought and occasional violent bursts of rainfall producing flash floods. In terms of water supply, the problem of low and erratic precipitation patterns is exacerbated by the important presence of karst formations in the province, which are one of the more complex environments in what concerns natural hazards (Gutiérrez et al., 2014; North et al., 2009) and more specifically groundwater supply (Bakalowicz, 2005).

After the intensification of urbanization in the second half of the 20th century, recurrent physical droughts have resulted in episodes of water supply stress. In the late 1970s, for instance, the well-known tourist center of Benidorm had to be supplied with sea tankers due to critical water shortages (Vera and Rico, 1995). More recently, during the early 1990s a number of successive droughts also caused supply problems in some coastal municipalities including the salinization of municipal wells (Rico, 2007). The 2013–2014 hydrological year has been the driest in over 100 years. Between January and August 2014, the city of Alicante, for instance, received only 29 mm of rain when the historical average for this period is 170 mm. Most cities in the province have received at most 30 % of the average rain, while in one case (El Campello) the figure was as low as 7 % and constituted a Spanish and European historical record (Laboratorio de Climatología, 2014). The drought hit especially dry land agriculture and could affect irrigated agriculture as upstream reservoirs see their reserves rapidly dwindling. On the urban side, tensions regarding the impact on municipal supplies of the use of water for irrigating private gardens and filling up swimming pools have begun to appear in some of the northern towns of the province (El País, 2014). Domestic water demand in most of this area displays a strong seasonal character with demand reaching a peak in July–August, coinciding with the summer drought and with high water demand by the agricultural sector as well. For example, in the municipality of Torrevieja consumption jumps from 0.59 million m^3 in December to 1.5 million m^3 in August, i.e., 3 times more. In general, domestic water use in the northern municipalities is higher than in the southern municipalities and generally above the Spanish average, which is about 150 lpd (Table 1). Beyond the complex hydrological and meteorological conditions, the urban sector must face the competition of a dynamic and very

productive agriculture that usually holds solid water rights to most surface waters.

In any case, despite the important efforts made in recent years to reduce water consumption, there are still ample margins to continue with these efforts. Therefore, water conservation campaigns may have a role in fulfilling this objective.

4 The experience of Alicante with water awareness campaigns

Recent water awareness campaigns in Alicante show a strong relationship with the drought periods of the past 2 decades, in particular with the episodes of 1992–1996, 1999–2001 and 2005–2007. The period 1992–1996 saw the worst drought in 25 years and observed the highest frequency and duration of water conservation campaigns. The association between droughts and water conservation campaigns is again visible in the current period of drought that began in October 2013 and has produced the smallest amount of rain in 1 year in the city of Alicante since records exist. In general, institutional campaigns (e.g., by local, regional and national governments) do not have a specified duration and tend to be discontinuous in time with respect to the more regular campaigns by water companies. However, in the case of Alicante the latter have also relaxed their messages to customers possibly after the important decline (not directly drought-related) in domestic water consumption experienced in the city (20 % between 2007 and 2013). Besides government and water utilities, other private companies and civic groups such as association of parents and students of Alicante schools have promoted water conservation campaigns.

The specific characteristics of these campaigns can be very diverse, ranging from the free delivery of water-saving devices to the public (flow regulators, for instance) to (less frequently) advice prepared for specific target groups (e.g., households with swimming pools). However, the most common form of water awareness campaigns are messages appearing in the popular media and focusing on the necessity to modify water use habits. In Alicante, messages insist on the fact that water is a scarce resource (especially in this area) and list afterwards a number of actions to change water consumption habits. For example, in the drought episode of 2005 the awareness campaign launched by the Spanish Ministry of the Environment was based on advice such as "take showers and not baths", "turn off the tap while brushing your teeth" and "reuse your pool water".

In summary, water awareness campaigns in Alicante are still strongly associated with drought periods and, for the most part, insist on changing certain water consumption habits. The current drought of 2013–2014 has begun to generate responses at the institutional level asking citizens to conserve water but, so far, using the same messages as in the past. The question, however, is whether or not this change of habits constantly demanded by public authorities and private companies takes into account the evolution of water use and is reflective of the impact of past campaigns. We will attempt to examine this in the next sections.

5 Materials and methods

Our investigation of water uses and habits of citizens in the province of Alicante involved 450 telephone surveys carried out between 11 and 14 July 2011 in the aforementioned ten municipalities of the Alicante province. The sample was stratified according to the population living in each municipality selected (Table 1) with an estimated error of $\pm 4.62\,\%$ ($p = 0.005$).

