UNIVERSIDAD MIGUEL HERNÁNDEZ DE ELCHE

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TESIS DOCTORAL

ANÁLISIS DE LAS BARRERAS AL COMPORTAMIENTO DE CONSERVACIÓN DE AGUA: IMPLICACIONES PARA EL MARKETING SOCIAL

ANALYSING BARRIERS TO WATER CONSERVATION BEHAVIOUR: IMPLICATIONS FOR SOCIAL MARKETING

Presentada por:

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AUTORIZACIÓN DE PRESENTACIÓN DE LA TESIS DOCTORAL

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Como director de la tesis reseñada certifico que ha sido realizada bajo mi dirección por Dª Carla Rodríguez Sánchez en el Departamento de Estudios Económicos y Financieros de la Universidad Miguel Hernández de Elche, y autorizo su presentación.

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A mis padres y Franco.

"Caminante, son tus huellas el camino y nada más. Caminante, no hay camino, se hace camino al andar. Al andar se hace el camino, y al volver la vista atrás se ve la senda que nunca se ha de volver a pisar. Caminante no hay camino sino estelas en la mar"

(Antonio Machado)

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RESUMEN EJECUTIVO

La investigación académica en temas de agua se ha visto aumentada exponencialmente en las últimas décadas debido a que cada vez existen más estudios (e.g. UNESCO, 2015) que consideran la escasez del agua para consumo humano como uno de los problemas ambientales más agudos que enfrenta la humanidad. A pesar de que tanto el sector agrícola como el industrial están sufriendo importantes problemas de escasez, según predicciones del IPCC (2008) la demanda de agua residencial debe ser un área prioritaria de análisis dado el aumento de los proyectos de urbanización, el cambio de patrones de consumo, y el aumento del nivel de vida. Asimismo, aunque es necesario que se desarrollen estrategias desde el punto de vista de la oferta (e.g. mejorar los sistemas de distribución de agua), el análisis de la gestión de la demanda es una parte crucial del control total del ciclo del agua que debe complementar al de la oferta (con una mayor tradición investigadora). Finalmente, dentro del análisis de la demanda, el estudio sobre la conservación de agua y la identificación de sus determinantes (psicológicos, demógraficos y sociales) se propone como la estrategia más importante para la planificación y la gestión del agua para futuras décadas (Suari, 2013). Esto se debe a que sólo a través de la identificación de los factores claves en la conservación del agua, se pueden desarrollar estrategias eficaces para abordar esta gestión (Russell y Fielding, 2010).

Teniendo en cuenta todo lo anterior, la presente tesis trata de ampliar el conocimiento en el ámbito de la conservación de agua residencial, analizando una serie de variables demográficas y psicológicas, escasamente estudiadas en la literatura sobre temas de agua, que pueden entenderse como posibles barreras al comportamiento de conservación de este recurso. En este sentido, se tienen en cuenta de forma diferenciada los dos tipos de consumo residencial: comportamiento de conservación de agua en el hogar e individual. Asimismo, se propone que el ámbito del marketing social tiene un papel importante en este proceso ya que este enfoque de marketing tiene como objetivo conseguir cambios comportamentales para el beneficio tanto de los individuos como de la sociedad en su conjunto, centrándose en eliminar las posibles barreras que impiden dicho cambio (Lee y Kotler, 2016). La comprensión de las diferentes estrategias y herramientas que pueden utilizar los

agentes y especialista en marketing social para influir en el comportamiento de los ciudadanos para la conservación de agua es un área creciente de investigación en marketing y al cual se le ha prestado escasa atención en la literatura académica (Lowe, Lynch, y Lowe, 2015). Este objetivo general se desarrolla, aunque en diferentes grados, a lo largo de cuatro trabajos empíricos (tres de ellos publicados en revistas académicas y uno actualmente bajo revisión).

El primer estudio analiza si los hogares (500 hogares procedentes en su mayoría de la Vega Baja del Segura, España), con diferente tamaño y edad del cabeza del hogar muestran diferencias en las actitudes hacia el ahorro de agua. Asimismo, se construye una escala para medir la actitud hacia el ahorro de agua (consistente, válida, fiable y parsimoniosa) y se analiza en qué grado las actitudes y las citadas variables estructurales influyen en el consumo de agua del hogar. Los resultados muestran que todas las variables predictoras del consumo de agua son significativas y que la actitud presenta dos factores que actúan diferencialmente.

El segundo de los estudios analiza, a nivel individual, la influencia de la implicación personal en prácticas de conservación de agua, la credibilidad dada a la información sobre la escasez de agua, y la eficacia percibida de las conductas personales de ahorro de agua sobre el comportamiento de conservación de agua reportado (RWCB). Del mismo modo, se analizan las diferencias en este comportamiento reportado utilizando la edad, el sexo y el hábitat. Utilizando una encuesta en toda España (n = 637), realizado en 20 ciudades que han experimentado o no la escasez de agua, los resultados muestran que la contribución de cada variable resultó estadísticamente significativa, a excepción de la credibilidad dada a los problemas de escasez de agua futuros. Asimismo, el análisis discriminante agrupa con un 99,4% a los individuos en dos grupos con diferentes RWCB. En este caso, la credibilidad de los hechos y riesgos futuros sobre la escasez de agua no resultan significativo en la creación de estos grupos. A medida que la implicación es significativa y la credibilidad de la información no, llegamos a la conclusión general de que los aspectos informativos parecen no ayudar a generar una mayor RWCB.

El tercero de los estudios, también a nivel individual, persigue el desarrollo de un nuevo instrumento para medir la percepción del público hacia los riesgos

subyacentes del consumo de agua urbano utilizando un enfoque psicométrico. La razón principal para su desarrollo fue que no se encontró en la literatura ningún instrumento de medida que se centrase específicamente en medir este tipo de riesgo, a pesar de la creciente importancia de este concepto en la literatura ambiental. Para lograr este objetivo se presentan dos estudios en dos contextos diferentes dentro del mismo país (España). El primero de ellos se llevó a cabo en 2012 en un período fuerte de precipitaciones, mientras que el segundo en 2014 en un período de sequía. Esta nos permite comprobar la hipótesis de invariancia de la escala propuesta, confirmando que no es sensible al contexto climático. Esta escala, llamada *UWPR*, en comparación con otras escalas existentes en la literatura, es simple y fácil de usar en los cuestionarios, además de invariante, fiable y válida.

El cuarto de los estudios, siguiendo el enfoque individual, tiene como objetivo analizar la influencia que tiene la escala de percepción del riesgo desarrollada en el estudio anterior (*UWPR*) junto con otras variables analizadas anteriormente (credibilidad de la información sobre futuros problemas del agua e implicación personal en la práctica de conservación del agua) sobre el comportamiento reportado de conservación de agua (RWCB). Además se analiza el efecto moderador del contexto de estrés hídrico ("zonas con escasez de agua" vs. "zonas sin escasez") para descubrir posibles diferencias en el nivel de las variables, las relaciones subyacentes y el poder explicativo del modelo propuesto. Los resultados muestran que el modelo de medición propuesto es fiable y válido para ambos contextos situacionales con un poder explicativo muy similar, evidenciando la alta validez externa del modelo y su uso en diferentes entornos de estrés hídrico. Asimismo, la mayoría de las relaciones entre las variables del modelo son estadísticamente significativas, excepto la relación entre la credibilidad del mensaje y RWCB (que está mediada por la implicación personal) y la relación de percepción del riesgo y RWCB. En general, estos hallazgos ponen de manifiesto que las estrategias de demanda (e.g. programas de concienciación) deben centrarse en involucrar a los ciudadanos en lugar de insistir en la credibilidad de las afirmaciones sobre el estado actual/futuro del agua y que deben adecuarse al contexto de estrés hídrico donde se implementen.

Finalmente, a la luz de los hallazgos obtenidos en cada uno de los estudios empíricos presentados en esta tesis, se ofrece una serie de implicaciones prácticas

desde el ámbito del marketing social dirigidas a los decisores encargados de gestionar estrategias de demanda de agua. Asimismo, desde el punto de vista académico, se proponen futuras líneas de investigación a desarrollar como prioritarias en el ámbito de conservación de agua.

EXECUTIVE SUMMARY

Academic research on water issues has exponentially increased in recent decades due to the increase on the number of studies (e.g. UNESCO, 2015) that consider water shortage for human consumption as one of the most acute environmental problems faced by the humanity. Although both the agricultural and the industrial sectors are suffering major shortages, according to predictions of the IPCC (2008) demand for residential water should be a priority area of analysis given the increasing urbanization projects, changing patterns consumption, and rising living standards. Likewise, demand-side management has emerged as a crucial part of a total water cycle management approach, and as an important complement of more widely used supply-side approaches (e.g. improving systems for water distribution) for managing fresh water (Russell & fielding, 2010). Finally, within the demand-side analysis, water conservation behaviour is gaining ascendancy around the world as the most important strategy for water planning and management for future decades (Suarí, 2013). This is because only through identifying the key psychological and social drivers of water use and conservation can effective strategies (e.g. water policy, communication campaigns or social marketing programs) be developed to address urban water demand management (Russell & Fielding, 2010).

Based on the above, this dissertation attempts to broaden the knowledge of water conservation by analysing several demographic and psychological determinants, scarcely studied in the literature, as barriers to engaging in this pro-environmental behaviour. In this sense, the two types of residential consumption are considered differentially: household and individual level of research. In addition, it is proposed that social marketing has an important role in this process since it aims to generate behavioural change, concentrating on removing barriers to change (Lee & Kotler, 2016). Understanding the different levers that marketers can use to influence behavioural change for natural resources conservation is a growing area of research in marketing and one that has not been analysed in depth (Lowe, Lynch, & Lowe, 2015). This general objective is developed, albeit to different degrees, throughout

four empirical studies (three of them published in academic journals and one currently under review).

The first study examines whether households (500 households mostly from the Vega Baja del Segura, Spain), with different size and age of household head show differences in attitudes towards saving water. In addition, a scale is developed to measure the attitude towards saving water (consistent, valid, reliable and parsimonious). Furthermore, it is analyzed to what extent attitudes and the structural variables previously cited influence household water consumption. Results show that all the predictors of household water consumption are significant and attitude construct has two different factors.

The second study analyses, at individual level, the influence of personal involvement in water conservation practices, credibility of water scarcity problems, perception of the efficacy of specific conducts and personal involvement on reported water conservation behaviour (RWCB). Similarly, the differences in this reported behaviour using age, gender and habitat are analyzed. Using a survey across Spain (n=637) and conducted in 20 cities that have experienced or no water scarcity, the results show that the contribution of each variable was statistically significant, except for the credibility given to the problems on water shortage in the future. Additionally, discriminant analysis allows grouping 99.4% of the sample into two possible clusters with different water conservation behaviours profiles. Credibility of facts and risks are not significant in the creation of these two groups. As involvement is highly significant and credibility of information is not, it is possible to conclude that informative aspects do not help to generate greater water conservation behaviour.

The third study, also at the individual level, pursues the development of a new instrument to measure public perception of the risks underlying water for consumption using a psychometric approach. The main reason for developing it was to address the lack of specific risk perception measurement in environmental literature despite the growing importance of this concept. To reach this objective, two data gathering processes are implemented in two different situational contexts within the same country (Spain). The first one was conducted in 2012 in a strong rainfall period while the second one in 2014 in a drought period. This allows

checking the invariance assumption of the proposed scale, and confirming that this scale is not sensitive to climate context (rainy vs. dry period). This scale, called *UWPR*, compared to other existing scales in the literature, is simpler and easier to use in questionnaires, invariant, reliable and valid.

The fourth study, following the individual approach, analyses the relationship between the previously developed risk perception scale (*UWPR*) along with other previously analysed variables (credibility of the information on future water problems and personal involvement in water conservation practice) and reported water conservation behaviour. In addition, the moderating effect of water stress context ("scarce" vs. "non–scarce" regions) is analysed to uncover potential differences in the level of the variables, underlying relationships and the explanatory power of the proposed model. The results show that the proposed measurement model is reliable and valid for both situational contexts (water scarcity and non–scarcity) with very similar explanatory power, evidencing the high external validity of the model, which allows its use in different water stress environments. Most of the relationships are statistically significant except two antecedents of RWCB (message credibility and risk perception of water consumption) which are not significant. In this regard, the relationship between message credibility and RWCB is mediated by personal involvement. In general, these findings highlight that the natural resources management (e.g. communication campaigns) should focus on developing personal involvement with conservation behaviour rather than insist on the credibility of the claims about the current and future status of resources. Furthermore, these strategies must be adapted to the context of water stress where implemented.

Finally, in the light of the findings in each of the empirical studies presented in this dissertation, it is offered a number of practical implications in the field of social marketing aimed at decision makers responsible for managing water demand strategies. In addition, from an academic point of view, future research lines to develop as a priority in the field of water conservation are proposed.

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CHAPTER 1

INTRODUCTION TO WATER CONSERVATION

This dissertation attempts to broaden the knowledge of water conservation by analysing several demographic and psychological determinants, scarcely studied in the literature, as barriers to engaging in this pro-environmental behaviour. Likewise, it is proposed that social marketing has an important role in this process since it aims to generate behavioural change, concentrating on removing barriers to change (Lee & Kotler, 2016). Understanding the different levers that marketers can use to influence behavioural change for natural resources conservation is a growing area of research in marketing and one that has not been analysed in depth (Kronrod, Grinsteing, & Wathieu, 2012; Lowe, Lynch, & Lowe, 2015).

First, there is a presentation of the importance of the topic under study and the main strategies for achieving water conservation behaviour highlighting the important role of social marketing. Then social marketing as a discipline is analysed for the conservation of natural resources and a study approach where environmental psychology and social marketing complement each other is proposed. Second, in order to propose some factors that may influence water conservation behaviour as barriers to engaging in this type of behaviour, a review of the determinants analysed in literature has been conducted. Due to the fact that there are two lines or levels of research (household and individual level) to explain water conservation behaviour, this literature review has been separated into two sections. Third, a theoretical model is proposed for each of these two levels of analysis using some variables which are quite novel in the field of water conservation. Finally, these models are tested in several articles published[1] in different journals and some conclusions and implications are provided.

1.1. What is water conservation?

Water is the most important natural resource on Earth since all living beings need it to live. Although 72% of the earth surface is covered by water, only 0.3% approximately of the world's fresh water is directly accessible for human uses (NGWA, 2012). This apparent abundance of water along with the recognition by the United Nations (U.N.) General Assembly and the U.N. Human Rights Council

[1] The last article presented here is under review on the date of the dissertation submission.

(2010) that safe drinking water and sanitation is a human right may cause people to perceive water as an infinite resource. However, the actual situation is very different, water is a finite resource and fresh water is becoming increasingly scarce in the world. This fact may be due to causes such as human water consumption patterns and world population growth rate (Hoekstra, Mekonnen, Chapagain, Mathews, & Ritchter, 2012). According to the United Nations (2015) the world's population grows on average by about 80 million people per year and it is estimated that there will be 9.7 thousand millions by 2050. Additionally, water scarcity can be the result of climate conditions such as low rainfall and floods (Schewe et al., 2014). Both facts have led to a decrease in water reserves all over the world at an alarming rate (Vörösmarty, Green, Salisbury, & Lammers, 2000).

Thus, many studies (e.g. Barlow, 2007; Bigas, 2012; Weiss, 2012; Adams, 2014; Weiss & Slobodian, 2014) claim fresh water to be the new environmental crisis of this century. First, because the supply needed to satisfy basic human needs (e.g. drinking, bathing and sanitation) will not exist, or will be too costly to afford. According to the Water Resources Group (2009) in 15 years the demand for water will exceed supply by 50%. Second, because people will not have the fresh water needed to grow crops and supply food. Third, because a lack of fresh water will devastate ecosystems, which people rely on (e.g. fishing). Finally, severe and frequent weather events will cause devastating floods and other water-related calamities (Weiss, 2012). Therefore, the study of fresh water has gained prominence in the scientific community in recent decades.

In this regard, although a range of sectors including industry and agriculture is suffering water scarcity, IPCC predictions suggest that residential water demand is an important area for focus given the increase in urbanization projects, changing consumption patterns and rising living standards (Bates, Kundzewicz, Wu, & Palutikof, 2008). Thus, specific policy and strategies are required both from the supply (e.g. by improving distribution systems) and demand-side to address urban water demand management (Brooks, 2006). Demand-side management has emerged as a crucial part of a total water cycle management approach, and as an important complement of more widely used supply-side approaches for managing fresh water

(Russell & fielding, 2010). Water demand management strategies can be broadly divided into three major categories, economic, technological and behavioural (Brooks, 2006; Saurí, 2003). Although substantial water savings are possible through technological solutions (e.g. retrofits to irrigation systems, McCready, Dukes, & Miller, 2009; or leak detection, Buchberger & Nadimpalli, 2004), achieving a broader shift in patterns of consumption, in part, requires a change in consumer behaviour (Schultz et al., 2014; Landon, Kyle, & Kaiser, 2016). Thus, water conservation behaviour is gaining ascendancy around the world as the most important strategy for water planning and management for future decades (Suarí, 2013).

Overall, water conservation can be defined as "the preservation, control and development of water resources, both surface and groundwater, and prevention of pollution" (OECD, 2001). More specifically, the U.S. Water Resources Council defines water conservation as the activities designed to (1) reduce water demand, (2) improve use efficiency and reduce losses and water waste, and (3) improve land management practices (cited by Alliance for Water Efficiency, 2010). In the environmental literature the definition of water conservation behaviour is far from being conclusive (see Table, 1). Most studies that examine this behaviour offer no definition, thereby generating a misconception or a misunderstanding of the term. For instance, "water saving" and "water conservation" terms are used as equivalents in many studies (e.g. Jorgensen, Graymore, & O'Toole, 2009). This misunderstanding may be due mainly to the fact that in practice both perspectives are complementary and inter-related, despite being theoretically different terms because they pursue different objectives (Pereira, Cordery, & Iacovides, 2002). In the case of "water saving", the aim is to limit or control water demand and use for any specific purpose. In contrast, "water conservation" aims to preserve the resource and combat its degradation in order to achieve sustainability[2] (Pereira et al., 2002).

[2] Sustainability was first defined in the Brundtland Report of the World Commission on Environment and Development (WCED 1987, p. 43) as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" and it is based on three basic pillars: Economic development, social development and environmental protection.

Table 1. Some definitions of water conservation in the literature

Authors	Definitions
Baumann et al. (1984)	The socially beneficial reduction of water use or water loss.
Ward & King (1997, p. 173)	*"Any decision that promotes a reduction in water use over time that pays for itself"*
Atkins (2003, p.1)	*"Those activities designed to reduce the demand for water, improve the efficiency of its use, and reduce losses and waste."*
Corral-Verdugo et al. (2006, p.140)	*"Water conservation is one significant instance of sustainable behavior."*
Russell & Fielding (2010, p.2)	*"Any actions that reduce the amount of water used or enable water to be used more efficiently."*
Adams et al. (2013, p.115)	*"Indoor conservation was defined to include the adoption of new technologies (low flow faucets, etc.); installation of water saving appliances (toilet, etc.); how water is used in the house (washing dishes, etc.); and testing drinking water."*
Dupont & Rezzenti (2013, p. 22)	*"Indoor water conservation choices refer to the presence/absence of low volume toilets and low flow showers in the home. Outdoor water conservation choices refer to the frequency of lawn and garden watering by the household during summer months."*
Saurí (2013, p. 230)	*"Water conservation may just mean efficiency in use or include all measures addressed to curb consumption."*
Ellert et al. (2015)	A lower rate of consumption over time.

Source: own elaboration.

Evidence suggests that the most effective measures for reducing residential water consumption include the use of water efficient appliances (e.g. water efficient washing machines, dual flush toilets or low volume shower roses) and behavioural change such as reducing shower times and changing gardening practices (Victorian Government, 2004; Millock, & Nauges, 2010). Water efficient appliances use and behavioural change depend on encouraging consumers to make voluntary choices within a broader facilitating environment of appropriate policy and pricing signals, infrastructure and information (Hassell & Cary, 2007). In this regard, the integration of behavioural science in general and environmental psychology in particular into the broader domain of water resources research has made an important contribution to furthering the understanding of water conservation (Russell & Fielding, 2010). This

is because only through identifying the key psychological and social drivers of water use and conservation can effective strategies (e.g. water policy, communication campaigns or social marketing programs) be developed to address urban water demand management (Russell & Fielding, 2010). By identifying the determinants of residential water conservation behaviour, water managers and decision makers can gain an in-depth understanding of the ways in which they can positively influence the behaviour of citizens towards a more responsible use of water (Fielding, Russell, Spinks, & Mankad, 2012).