The survey included 43 questions, most of them under the format "yes/no" and the rest under the format of multiple choice. Respondents representing each household were asked about the characteristics of their homes and their water-using appliances (indoor and outdoor), the presence of water-saving devices, their attitudes on water use (indoor and outdoor) and their memories of past water awareness campaigns (see Table 2 for some examples of questions). To minimize the effect of receiving socially expected answers, our survey was designed to avoid any kind of judgment or suggestion about what would be the best environmental conduct.

Nonetheless, socioeconomic variables such as sex, age, income or education were also introduced in the survey. It is important to mention that for the different questions there could be different numbers of "lost values", i.e., people that did not answer a given question.

The average age of the respondents was 56.7 years. Over one-third were men ($n = 162$) while around two-thirds were women ($n = 288$). Average household size was 2.69 persons. Approximately 11 % of households included at least one person below 10 years ($n = 50$) while two-thirds ($n = 300$) had at least one person over 60 years. Most of the interviewees were Spanish ($n = 398$) and almost one-fourth of foreigners were British. Most of the surveys were responded by retired people ($n = 200$) and employed people ($n = 122$), and most of the respondents admitted a net income per household below EUR 36 000 per year ($n = 234$). We acknowledge certain gender and age biases if we compare our sample with data on the average Spanish population (average age 2011: 41.24 years). However, an important part of the questions was not related to perception but about characterization of the household relationship with water (water use and appliances) so this should not be much of a concern. Moreover, regarding age, biases are minimized if we take into account that the survey was answered by adults. Concerning the gender bias we acknowledge that it may have a certain influence on some of the responses; however, there is a long-standing but inconclusive debate on whether and how it influences environmental behavior (Meinzen-Dick et al., 2014) which goes much beyond the scope of our article.

Table 2. Examples of questions of the survey.

Topic	Questions
Socioeconomic variables	Sex Age of the respondent Age groups at the home Nationality Employment status Net annual household income
Characteristics of the home	Type of building (apartment block, apartment block with common zone, semi-detached or detached house) Area of your home
Outdoor water use characteristics	Do you have a garden? What is the size of the garden? What percentage of the garden is lawn? Do you have a swimming pool? What is the size of the swimming pool (in m^3)?
Indoor water appliances and water-saving devices	How many taps do you have at home (and which type of taps)? Do you have flow restrictor in the shower/s? What type of dishwasher do you have, in the case you have it?
Attitudes on indoor water use	Do you flush the toilet after every use? How often do you use your washing machine? Do you use the half-load function in your dishwasher (in case you have it)?
Attitudes on outdoor water use	What type of watering system do you use for your garden? How often do you empty the swimming pool to refill it again?
Attitudes on water use in general	Do you track water consumption based on your billing? Are you planning to buy any water-saving device for any of your water appliances?
Memories on water awareness campaigns	Do you remember any awareness campaign to save water?

6 Survey results

The results of the survey are organized and presented next according to the following items: characteristics of the housing unit (apartment, single house or condominiums), water appliances, water use habits and perception of water awareness campaigns.

6.1 Description of the home and of outdoor water uses

Most of the surveyed people lived in detached or semi-detached houses ($n = 255$), followed by apartments ($n = 146$) and apartments in blocks with shared garden and swimming pool ($n = 49$). Most housing units were built after the 1980s. The average size of the home was 136.12 m^2, while the median size was approximately 100 m^2.

Around 40 % of respondents ($n = 178$) had a private garden. Most gardens occupied an area smaller than 20 m^2 ($n = 44$), followed by those between 21 and 50 m^2 ($n = 35$) and those between 51 and 100 m^2 ($n = 30$). We observed a non-negligible presence of gardens over 500 m^2: those between 501 and 750 m^2 ($n = 14$) and those with more than 750 m^2 ($n = 16$). Lawns were absent in almost two-thirds of the gardens ($n = 112$). Only 22 cases presented lawn areas in more than 50 % of the garden and the rest ($n = 44$) had lawn areas in less than 50 % of the garden.

Almost three out of four homes did not have any swimming pool ($n = 326$). Among homes with this facility ($n = 124$), half had community swimming pools ($n = 64$) and half had private swimming pools ($n = 60$). Most swimming pools had a closed system of water treatment ($n = 107$). The most frequent pool capacity was between 51 and 100 m^3 ($n = 48$).

6.2 Indoor water appliances and water-saving devices

In what concerns water-using appliances, most homes had bathrooms with mixer taps ($n = 381$) while bathrooms with two separated taps were less frequent ($n = 120$) (some of the respondents had both). The average number of mixer taps at home was 4.76 while that of separated taps was 3.68. The lower average number of separated taps is related to the fact that in many cases they are combined with mixer taps in the same home, possibly indicating a gradual substitution of

these fixtures. Concerning water-saving devices, 38.6 % of the homes had some kind of flow restrictor in taps ($n = 171$), while the remainder 61.4 % ($n = 272$) did not control by any means the flow of tap water.

Most of the homes had showers ($n = 401$) and the majority of showers were equipped with a single lever shower mixer ($n = 330$). The rest of showers had separated levers ($n = 69$) or a push button ($n = 7$). Similar to taps, some homes combined different kinds of showers. Concerning flow restrictors in the shower the percentage was similar to that of taps, but this time less people answered (yes = 36.7 %; no = 63.3 %). However, the most common bathtub was medium-sized ($n = 215$), followed by luxury bathtubs (> 350 L) ($n = 76$) and, finally, small bathtubs (less than 90 L) ($n = 44$)[1]. Around 25 % of the homes did not have a bathtub ($n = 124$).

Most housing units had up to two toilets. Most toilets were between 2 and 10 years old ($n = 232$), followed by those that were over 10 years old ($n = 174$) and those that were less than 2 years old ($n = 55$). Less than one-third of respondents ($n = 136$) reported to have at least one mechanism (dual flushing system or device to reduce the capacity of the toilet tank) to reduce water consumption in the toilet.

Practically all homes had a washing machine. Most of the respondents had a conventional washing machine of 4 years or older ($n = 230$) while the remainder either had an environmentally friendly ($n = 116$) or a conventional washing machine less than 4 years old ($n = 100$); only 2 respondents claimed not to have washing machine. In any case, most of the washing machines were equipped with "half-load" system and more than half the respondents acknowledged using the half-load option of the washing machine (54.1 %) while one-fourth admitted that they did not use it (24.6 %). The remainder did not have this option in their washing machine.

However, more than half of the respondents did not own a dishwasher ($n = 248$), but when available most dishwashers were environmentally friendly ($n = 64$) or conventional but less than 4 years old ($n = 47$). As a result most dishwashers were reported to have half-load systems. Almost half the respondents used the half-load option of the dishwasher (45.3 %) while almost one-third did not use it (29.3 %). The remainder respondents did not have this option in the dishwasher.

Eventually, it is also relevant to mention that virtually all the respondents stated that their taps, showers, toilets, etc., did not leak and that over 90 per cent of the homes had individual water meters.

6.3 Description of indoor and outdoor water use habits

Water awareness campaigns ask for changes in the water use habits of the population. However, in many cases, as described before, campaigns repeat some messages over and over again without usually assessing whether those water habits that need to change still hold true. In this section we will focus on regular habits of water use according to the survey.

Beginning with habits in the shower, almost half of the respondents spent between 2 and 5 min in the shower ($n = 180$), while over one-third spent between 6–10 min ($n = 150$). The remainder claimed to spend more than 10 min under the shower ($n = 66$).

One of the usual ways of wasting water in the shower is to let the water flow until it reaches a comfortable temperature. In most of cases the time did not exceed 10 s ($n = 282$). However, a small number ($n = 41$) of respondents admitted to taking a bath on a daily basis, while most of the respondents never ($n = 195$) or very occasionally (from 1-6 times per year, $n = 65$) took a bath preferring to shower instead.

Beyond water habits in the toilet we also asked for the frequency of use of water-related appliances. While, as we commented, most of the surveyed did not have a dishwasher, we observe that 66 % ($n = 126$) of those who did used it on a weekly basis. In any case, most of the surveyed ($n = 329$) said that they washed the dishes by hand on a daily basis. However, three quarters of the sample used the washing machine on a weekly basis rather than on a daily basis.

Concerning water-saving attitudes, in Table 3 we show the frequency with which respondents undertook different actions to save water. Eventually, when asked if they were planning to buy/upgrade water-saving devices (such as flow restrictors), most respondents answered negatively ($n = 395$), while a number of respondents ($n = 36$) acknowledged that they did not know any device.