1.2. How to achieve water conservation behaviour?

Generally, Rothschild (1999) proposes three strategies for achieving behavioural change: education, law (regulation) and social marketing. Thus, environmental managers and decision makers can employ some of these strategies to encourage conservation behaviour. Likewise, other authors propose similar primary methods for achieving individual behaviour change, and hence social change. For instance, a report from the Department for Environment Food & Rural Affairs (DEFRA, 2003) suggests the following strategies to influence people to achieve environmental goals:

1) Legislation.

2) Economic instruments which alter the price of products or services to make it cheaper to protect the environment, and more expensive to pollute it.

3) Education and provision of information, so that people can make an informed choice.

4) Marketing and influencing strategies.

In addition, Millock and Nauges (2010) suggest policymakers can choose between two types of demand-side management policies to achieve water conservation: price policies and non-price policies. Non-price policies consist of, for example, water restrictions on specific uses (such as irrigation or car washing), information and education campaigns to encourage water conservation, and rebates for adoption of water-efficient technologies (see Campbell, Johnson, & Larson,

2004). Information and education campaigns have often been used in conjunction with other tools to bring about behavioural change. Moreover, other authors such as Donovan and Henley (2010) have proposed education (information and skills), motivation (persuasion) and advocacy (for socio-political actions). Finally, UK's National Centre for Social Marketing (NSMC, 2011) proposes education, control (legislation; regulation) and social marketing.

Educational programs aim to generate knowledge, skills, understanding and values for adopting conservation practices voluntarily (Nevin, 2008). Regulation can promote saving behaviour in a non-voluntary way by using the threat of punishment for noncompliance (Rothschild, 1999). Finally, social marketing can offer benefits and reduce barriers providing opportunity in the environment and incentives (Kennedy, 2010). As many authors point out (e.g. DEFRA, 2003; Willuweit, 2009; Kennedy, 2010; Wymer & Basil, 2014) a combination of these three strategies would be the best option to achieve behavioural change. However, clearly, some might be more appropriate depending on the context in which they are applied.

In isolation the use of a social marketing approach may be the most effective strategy because of mainly two reasons (Rothschild, 1999). First, education can show and create awareness about existing benefits of the desirable behaviour but cannot deliver them (Rothschild, 1999). For that reason, behaviourists (e.g. Cone & Hayes, 1984) argue that environmental education is effective in raising awareness but not in changing behaviours. Through education, governments can inform and teach citizens to protect the environment but this approach does not focus on reducing the barriers or inhibitors of the desirable behaviour nor does it provide any direct and/or immediate reward (Abrahamse, Steg, Vlek, & Rothengatter, 2005; Rundle-Thiele, Russell-Bennett, Leo, & Dietrich, 2013). As Monroe (2003) points out evidence suggests that promoting environmental literacy is best achieved through education; while promoting behaviours is best achieved through social marketing.

In the water conservation field, however, educational programs are one of the most frequently used strategies to achieve behavioural change (Michelsen,

McGuckin, & Stumpf, 1999)[3]. The assumption underlying these education programs is that behavioural change is preceded by changes in knowledge (Murphy, Watson, & Moore, 1991). However many empirical studies (e.g. Moore, Murphy, & Watson, 1994; Watson, Murphy, Kilfoyle, & Moore, 1999) have shown that knowledge is not a good predictor of actual water conservation behaviour, whereas other studies have found contrary evidence (e.g. Clark & Finley, 2007; Randolph & Troy, 2008). In this regard, as Hassell and Cary (2007) highlight, very little has been published that systematically evaluates the role of information in reducing water use. Thus, most studies have measured the short term effectiveness of campaigns during drought situations instead of the long term effects of ongoing campaigns.

The second reason is that laws involve the use of coercion to achieve behavioural change in a non-voluntary manner or threaten punishment for noncompliance or inappropriate behaviour (Rothschild, 1999; Lee & Kotler, 2016). Policymakers use two main strategies. First, managers of water utilities often impose restrictions on the use of water (see Kenney, Klein, & Clark, 2004; Fielding et al., 2012). Second, pricing policies are considered to be the best instrument for achieving water conservation because the welfare loss of water restrictions usually exceeds that of a price increase (Roibás, García-Valiñas, & Wall, 2007; Grafton & Ward, 2008). However, as Millock and Nauges (2010) point out water managers have often chosen to impose restrictions on water use rather than imposing higher prices because residential water demand is known to be price inelastic. This is due to the fact that water restrictions are a lower burden on poorer households than price increases and would ensure immediate response in the case of serious and unexpected water shortages (Millock & Nauges, 2010).

Through education and law the change in behaviour is coerced. Social marketing, however, emphasizes that effective program design begins with understanding the barriers (internal or external) people perceive to engaging in an activity in order to overcome them (see, for example, Andreasen, 1994) and showing the perceived benefits of the desired behaviour to aim at long-term voluntary

[3] For further information about the effect of water education programs on water consumption and conservation behaviour see Serna (2014).

behavioural change (Daniel, Bernhardt, & Eroglu, 2009). Thus, as Lee and Kotler (2016) highlight, "*the most challenging aspect of social marketing (also its greatest contribution) is that it relies heavily on "rewarding good behaviors" rather than "punishing bad ones" through legal, economic, or coercive forms of influence*" (p.9). In line with the above, Mckenzie-Mohr (2000a) states that only by knowing the barriers that prevent individuals from engaging in a particular behaviour, will managers and policy makers be able to achieve voluntary behavioural change in citizens.

Hence, social marketing represents a much more holistic, flexible and iterative process of water conservation policy planning compared to traditional approaches. Social marketing may complement the utilization of traditional policy tools (e.g. regulatory) and informative measures (e.g. educational programs or communication campaigns), with a new perspective of strong customer orientation at all stages of decision making (Chkanikova, 2009).

CHAPTER 2

HOW MARKETING CAN PROMOTE WATER CONSERVATION BEHAVIOUR: THE ROLE OF SOCIAL MARKETING

CHAPTER 2

In this section firstly, the origin, definition and domain of the social marketing concept are explained. Then, social marketing studies on environmental issues (mainly on natural resources conservation) are reviewed, differentiating them from other types of marketing studies related to the environment and sustainability. Finally, a community-based social marketing framework[4] is proposed (McKenzie-Mohr & Smith, 1999; McKenzie-Mohr, Lee, Schultz, & Kotler, 2012) as the strategy for achieving water conservation behaviour using knowledge of both the field of social marketing and environmental psychology.

Marketing as a discipline has significantly changed over the years due to the transformation of human nature and social behaviour. Given that marketing operates in a complex and changing environment, it has adapted to challenges from the main forces in the environment - demographic, economic, natural, technological, political and cultural (Kotler, Wong, Saunders, & Armstrong, 2004). Up to approximately the 1970s, marketing research focused mainly on commercial transactions between profit companies and consumers (Malhotra, 2011). In the 1970s and early 1980s, new approaches appeared as an extension of marketing where non-profit companies have an important role in trade relations with a broader type of audience (Andreasen, 1994). Likewise, the traditional view of product as a good or service expanded and ideas or anything likely to be of value for stakeholders were also considered (e.g. see Kotler & Levy, 1969). Social marketing has both practical and conceptual roots in this context. Although some foundations of social marketing were published in the 1950s[5] and 1960s, social marketing as a discipline did not emerge until 1970s with the article "Social marketing: An approach to planned social change" published in the Journal of Marketing by Kotler and Zaltman (1971) (for further information about the evolution of social marketing see Andreasen, 2003).

Kotler and Zaltman (1971) define social marketing as: "*the design, implementation and control of programs calculated to influence the acceptability of social ideas and involving considerations of product planning, pricing,*

[4] The community-based social marketing framework will be explained in depth at the end of this section.

[5] For instance, in 1952 an article was published in the Public Opinion Quarterly journal in which the author (Wiebe, 1952) asked: Why can't we sell brotherhood like we sell soup?

communication, distribution, and marketing research" (p.5). This early conceptualization was criticized for its inaccuracy, for instance, the fact that it was very similar to the traditional definition of commercial marketing but applied to "ideas" (Andreasen, 1994). So, in later years researchers have worked on achieving a more precise definition. Although there are many definitions of social marketing (e.g. see ISMA, 2016), one of the most comprehensive and widely used in literature is the one stated by Andreasen (1994, p.110), *"the adaptation of commercial marketing technologies to programs designed to influence the voluntary behavior of target audiences to improve their personal welfare and that of the society of which they are a part".*

Nevertheless, as Lee and Kotler (2016) claim, social marketing is still an unknown and misunderstood term for most marketing researchers and increasingly confused with other marketing terms such as societal marketing, social media or socially responsible marketing. For instance, a review (Takahashi, 2009) of the social marketing approach for environmental topics shows the difficulty in determining which cases did in fact use a social marketing approach. Thus, most of these studies focused explicitly on raising awareness through social advertising clearly aligned to a communication or an information approach rather than using a social marketing one. Finally, it is important to note that social marketing has not yet made an intense appearance in academic research compared to other marketing spheres but it has been applied quite frequently in the professional field (Vassilikopoulou, Siomkos, & Rouvaki, 2008). In recent years, however, the number of academic papers has been growing and new academic journals have emerged in this field (e.g. Journal of Social Marketing).

Social marketing pursues behavioural change to benefit society as a whole and is based on four principles (Lee & Kotler, 2016):

1) Influencing behaviours: The "bottom line" of social marketing is behaviour change, so it focuses on achieving specific behavioural goals with specific audiences in relation to topics relevant to the social good. Therefore, social marketing involves: (a) changing beliefs, attitudes and behaviours of

individuals or organizations for a social benefit, and (b) the social change is the primary objective (Rangun & Karim, 1991).

2) Utilizing a systematic planning process that applies marketing principles and techniques: In order to develop the optimal social marketing strategy to achieve behavioural change social marketers may also use a traditional marketing mix tool (the 4 Ps). They pay particular attention to the nature of the behaviour that is to be promoted (product), to the ways in which this promotion will take place (place), to the costs that the target population believes that they will have to incur to engage in that behaviour (price) and to the way it has to spread (communication) (for further information see Lefebvre, 2011; Gordon, 2012). However, the effectiveness of the four Ps model in social marketing has been criticized by several authors (e.g. Peattie & Peattie, 2003; Hastings, 2007). Thus, as some systematic reviews on the effectiveness of social marketing interventions (Stead, Gordon, Angus, & McDermott, 2007; Schultz, 2014) have shown, many social marketing programs use other strategies such as social norms, community involvement or commitments as tools to achieve behavioural change.

3) Focusing on priority target audience segments: Andreasen (2005) proposes three levels of influence. He states that social marketers must focus their efforts not only on influencing individual behaviour (downstream level) but also influencing the peers of the target market (mid-stream level) or organisations and institutions that can play some positive role in supporting the desirable behaviour (e.g. policy makers - upstream level). Recently, this last level of influence has become important in environmental studies since social marketers also have a role to play in influencing policymakers to adopt regulations (upstream changes) for complementing and accelerating behaviour changes among large-scale audiences, and to increase compliance with existing regulations (see Kennedy, 2010).

4) Delivering a positive benefit for individual and/or society. Thus, although in some social marketing programs the primary beneficiary is the target consumer or her/his family (e.g. organ donation), this individual benefit must

become social benefit in the mid- and long-term (Andreasen, 1994). Also, other programs focus on the collective/social good from the beginning. This is the case of most social marketing programs related to the environment such as water conservation. In many cases behavioural change toward sustainable use of resources means that individuals have to change their lifestyle and habits (e.g. having a shower instead of a bath) and even make an economic effort (e.g. buying water-efficient fixtures and appliances). However, the benefit for society of water sustainability (i.e. water is available for everyone now and in the future) should be the main end goal of the social marketing efforts.

The above last point is a key difference between social marketing and other types of marketing approaches. Social marketing must face the widely recognised principle in psychology (e.g. Miller, 1999; Moore & Loewenstein, 2004) that people often act automatically and unconsciously based on their self-interests, which is an interest clearly and consistently acknowledged and pursued in commercial marketing (Rothschild, 1999). In contrast, social marketing seeks to make people behave in a way that is often in conflict with their own wishes (e.g. not to smoke, not to eat junk food or to have a 5 minute shower), which makes it more challenging. In line with this, Lee and Kotler (2016) wonder who determines whether the social change created by the program is beneficial, leaving this issue unanswered for the social marketing community. Thus, although most causes supported by social marketing efforts are considered as a good cause by the majority of society (as could be the case of water conservation) other causes, such as abortion, may be more controversial.

Additionally, another important point to highlight is that social marketing applies to programs and not to campaigns. This is because campaigns have a fixed termination point while programs may last decades and contain several campaigns within them (Andreasen, 1994)[6]. For instance, as Andreasen (1994, p. 110) explains, "*the American Cancer Society has a long-run social marketing program to reduce the incidence of smoking, within which they have annual campaigns, such as each*

[6] In social marketing literature programs and campaigns are often misused interchangeably (e.g. McKie & Toledano, 2008; Donovan, 2011; Henley, Raffin, & Caemmerer, 2011).

year's Great American Smokeout. An important strength of social marketing is that it takes a programmatic rather than campaign view of its mission".

Social marketing has had a deep positive impact on social issues in the areas of public health (e.g. tobacco use and heavy/binge drinking), injury prevention (e.g. school violence and domestic violence), community involvement (e.g. blood and organ donation), environmental issues (e.g. waste reduction or energy and water conservation) and more recently financial well-being (e.g. fraud) (Lee & Kotler, 2016). However, social marketing researchers have focused mainly on analysing health-related behaviours such as alcohol, tobacco or drugs consumption (e.g. Gilmore, 2009; Bauld, McKell, Carroll, Hay, & Smith, 2012; Ford, MacKintosh, Spinks, & Mankad, 2013) and public or family health (e.g. Morris & Clarkson, 2009; Stead, McDermott, MacKintosh, & Adamson, 2011) paying scant regard to other issues.

In this regard, in the first World Social Marketing Conference celebrated in Brighton (England) in 2008, prestigious researchers like Philip Kotler, Doug McKenzie-Mohr and Nancy Lee highlight the need for research on one of humanity's most pressing issues, environmental problems, from a social marketing approach (McKenzie-Mohr et al., 2012). Although it is possible to find extensive research in marketing on environmental issues, most studies have focused on analysing environmental sustainability in trade relations at firm level (for an exhaustive review on sustainability and marketing research see Kilbourne & Beckmann, 1998, and McDonagh & Prothero, 2014) far removed from the objective of social marketing. On the one hand, from the supply perspective, studies analyse marketing activities (e.g. develop new products or sustainable packaging) not only to satisfy human needs but also to minimise environmental harm (e.g. Prothero, 1990; Fuller, 1999; Peattie & Charter, 2003; Polonsky, 2011). This approach is labelled in different ways such as green marketing, ecological marketing, environmental marketing, sustainable marketing and even responsible marketing. On the other hand, from a demand viewpoint, studies analyse the determinants of "green consumerism" or the "attractiveness" of green products attributes in purchasing decisions (e.g. Sparks & Shepherd, 1992; Young, Hwang, McDonald, & Oates, 2010; Olson, 2013;

Schuitema & de Groot, 2015). In both cases, the underlying idea is to persuade consumers to buy products (environmentally friendly ones), or to dispose of them more responsibly.

In addition, some marketing studies (e.g. Jackson, 2005a; Bekin, Carrigan, & Szmigin, 2007; Schreurs, Martens, & Kok, 2012) on environmental issues have also taken into account analysis of demand reduction from a sustainable point of view. For instance, Peattie and Peattie (2009) published an article in which they consider the potential contribution of the marketing discipline to consumption reduction from a social marketing perspective. These studies claim that to contribute towards sustainability it is not enough to buy products in an environmentally friendly way, but it is also necessary to consider the question of how to reduce consumption within the mainstream marketing debate by changing lifestyle and patterns of consumption (Murray & Cherrier, 2002; Moisander, 2007; Peattie & Peattie, 2009; Lee, Roux, Cherrier, & Cova, 2011; Ortega-Egea & García-de-Frutos, 2013; García-de-Frutos, Ortega-Egea, & Martínez-del-Río, 2016). Peattie and Peattie (2009) use the term "anti-consumption", which literally means against consumption (Lee, Fernandez, & Hyman, 2009), to achieve sustainable behaviour (e.g. refuse to purchase products that are harmful to the environment).

It is important to note that this idea of consumption reduction is not recent but has its origin in the "demarketing" concept introduced by Kotler and Levy in 1971. They define this concept as "that aspect of marketing that deals with discouraging customers in general or a certain class of customer in particular on either a temporary or permanent basis" (p.75). However, demarketing strategies at first moment did not pursue an objective of environmental sustainability but coping with excess demand or unwanted demand (Kotler & Levy, 1971). As for example, in an economic environment with economic shortage and seller's market features, that is, a situation where there are fewer products and services available than consumers willing and capable of absorbing them (Dadzie, 1989).

Nevertheless, to achieve an environmentally sustainable future deep knowledge in other consumption domains is needed (McKanzie-Mohr, 2011). Thus, as Moisander (2007) says, "*Protecting different areas of the natural environment*

requires not only morally responsible shopping practices but also more sustainable ways of managing the household and the little routines and chores of everyday life" (p. 406). This is the case of consumption of natural resources like water or energy and social marketing also has an important role to play. Likewise, social marketing may influence a target audience to achieve conservation behaviour through one of four ways (Lee & Kotler, 2016):

1) *Accept* a new behaviour (e.g. water recycling and reuse).

2) *Reject* a potentially undesirable behaviour (e.g. buying a house with a large swimming pool).

3) *Abandon* an old undesirable behaviour (e.g. not having a bath)

4) *Modify* a current behaviour (e.g. using less water to wash the dishes).

Social marketing may also encourage a one-time behaviour (e.g. installing a low-flow showerhead) or the establishment of a habit and the prompting of repeated behaviour (e.g. taking a five-minute shower) (Lee & Kotler, 2016). Although it is possible to find studies in social marketing literature analysing the adoption of a new environmental behaviour (e.g. adopting recycling behaviour: Landis, 2005; Prestin, & Pearce, 2010), behaviour modification is the most widely analysed way to influence individuals and, as many authors highlight (Kronrod et al., 2012; Lowe et al., 2015) it is a prominent area of research in marketing and one that is not well understood.

Regarding the need for a further knowledge in other consumption domains, Kotler (2011) published an article[7] in which appeals for better use of natural resources in marketing practices since natural resources are finite. In this paper he introduces the idea that it is necessary that all stakeholders- employees, channels, suppliers, and investors- be aware of their use of energy and water supplies to contribute to conservation causes. In addition, he highlights the simultaneous use of

[7] This is a significant study in the literature on social marketing in resource conservation, the title gives an idea of its importance: "*Reinventing Marketing to Manage the Environmental Imperative"*(Kotler, 2011)

two marketing perspectives to reach this goal: “demarketing” and social marketing. "Demarketing" is the goal (modify behaviour towards consumption reduction) and social marketing tools are the facilitators to achieve the desired behaviour. Since Kotler’s paper, use of the term “demarketing” has increased considerably in environmental social marketing studies (e.g. Lowe et al., 2014, 2015; Yakobovitch & Grinstein, 2015).

In line with this, although the "demarketing" concept has been applied to different goods in social marketing studies (e.g. use of tobacco, Peattie & Peattie, 2009, or general anaesthesia within a dental practice, Lawther, Hastings, & Lowry, 1997), depending on the nature of the good to be reduced, the process may be totally different. For example, saving or conserving water is different from reducing the consumption of manufactured goods because:

1) It is possible to achieve a substantial reduction in the consumption of many goods, but not water, where a minimum is required for subsistence (WBCSD, 2005).

2) Water, like energy, is a basic product that it is usually consumed both individually and collectively (household consumption) (Russell & Fielding, 2010).

3) Water is an asset with a debatable economic nature and some people consider it to be a fundamental right (Biswas, 2007).

Hence, the way that social marketers must research and manage this change of behaviour (reducing consumption of natural resources) should be different and specific.

Another publication related to social marketing and the conservation of natural resources was written by McKenzie-Mohr et al. (2012). This book explains how to use social marketing tools to motivate environmental protection behaviours such as water/energy efficiency, alternative transportation and watershed protection, using case studies of innovative programs from different countries in both residential and commercial sectors. Additionally, it is possible to find a few works in social

marketing literature that also use social marketing as a tool to promote natural resource conservation behaviours, but numbers are still limited (Yakobovitch & Grinstein, 2015). In this regard, as this dissertation focuses on a specific behavioural change (water conservation) the relevant social marketing literature discussed below refers to academic articles in the environmental conservation arena (mainly on the topic of water) which focus on or incorporate the field of social marketing or its tools as a central component in their arguments to change behaviour. Thus, other articles (e.g. Andreasen, 2001; Phipps & Brace-Govan, 2011) more focused on explaining the role of social marketing from a theoretical, conceptual, moral or ethical perspective are not included. For instance, in a theoretical article, Phipps and Brace-Govan (2011) highlight the importance of social marketing to shift the formal, informal, and philosophical antecedents of the water consumption marketplace from using water as a right to responsible consumption.