In what concerns outdoor uses, garden irrigation was performed mainly using garden hoses ($n = 89$), followed by sprinklers ($n = 38$), drip irrigation ($n = 38$) and finally a myriad of other irrigation methods such as watering cans, buckets, etc. Concerning the origin of irrigation water, in most cases water came from the general network ($n = 130$), followed by stored rainwater ($n = 20$), wells ($n = 8$) or treated wastewater ($n = 6$). Finally, when asked about how often they emptied and refilled the swimming pool, few respondents knew the answer; yet, the most frequent response was "never" ($n = 48$).

6.4 Remembrance of past water awareness campaigns

In regards to awareness campaigns to save water, answers were similar between those who recalled at least one campaign ($n = 209$) and those who did not ($n = 236$). Concerning those who recalled at least one campaign, the most common media mentioned was television ($n = 182$), followed by the press ($n = 37$), institutional campaigns ($n = 35$), radio ($n = 32$), water companies ($n = 27$), street advertising ($n = 17$), friends, family and neighbors ($n = 17$), Internet ($n = 15$) or other channels ($n = 12$).

[1] Note that some homes have a combination of different categories.

Table 3. Frequency of water-saving attitudes (in %).

Water-savings attitudes	Never	Sometimes	Frequently	Always
Turn off the tap while brushing the teeth	6.25	5.13	4.46	84.15
Pull the chain after every use	2.89	18.00	12.89	66.22
Turn on the washing machine once it is full	1.58	4.06	9.48	84.88
Turn on the dishwasher once it is full	4.52	5.53	8.54	81.41
Turn off the shower while soaping	18.22	6.00	5.33	70.44

Through contingency table analysis we found a significant relation between the presence of water-saving devices and the remembrance of water campaigns: with the presence of tap and toilet flow restrictors (Chi-square = 10.320; sign = 0.001) and shower flow restrictors (Chi-square = 7.559; sign = 0.006). At the same time we also found a positive and significant relation between the non-remembrance of drought campaigns and the refusal to buy water-saving devices (Chi-square = 8.019; sign = 0.005). We also found a positive significant relations between comparing water consumption of different periods with the remembrance of water awareness campaigns (Chi-square = 10.488; sign = 0.001). There was also a significant relation between some water-saving habits and the remembrance of water campaigns, e.g., using the dishwasher at a full capacity (Chi-square = 9.817; sign = 0.020). There were also correlations for outdoor behaviors, such as watering the garden: people that remembered campaigns tended to have drip irrigation rather than sprinklers or hoses (Chi-square = 6.863; sign = 0.076). We also found statistically significant relations between employment status and remembrance of water-saving campaigns, with retired people remembering significantly less water campaigns (Chi-square = 14.195; sign = 0.048).

Moreover, there was also a significant relation between income and remembrance of water campaigns (Chi-square = 8.180; sign = 0.085), with respondents from low income homes significantly remembering less water campaigns than respondents from high income homes.

7 Discussion

If water awareness campaigns have to fulfill their potential and leave a longer imprint in the behavior of water users (Wang et al., 1999; Hurlimann et al., 2009; Saurí, 2013) it is fundamental that they take into account the dynamic residential and sociodemographic characteristics as well as the water use habits of the population targeted. Thus, it is crucial to ascertain whether recommendations for particular behaviors are grounded on a sound appraisal of existing water habits. It is also very important to evaluate a campaign's scope and impacts on water use habits on a regular basis to revise, if needed, messages and channels of diffusion as well. The rationale behind the survey was to provide specific insights and recommendations for Alicante (Table 4) and, through this case, to develop academic insights that may be of value for improving the design and application of water awareness campaigns facing multiple urban and social realities in areas of mixed populations and urban models.

In our case study, and perhaps in contrast to Anglo-American and Australian cases, outdoor water consumption appears to be relatively modest because of the predominantly small size of garden plots, the relatively scarce presence of lawns and the fact that only about one-third of the sample had swimming pools (and half of these shared the pool with other neighbors). Still, there are a number of actions to further reduce water use: for instance, planting garden species more adapted to local climates, avoiding water losses in the swimming pool by evaporation or using mulching to improve the quality of the garden. In areas where low-density urbanism is dominant, awareness campaigns targeting outdoor uses may be more relevant than campaigns targeting all uses.