Firstly, there are *general studies* analysing social marketing program components for achieving different conservation behaviours. For instance, Foxall, Castro, James, Yani-de-Soriano and Sigurdsson (2006) recommend the use of the "*Behavioural Perspective Model*", widely used in consumer behaviour research, to develop social marketing programs aimed at conserving natural resources such as consumption of domestic energy and water or waste disposal. Additionally, Kronrod et al. (2012) analyse the use of assertive vs non-assertive message in promoting different pro-environmental behaviours (e.g. economizing water or reducing air and sea pollution) in social marketing programs and the moderating role of perceived issue importance in this relationship. Secondly, there are more *specific studies* analysing only one change of behaviour, for instance, reduction of waste trash (e.g. McKenzie-Mohr, 2002; Brosius, Fernandez, & Cherrier, 2013) or reduction of carbon emission (e.g. Smith & O'Sullivan, 2012; Smith, 2014). In this regard, energy conservation is the most studied behaviour in social marketing literature (e.g. McKenzie-Mohr, 1994; Gray & Bean, 2015; Harries, Rettie, Studley, Burchell, & Chambers, 2013).

Studies analysing water conservation behaviour from a social marketing perspective are very scarce. As Hurlimann, Dolnicar and Meyer (2009) point out, the

impact of marketing interventions on water-related behaviour has been researched to a limited extent. Syme, Nancarrow and Seligman (2000) provide a representative review of the studies conducted to examine the effectiveness of persuasive water conservation programs once they have been implemented (summative evaluations). They also examine the relevant attitudinal and communications literature on water conservation to propose specific suggestions for improving social marketing programs. Shang, Basil and Wymer (2010) analyse, using experiments, how consumers respond to different elements of hotel linen and towel reuse promotions aimed at conserving water. They propose several elements (e.g. hotel should include its own logo on message, donate the saved money to charity, etc.) to design effective marketing campaigns within a social marketing program in this regard. Other examples of using social marketing to achieve water conservation are the studies by O'Donnell and Rice (2012) and Peter and Honea (2012) applied to the case of bottled water drinking. Finally, Lowe et al. (2014, 2015) have recently published two articles where they examine changes in household water consumption within the context of a social marketing program designed to reduce water consumption.

According to the information presented above some ideas can be highlighted. First, the development of social marketing by areas of application is unbalanced since the health sector has received most of the attention in social marketing literature in general (Cheng, Kotler, & Lee, 2011) and energy conservation in the environmental topic in particular (Gray & Bean, 2015). Second, water conservation in social marketing is a novel field of research. Takahashi (2009) uses the analogy of human development to describe the current state of the field of social marketing in the environmental arena, suggesting it is in the adolescent stage, but, in the case of water conservation it is still in the childhood stage. Third, most studies have focused exclusively on analysing the effectiveness of social marketing programs/campaigns, almost forgetting other social marketing domains such as the analysis of barriers to achieve behavioural change. However, understanding perceived barriers and benefits influencing consumer behaviours is necessary to develop efficient environmental conservation strategies (Foxall et al. 2006; McKenzie-Mohr et al., 2012).

The importance of studying behavioural barriers in social marketing has been underlined by authors like Geller (1989, 2002) and McKenzie-Mohr (2000b) who state that the integration of behavioural science and social marketing, both practically and theoretically, could get over two of the major limitations of pro-environmental behaviour change, that is, long-term change and large-scale application. With this idea in mind, William Smith and Doug McKenzie-Mohr develop the community-based social marketing (CBSM) framework[8] as a step-by-step model grounded in psychological social/environmental psychology principles (McKenzie-Mohr & Smith, 1999; McKenzie-Mohr et al., 2012). This method has been used to foster water conservation practices and many other pro-environmental behaviours mainly from a professional point of view (see Tools of Change, 2015) and includes five steps:

1) Carefully selecting the behaviour to be promoted: Knowing which specific behaviours are most important to target is a critical first step in developing effective environmental programs (McKenzie-Mohr & Schultz, 2014). Prior to selecting which behaviour to promote, it must be decided which audience to target (McKenzie-Mohr et al., 2012).

2) Identifying the barriers and benefits associated with the selected behaviour: Barriers refer to anything that reduces the probability of engaging in the target behaviour and they are internal or external to the individual (Mckenzie-Mohr, 2000a). For instance, in the case of water conservation some of these internal barriers to the individual may be, for instance, factors such as lack of knowledge on how to save water, non-supportive water conservation attitudes or an absence of motivation; whereas benefits refer to a person's beliefs about the positive outcomes associated with the behaviour (Mckenzie-Mohr, 2000a).

3) Designing a strategy that utilizes behaviour-change tools (e.g. commitment, prompts, norms, goal setting or convenience) to overcome these barriers

[8] For further information also consult www.cbsm.com

and to promote benefits (for further detail see McKenzie-Mohr & Schultz, 2014; Schultz, 2014).

4) Piloting the strategy with a small segment of a community.

5) Finally, evaluating the impact of the program once it has been broadly implemented.

In this dissertation several ideas from CBSM are used; first, the need for a multidisciplinary approach for achieving behavioural change towards a sustainable consumption of natural resources. Likewise, this fact responds to the belief expressed by several authors (e.g. Takahashi, 2009; Gordon, 2012; Spotswood, 2014) that social marketing, which is a developing field, needs the contribution of different research approaches that can help shape its foundations for the betterment of the field. In this regard, environmental psychology can provide a huge amount of knowledge about what the barriers to and motives for water conservation behaviour are. At this point it is interesting to introduce a distinction between "theories of change" (e.g. Lefebvre, 2000); used in the field of social marketing research, and "models of behaviour" (e.g. van der Linden, 2014a); used in the environmental psychology field. While theories of change show how behaviours can be changed and/or change over time, models of behaviour seek to understand a specific behaviour by identifying the underlying psychological factors that influence it. So models of behaviour attempt to understand the psychological determinants that explain and predict a given behaviour while theories of change generally describe more conceptual and generic processes (Darton, 2008). Although both approaches have distinct purposes, they need to be highly complementary to achieve effective behavioural change.

For instance, van der Linden (2014b) argues that the ineffectiveness of most climate change campaigns may be partly due to the fact that most public climate change interventions pay little (or no) attention to the psychological determinants of the behaviours that they are intending to change. In addition, Steg and Vlek (2009) suggest that to analyse the effectiveness of an environmental campaign, knowing what were the psychological factors leading (or not) to behavioural change provides

much more information that simply focusing on the behavioural outcomes. It is necessary to analyse in-depth the theoretical and empirical pathways which explain how to move from communicating information to the desired behaviour (van der Linden, 2014b). Thus, in this dissertation two approaches are followed: 1) the general perspective of the social marketing discipline as explained above and 2) the environmental psychology approach.

Second, as already noted, the main objective of this dissertation is to examine several demographic and psychological variables to which little attention has been paid in water conservation literature. All these variables are potential barriers that must be overcome to achieve conservation of the resource. Thus, the second step in McKenzie-Mohr's et al. (2012) CBSM methodology and Steg and Vlek's (2009) strategy, is widely developed for the case of water conservation behaviour. In this regard, similar to the social marketing approach, environmental psychology (Steg & Vlek, 2009) suggests four steps to encourage pro-environmental behaviour:

1) Identification of the behaviour to be changed.
2) Examination of the main factors underlying this behaviour.
3) Design and application of interventions to change behaviour to reduce environmental impact.
4) Evaluation of the effects of interventions.

Environmental psychology has paid more attention to analysis of the factors affecting water conservation behaviour (step 2) than social marketing so literature in the field of environmental psychology is mainly used in this dissertation.

Third, to uncover these potential barriers the methodology proposed by CBSM (McKenzie-Mohr & Smith, 1999) has been followed, which involves three steps:

1) Reviewing relevant articles and reports.
2) Obtaining qualitative information through focus groups and/or observation to explore in-depth some aspect regarding the activity (in our case possible

factors that may be potential barriers to engage in water conservation behaviour and how to measure them).

3) Conducting a survey with a random sample of residents. Thus, individuals have been asked about a wide range of factors that might influence their water conservation behaviour and afterwards, it has determined which of these factors are linked to water conservation behaviour (Abrahamse, Schultz, & Steg, 2016).

These factors are considered in preliminary stages of formative research in environmental social marketing programs using CBSM (see p.36). Thus, following stages such as the design and implementation of social marketing program have not been addressed in this dissertation because it is beyond the scope of this work.

Fourth, as previously stated, analysis of the pro-environmental behaviour to target should be as specific as possible for each type of behaviour since the barriers and motivations that influence them may be different (McKenzie-Mohr, Nemiroff, Beers, & Desmarais, 1995; Tabanico & Schultz, 2008). In this sense, this dissertation focuses only on water conservation behaviour rather than natural resources conservation in general. In addition, within water conservation behaviour curtailment and efficiency behaviour are taken into account (Russell & Fielding, 2010). This dissertation also highlights the attitude-behaviour gap in environmental programs (Kollmuss & Agyeman, 2002) as an important reason for their inefficacy.

Finally, the main difference of this research in relation to the CBSM framework is that, in this case, the analysis is performed from an individual rather than from a more social level.

CHAPTER 3

DETERMINANTS OF WATER CONSERVATION BEHAVIOUR

As previously stated, understanding the factors contributing to water conservation behaviour is a critical issue given the need to conserve water for environmental sustainability, efficient municipal water management, and climate change mitigation. However, in the field of environmental psychology relatively limited research has been conducted to date compared to other resources such as energy (Russell & Fielding, 2010). In general, two levels (or lines) of research are used to explain water conservation behaviour: household and individual. The trend towards individualist approaches is more prevalent in the growing body of research on environmental psychology oriented consumer practices. Existing studies have identified a plethora of psychological, social, contextual and sociodemographic predictors of both household and individual water conservation intentions and behaviours as detailed below.

3.1. Determinants at household level

It is important to highlight the difficulty of analysing water conservation or saving behaviour in the literature. Although in general these concepts may be defined as lower water consumption, many studies (e.g. Campbell et al., 2004; Corral–Verdugo, Bechtel, & Fraijo-Sing, 2003) approach these variables using water consumption or use as a dependent variable, especially at household level. Virtually all studies use household water consumption data due to the difficulty of measuring water conservation or saving based on household consumption data (usually information on the bill or water meter data). Thus, these articles seek to analyse the determinants of water consumption and relate them to the concept of water conservation or saving. For that reason, this literature review only takes into account articles which aim to analyse factors that influence water conservation behaviour (or saving) through knowledge of water consumption. Most of these studies use external drivers to the individual and use econometric models to estimate the water demand function with an economic approach (for a systematic review see Arbués, García-Valiñas, & Martınez-Espiñeira, 2003; Klein, Kenney, Lowery, & Goemans, 2006; House-Peters, & Chang, 2011). These external factors have been classified in this dissertation into four groups and most of these studies are presented in Table 2: 1)Climate, seasonal variability, rainy season; 2)Incentives/disincentives for water

consumption; 3)Household characteristics related to the members or water tools; and 4)Property characteristics.

Table 2. External determinants of household water consumption

Factors	Authors
Climate/seasonal variability/rain period	Berk et al. (1980); Lee & Warren (1981); Schneider & Whitlatch (1991); Lyman (1992); Nieswiadomy (1992); Nieswiadomy & Cobb (1993); Dandy et al. (1997); Renwick & Archibald (1998); Renwick & Green (2000); Mukhopadhyay et al. (2001); Olmstead et al. (2003); Campbell et al. (2004); Martínez-Espiñeira & Nauges (2004); Arbués & Villanua (2006); Gaudin (2006); Kenney et al. (2008); Polebitski & Palmer (2009); Schleich & Hillenbrand (2009); Dupont & Renzetti (2013)*; Romano et al. (2014)
Incentives/disincentives (e.g. tariff; structure prices; regulation: charges, rebate on water; restrictions…)	Berk et al. (1980); Lee & Warren (1981); Lee (1981); Agthe & Billings (1987); Murdock et al. (1991); Schneider & Whitlatch (1991); Lyman (1992); Nieswiadomy (1992); Nieswiadomy & Cobb (1993); Dandy et al. (1997); Renwick & Archibald (1998); Höglund (1999); Mayer et al. (1999); Nauges & Thomas (2000); Renwick & Green (2000); Agthe & Billings (2002); Olmstead et al. (2003); Arbués et al. (2004); Campbell et al. (2004); Martínez-Espiñeira & Nauges (2004); Arbués & Villanua (2006); Gaudin (2006); Mazzanti & Montini (2006); Kenney et al. (2008); Polebitski & Palmer (2009); Schleich & Hillenbrand (2009); Dupont & Renzetti (2013); Willis et al. (2013); Romano et al. (2014)
Household characteristics (household composition; age members; household income; water-using appliances; water saving technologies…)	Agthe & Billings (1987); Aitken et al. (1991); Murdock et al. (1991); Schneider & Whitlatch (1991); Lyman (1992); Nieswiadomy (1992); Nieswiadomy & Cobb (1993); Renwick & Archibald (1998); Höglund (1999); Mayer et al. (1999); Nauges & Thomas (2000); Renwick & Green (2000); Mukhopadhyay et al. (2001); Agthe & Billings (2002); Loh & Coghlan (2003); Olmstead et al. (2003); Campbell et al. (2004); Nancarrow et al. (2004); Martínez-Espiñeira & Nauges (2004); Syme et al. (2004); Zhang & Brown (2005); Arbués & Villanua (2006); Mazzanti & Montini (2006); Gaudin (2006); Kim et al. (2007); Blokker et al. (2009); Schleich & Hillenbrand (2009); Polebitski & Palmer (2009); Dupont & Renzetti (2013); Makki et al. (2013); Willis et al. (2013); Hong & Chang, (2014); Matos et al. (2014); Rathnayaka et al. (2014)
Property characteristics (house age; house value; house size, area, primary/secondary residence; pool; garden…)	Aitken et al. (1991); Schneider & Whitlatch (1991); Lyman (1992); Nieswiadomy (1992); Nieswiadomy & Cobb (1993); Höglund (1999); Mayer et al. (1999); Nauges & Thomas (2000); Renwick & Green (2000); Mukhopadhyay et al. (2001); Agthe & Billings (2002); Olmstead et al. (2003); Campbell et al. (2004); Zhang & Brown (2005); Wentz & Gober (2007); Blokker et al. (2009); Polebitski & Palmer (2009); Schleich & Hillenbrand (2009); Dupont & Renzetti (2013); Makki et al. (2013); Hong & Yang, (2014); Matos et al. (2014); Rathnayaka et al. (2014)
*RCB: Reported water consumption	

Source: own elaboration

As can be seen in Table 2, incentives/disincentives (specifically prices) are the most traditional factors considered as influencing domestic water demand in the literature. Most of these studies find that domestic water consumption tends to be price-inelastic (decrease in demand is lower than the increase in price). However, in recent years, more and more variables have been incorporated into these models specifically related to household characteristics.

For instance, it is widely accepted and empirically demonstrated, that domestic water consumption positively correlates to household income (Corbella & Pujol, 2009). Aggregate water demand increases with the number of people living in a household, one of the most important variables for predicting both water consumption and water conservation behaviour (Russell & Fielding, 2010). However, as Arbués et al. (2000) highlight, economies of scale for optimizing water use cannot generally be achieved in small households because there is an optimal household size in which these economies of scale tend to vanish. The age and educational level of members of the household are also relevant drivers of domestic water consumption. It seems that older people tend to use less water per capita than younger people. In addition, families with children or teenagers can be expected to use more water due to activities such as having baths, bathing in the pool and so on. Nevertheless, researchers who have examined age and education as determinants of water conservation show mixed results. For instance, some studies (e.g. Lyman, 1992) find that older residents had high water use and were less likely to report conservation intentions (Kantola, Syme, & Campbell, 1982; Clark and Finley, 2007).

Finally, some authors (e.g. Arbués et al., 2003) suggest that climate is one of the most relevant drivers of domestic water consumption. Household water consumption is supposed to vary depending on climate variables, especially temperature (positive relationship) and rainfall (negative relationship), but it depends on overall garden watering needs. In addition, property characteristics (e.g. main or secondary residence, number of bathrooms, pool, garden, etc.) may influence consumption but their effect is non-consistent, due to correlation with other factors (Schneider & Whitlatch, 1991).

In addition, several studies (e.g. Bruvold & Smith, 1988; Domene & Saurí, 2006; Grafton, Ward, To & Kompas, 2011; Jorgensen, Martin, Pearce, & Willis, 2013, 2014; Martínez-Espiñeira & García-Valiñas, 2013; Willis et al., 2013; Martínez-Espiñeira, García-Valiñas, & Nauges, 2014; Koutiva & Makropoulos, 2016) also include in these models psychological variables related to attitudes. In these studies, the psychological variables usually do not influence water consumption being the external variables to the individual such as characteristics of the household the relevant predictors (Russell & Fielding, 2010).

However, results from these studies are inconclusive being a current debate in the literature. For instance, Bruvold and Smith (1988) analyse knowledge of water use and conservation beliefs along with other external variables such as water marginal price, temperature, household size, household income, and so on, to explain household water consumption. All these variables were significant in the regression (R^2 = 0.42) except conservation beliefs. Grafton et al. (2011) introduce in their econometric water demand model (with more than 15 external variables) environmental concern variable, which they also found to be non-significant. More recently, Martínez-Espiñeira et al. (2014) analyse two types of water saving practices using external variables such as socioeconomic and household characteristics, and weather conditions. In addition, they include two psychological variables (environmental concern and knowledge about environmental protection campaigns), with mixed results regarding the significance of these variables.

3.2. Determinants at individual level

As noted above, research at household level has mainly focused on incentives external to the individual (e.g. price, water policy, incentives for installing water efficient appliances or weather conditions). However, it has been shown that these motivational elements are not stable, long-term motivators of pro-environmental behaviour (Steg, Bolderdijk, Keizer, & Perlaviciute, 2014). Therefore, in recent decades study of the determinants of stable pro-environmental conduct (e.g. internal drivers such as environmental concern, attitudes or social norms) has become a central area of research for both social and environmental psychologists (Gifford & Nilsson, 2014). The environmental impact of any individual's personal behaviour is

usually small and such individual behaviour has an environmentally significant impact only when many people independently do the same thing, that is, at aggregate level (Stern, 2000). Thus, proposed theories and analyses at individual level should be generalized to a set of individuals in society.

Before starting with the study of the predictors analysed in the literature to explain water conservation at individual level using psychological variables, a more general vision of the models used in environmental psychology literature and applied to water conservation is provided. Models on water conservation behaviour in residential situations have been based primarily on two broad models or patterns of human behaviour: the rational-economic model (rational choice model) and attitude-behaviour model (McKenzie-Mohr et al., 1995; Hassell & Cary, 2007). The first states that, to influence conservation-based decisions, consumers require only information since they make decisions by calculating the individual costs and benefits of different courses of action. Thus, they choose the options that maximize their expected net benefits (Jackson, 2005b). This model is based on the premise that individual self-interest provides the foundation for human behaviour as a result of cognitive deliberation. Nevertheless, this model has been widely criticized because it does not recognise some limitations of rational deliberative actions (e.g. affective, habits and routines or heuristic influences).

The second model is the most frequently used in literature and it is mainly represented by Fishbein's and Azjen's (1975) *Theory of Reasoned Action* and subsequently Azjen and Fishbein's (1980) *Theory of Planned Behavior*. These models conceptualize linkages between beliefs, attitudes, perceived social norms and behaviours and Kantola et al. (1982) and Kantola, Syme, and Nesdale (1983) were the first to apply them to water conservation behaviour. As an extension to these models, and based on Triandis' (1977) study, Stern (2000) proposes a theoretical model linking attitudes, contextual factors, personal capabilities and habits. However, this model has not been deeply tested empirically in water conservation. Finally, other models have also been used that focus on social identity theory and social norms (Tajfel & Turner, 1986) to understand how individual water conservation behaviour is influenced by groups (e.g. Grønhøj, 2006). In line with

this, Jorgensen et al., (2009) have recently proposed a theoretical integrated social and economic water use model based on their examination of previous water use behavioural models.

In studies that use psychological variables as antecedents of water conservation behaviour, there is no consistency in the measurement of the dependent variable. This lack of consensus is a subject of discussion in the literature (Jorgensen et al., 2013, 2014). As in the case of household level, most studies use water consumption data rather than water conservation (or saving) behaviour data at individual level of research. For instance, a recent meta-review of 87 experimental studies conducted in the field of environmental behaviour reports less than a handful of studies related to water conservation behaviour (Osbaldiston & Schott, 2012). These studies use metered consumption data (e.g. Aitken, McMahon, Wearing & Finlayson, 1994; Gregory & Di Leo, 2003), water-use diaries (e.g. Harriden, 2012; Beal, Stewart, & Fielding, 2013) or observational data (e.g. Corral-Verdugo et al, 2012; Corral-Verdugo et al., 2003).

This body of research usually examines the relationship between water consumption and general attitudes toward water conservation or specific attitudes related to water management (e.g. Syme, Seligman, & Thomas, 1991) and report mixed significance regarding the influence of the psychological predictors (see Fielding et al., 2012, for a review). These differences are probably due to the obvious disparity in the levels of analysis because individual motivations and attributes are inconsistent with household consumption data (Corral-Verdugo et al., 2012; Jorgensen et al., 2014). Other studies, however, use behavioural intentions (e.g. Clark & Finley, 2007; Lam, 2006; Corral-Verdugo, Carrus, Bonnes, Moser, & Sinha, 2008) and self-reported behaviour (e.g. Troy & Randolph, 2006; Miller & Buys, 2008; Gilbertson, Hurlimann, & Dolnicar, 2011) to measure water conservation behaviour.

To perform this literature review (psychological factors used to explain water conservation behaviour) and to ensure that all relevant articles were included in the review, three major databases (ScienceDirect, Scopus and Google Scholar) were consulted by searching for the terms ‘‘water conservation behaviour”, “water

conservation", "water saving", "reduction water demand" and "factors", "variables", and "determinants". This approach helped to narrow down the number of studies considerably. In addition, an issue-by-issue search was performed in especially relevant journals in the field of environmental psychology such as Journal of Environmental Psychology; Environment and Behavior; Journal of Environmental Management; Resources, Conservation and Recycling; Journal of Applied Psychology; Journal of Applied Social Psychology or Journal of Environmental Education. Then, the abstracts and the keywords of the papers were read in order to identify the potential link with behavioural models of water conservation, paying special attention to the dependent measurements. Appendix 1 shows the main studies in the environmental psychology literature that use behavioural models of water conservation with psychological variables (most commonly, attitudes, motives, beliefs, values and social norms).

Likewise, as can be seen in this table (Appendix 1) and as explained above, attitudes have been analysed from the very beginning (e.g. Kantola et al., 1982) within the *Theory of Planned Behaviour* (TPB) (Azjen, 1988; 1991). According to this theory, the most immediate predictor of behaviour is an intention to engage in the behaviour (i.e., a motivation or plan) and intentions are, in turn, predicted by three main factors: attitudes, subjective norms and perceived behavioural control (e.g. Harland, Staats, & Wilke, 1999; Lam, 1999, 2006; Clark & Finley, 2007). In this regard, although the relationship is imperfect, behavioural intentions are one of the most robust and widely applied predictors of consumer behaviour (e.g. Azjen, 2001). Likewise, as explained above, many authors (e.g. Clark & Finley, 2007; Lam, 2006) approach water conservation behaviour using intention to save or to conserve water.

Additionally, although attitudes have been demonstrated to influence intention to conserve water (e.g. Clark & Finley, 2007) and reported water conservation behaviour (e.g. Murphy et al., 1991), other studies (e.g. Aitken et al., 1994; Gregory & Di Leo, 2003) find no relationship. These ambiguous findings may be due to the mismatch between the specificity of the attitude and behaviour variables. Russell and Fielding (2010) support this idea with a very helpful example, if the behaviour to be

explained is installing a rainwater tank, the specific attitude to be used to explain this particular behaviour must be attitudes toward installing rainwater tanks rather than more global attitudes toward environmental protection or water conservation in general. The attitude-behaviour gap is also found in many other pro-environmental behaviours and is a current research topic in environmental psychology (e.g. Claudy, Peterson, & O'Driscoll, 2013; Lavergne & Pelletier, 2015).

Social norms regarding water conservation have also been found to be positively related to water conservation behaviour (e.g. Trumbo & O'Keefe, 2005; Corral-Verdugo & Frías-Armenta, 2006). If people perceive that society as a whole or their family and friends attach importance to water conservation practices they will feel that they have social support to perform this type of behaviour. Finally, perceived behavioural control reflects the extent to which people think that the behaviour is something they can easily do and this variable is also positively related to water conservation behaviour (e.g. Harland et al., 1999; Clark & Finley, 2007). Therefore, according to the TPB "*if people have a positive attitude toward water conservation, if they perceive that important others in their life think that it is a good thing, and if they think that it is something they can easily do, then they will intend to engage in water conservation and their intentions should in turn translate into water conservation actions*" (Russell & Fielding, 2010, p. 3). This theory underpins most of the articles in the field of environmental psychology that attempt to explain not only the behaviour of water conservation but also other conservation behaviours (e.g. Kaiser, Hübner, & Bogner, 2005).

In addition, other psychological variables such as values and beliefs have been analysed in depth. These concepts are highly related to each other since value reflects a belief about the desirability of a certain end-state (de Groot, & Steg, 2008). In the case of water conservation beliefs is the frequently used concept and they are often conceptualized as a person's worldview reflecting beliefs about the relationship of people with the natural world (Schultz, Shriver, Tabanico, & Khazian, 2004). Studies that analyse the relationship between beliefs and water conservation behaviours have usually chosen a very well established scale in literature called the "*New Ecological Paradigm*" (NEP) (Dunlap & Van Liere, 1978). Authors such as Corral-Verdugo et

al. (2003) find that ecological beliefs (e.g. “Drinkable water will exhaust very soon, if we do not save it”) support water conservation, whereas utilitarian beliefs (e.g. “Drinkable water is an unlimited resource”) tend to inhibit efforts to conserve water.

Other less commonly used variables to explain water conservation behaviour are habits (e.g. Aitken et al., 1994; Gregory & Di Leo, 2003; Trumbo & O’keefe, 2005), knowledge (e.g. Murphy et al., 1991; Moore et al., 1994; Dolnicar, Hurlimann, & Grün, 2012), involvement (e.g. Syme, Beven, & Sumner, 1993; Gregory & Di Leo, 2003; Dolnicar et al., 2012), efficacy of water saving conducts (e.g. Kantola et al., 1982; Trumbo & O’Keefe, 2001; Lam, 2006) and environmental awareness and concern (e.g. Mondéjar-Jiménez, Cordente-Rodríguez, Meseguer-Santamaría, & Gázquez-Abad, 2011; Willis, Stewart, Panuwatwanich, Williams, & Hollingsworth, 2011; Adams, 2014). Emotions have recently been found to be a prominent predictor of conservation behaviour in environmental psychology (Kals & Müller, 2012; Vidal & Dias, 2016). However, only three articles have been found that use emotions as an antecedent of water conservation behaviour (Bissing-Olson, Fielding, & Iyer, 2016; de Miranda Coelho, Gouveia, de Souza, Milfont, & Barros, 2016; Manríquez-Betanzos, Corral-Verdugo, Vanegas-Rico, Fraijo-Sing, & Tapia-Fonllem, 2016). Most studies (e.g. Bamberg & Möser, 2007, Kaiser, Schultz, Berenguer, Corral-Verdugo, & Thanka, 2008; Perrin & Benassi, 2009) analyse emotions for conservation motivations in general or indirectly relate them to cognitive constructs (Vining & Ebreo, 2002; Corral-Verdugo et al., 2009; Larson, Ibes, & White, 2011).

As well as studies that explain water conservation behaviour using behavioural models with inferential statistical techniques such as structural equation modelling or multiple regression (see Appendix 1), some studies take an experimental approach. These studies usually aim to explain this type of behaviour by using variables (treatments) related to the provision of information (e.g. Geller, Erickson, & Buttram, 1983; Kurz, Donaghue, & Walker, 2005; Wichman, 2015), strategies of communication (e.g. Ferraro & Price, 2013; Schultz et al., 2014; Seyranian, Sinatra, & Polikoff, 2015; Richetin, Perugini, Mondini, & Hurling, R., 2016) or educational campaigns (e.g. Thompson & Stoutemyer, 1991; Watson et al., 1999; Middlestadt et

al., 2001). In general, these studies find that providing information lead to more water conservation behaviour through knowledge.

Other studies that also aim to explain water conservation behaviour follow a descriptive approach (de Oliver, 1999; Gilg & Barr, 2006; Troy & Randolph, 2006; Dolnicar & Hurlimman, 2010; Fan et al., 2013; March, Domènech, & Saurí, 2013). For instance, Dolnicar and Hurlimman (2010) find that Australians generally report very positive attitudes towards water conservation and water saving appliances. Nevertheless, these positive attitudes were not consistently translated into actual behaviour since they perceive certain barriers such as inconvenience and impracticality and costs associated with purchasing water saving appliances. Gilg and Barr (2006) performed a cluster analysis and find four different types of individual (demographics characteristics) according to their behaviour. More recently, March et al. (2013) conducted a survey in Barcelona (Spain) on drought perception and behaviour and report that conservation campaigns were successful in raising awareness about the drought, but messages failed to target specific uses (indoor/outdoor). Finally, a small numbers of studies (Grønhøj, 2006; Randolph & Troy, 2008; Kallis, Ray, Fulton, & McMahon, 2010; Koutiva, Gerakopoulou, Makropoulos & Vernardakis, 2016) use a combination of quantitative and qualitative approaches to explain water conservation behaviour.

As this literature review shows, studies have focused primarily on a few cognitive variables (e.g. attitudes, social and subjective norms or beliefs) to explain water conservation behaviour. Surprisingly, nowadays most published articles, especially in marketing, continue to use and replicate the "*TRA*" or "*TPB*" models to explain different pro-environmental behaviours in different contexts (e.g. Muralidharan, & Sheehan, 2016; Paul, Modi, & Patel, 2016). And that is despite the fact that these traditional models have so far failed to account for the attitude-behaviour gap, raising critical questions about the usefulness of traditional behavioural intention theories (Peattie, 2010). Therefore, it seems coherent to consider new variables to include in these behavioural models to better explain water conservation behaviour. In this sense, consumer behaviour in the field of marketing

can also provide valuable information on possible determinants[9] since water is a natural resource consumed by individuals (Foxall et al., 2006).

In this way, this dissertation explains water conservation behaviour using not only variables from environmental psychology field (e.g. attitudes and efficacy of conducts) but also other variables that have traditionally been analysed in consumer behaviour models in marketing. These variables are credibility of the information, personal involvement and risk perception. Analyses of these variables (e.g. definition, importance, literature review and so on) are widely explained in the articles presented in Appendix 2.

[9] For further information on the possible application of theories and models of consumer behaviour in marketing for the case of domestic water consumption see Sowdagur (2006)

CHAPTER 4

RESEARCH OBJECTIVES

As already noted, the literature contains two lines (or levels) of research to explain water conservation behaviour: research at household level and individual level. In this study, both lines have been taken into account. Given that this dissertation is configured as a set of published articles, the objectives presented below are developed in different manuscripts. The information on what article develops each objective is presented in section 6 (Results).

4.1. Household level

Initially, it was decided to analyse household water consumption since some of the most significant use of water (in terms of quantity) takes place in the home (USGS, 2015).

4.1.1. Objectives aimed in Article 1

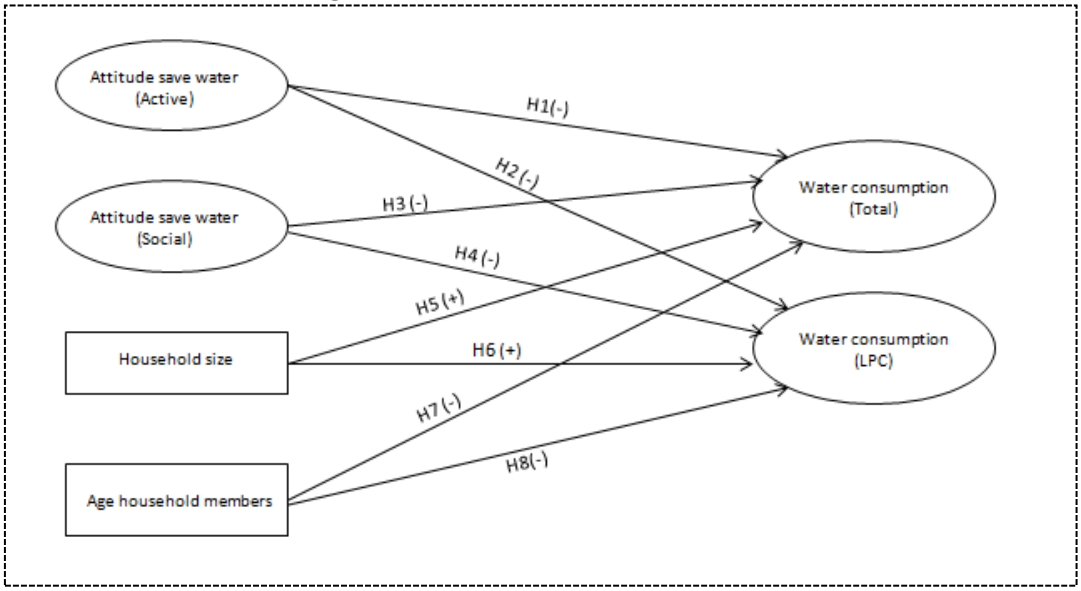
Although there has been extensive research on variables external to the individual (e.g. price, characteristics of the house, weather and so on), less is known about the role of psychological variables (e.g. attitudes) to explain this behaviour. As it was stated, recently, there is a discussion in environmental psychology on the analysis of water conservation behaviour using household data (e.g. Jorgensen et al., 2013, 2014). Most of studies using household consumption (metered data) have found that psychological determinants are often weak predictors (e.g. Grafton, et al., 2011; Harlan et al., 2009; Newton & Meyer, 2012; Syme et al., 2004). This may be due to the fact that these determinants are measured at the individual level and metered consumption at the household level, there being an obvious difference in their levels of analysis. However, other studies (e.g. Syme et al., 1991; Willis et al., 2011) have reported significant effects on household consumption when individual motivations have been measured. Therefore, there are mixed results in this regard. Moreover, there is no consensus in literature on how to measure attitude as antecedent of water consumption since some authors (e.g. Russell & Fielding, 2010) affirm that the non relationship between these variables is because the variable "attitude" usually refers to a "general" concept (environmental attitude) while the second variable refers to a very specific type of behaviour (water consumption or saving).

In line with the above, as household water use is a collective outcome, theories must take into account the dynamics of the collective consumption to adequately capture the antecedents of resources conservation at home. Thus, studies have shown (e.g. Renwick & Green, 2000; Blokker et al., 2009; Matos et al., 2014) that the characteristics of the household and personal capabilities of household members are important factors in understanding conservation behaviours in general (Stern, 2000) and water conservation behaviour in particular (Clark & Finley, 2007). However, the type of relationship between some of these variables and household water consumption is still unclear (Fielding et al., 2012). For instance, although research clearly has demonstrated that a significant proportion of water use can be explained by the size of the household, that is, the number of residents in the house (e.g. Aitken et al., 1991; 1994), it is not clear if this is a positive or negative relationship because of economies of scale. Likewise, researchers who have examined age as an antecedent of water conservation have demonstrated mixed results (see p. 15 of this dissertation). Therefore, more research is needed to delineate the relationship between personal capabilities and water conservation behaviours. For this reason, the first general objective of this dissertation is as follow:

General objective 1: *To test a theoretical behaviour model of water household consumption using attitudes and household composition characteristics.*

Proposed model:

Figure 1. Theoretical model Article 1



As can be seen in this model (Figure 1) the dependent variable water (household) consumption was approached using two measures. First, total household water consumption, which is the common measurement used in the literature to measure this variable. Second, following the recommendation of authors like Newton and Meyer (2012) and Gregory and Di Leo (2003) the variable litres per capita per day (LPCPD) was also used, simply dividing household consumption by the number of members in the household. Additionally, it is important to note that although some studies have used household characteristics as moderating variables (see for example Hurlimann et al., 2009), in this study the interest is in analysing the direct influence of these variables on household water consumption.

Although there were various proposals to measure attitude towards saving water at the time of this study was performed (2011-2012), many of them considered dimensions which did not appear to have a direct relationship with the phenomenon studied (e.g. Gilg & Barr, 2006; include a recycling factor or Laborín, Arreguín & Valenzuela, 2002; include a locus of control factor). Other scales introduced specific items related to saving or conserving water, although there was no one scale designed specifically to measure attitudes towards saving water in the residential sphere. Thus, we defined the following sub-objective:

Sub-objective 1.1: *To check reliability and validity (nomological, construction, content, convergent and discriminant validity) of the existing measures that analyse attitudes towards saving water and to propose a holistic scale for measuring attitudes towards saving water.*

Finally, as van Liere and Dunlap (1980) point out, younger people display a greater environmental attitude and concern for sustainability than older people. However, many studies (e.g. Clark & Finley, 2007; Gilg & Barr, 2006; Gregory & Di Leo, 2003) show that older residents are more likely to conserve, which demonstrates a discrepancy between attitude and behaviour. Moreover, some studies (e.g. Lam, 2006), find no relationship between age and attitude and very few studies (e.g. Gregory & Di Leo, 2003) analyse the relationship between household size and attitude. Hence, the last sub-objective is:

Sub-objective 1.2: *To test whether different household sizes and ages display different attitudes towards saving water in the home.*

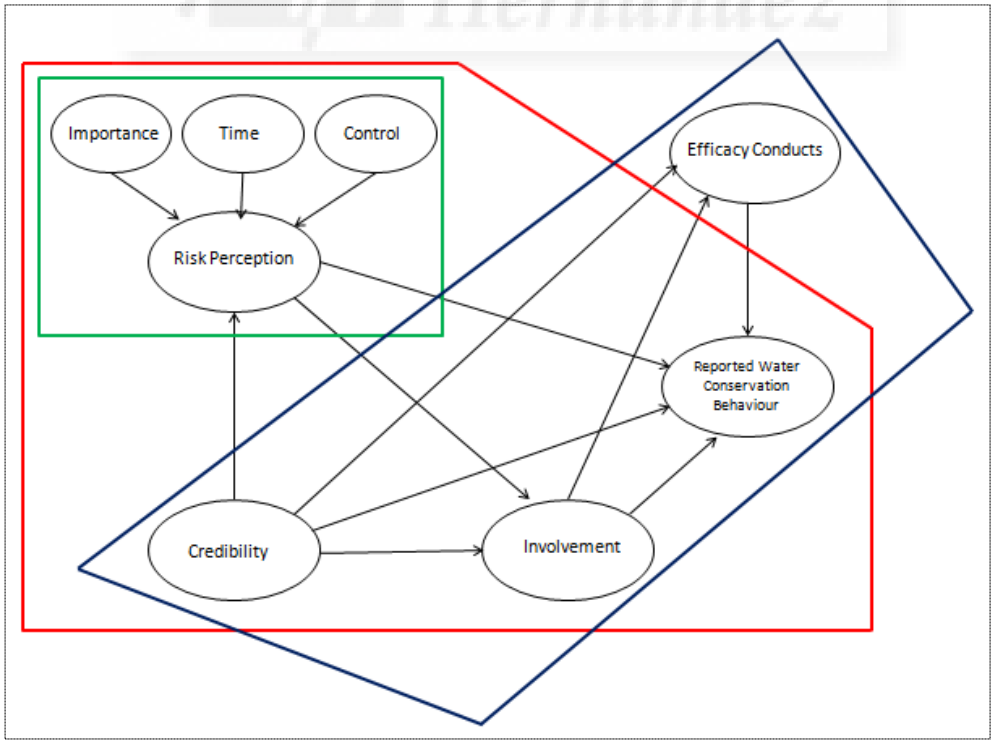
4.2. Individual level

In addition, it was decided to analyse water conservation behaviour from an individual point of view. As it was showed in the literature review of psychological determinants to explain water conservation behaviour, only few cognitive variables (e.g. attitudes, social and subjective norms, beliefs) have been analysed as antecedents of water conservation behaviour. Thus, the second general objective of this dissertation is as follows:

General objective 2: *To test a theoretical behaviour model of water conservation behaviour using a set of demographics and psychological variables which have been scantily analysed in the water conservation literature. These variables are potential barriers to engaging in this type of pro-environmental behaviour.*

Proposed model:

Figure 2. General theoretical model at individual level



Note: At individual level, Article 2 ; Article 3 ; Article 4

As the above model is quite complex and to better operationalise it, it has been broken down in three parts. Each of these parts is complete and independent in itself and naturally complemented by the other parts of the model. This fact has also facilitated its possible publication in three separate articles.