All in all, water habits did not appear overly extravagant (at least in comparison with areas such as California or Arizona) in terms of average water consumption. However, data in Table 1 show that water use in the municipalities of our case study is still well above use in dense Mediterranean cities, such as Barcelona. This certainly provides a margin for further reductions. However, savings probably have to be sought in areas not well covered by existing conservation messages. Most water awareness campaigns, at least in Spain, still insist on taking showers instead of baths when, according to this and other studies (see for example March et al., 2013), this is a habit already well established in the collective mentality regarding personal hygiene. For instance, our survey revealed that 60 % declared never taking a bath, contrasting with 12 % taking a daily bath. As to water-saving attitudes in the household, most respondents (above 70 % in all cases and above 80 % in most of them) declared following conservation measures such as turning off the tap while brushing their teeth, operating washing machines and dishwashers at full loads, etc. Still, however, we observe that over half of the sample admits to spend more than 5 min under the shower. In that sense, while limited, there is space for further reductions.

Awareness campaigns still have an important role for reducing water use that concerns the proliferation of water-saving fixtures for indoor uses. In this respect, our case study

Table 4. Recommendations for Alicante for future water awareness campaigns.

General	Specific actions to promote
Outdoor water use habits	– Take into account the suburban condition of an important part of the population – Tailor messages to uses dominant in a suburban setting such as gardens – Promote more efficient garden watering systems – Promote local garden species and mulching techniques – Promote the use of alternative water resources for non-drinking water purposes
Indoor water use and water-saving appliances	– Promote the use of alternative water resources for non-drinking water purposes – There is important room to improve water savings through easy technological fixtures, such as flow restrictors – Water-saving devices in taps (over 60 % of homes did not have them) – Water-saving devices in toilets (two-thirds of respondents did not have any saving mechanism) – Programs of renewal of old washing machines with new efficient ones – Incentives for efficient dishwashers
Water awareness campaigns channels	– Promote water awareness campaigns in social media, especially to target young adults – Need to explore alternative ways to reach those populations

did not show much presence of these devices. At the same time, however, an overwhelming majority of respondents did not plan to buy/install such devices in the future presumably because they did not consider their consumption high enough. What our survey suggests, therefore, is that awareness campaigns could take also a more proactive stance encouraging consumers (possibly in combination with some subsidies) to purchase relatively inexpensive and easy-to-install water-saving mechanisms such as flow regulators for taps or showers.

A relevant finding of our survey is the statistical relation between the remembrance of water campaigns and the presence of water-saving measures and certain environmentally friendly attitudes. This may demonstrate that water awareness campaigns are useful in influencing actions that reach beyond the drought period (the action to install these devices may be related to the campaign and the drought, but their role extends beyond the drought period). However, we cannot be confident about the direction of the relation: that is, whether people concerned with water use tend to remember water campaigns more than those not concerned or whether water awareness campaigns contributed to changing some habits and made more people concerned with water use.

Eventually, it is critical that water awareness campaigns are tailored to different audiences. As a matter of fact, over half of the respondents did not remember any past water campaigns, which may suggest some problems of communication and diffusion of the messages. Our survey shows that retired people are the group that remembered less water campaigns. Nonetheless, this finding is difficult to interpret, as it could be the case either that they received the message but forgot about it as time passed or that water campaigns did not target them specifically. Another finding is that low-income homes significantly remembered less water campaigns than respondents with high incomes. The latter fact raises an important issue, as it may indicate that channels used by water awareness campaigns may have not reach the whole population in the same manner. In any case, the Alicante case shows that while messages have not changed from past campaigns, there have been shifts of the targeted groups. While the general public is still the main recipient of conservation campaigns, over the last 10 years schoolchildren appear more and more as the specific target audience of water (and environmental in general) conservation actions. The underlying rationale of this interest in children is, first, that messages may be better apprehended by this population segment and, second, that children, by influencing their parents, may become very active agents in changing water and other environmental habits at home. It is also thought that by focusing on children, the long-term effect of campaigns may be better ensured than with adults. We would add that social media could play an important role in targeting young adults.

8 Conclusions

Although the debate as to the relative merits of awareness campaigns vis-à-vis other alternatives of drought management and, more generally, water conservation (especially economic instruments) will continue, it is important to acknowledge that non-economic behavioral change such as that induced by these campaigns may last longer than that induced by rising prices or taxes while, at the same time, avoiding to a large extent the traditional problems of equity and fairness that many times hamper the social effectiveness of economic measures.

In conclusion, awareness campaigns during droughts should be aware of the heterogeneity of users as well as the uneven urban model where they are applied if they are to have a significant impact on users. They have also to be reflective of what has changed (both in terms of habits and so-

ciodemographic characteristics) and how these changes can be incorporated into the new campaigns in a sort of iterative fashion that not only strengthens drought management but also contributes to create better socio-environmental realities.

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