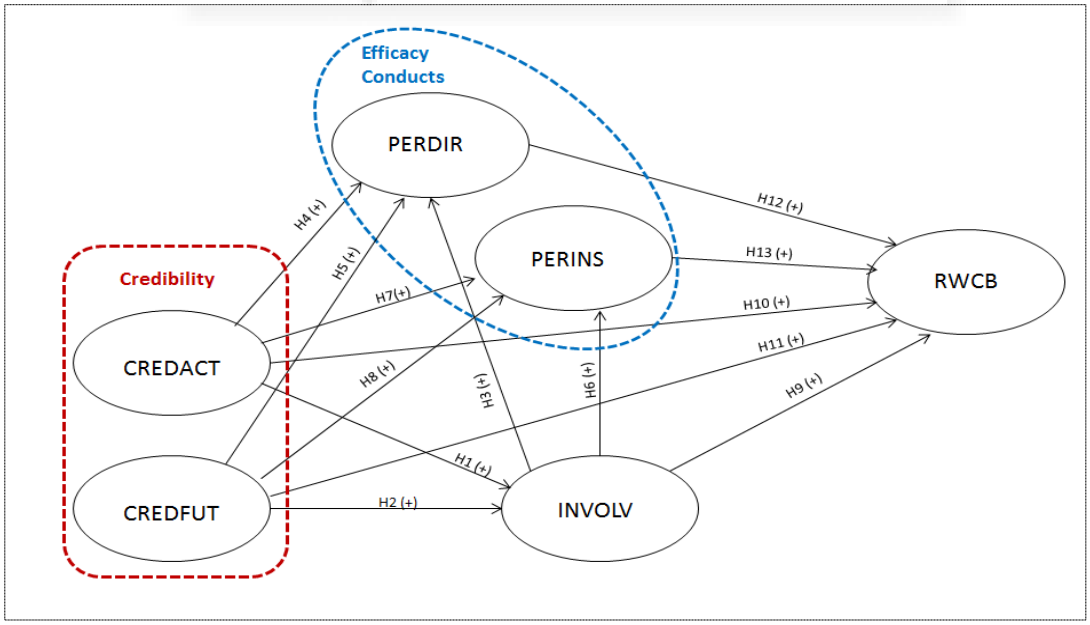
4.2.1. Objectives aimed in Article 2

It is proposed that for water conservation behaviours to be adopted, it seems coherent that first people perceive as credible the information on water problems (present and future). This perception may lead to both higher involvement in water conservation practices and a greater perception of the individual efficacy of actions during personal consumption, which in turn may lead to greater water conservation behaviour. Therefore:

General objective 2.1: *To test a theoretical behaviour model of reported water conservation behaviour using as antecedents the credibility given the problem of water scarcity, the perception of the efficacy of specific conducts and personal involvement.*

Proposed model:

Figure 3. Theoretical model Article 2



Note: CREDACT=Credibility current phenomena; CREDFUT=Credibility future risks; INVOLV=Involvement; PERDIR=Perception of efficacy of actions conducted during personal consumption; PERINS=Perception of the efficacy of actions conducted in the water installations; RWCB =Reported water conservation behaviour.

In addition, the definition of and approaches to water conservation behaviour are far from conclusive in the environmental literature being currently a subject of debate. Most studies try to approach the concept of actual water conservation behaviour using actual water consumption (e.g. Campbell et al., 2004; Corral–Verdugo et al., 2003). Nevertheless it seems coherent to say that if we want to measure 'actual water conservation', then it is necessary to take into account the difference in consumption between "t" and "t–1" moments. In line with this, several studies (e.g. Aitken et al., 1994; Gregory & Di Leo, 2003) use household consumption (water bill or smart water meter) to measure water use, but as already noted, there is an obvious difference in the levels of analysis since individual motivations and attributes are inconsistent with household consumption data (Corral–Verdugo et al., 2012; Jorgensen et al., 2014). There is also no consensus in the environmental literature over the definition of water conservation behaviour making it even more difficult to measure this concept. For example, some authors often use this concept synonymously with water demand management (e.g. Baumann et al., 1998; Russell & Fielding, 2010) or with water saving (e.g. Jorgensen et al., 2009). The majority of studies that examine this behaviour offer no definition (e.g. Clark & Finley, 2007; Dolnicar et al., 2012).

This dissertation notes that most definitions of water conservation behaviour only take into account the output of the consumer behaviour process: conduct (uses, activities, actions…). For instance, Atkins (2003) defines water conservation as those activities designed to reduce the demand for water, improve the efficiency of its use, and reduce losses and waste. Similarly, the U.S. Water Resources Council defines water conservation as the activities designed to (1) reduce water demand, (2) improve use efficiency and reduce losses and water waste, and (3) improve land management practices (cited by Alliance for Water Efficiency, 2010). However, these definitions can be seen as more closely related to the concept of "water conservation practices" (see e.g. Gauley, Ziemann, Williams, 2015; Tsai, Cohen, & Vogel, 2011) or "water conservation strategies" (see e.g. Muthukumaran, Baskaran, & Sexton, 2011), than "water conservation behaviour". As water is a natural resource consumed by individuals, a greater consumer behaviour approach is needed. To address this issue, the next objective is defined as follows:

Sub-objective 2.1.1: *To propose a definition of water conservation behaviour.*

Finally, it was of interest to identify distinct groups of people according to their behaviour because it could be useful for segmenting the population and identifying groups more or less susceptible to different policy signals or water conservation campaigns. Thus, the final objective is:

Sub-objective 2.1.2: *To find out whether there are differences in reported water conservation behaviour based on the profiles developed from the previous explanatory variables.*

4.2.2. Objectives aimed in Article 3

Studies on risk perception of environmental problems are very important to develop and improve the awareness of individuals and society of environmental issues (Baldassare & Katz, 1992), and it is a central topic in environmental psychology (Spence, Poortinga, Butler, & Pidgeon, 2011). The interest in studying the perception of environmental hazards first appeared in the 1950s and 1960s in the field of human geography with the study and analysis of natural disasters (Fischhoff, Svenson & Slovic, 1987; Cutter, 1993). The 1960s saw the publication of the first studies to analyse environmental risk perception (O'Connor, Bord, & Fisher, 1999). It is approximately since the 1980s, mainly due to the work of Slovic, Fischhoff and Lichtenstein (1979) and Short (1984), when the concept of risk perception became particularly relevant in the scientific field. From this moment, a significant number of researchers were interested in this field of study from an applied perspective (political level) and a basic research approach (Adeola, 2007), especially as regards risk communication and management. Since the 1990s, the scientific community began to consider the need for a thorough study of ecological risk perception (climate change, environmental pollution, natural disasters, depletion of natural resources, etc.). Hence, it became a priority area of research in the field of risk management and future studies on specific topics such as water were proposed (McDaniels, Axelrod & Slovic, 1995).

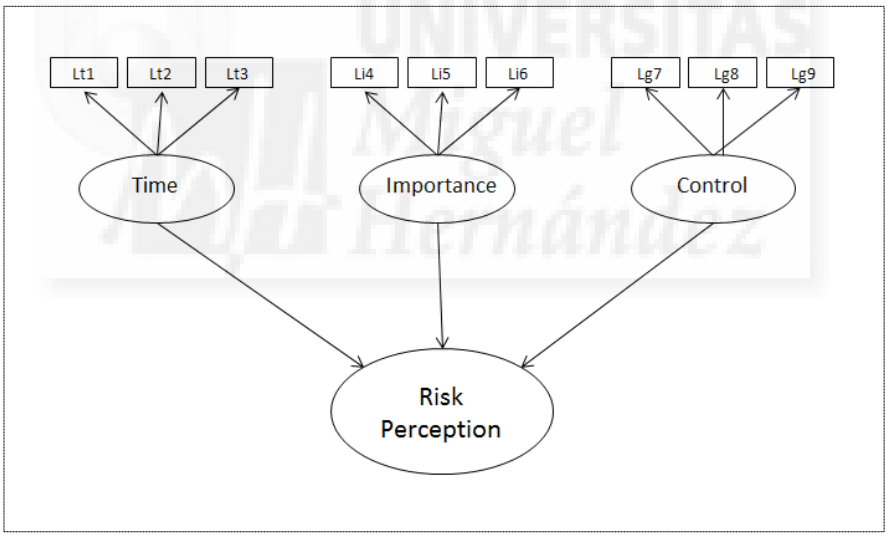
Understanding how individuals perceive the risk of water shortage can help to effectively manage and develop more effective communication strategies to achieve

greater sustainability of the resource (Kiriscioglu, 2010). Thus, it is important to quantify and characterise this perception because depending on how risks are perceived (low/high) it will be more or less likely that individuals make their own decisions to collaborate with hazard reduction (Baldassare & Katz, 1992; McCaffrey, 2004). Therefore, risk perception of urban water consumption can be an important barrier to people engaging in water conservation behaviour. Despite the importance of this variable, no instrument has been found that measures the public's perception towards the risks underlying water for consumption, understood as water intended for (urban) human consumption. Therefore, the next objective is:

General objective 2.2: *To develop an instrument to measure public's perception towards the risks underlying water for consumption.*

Proposed model:

Figure 4. Theoretical model to measure risk perception Article 3



4.2.3. Objectives aimed in Article 4

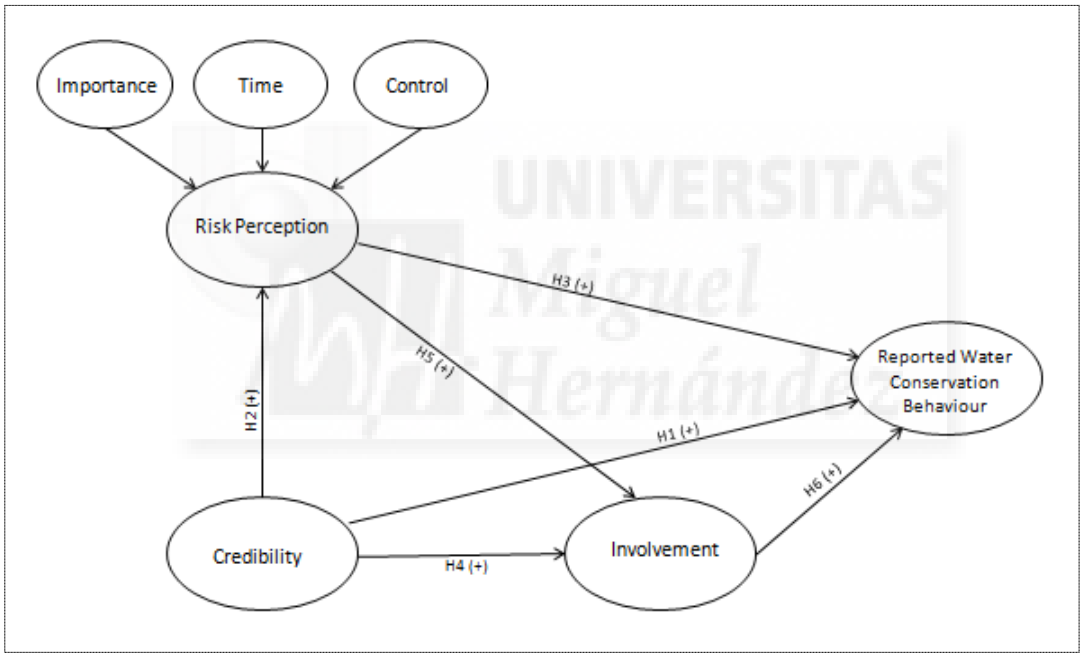
Finally, scientific and technical studies show that perceived risk of the current high consumption of urban water (a hazard that contributes to scarcity) tends to be moderate or low (Axelrod, McDaniels, & Slovic, 1999). Thus, the high degree of scepticism over water problems and this hazard's lack of credibility mean that the public may does not develop a perception of risk. This fact can create a lack of involvement in water conservation behaviour and may inhibit this behaviour, generating lack of interest and affecting conservation behaviour (Po, Kaercher, &

Nancarrow, 2003). Despite the importance of this situation, no previous studies have examined the role of credibility, personal involvement and perceived risk in the development of water conservation behaviour. Therefore, the final general objective of this dissertation is:

General objective 2.3: *To test a theoretical behaviour model of reported water conservation behaviour using as antecedents the credibility given the problem of water scarcity, risk perception of urban water consumption and personal involvement.*

Proposed model:

Figure 5. Theoretical model Article 4



In addition, when studying the adoption of water conservation behaviour, it is important to contextualize the analyses in relation to the area where the individuals live (Russell & Fielding, 2010). Thus, different environments (scarcity vs. non scarcity) may not only lead to different start points but also to different elasticity when responding to pro-water saving stimuli. Although the affirmation "*It is necessary to consider contextual analysis in water studies*" could seem "not surprising", no study has been found in the literature that empirically tests the same model (explaining water conservation behaviour or consumption) in these two different water stress contexts. The only study with a similar approach is by Corral–

Verdugo (2002). However, in this study the "scarcity vs non–scarcity" context is represented by a dummy variable depending on the area of study in a single model.

In this sense and as explained in previous sections, the water conservation literature has mainly focused on individual contextual factors such as household composition, physical infrastructure, availability of efficient technology or water pricing, but not on the possible difference of the drivers due to the water stress context. Therefore, the final objective attempts to answer empirically the call of some authors in this regard, for example:

• Dolnicar and Hurliman (2010, p.14): "*Another area for future study is whether water conservation attitudes and behaviors are systematically related to locations which have more or less experience with water shortages*"

• Corral-Verdugo (2002, p.535): *"Finally, PEC should be predicted by contextual factors; for example, water scarcity or pro–environmental norms are contextual factors, which in theory would promote the development of water conservation competency".*

• Russell and Fielding (2010, W05302): *"An understanding of the impact of context and personal capabilities brings to the fore the need to avoid a "one size fits all" approach to water conservation and instead highlights the need to tailor water conservation policies and programs to address the different contexts and needs of households".*

Sub-objective 2.3.1: *Testing the proposed theoretical model in two situational contexts ("scarcity" vs. "non–scarcity"), analysing for any significant differences between them*

CHAPTER 5

METHODOLOGY

5.1. The context

The four studies presented in this dissertation have been conducted in Spain. This country has some inherent characteristics related to water that make it optimal for water conservation studies:

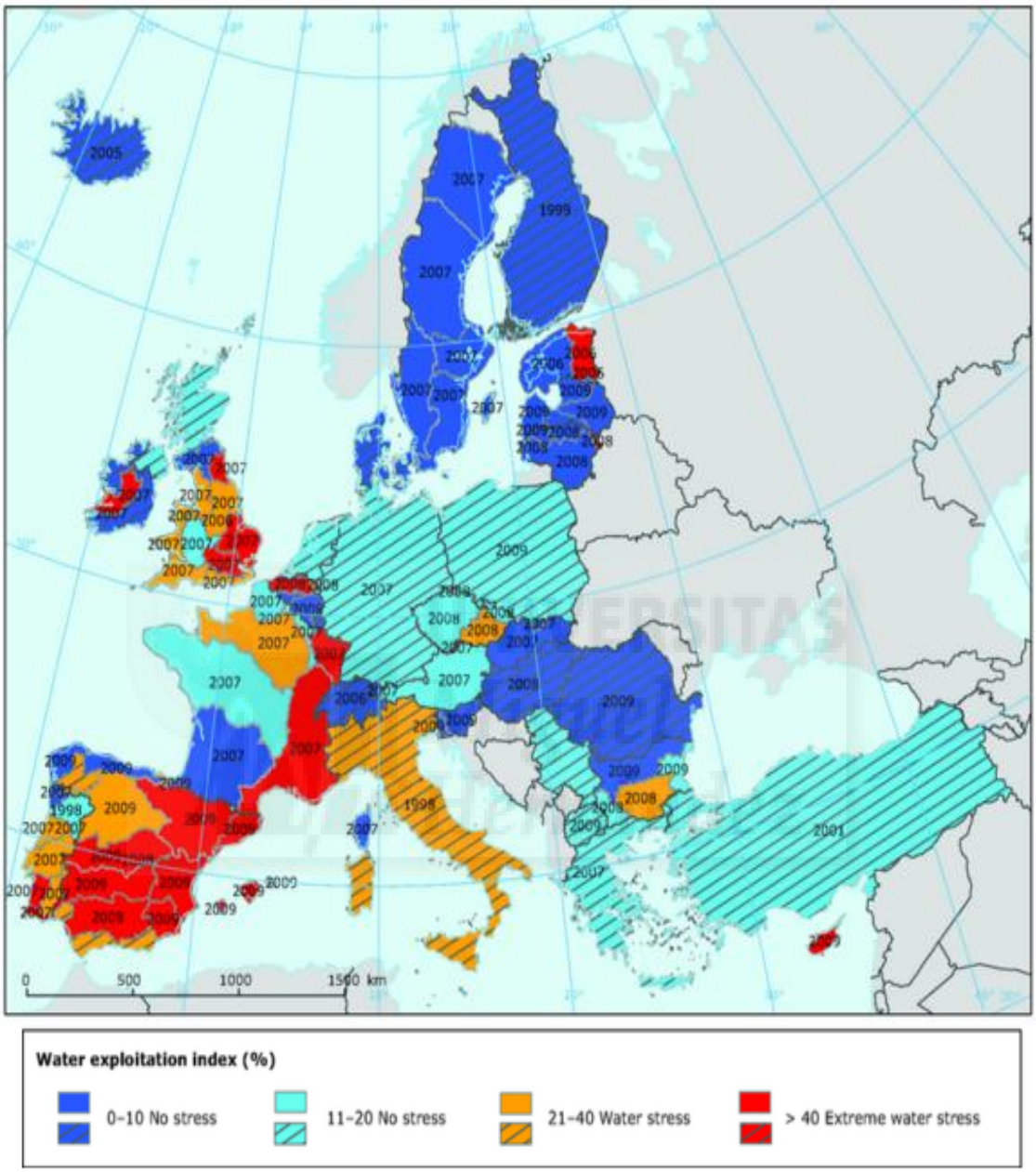
1) Spain is a developed country with a long history of significant water imbalances (Bosque Maurel, 2008). It is also one of the European countries most subjected to increased water stress, only behind Cyprus, Malta, and Belgium (EUROSTAT, 2016). For instance, in 2009, WEI10 in Spain was 32% compared with the European average of 12% (EEA, 2009); with WEIs reaching 64% in several southern areas (see Figure 6). This shows the existence of substantial pressure on the demand of available resources which is among the world's highest (Esty et al., 2005).

2) Water resources in Spain are irregularly distributed, with a marked difference between northern ("Wet Spain") and southern areas ("Dry Spain"). Likewise, the variability in water stress within the country is very marked and in some Spanish regions the extent of the water problem is critical (see Table 3).

3) It is a fact that there have been improvements in the use of urban water supplies in recent years. Thus, it seems that Spanish citizens do assume the problems arising from water scarcity. This fact results in a low litres per capita per day (LPCPD) consumption compared to other countries. Whereas Madrid, Barcelona and Valencia (major cities in Spain) have 131, 110 and 113 LPCPD respectively, other European large cities such as London, Lisbon, Milan, Stockholm or Oslo have 158, 159, 151, 178 and 197 LPCPD, respectively (IWA, 2010). However, this lower consumption is still high when considering that Spain is the EU country with the lowest water resources per capita (Garrido & Llamas, 2009).

[10]The Water Exploitation Index (WEI) describes how total water use puts pressure on water long–term resources. WEI < 20% means no water stress, 40% < WEI < 20% means water stress and WEI > 40% means severe water stress.

Figure 6. Water Exploitation Index in the smallest available data disaggregation



Source: EEA (2012)

Table 3. Cost recovery of urban water services per Spanish River Basin[1]

River Basin	Total Inhab.	Number Municipal.	Urban Water Use (%)	WEI[2]	Cost Recovery for Urban Use (%)
Miño-Sil	858,310	182	13.1	0.037	33.9
Eastern Cantabric	439,675	122	54.8	0.091	39.0
Western Cantabric	1,679,331	190	39.0	0.032	43.0
Duero	2,205,123	1,945	5.6	0.318*	46.0
Galicia Coast	2,036,770	157	25.9	0.252*	48.0
Ebro	3,226,921	1,623	4.4	0.516**	57.0
Inland River Basins of Basque Country	1,412,198	107	55.3	0.061	78.5
Tajo	7,879,123	1,091	28.8	0.460**	79.0
Inland River Basins of Catalonia	6,634,030	312	50.6	0.319**	81.0
Guadiana	1,472,800	473	5.2	0.459**	81.0
Guadalquivir	4,107,598	476	13.0	0.629**	84.5
Andalusian Mediterranean River Basins	2,424,620	249	18.4	0.490**	84.7
Júcar	5,177,061	751	19.2	0.542**	86.0
Segura	2,006,794	137	9.2	0.788**	88.0
Guadalete-Barbate	946,153	39	23.8	0.412**	92.8
Tinto, Odiel and Piedras	354,657	39	18.7	0.754**	95.4

Note: [1] Canary Islands and Balearic Islands are not included; [2] Water Exploitation Index; * stressed; ** severe stress. The Water Exploitation Index is the mean annual total abstraction of freshwater divided by the mean annual total renewable freshwater resource at the river basin level.

Source: own elaboration based on García-Rubio et al. (2015) using the River Basin Management Plans 2010–2015.

4) Spain is also a country where political "battles" have occurred around water availability, its management, and has even seen the passing of regulations to safeguard water in certain basins to the detriment of demand in other regions. This situation has meant public awareness in favour of retaining water resources against the needs or demands of other regions and the importance of saving water, with governmental actions to encourage the switching from old household appliances (e.g. washing machines) to others that consume less water (and energy).

Finally, from an academic perspective , despite Spain is a country with great water problems there are very few studies analysing factors to explain water conservation behaviours compared to other countries like Australia (e.g. Dolnicar &

Hurlimann, 2010; Willis et al., 2011; Fielding et al., 2016), the US (e.g. Shaw, Henderson, & Cardona, 1992; Tsai et al., 2011; Adams, 2014) or Mexico (e.g. Corral-Verdugo et al., 2002; Corral-Verdugo et al., 2008; de Miranda et al., 2016). In this way, most of the studies conducted in Spain have been performed at household level (e.g. Domene & Saurí, 2006; Aisa & Larramona, 2012; Martínez-Espiñeira & García-Valiñas, 2013; Martínez-Espiñeira et al., 2014; Arbués, Bolsa, & Villanúa, 2015) studying both external and internal factors. But, only few studies have been found analysing internal (mainly psychological) factors at individual level (Martínez-Soto, 2004; Mondéjar-Jiménez et al., 2011; García et al., 2013).

5.2. Methodological procedures

Data gathering has been implemented in three different procedures

5.2.1. Fieldwork at household level

Data for reaching the objectives presented in section 4.1 was gathered in December 2011.

- Target population: The target population encompasses households, assimilating the concepts of home and family, since a household is a group of people living in the same home, regardless the number of people, and independently on the relationship between them. Whereas, on the contrary, when dealing with the concept of families, there can be no single-person families and members must be related. This study includes single-person households since they also consume water. Finally, those who were recognized as the head of the household by the other members were interviewed. This individual is the leader with regard to creating and maintaining internal rules, and has a direct influence on the way the rest of the members think, feel and behave (Espinal, Gimeno, & González, 2006). In non-family households, the person who establishes the rules of cohabitation was interviewed. Hence, in the interviews it was not required the personal opinion of the respondent (father, mother or other family head) but the attitude and behaviour perceived at home/family as a whole in the case were more than two members over 14 years. In the case of households or single-parent nuclear family with children below 14 years, the opinion requested referred exclusively to the parents or householders.

- Data gathering method: Personal interviews were conducted in the home, eliminating all questionnaires with incongruent or extreme responses. Households were chosen only if they were residential homes without a business based there or more than one family living there, because in such cases higher levels of water consumption are displayed. A sample of 20% of the questionnaires was controlled via telephone. Respondent participation was voluntary and free. The sampling procedure applied consisted of two-stages. Firstly, the population was chosen, taking into account two levels (urban vs. rural), seeking to cover the largest possible population in the cities of Murcia and Alicante (the first was not included in our work), mainly in the area of Vega Baja del Segura. According to the European Environment Agency (EEA, 2016) the highest multi-annual summer average WEI for the period 2002-2012, was estimated for Cyprus (81 %) followed by Segura, Spain (55 %). This situation is worse in summer months when average rainfall is very low and water demand for agriculture and tourism activities is high. The final sample includes data from 24 urban centres and 10 rural centres following the Eurostat criterion (2010) to distinguish between urban and rural centres. Secondly, a random sampling procedure was used to choose households to be interviewed; fulfilling quotas for household size and type of property (house vs. apartment building). The final sample consisted of 500 households.

- Scales of measurement in the questionnaire: This information is detailed in the article presented in Appendix 2.1. In addition, the final questionnaire used to gather the data is presented in Appendix 3.1. It is important to highlight that the dependent variable (water consumption) was measured through actual consumption, understood as the amount of water actually used based on the latest water bill paid, both in general for the household and in per capita terms. Information was obtained during October and November (depending on the bill date), since these two months are representative of average annual water consumption, confirming this pattern using the monthly series of drinking water consumption in various Spanish cities.

5.2.2. Fieldworks at individual level

To reach the objectives at individual level presented in section 4.2. two independent data gathering procedures were carried out in November 2012 and in

May 2014. This second fieldwork was mainly implemented to confirm that the instrument of measurement developed in this dissertation ("*Urban Water Perceived Risk*" scale) was invariant to the contextual situation. This was done because during the first fieldwork (2012) there was an unexpected fact: November 2012 was one of the months with greatest rainfalls of the last three decades in the region. Rainfall was 50% above the normal monthly values for the whole of Spain, and more than doubled the south and southeast averages, which are, as it was explained before, areas that more often suffer from drought. These facts could eventually affect the obtained responses. Therefore, it was decided to repeat the fieldwork in a period of drought (which is quite common in central and southern Spain). This fact happened in the period January to May 2014. In the south-eastern area, rainfall was 25% of what is usual for that period, and in some areas it did not rain at all from January to April 2014. Therefore, the second data gathering was implemented in May 2014.

5.2.2.1. Fieldwork 2012

- Target population: The target population was Spanish residents aged 18 and above; and the sampling framework consisted of people with Internet access (for conducting the Web survey) and senior/older people that attended to educational centres. This second data gathering procedure overcome some of the limitations of the first empirical study as the fieldwork is expanded to areas with a different climatology and water availability history (northern called "Wet Spain" and southern areas "Dry Spain").

- Data gathering method: Two different methods to collect data were used, a Web survey and a self-administered survey on paper. The combined use of both surveys allows promoting honesty of responses -for the Web surveys (Babbie, 2008)- and reaching non-Internet users. For the Web survey, a sample design combining online viral dissemination and emailing was used. Thus, the link with the online questionnaire was virally distributed in social networks (Linkedin, Google+, Facebook, and others). It was also emailed to teachers, administrative and research staff and students at various educational Institutions in Spain. For the self-administered survey, a traditional paper–and–pencil (p&p) questionnaire was used to gather responses from people over the age of 60 because this group of people has

little access to the Internet. A nationwide sample of 839 responses was obtained. The final sample was obtained after controlling for several potential sources of bias and fraud: 1) Survey duplication fraud, the IP of the respondent was controlled (logical identifier of the computer device) eliminating any duplicates. Although it is possible that several people could answer from the same computer without having the intention to cheat, eliminating duplicate IPs rule out the possibility of obtaining repeated questionnaires from the same subject; 2) Inconsistency bias in the answers related to the variables of interest, eliminating questionnaires showing fixed patterns of replies (answering on the same scale all '1's or all '4's, as well as replies with a high random pattern); and 3) Time bias, removing all subjects that filled the questionnaire in less than 10 minutes, which is the minimum time estimated in the pre-test for adequately answering the survey. Additionally, it was eliminated all subjects under 18 and those with missing responses (this occurred only in the paper survey, as it was not possible to have missing values in the Web survey). The final sample used for each study and its descriptive analysis are presented in Appendix 2.2., 2.3. and 2.4.

- Scales of measurement in the questionnaire: First of all, a pre-test was conducted because many of the scales presented in the questionnaire to measure the variables used in this research were quite complex. This was done by using two focus group (group 1 = young people aged from 18 to 25; group 2 = people over 60) where each group was made up of ten individuals with different educational levels and gender. The objective was to identify problems with questions that might lead to biased answers in the questionnaire. Specifically it was tested the comprehensibility of all items, the total length of the questionnaire and the time needed to answer all questions. For instance, in the development of "*Urban Water Perceived Risk"* scale (UWPR) these focus groups were key to determine which items should be part of the final scale. Table 4 describes the accepted and non–accepted items in Spanish language with their English equivalent. Moreover, these focus groups were also used to provide qualitative information on the variables under study especially the importance of its study as potential barriers to water conservation behaviour. The information on the specific scales used in the questionnaire for measuring each variable is detailed in the articles presented in Appendix 2.2., 2.3. and 2.4.

Additionally the final questionnaire filled by the target population is presented in Appendix 3.2.

Table 4. Items for 'UWPR" scale (Spanish wording is in italics)

Dimensions	Items (in English and Spanish –in italics–)
Impact / Importance	**Accepted** - Non–important vs. very important (*No importantes vs. importantes*). - Non–dangerous vs. very dangerous (*No peligrosos vs. peligrosos*). - Inoffensive vs. hazardous (*Benignos vs. graves*). **Rejected** - Non–transcendent vs. transcendent (*Intrascendentes vs. trascendentales*). - Trivial vs. non–trivial (*Triviales vs. no triviales*). - No influence vs. influential (*Sin influencias vs. influyentes*). - Secondary vs. fundamental (*Secundarios vs. fundamentales*).
Time–related	**Accepted** - Long–term vs. short–term. *(Largo vs. corto plazo*) - So far vs. close *(Lejanos vs. inminentes*). - Non–urgent vs. very urgent (*No urgentes vs. urgentes*). **Rejected** - Non–pressing vs. pressing (*No apremiantes vs. apremiantes*). - Deferrable vs. non–deferrable (*Aplazables vs. inaplazables*). - Can be postponed vs. cannot be postponed (*Postergables vs. impostergables*). - Non–immediate vs. immediate (*No acuciantes vs. acuciantes*). - Can be delayed vs. cannot be delayed (*Demorables vs. no demorables*).
Control / Management	**Accepted** - Manageable vs. non–manageable (*Gestionables vs. imposibles de gestionar*). - Governable vs. non–governable (*Manejables vs. inmanejables*). - Easy surmountables vs. non–surmountables (*Fácilmente Superables vs. no superables*). **Rejected** - Governable vs. ungovernable (*Gobernable vs. ingobernable*). - Resolvable vs. non–resolvable (*Resolubles vs. no resolubles*). - Administrable vs. non–administrable (*Administrables vs. no administrables*). - Can be saved vs. cannot be saved (*Salvables vs. insalvables*).

Source: own elaboration

At this point it is important to highlight the scale used to measure water conservation behaviour. As it was explained in section 4.2, one of the objectives of this dissertation was to propose a definition of water conservation behaviour. As Pereira et al. (2002) claim "water conservation" aims to preserve the resource and combat its degradation in order to achieve sustainability in the long-term. In this regard, the literature indicates that to achieve sustainability, there must be awareness of its scanty supply (Corral-Verdugo et al., 2002), it must be seen as a problem (Berk, Schulman, McKeever, & Freeman, 1993) and individuals must be involved with the environment and water (Willis, Stewart, Panuwatwanich, Williams, & Hollingsworth, 2011). Similarly, it is vital that individuals understand the actual impact of the different ways of saving water (Noga & Wolbring, 2013), have control over their own behaviour (Allen & Ferrand, 1999) and want to continually reduce consumption over time (Willis et al., 2011). Thus, water conservation behaviour is defined in this dissertation as: "(1) Take personal consciousness of the ways to save water (2) understand what motivates present water consumption, (3) have a personal motivation for carrying out a correct use/consumption, (4) having a saving behaviour in daily actions and (5) take personal control of water use". This behaviour is understood as the decision process where the basic steps are the recognition of the problem, decision making and post–consumption evaluation (Hoyer & McInnis, 2007).

In this definition, cognitive aspects such as 'knowledge', 'awareness' and 'personal control' play a key role. On the one hand, as indicated by Kaiser and Fuhrer (2003) and Frick, Kaiser and Wilson (2004) knowledge and problem awareness are key aspects of environmental behaviour. For example, for the specific case of water conservation, in actual conservation projects it has been found that providing information on water conservation methods helps individuals to have a more efficient use (Sims, 2007). Another example is the study of Fielding et al. (2013) that concludes that information provision led to significant water savings. Additionally, Middlestadt et al. (2001) determine that students who were taught and understood water conservative behaviours performed more regularly these behaviours. In this regard, Kaiser and Frick (2002), Kaiser and Fuhrer (2003) and Frick et al. (2004) state three types of knowledge: *system knowledge*, *action-related*

knowledge, effectiveness knowledge. The first one is related to the question of how ecosystems operate or the knowledge about environmental problems. The second one is related to knowledge of behavioral options and possible courses of action. Finally, effectiveness knowledge addresses the relative gain or benefit (i.e., the relative conservational effectiveness) that is associated with a particular behaviour. The latter two types of knowledge are taken into account in our definition.

On the other hand, personal control positively affects environmentally responsible behaviour (Allen & Ferrand, 1999), which implys an interest in maintaining a long–term commitment to conservation (Muraven & Baumeister, 2000). This water conservation behaviour definition is consistent with Hungerford and Volk's (1990) 'environmentally responsible citizen' and with the 'responsible environmental behaviour' model proposed by Hines, Hungerford and Tomera (1987). This idea is also highlighted in Willis et al.'s (2011) study when they point out: "*Shifting residents towards sustainable water consumption practices thus requires the instilling of awareness, understanding and appreciation of the environment and water. Establishing a connection between attitudes and beliefs concerning water and the environment and their relationship on actual water consumption behaviour...*" (p. 1997). All the above and definitions are represented by items when water conservation behaviour is measured in the questionnaire:

Table 5. Items for measuring water conservation behavior

Concept	Items	Authors
Knowledge	-She/he knows what motivates her/his current water consumption. -She/he knows what to do to save water at home.	Gilg & Barr (2006); Nancarrow (2002) Willis et al. (2011); CSIRO (2002); Middlestadt et al. (2001)
Awareness	-She/he develops a personal awareness of the ways in which water can be saved.	CSIRO, (2002); Gilg & Barr, (2006); Mayer & DeOreo, (1999); Nancarrow & Syme, (1989); Willis et al.,(2011)
Conduct	-She/he actually is acting responsibly in water use.	CSIRO (2002); Gilg & Barr (2006); Willis et al. (2011)
Personal control	-She/he takes personal control of spending (long–term).	CSIRO (2002); Syme et al., (2000); Willis et al. (2011)

Source: own elaboration

5.2.2.2. Fieldwork 2014

- Target population: It consisted of all residents of 18 years of age or above in Murcia and Alicante provinces, which are those where the drought has been more intense in the stated period.

- Data gathering method: To avoid self–selection bias, a traditional paper–and–pencil (p&p) questionnaire was designed, and was conducted by interviewers. Participants were approached in public places (e.g.: Bus and train stations, gardens, streets, etc.) using a systematic random sampling procedure. 20% of the questionnaires were controlled via telephone. Fieldwork and controls were conducted during May and June 2014, respectively. The interviews were conducted in 44 cities and towns of Murcia and Alicante provinces. It was obtained a sample of 573 responses after interview controls (telephone calls). Three sources of bias were also controlled: (1) the perception of the interviewer concerning the accuracy of answers, (2) the inconsistency between responses, and (3) the equal response for all items. The final sample consists of 477 participants (for further details of its descriptive analysis see Appendix 2.3.).

- Scales of measurement in the questionnaire: Given that this second fieldwork was mainly addressed to test the invariance of "*Urban Water Perceived Risk"* scale, the same items appeared in the previous fieldwork were used. Information on this specific scale appears in the article presented in Appendix 2.3. The final questionnaire filled by the target population in this second fieldwork at individual level is also presented in Appendix 3.3.

CHAPTER 6

RESULTS

This research has resulted in four manuscripts (three already published and one currently under review). Table 6 summarises specific information on each article, specifying the objectives stated in section 4 (Research objectives) and information on the journal where each article is published or is under review.

Table 6. Information articles included in this dissertation

Household level	
Article 1 published	**Information Journal:**
Title: "Attitudes towards saving water, household structural characteristics and water consumption". **Presented in Appendix 2.1.**	**Title**: Psyecology SJR areas: Applied Psychology, Experimental and Cognitive Psychology. SJR index (2013): 0.148 (Q4)
Objectives developed in this article: General objective 1: *To test a theoretical behaviour model of water household consumption using attitudes and household composition characteristics*. Sub-objective 1.1: *To check the reliability and validity (nomological, construction, content, convergent and discriminant validity) of the existing measures that analyse attitudes toward saving water and to propose a holistic scale for measuring attitudes towards saving water.* Sub-objective 1.2: *To test whether different household sizes and ages display different attitudes towards saving water in the home.*	
Individual level	
Article 2 published	**Information Journal:**
Title: "The role of personal involvement, credibility and efficacy of conduct in reported water conservation behaviour". **Presented in Appendix 2.2.**	**Title:** Journal of Environmental Psychology JCR (SSCI) areas: Psychology multidisciplinar, Environmental Studies. JCR index (2014): 2.640 (Q1) SJR areas: Applied & Social Psychology. SJR index (2014): 1.097 (Q1)
Objectives developed in this article: General objective 2.1: *To test a theoretical behaviour model of reported water conservation behaviour using as antecedents the credibility given the problem of water scarcity, the perception of the efficacy of specific conducts and personal involvement.* Sub-objective 2.1.1: *To propose a definition of water conservation behaviour.* Sub-objective 2.1.2: *To find out whether there are differences in reported water conservation behaviour based on the profiles developed from the previous explanatory variables.*	

Table 6. Information articles included in this dissertation

<table>
<tr><td>Article 3 published</td><td>Information Journal:</td></tr>
<tr><td>Title: “Perceived risk of urban water consumption: Scale development, validation and characterisation in Spain.”
Presented in Appendix 2.3.</td><td>Title: Urban Water Journal
JCR (SCI) areas: Water Resources.
JCR index (2014): 1.794 (Q1)
SJR areas: Geography, Planning & Development; Water Science & Tech.
SJR index (2014): 0.604 (Q1).</td></tr>
<tr><td colspan="2">Objective developed in this article:
General objective 2.2: To develop an instrument to measure public’s perception towards the risks underlying water for consumption.</td></tr>
<tr><td>Article 4 under review</td><td>Information Journal:</td></tr>
<tr><td>Title: “Impact of credibility, risk perception and involvement on reported water conservation awareness and practice. A contextual study”.
Presented in Appendix 2.4.</td><td>Title: Journal of Applied Social Psychology
JCR (SSCI) areas: Social Psychology.
JCR index (2014): 0.790 (Q4)
SJR areas: Social Psychology.
SJR index (2014): 0.479 (Q2)</td></tr>
<tr><td colspan="2">Objectives developed in this article:
General objective 2.3: To test a theoretical behaviour model of reported water conservation behaviour using as antecedents the credibility given the problem of water scarcity, risk perception of urban water consumption and personal involvement.
Sub-objective 2.3.1: To test the proposed theoretical model in two situational contexts ("scarcity" vs. "non–scarcity"), analysing for any significant differences between them.</td></tr>
</table>

Source: own elaboration

CHAPTER 7
CONCLUSIONS

7.1. Conclusions

Below are the main findings of the empirical studies detailed in the previous section, at household and individual level, developed in this dissertation. These findings are widely discussed in the articles presented in Appendix 2.

7.1.1. Main conclusions at household level: Article 1

The first study aimed to further understand the role of attitudes and household characteristics (age and number of members in the household) in household water consumption. The study was conducted in the area of Vega Baja del Segura (areas of Murcia and Alicante, Spain) where water shortages have traditionally been a major economic and urban problem (due to the lack of supply during dry seasons, etc.).

First of all, the scale developed to measure attitudes to saving water is reliable, valid and parsimonious. Furthermore, this scale is more focused on sustainability than on pro-environmental aspects because its items reflect the five psychological characteristics of sustainable behaviour (Corral-Verdugo & Pinheiro, 2004): effectiveness, deliberation, anticipation, solidarity and austerity. It also presents two different factors labelled "Active Concern" and "Social Concern". The former refers to the attitude towards water saving within the household while the later refers to the attitude in society (third parties).

The analysed variables show a high positive attitude to water savings. Both attitudinal factors show a high score but "Social Concern" scores higher than "Active Concern". These attitudinal levels are coherent with the permanent concern over the risk of drought in Murcia and Alicante. Both areas show a substantial increase in water demands, given the increase in second homes in the Mediterranean area and owing to the greater availability of gardens and swimming pools in detached villas. This fact may lead to the high levels of household water consumption in the analysed sample. However, the median (which eliminates the influence of households with high/low consumption) barely registers any differences with the national mean of 149 LPCPD in 2009.

Regarding whether different household sizes and ages display different attitudes towards saving water, it is observed that households with few members

displayed a higher level of "Active Concern" than larger ones. The opposite is noted for the "Social Concern" factor. However, age only shows significant differences in the case of "Social Concern". Likewise, subjects aged between 39 and 50 present a more favourable attitude towards water savings.

Finally, the analysed factors ("Active Concern" and "Social Concern"; household size and age) are predictors of total actual consumption and litres per capita, although the standardized coefficients of age and both attitudinal factors are small. This is an important finding since there is current debate in literature on the use of cognitive variables to explain water consumption at household level (see sections 3.1. and 4.1. of this dissertation). This significance may be due to the fact that a specific measure of attitude (attitude to saving water) has been used rather than a general environmental attitude measurement and because respondents were required to provide their opinion taking into account their family as a whole, avoiding possible inconsistencies (individual level vs. household level).

7.1.2. Main conclusions at individual level

This section describes the main conclusions of the different empirical studies performed to explain water conservation behaviour at individual level (see section 6), distinguishing by article.

7.1.2.1. Article 2

The first individual level study analyses water conservation behaviour using as antecedents: credibility of water scarcity problems, perception of the efficacy of specific conducts and personal involvement in water conservation practices. These factors have not been previously addressed in depth in water conservation literature; they have, however, been considered in other contexts (e.g. behaviour towards climate change, waste separation behaviour or purchase of 'green products').

Before addressing this general objective it was necessary to develop a definition of water conservation behaviour given the lack of consensus over its definition and measurement. Thus water conservation behaviour is defined here as: *"(1) Take personal consciousness of the ways to save water (2) understand what motivates present water consumption, (3) have a personal motivation for carrying*

out a correct use/consumption, (4) having a saving behaviour in daily actions and (5) take personal control of water use". This definition is based on previous studies related to sustainable behaviour and it is understood as the decision process where the basic steps are recognition of the problem, decision-making and post-consumption evaluation (see section 5.2.2.1. for further detail).

Regarding the relationships in the proposed model (Figure 3, see section 4.2.), personal involvement is the main factor influencing reported conservation behaviour, highlighting the importance of carrying out actions to increase the involvement of individuals. In addition, it is noteworthy that related to the two types of perceived efficacy of specific conducts analysed in this study; actions during consumption and actions conducted in water installations, the latter has a greater influence in reported water conservation behaviour. This result highlights the importance of this type of conducts, called in literature "*efficiency behaviours*" (Russell & Fielding, 2010), to achieve water conservation behaviour. Finally, contrary to expectation, credibility of the problem regarding the existence of objective facts does not influence reported conservation behaviour. Moreover, although the relationship between credibility of future water problems and water reported conservation behaviour is significant, the small effect size highlights the reduced relevance of message credibility of water problems on water conservation behaviour in the Spanish case.

Finally, the cluster analysis distinguishes two different groups of people according to the analysed variables. Group 1 contains more males than females, they score lower than Group 2 in all reported behavioural variables (e.g. "Frequently tries to use water correctly" or "Controls the amount of water used") and live mainly in areas without shortages. Group 2, with a greater proportion of females, comprises citizens living in water scarcity areas who score highly in all the behavioural variables. This second group is the largest in the sample (70.8%).

7.1.2.2. Article 3

The second individual level study seeks to develop a new instrument to measure public perception of the risks underlying water for consumption (UWPR) in order to address the lack of specific risk perception measurement in environmental literature despite the growing importance of this concept.

This scale was developed using the psychometric approach, which is the most widely used paradigm in literature. This UWPR scale presents several advantages over others in literature:

1) While scales in literature use a range of 5 to 65 simultaneous hazards, this scale focuses on one single problem or hazard (‘urban water consumption’). In addition, the number of attributes or items considered is reduced from a 14 to 30 range to only 8, whilst maintaining high levels of reliability and validity. This permits a more parsimonious measurement of the construct, allows an easier response and can be used together with other scales in the same questionnaire.

2) Two large samples were used (a test sample and a validation sample), which allow proportional representation of different population groups (by gender, habitat, age, income and education).

3) Situational context of the study is taken into account (a period of heavy rainfall, 2012 and a period of drought, 2014). In this sense, because the UWPR scale is invariant, comparisons can be made knowing that the scores obtained come from a test that is not affected by variations in perception of situational context of water scarcity. UWPR, as a perceived risk construct, maintains the same structure and metric (not score) in scarcity vs. non-scarcity situations. Finally, derived from this invariance, the UWPR scale provides equivalent scores in both situations, minimizing the influence of acquiescence bias.

Finally, the UWPR distribution fits into a ‘Type I Pareto distribution’ or ‘Pearson Type VI distribution’, shaping the objective instrument, and suggesting that the perceived risk is a complex phenomenon that requires a multi–parameter distribution. The assumption that perceived risk measurement can be adjusted to this distribution, enables inferences about the population, reducing the bias that occurs when variables are added, facilitating understanding of the phenomenon and calculating probabilities.

7.1.2.3. Article 4

The last individual level study analyses the relationship between the previously developed risk perception scale (UWPR) along with other previously analysed variables (credibility of the information on future water problems and personal involvement in water conservation practice) and reported water conservation behaviour. In addition, the moderating effect of water stress context ("scarce" vs. "non–scarce" regions) is analysed to uncover potential differences in the level of the variables, underlying relationships and the explanatory power of the proposed model.

The results show that the proposed measurement model is reliable and valid for both situational contexts (water scarcity and non–scarcity) with very similar explanatory power. Likewise, the evidence supports the high external validity of the model, which allows its use in different water stress environments. In addition, all the structural relationships in the model are significant, with the exception of two relationships in both situational contexts. First, the relationship between risk perception of urban water consumption and reported water conservation behaviour is not significant, showing that having a high perceived risk of urban water consumption does not lead to conservation behaviour. Second, the relationship between credibility of the information on future water problems and reported water conservation behaviour is mediated by personal involvement (partially mediated in the case of the "scarcity" sample and fully in the "non-scarcity" sample). That is, although individuals perceived certain water problems as credible, they must be personally involved in water conservation practices to engage in such behaviour, analogously to evidence found in Article 2.

Finally, the descriptive analysis shows significant differences in personal involvement in water conservation practices and reported water conservation behaviour. As expected, in areas with water scarcity people report higher levels of personal involvement and water conservation behaviour than in non–scarcity areas. Contrary to expectations, however, the levels of credibility attached to messages on future water risks and risk perception of urban water consumption were similar in both water contexts. The result related to credibility could be due to the globalization of information. Thus, most information individuals receive on environmental

problems comes from mass media and given that both samples come from the same country, information tends to be uniform. In the case of risk perception the finding is more striking. However, the fact that no differences have been detected in the two contexts can be explained through a "habit effect". This is, individuals living in water shortage areas get used to the risk and show greater tolerance towards it.

7.2. Conclusiones (in Spanish)

A continuación se presentan los principales hallazgos obtenidos en los estudios empíricos detallados en la sección anterior, tanto a nivel de hogar como individual, desarrollados en esta tesis doctoral. Estos hallazgos han sido ampliamente discutidos en cada uno de los artículos presentados en el Apéndice 2.

7.2.1. Principales conclusiones a nivel de hogar: Artículo 1

El primer artículo persigue aumentar el conocimiento sobre el papel que tienen las actitudes y las características del hogar (edad y número de miembros en el hogar) en el consumo de agua en el hogar. El estudio se realizó en la zona de la Vega Baja del Segura (Murcia y Alicante) donde existe tradicionalmente un acuciado problema de sequía, tanto desde el punto de vista económico como urbano (por ejemplo, debido a la falta de provisión de agua durante ciertas épocas de sequía).

En primer lugar, la escala desarrollada para medir las actitudes hacia el ahorro de agua es fiable, válida y parsimoniosa. Además, dicha escala está más centrada en aspectos de sostenibilidad que en aspectos pro-ambientales, ya que sus ítems reflejan las cinco características psicológicas del comportamiento sostenible (Corral-Verdugo y Pinheiro, 2004): eficacia, deliberación, anticipación, solidaridad y austeridad. Asimismo, presenta dos factores diferenciados denominados "Preocupación Activa" y "Preocupación Social". La primera se refiere a las actitudes de los individuos hacia el ahorro de agua dentro del hogar mientras que el segundo a las actitudes hacia el ahorro de agua por parte de la sociedad (terceras personas).

El análisis de las variables muestra una elevada actitud hacia el ahorro de agua en la muestra analizada. Aunque ambos factores actitudinales presentan elevadas puntuaciones, es la "Preocupación Activa" el factor que presenta un mayor nivel en sus puntuaciones. Estos niveles actitudinales están en consonancia con la preocupación permanente sobre el riesgo de sequía existente en las zonas de Murcia y Alicante. Estas provincias presentan un incremento substancial de la demanda de agua, debido al creciente número de segundas residencias en el área del Mediterráneo; así como a la existencia de un mayor número de jardines y de piscinas en las viviendas unifamiliares. Este hecho puede ser la razón del elevado nivel de

consumo de agua encontrado en la muestra analizada. Sin embargo, en un análisis a nivel de mediana (eliminando la influencia de los hogares con un alto/bajo consumo de agua) apenas se observan diferencias respecto al consumo medio nacional de 149 litros consumido por habitante y día (LHD) en 2009.

En relación a si los diferentes tamaños de los hogares y edades del cabeza de familia generan diferencias en las actitudes hacia el ahorro de agua, se observa que los hogares con pocos miembros tienen un mayor nivel de "Preocupación Activa" que los hogares más grandes, observándose lo contrario para el factor "Preocupación Social". Sin embargo, la edad sólo presenta diferencias significativas en el caso del factor "Preocupación Social", de forma que los individuos con edades comprendidas entre 39 y 50 años presentan una actitud más favorable hacia el ahorro de agua.

Finalmente, los factores analizados ("Preocupación Activa" y "Preocupación Social"; tamaño del hogar y edad) son predictores tanto del consumo total de agua del hogar como del de litros per cápita, aunque los coeficientes estandarizados de la variable edad y de ambos factores actitudinales son pequeños. En este último caso, se trata de un hallazgo importante ya que actualmente existe un debate en la literatura sobre el uso de las variables cognitivas para explicar el consumo de agua en los hogares (ver secciones 3.1. y 4.1. de esta tesis doctoral). Esta significatividad encontrada en la relación de ambas variables (actitud-comportamiento) puede deberse al uso de una medida específica de la actitud (actitud hacia el ahorro de agua) en vez de haberse utilizado una más general (actitud pro-ambiental). Asimismo, a que los encuestados estaban obligados a dar su opinión teniendo en cuenta a su familia como un conjunto, evitando así posibles inconsistencias en los niveles de análisis (nivel individual frente a nivel hogar).

7.2.2. Principales conclusiones a nivel individual

En esta sección se describen las principales conclusiones de los diferentes estudios empíricos llevados a cabo para explicar el comportamiento de conservación de agua a nivel individual (véase sección 6), distinguiendo según el artículo desarrollado.

7.2.2.1. Artículo 2

El primer estudio analiza el comportamiento de conservación de agua a nivel individual utilizando como antecedentes: la credibilidad de los problemas de escasez de agua, la percepción de la eficacia de las conductas específicas y la implicación personal en las prácticas de conservación de agua. Estos factores no se han abordado en profundidad anteriormente en la literatura sobre conservación de agua; aunque sí se han considerado en otros contextos (por ejemplo, comportamiento frente al cambio climático, comportamiento de separación de residuos o compra de "productos verdes").

Antes de abordar este objetivo general, ha sido necesario desarrollar una definición concreta del comportamiento de conservación de agua debido a la falta de consenso sobre su definición y medición en la literatura. De esta forma, en este trabajo se define el comportamiento de conservación de agua como: "*(1) Tomar conciencia personal de las diferentes formas de ahorrar agua (2) entender a qué se debe el actual consumo de agua, (3) tener una motivación personal para llevar a cabo un correcto uso/consumo, (4) llevar a cabo un comportamiento de ahorro de agua en conductas cotidianas y (5) tener control personal del uso de agua*". Esta definición se basa en estudios previos relacionados con el comportamiento sostenible y se entiende como un proceso de decisión donde los pasos básicos son: reconocimiento del problema, toma de decisión y evaluación post-consumo (véase el apartado 5.2.2.1. para un mayor detalle).

En cuanto a las relaciones en el modelo propuesto (Figura 3, véase sección 4.2.), la implicación personal es el principal factor que influye en el comportamiento reportado de conservación de agua, poniendo de manifiesto la importancia de llevar a cabo acciones para aumentar la implicación de los individuos. Asimismo, es importante destacar que, en relación a los dos tipos de eficacia de las conductas específicas de ahorro de agua analizadas en este estudio; conductas durante el consumo y conductas realizadas para instalar mecanismos para el ahorro de agua, éstas últimas tienen una mayor influencia en el comportamiento reportado de conservación de agua. Este resultado pone de relieve la importancia de este tipo de conductas, conocidas en la literatura "*comportamientos de eficiencia*" (Russell y

Fielding, 2010), para lograr comportamiento de conservación de agua. Finalmente, y contrariamente a lo esperado, la credibilidad del problema de la escasez de agua con respecto a la existencia de hechos objetivos no influye en el comportamiento reportado de conservación de agua. Asimismo, a pesar de que la relación entre la credibilidad sobre futuros problemas de agua y el comportamiento reportado de conservación de agua es significativa, el pequeño tamaño del efecto pone de manifiesto la reducida importancia que tiene la credibilidad del mensaje sobre problemas de agua en el comportamiento de conservación de agua para el caso español.

Finalmente, el análisis clúster llevado a cabo permite distinguir entre dos grupos de personas de acuerdo con las variables analizadas. El Grupo 1 está formado por un mayor porcentaje de hombres, presentan puntuaciones menores en todas las variables sobre comportamiento reportado (por ejemplo, "frecuentemente intentas utilizar el agua de forma correcta" o "controlas la cantidad de agua utilizada") que el Grupo 2 y residen principalmente en las zonas sin escasez de agua. El Grupo 2, en cambio, presenta una mayor proporción de mujeres, está formado por ciudadanos que viven en zonas de escasez de agua y que puntúan alto en todas las variables de comportamiento reportado. Este segundo grupo es el más numeroso de la muestra (70,8%).

7.2.2.2. Artículo 3

El segundo estudio a nivel individual tiene como objetivo desarrollar un nuevo instrumento para medir la percepción pública de los riesgos subyacentes al consumo urbano de agua (UWPR) debido principalmente a la falta de instrumentos para medir este tipo de riesgo específico en la literatura, a pesar de la creciente importancia de este concepto.

Esta escala se ha desarrollado utilizando el enfoque psicométrico, que es el paradigma más utilizado en la literatura. Esta escala UWPR presenta varias ventajas con respecto a otras presentes en la literatura:

1) Mientras que las escalas en la literatura analizan de 5 a 65 peligros simultáneamente, esta escala se centra en un único problema o peligro

(consumo urbano de agua). Además, el número de atributos o elementos considerados se reduce de 14-30 atributos a solamente 8, manteniendo al mismo tiempo elevados niveles de fiabilidad y validez. Esto permite una medición más parsimoniosa del constructo y una respuesta más sencilla, pudiéndose utilizar junto a otras escalas en un mismo cuestionario.

2) Se han utilizado dos muestras de gran tamaño (una muestra de prueba y otra de validación), lo que ha permitido una representación proporcional de los diferentes grupos existentes en la población (por sexo, hábitat, edad, ingresos y educación).

3) Se ha tenido en cuenta el contexto situacional (un período de fuertes lluvias en 2012 y un período de sequía en 2014). En este sentido, como se ha comprobado que la escala UWPR es invariante, es posible hacer comparaciones sabiendo que las puntuaciones obtenidas provienen de un instrumento que no se ve afectado por variaciones en la percepción de los individuos sobre el contexto situacional de escasez de agua. La escala UWPR, como constructo de riesgo percibido, mantiene la misma estructura y métrica (no puntuaciones) en situaciones tanto de escasez como de no escasez. Finalmente, y derivado de esta invariancia, la escala UWPR presenta resultados equivalentes en ambas situaciones, minimizando la influencia del sesgo de aquiescencia.

Finalmente, la escala UWPR se distribuye aproximadamente como una "distribución de Pareto tipo I" o "distribución Pearson tipo VI", dando forma al instrumento desarrollado en este trabajo. Esto sugiere que el riesgo percibido bajo estudio es un fenómeno complejo que requiere una distribución de múltiples parámetros. El supuesto de que la medición del riesgo percibido puede ajustarse a dicha distribución, permite realizar inferencia respecto a la población, reducir el sesgo que se produce cuando se agregan variables y facilitar la comprensión del fenómeno y el cálculo de probabilidades.

7.2.2.3. Artículo 4

En el último estudio a nivel individual se analiza la relación entre la escala de percepción del riesgo previamente desarrollada (UWPR) junto con otras variables analizadas anteriormente (credibilidad de la información sobre problemas futuros de agua e implicación personal en la práctica de conservación de agua) y el comportamiento reportado de conservación de agua. Además, también se estudia el posible efecto moderador del contexto de estrés hídrico (regiones con "escasez" de agua frente a regiones “sin escasez") para descubrir posibles diferencias en el nivel de las variables, las relaciones subyacentes y el poder explicativo del modelo propuesto.

Los resultados muestran que el modelo de medición propuesto es fiable y válido en ambos contextos situacionales (“escasez” de agua y “no escasez”) con un poder explicativo muy similar. Esto evidencia la alta validez externa del modelo, lo que permite su uso en diferentes entornos de estrés hídrico. Asimismo, todas las relaciones estructurales en el modelo son significativas, con excepción de dos relaciones en ambos contextos situacionales. En primer lugar, la relación entre la percepción de riesgo del consumo urbano de agua y el comportamiento reportado de conservación de agua no es significativa, lo que muestra que un elevado riesgo percibido del consumo urbano de agua no conduce a un comportamiento de conservación del recurso. En segundo lugar, la relación entre la credibilidad de la información sobre problemas futuros de agua y el comportamiento reportado de conservación de agua está mediada por la implicación personal (parcialmente mediada en el caso de la muestra con “escasez” de agua y totalmente mediada en la de "no escasez"). Este resultado muestra que, aunque los individuos perciban como creíbles ciertos problemas futuros sobre la disponibilidad de agua, éstos deben estar involucrados personalmente en las prácticas de conservación de agua para llevar a cabo este tipo de comportamiento, de forma análoga a la evidencia encontrada en el artículo 2 de esta tesis.

Finalmente, el análisis descriptivo muestra diferencias significativas en la implicación personal en las prácticas de conservación de agua y en el comportamiento reportado de conservación. Como cabía esperar, en zonas con

escasez de agua las personas reportan mayores niveles de implicación personal y de comportamiento de conservación de agua que en las zonas donde no existe esta escasez. Sin embargo, contrariamente a lo esperado, los niveles de credibilidad de los mensajes sobre riesgos futuros de agua y la percepción del riesgo del consumo urbano de agua son similares en ambos contextos situacionales. En el caso de la credibilidad, este resultado puede ser debido a la globalización de la información, ya que la mayoría de las personas reciben la información sobre problemas medioambientales a través de los medios de comunicación masivos y dado que ambas muestras provienen de un mismo país, la información tiende a ser uniforme. En el caso de la percepción del riesgo, el resultado encontrado es más sorprendente, aunque el hecho de que no se hayan detectado diferencias significativas entre ambos contextos situacionales podría explicarse a través del llamado "*efecto de hábito*"; esto es, las personas que viven en zonas con escasez de agua se acostumbran al riesgo mostrando una mayor tolerancia hacia él.

CHAPTER 8

IMPLICATIONS

As previously stated, analysis of the factors that are potential barriers to engagement in water conservation behaviour is necessary to develop efficient conservation programs. This should be the second stage in any environmental social marketing program or environmental campaign to achieve water conservation behaviour (see section 2). Likewise, knowing the inhibitors to engagement in water conservation behaviour will enable water managers and decision makers to design specific actions to overcome them. A variety of behavioural change tools (e.g. communication, education, commitments, prompts or feedback) can assist with this task depending on the barrier to be reduced or the motivator to be increased. According to the finding of this dissertation some of these strategies are proposed to promote water conservation behaviour. Most of these strategies have been shown to be an attractive alternative to information-intensive campaigns for designing social marketing programs to foster sustainable behaviour.

Our findings at household level show that "attitudes to saving water" is a factor influencing water household consumption, especially the "Social Concern" factor. Therefore what implications can be drawn from the above?

1) Creating a culture of water conservation, both within the household and at a broader community level, to promote willingness to engage in long-term water conserving actions. This culture of water conservation should be inculcated among citizens to promote the orientation of economic, social and cultural processes towards the development of water resource sustainability.

2) As individuals have attached great importance to the fact that pro-environmental behaviour should be inculcated during primary education, it highlights the need to develop educational environmental campaigns from an early age. In this regard, emphasis should be placed on individual water conservation behaviour and on collective behaviour (e.g. at family or community level).

3) In addition, individuals consider that water-saving behaviours carried out by third persons are even more important than the action they take themselves. This is an important finding to take into account in social marketing programs since studies have shown (see for example Mckenzie-Mohr & Smith, 1999) that people are more

likely to participate in an activity if those around are participating in such activity. In this regard, actions could be performed either to take advantage of this perception or to reduce it where necessary.

Advantage of this perception could be taken by using smart meters and in-home displays with a trial group of selected households to inform consumers not only about their consumption but also about their neighbours' consumption. Likewise, they would have the chance to compare their consumption with other consumers and similar households creating peer pressure and social comparisons. In addition, a virtual water game could be also included in this strategy (*gambling* tool). This game would help to achieve significant home reductions by providing household members (children and adults) with simple tips and advice to save water on a daily basis. By setting daily and weekly goals for the household, the game would generate cooperation between family members that will indeed encourage them to work together to reduce their water consumption. These ideas are in line with a European project currently being performed in Cardiff (UK) (for further information see Terlet, Beach, & Rezgui, 2016).

The fact that individuals attach great importance to the behaviours of others may be an inhibitor of their individual behaviour because personal responsibility for water saving may be transferred to third parties. Education campaigns should therefore be an effective tool for enhancing individual responsibility and emphasising individual behaviour in achieving water sustainability.

4) Finally, our results show that although there is a high positive attitude towards saving water, it apparently does not lead to important low household water consumption. Strategies are needed therefore to reduce this "attitude-behaviour" gap. One of these strategies could be the use of prompts. This tool consists of visual or auditory aids to remind household members to carry out an activity that they might otherwise forget. It is very efficient in simple and easy behaviours (e.g. turn off the tap while you are shampooing your hair), which are not performed because they have become a habit and they are not cognitively processed. The use of prompts has been successfully implemented in other environmental domains, such as energy

conservation (e.g. Oceja & Berenguer, 2009) and recycling (O'Connor, Lerman, Fritz, & Hodde, 2010).

Additionally, at individual level, several implications can be drawn from our findings.

1) The "*Urban Water Consumption Perceived Risk"* scale (UWPR) can be used by scholars and technicians to measure urban water perceived risk in their academic research and water management projects. Compared to other existing scales in literature, UWPR is simple, easy to use in questionnaires, invariant, reliable and valid.

2) Personal involvement in water conservation practices is a key element to engage in water conservation behaviour. Thus, analogously to Schultz (2014), our results show that people who perceive water conservation practices as "useful" and "very important" may be more likely to engage in more complex and lasting conservation behaviours. Likewise, social marketing programs should develop strategies to increase personal involvement in this type of behaviour.

Social marketers can use persuasive communication to increase personal relevance (involvement) in the water use decision. In essence, persuasive communication can serve as a stimulus to change one's likelihood of engaging in a behaviour, reinforce one's own habitual behaviour, or motivate one to become more involved in the behavioural process, as highlighted by Gregory and Di Leo (2003). Additionally, commitment strategies can provide effective motivational tools. We believe that active personal involvement is a promising strategy in this regard. Thus, when people are actively involved, such as being asked to go to a shanty town where there are water supply problems or hold a container to measure the flow rate of a shower, they are more likely to be committed to the activity. This could be an important motivator for water conservation behaviour as it is for other environmental domains such as energy conservation (e.g. Gonzales, Aronson, & Costanzo, 1988).

3) Water conservation programs should aim to increase the perceived effectiveness of individual water saving conduct. Thus, when people perceive they contribute towards solving a specific environmental problem they are more likely to

engage in such behaviour. Hence, we believe that water-conservation campaigns should state not only the effectiveness of different actions to save water in personal water use (e.g. turning the tap off during personal hygiene or shower and not taking a bath), but also the advantages of using efficient technologies (e.g. dual flush systems in toilets or flow restrictors at home). Campaigns for the use of efficient technologies must also convey the idea that water efficient appliances are not expensive and are easy to install at home (e.g. show a video of how the installation must done or do it live). Additionally, providing procedural information[11] or rebates and incentives (e.g. for installing water efficient appliances) may also help to develop householders' confidence and efficacy.

Moreover, feedback strategy, widely used in social marketing programs, may help to increase the perceived effectiveness of saving water conducts. Providing feedback means giving information to individuals on their actual saving water achievements related to the specific conducts they are engaged in. This feedback has been shown as an important tool to increasing perceived control and outcome expectancy and has been an effective strategy in many water conservation programs (see Hassell & Cary, 2007). Additionally, with the development of new technologies, the granularity of feedback has become increasingly more polished and individuals can receive real-time feedback about water consumption in their homes. Although smart water meters are a very innovative technology (only a few companies have them), countries like the USA and Australia are installing them with successful results (see for example, Sønderlund, Smith, Hutton, & Kapelan, 2014; Liu, Giurco, & Mukheibir, 2016).

4) The provision of information about objective facts of current water problems and possible future problems with scarcity does not lead to water conservation behaviours, even though this information is perceived as credible. However, this important statement should be investigated in depth[12] by using alternative approaches such as experimentation (see e.g. Price, Fielding, Gardner, Leviston, & Green, 2015).

[11] Procedural information is often defined as action information or "how do it" information (Ummelen, 1997)

[12] This is one of the future research lines proposed in the next section.

In addition, we believe this finding cannot be generalised because it is related to Spanish idiosyncratic factors. As explained above in this dissertation, Spain is a country where political "battles" have occurred around water availability and management, and regulations have even been put in place to safeguard water in certain basins to the detriment of demand in other regions. Thus people may not perceive information on water problems as credible because they no longer distinguish whether the information offered is truthful, showing great response variability to this situation. Likewise, as suggested by Kennedy (2010), it would be of interest to develop social marketing interventions at “upstream level” to modify political behaviour in this regard.

5) People with direct experience of water shortages are much more involved and have greater reported water conservation behaviour. Hence, social marketing programs should consider the situational contexts and differentiate between areas of high and low water scarcity. In this case, community-based social marketing may be an effective strategy since it suggests that any program or tool used to achieve behavioural change should be implemented at community/local level and not on a large scale (e.g. nationwide). This is because not every social marketing program or tool (e.g. communication/promotion or incentives/disincentives to save water) works in the same way everywhere, they must be tailored to the situational context where they will be implemented.

6) Finally, analogously to the above point, the findings show the existence of two different water consumer profiles. Therefore social marketing programs must perform a segmentation analysis of the population to effectively target both subgroups.

CHAPTER 9

LIMITATIONS AND FUTURE RESEARCH LINES

A retrospective view on the research conducted for this dissertation indicates that it also suffers from inevitable limitations and weaknesses. Two main limitations must be highlighted in this research, which will in turn be potential future lines of research.

First, the use of self-reported measurements since the reliance on self-reported measures of behaviour may represent a methodological limitation. Although the use of self-reports of behaviour is less intrusive and time-intensive than conducting observational measurements, self-reports may not accurately reflect actual behaviour. In line with this, future studies should measure water conservation behaviour in a more accurate and realistic way.

Second, the proposed water conservation behaviour model has modest explanatory power. Although it is congruent with the majority of studies that explain water conservation behaviour using psychological variables, we believe this limitation highlights the need to include non-cognitive variables and unreasoned influences. Thus, we are exploring the inclusion of the following variables:

1) Emotions: Emotion has been largely ignored regarding cognitive structures predicting conservation behaviour. However, as many authors claim (e.g. Vining & Ebreo, 2002) there is a high potential for both positive and negative emotions to be predictors and mediators of conservation behaviour. Only three recent studies have been found that consider emotions as antecedents of water conservation behaviour (Bissing-Olson et al., 2016; de Miranda Coelho et al., 2016; Manríquez-Betanzos et al., 2016). In this regard, and parallel to this dissertation, we have just published an article in the Journal of Environmental Psychology analysing the role played by message/source credibility and negative emotions in the formation of comparative perceptual bias of several environmental hazards (Sarabia-Sanchez & Rodriguez-Sanchez, 2016). Thus, we believe it is a promising line of research, which must be expanded to other environmental domains as water conservation behaviour topic.

2) Habits and routines: Everyday life is influenced by habits, routines, rituals and recognisable patterns of activities. In this sense, several environmental studies (e.g. Ouellette & Wood, 1998; Verplanken, Aarts, & van Knippenberg, 1997) show that repetitive past behaviour directly affects future behaviour, regardless of cognition. Likewise, literature suggests that behaviour may be a function of both reasoned influences (e.g., attitudes, intentions) and unreasoned influences (e.g. habits and routines). It is possible to find some articles on the topic of water conservation that examine these variables (e.g. Aitken et al., 1994; Gregory & Dileo, 2003) but they are few in number

3) Resistance to change: This concept has been widely analysed in organizational contexts (e.g. Dent & Goldberg, 1999; Piderit, 2000) but not in environmental research. However, studying the resistance to change may be relevant in social marketing for two reasons. First, it indicates the degree of inertia (intensity habits) which social marketing programs must face. For instance, advertising campaigns that do not adequately address the core of the message will meet high resistance which cannot be overcome with the arguments/emotions presented in these campaigns. Second, citizens/consumers develop different levels of resistance to change in resources consumption (e.g. water, energy) or products (consumer goods, household products, etc.), which prevent environmental and social marketing campaigns from being effective.

In addition, based on the results of this dissertation we believe that three more line of research should be considered. First, further analysis of individuals' personal involvement in water conservation practices is needed. Researchers must not only identify involvement with water use, but must also determine why personal involvement is higher for some consumers than for others. As Gregory and Di Leo (2003) point out: "*determining motives for involvement will help researchers understand the factors influencing the involvement process and the role of reasoned processes in the stimulus-response relationship*" (p.1286). Second, study is needed, using an experimental methodology, of the type of messages that are most effective

for reinforcing or promoting water conservation behaviour. In this regard, it would be of interest to analyse not only the elements used in the message (e.g. images, colours, characters) but also the type of content (arguments vs. emotions), which leads citizens to perceive as credible the information on the current water problems facing the planet. Finally, an obvious path to take in relation to further research is to implement and test the strategies and tools recommended the previous section.

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APPENDICES

Appendix 1: Table psychological determinants water conservation behaviour

Table 1. Psycohological determinants water conservation behaviour

Author	Method	Dependent variable	Psychological variable analyse	Main findings
Bruvold (1979)	Multiple regression	Reported water conservation (conducts): No report R^2 value	Perceived seriousness of the drought; Need to continue conservation in the future	Perceived seriousness of the drought (r=0.31**) was the most important variable following by Need to continue conservation (r=0.097*).
Kantola et al. (1982)	Multiple regression	Behavioural intention to save water: R^2= 0.30	Individual subjective norms; Social norms; Attitudes; Interest and importance of the water issue; Efficacy of the conducts	Social norms (r=0.32**), attitudes (r=0.23**), and age (r=-0.31**), are the highest explanatory variables.
Cameron & Wright (1990)	Politomous logistics regression	Reported water conservation retrofit devices: 1) In shower, 2) In toilet. No report R^2 value	Awareness of water conservation (1. Had energy audit; 2. Educational level; 3. Previous experience with drought); Perceived benefits of installing retrofit devices (characteristics of the house, e.g. having a dishwasher); Availability of the retrofit devices; conservation-mindedness (e.g. effort to conserve hot water)	None of these variables are significant in the case of "non installing any retrofit device". However when analysing the behaviour of installing retrofit device: 1) "In shower and toilet" some variables are significant (Previous experience with drought, b=0.80**; Having a dishwasher, b=0.57*; Effort to conserve hot water, b=0.55**), 2) "Only in shower": Having a dishwasher, b=0.66**; Effort to conserve hot water, b=0.33**
Murphy et al. (1991)	Multiple regression	Reported saving behaviour: R^2= 0.19	Knowledge; Attitudes; Intention to act	Knowledge (r=0.12**), Attitudes, (r=0.27**) and Intention to act (r=0.33**),
Aitken et al. (1994)	-Study 1: Multiple regression -Study 2: Experiment	- Study 1:Actual water consumption (metered water household data): R^2= 0.60 -Study 2: Idem study 1 but average data	- Study 1: Attitudes to use water at home; Habits; Values - Study 2: Cognitive dissonance, Feedback information	-Study 1: None of these variables are significant but Number of resident per household, Net annual property value and Number of clothes washing explain 60% of the variance. -Study 2: Both variables (treatments) are statistically significant.

Author	Method	Dependent variable	Psychological variable analyse	Main findings
Moore et al (1994)	Longitudinal study using bivariate correlations	Reported water conservation behaviour (conducts): No report R^2 value	Attitudes to conserve water; Knowledge of water conservation; Intentions to save water in the future;	The results indicated that there was a move towards greater conservation as measured by the variables studied over the three year period, which media interventions and water costs were perceived as influential in this change, and that reported conserving behaviour continued to be better predicted by stated intentions than by knowledge.
Harland et al. (1999)	Hierarchical multiple regression	Intention to turn off faucet while brushing teeth: R^2= 0.50	Attitude to act; Subjective norms; Personal norms; Perceived behavioural control	All variables were significant (Attitude to act, ß=0.23**, Perceived behavioural control, ß=0.38**, Personal norms, ß=0.51**) except Subjective norms.
Lam (1999)	Hierarchical multiple regression	Behavioural intention to save water: R^2= 0.41	TPB (Attitudes; Subjective norms: normative beliefs, motivation to comply; Perceived behavioural control) Perceived moral obligation; Perceived water right	Only attitudes to act (ß=0.51**) and Perceived behavioural control were significant (ß=0.29**).
Trumbo & O'Keefe (2001)	Hierarchical multiple regression	Behavioural intention to save water: R^2= 0.27	TPB (Attitude; Normative pressure; Self-efficacy); Environmental values; Information seeking; Information exposure; Previously engaged in water conservation practices	Block: Environmentalism values (ß=non-significant) Block: Past actions (ß =non-significant) Block : TPB (Self-efficacy ß =0.11*,Attitude ß=0.18*, Normative pressure ß=0.31* Block : Information (Exposure, ß=non-significant , Seeking ß=0.12*)
Corral-Verdugo et al. (2002)	SEM	Actual water consumption (bill data house): No report R^2 value	Pro-environmental motives	Pro-environmental motives (ß =-0.36**), is a mediator of the relationship between Tragedy of the commons (ß =-0.33**) and water consumption.
Corral-Verdugo (2002)	SEM	Actual water consumption (observational data): R^2=0.30	Pro-environmental competency second order variable: Personal motives, Anthropocentric beliefs, Tragedy of the commons	Pro-environmental competency: ß=0.50**

Author	Method	Dependent variable	Psychological variable analyse	Main findings
Corral-Verdugo et al. (2003)	SEM	Actual water consumption (observational data): -First model: R^2=0.07 -Second model: R^2=0.18	- First model:''Natural balance'' beliefs; "Limits to growth'' beliefs; ''HEP'' beliefs - Second model:Water utilitarian beliefs (WUB); Water ecological beliefs (WEB)	-First model: only ''HEP'' Beliefs is significant (ß=0.22*) - Second model: both variables are significant WUB (ß=0.37*); WEB (ß=-0.18*)
Gregory & Di Leo (2003)	-1 step: multiple discriminant analysis - 2 step: multiple regression	Actual water consumption (metered water household data): R^2=0.31	Environmental awareness; Attitudes to save water; Personal involvement; Habits	-1 step: the most predictor variables (discriminant) were Involvement, Env. awareness (local concern); Habits (washing clothes, washing machine, shower) - 2 step: Involvement (ß= -0.09*), Env. awareness (local concern ß=n.s); Habits (washing clothes ß=0.12*, washing machine ß=0.20**,shower ß=0.19, p<0.01). Also Income (ß=0.16**)
Aguayo et al. (2004)	SEM	Reported water conservation behaviour (conducts): R^2=0.25	Internal locus of control; Instrumental skills of saving; Motives to protect the environment	All are significant, Instrumental skills of saving (ß=0.34**), Internal locus of control (ß=0.14**), Motives to protect the environment (ß=0.14**)
Syme et al. (2004)	SEM	Actual external water use (metered water household data): No report R^2 value	Lifestyle; Garden recreation importance; Garden interest; Attitudes water conservation; Social desirability	These internal variables have a very small effect (the highest is lifestyle ß=0.12*). Relevant variables are external (Lawntech ß=0.22**; Garden ß=0.26**).
Leviston et al. (2005)	SEM	Reported water use: R^2=0.13	Attitudes to conserve water; Subjective norms; Perceived control; Risk; Trust; Responsibility; Values	Attitudes (outcome evaluation using less water) ß=0.28**, Trust (in water requirements) ß=0.17**, and Subjective norms (motivation to comply with non-industry) ß=-0.29** are significant.
Trumbo & O'Keefe (2005)	SEM	Intention to conserve water (conducts): R^2=0.29	Attitudes to conserve water; Normative pressure; Information seeking	All were significant, Normative pressure (ß=0.27**), Information seeking (ß=0.23**), Attitudes to conserve water (ß=0.19**).
Corral-Verdugo & Frías-Armenta (2006).	SEM	Reported water conservation (conducts): No report R^2 value	Normative beliefs water conservation; Antisocial behaviour; Beliefs in the efficacy of water laws	Only normative beliefs water conservation (ß=0.22*) and antisocial behaviour (ß=-0.18*) were significant.

Author	Method	Dependent variable	Psychological variable analyse	Main findings
Corral-Verdugo et al (2006)	SEM	Reported water conservation (conducts): R^2=0.14	Present orientation, Past Orientation, Future Orientation	Only Present Orientation (ß= -0.20**) and Future Orientation (ß=0.36**) are significant
Lam (2006)	Hierarchical multiple regression	Study 1: Behavioural intention to install a dual-flush controller at home: R^2=0.37 Study2: Idem study 1: R^2=0.37	- Study 1: Attitude to install saving devices; Normative belief; Motivation to comply; Vulnerability; Subjective effectiveness of alternative solutions (SEAS); Collective efficacy (2measures) - Study2: Idem variables study 1(some changes in scales); Personal Efficacy (2measures)	-Study 1: Only SEAS (ß= -0.43**) and Vulnerability (ß= 0.18**) were significant - Study2: Subjective norm (ß= 0.15**), SEAS (ß=-0.19**), Collective efficacy 1 (ß= 0.28**), Personal Efficacy 2 (ß= 0.27**)
Clark & Finley (2007).	Hierarchical multiple regression	Intention to conserve water: R^2=0.27	Attitudes to conserve water; Subjective norms; Perceived control; Environmental attitudes (NEP); Information water issues, and Water shortage concern.	Block: TPB (Attitudes to conserve water r=0.30**; Subjective norms r=0.14**; Perceived control r=0.22**) Block: NEP (r=0.29**) Block: Information (r=0.41**) Block: Concern: (r=0.17**)
Corral-Verdugo et al. (2008)	SEM	Intention to save water (saving conducts): R^2=0.17	"New Human Interdependence Paradigm" (NHIP); "Human Exception Paradigm"(HEP); "New Environmental Paradigm" (NEP)	Only "NHIP" is significant (ß=-0.30**)
Miller & Buys (2008)	Logistic regression	Dichotomous reported behaviours: 1) Car washing on lawn or driveway, 2) Water efficient plants or Weedkillers: No report R^2 value	Community responsibility (6 categories, e,g, Environmental, Water conservation, Reporting faults, Animal waste); Social capital (8 categories, e.g. Neighbourhood connection, Proactivity); Lifestyle (3 categories, e,g, housing choice)	1) Car washing: "On lawn": Neighbourhood Connections (b=0.14*) and Environmental (b=0.88*). "On driveway": Water conservation (b=-1.12*) and Reporting faults (b=-0.63**) 2) Gardening: "Water efficient": Housing choice (b=0.73*), Water conservation (b=-1.51*), Animal waste (b=-0.71*). "Weedkillers": Proactivity (b=0.08*), Environmental (b=-1.05*).

Author	Method	Dependent variable	Psychological variable analyse	Main findings
Marandu et al. (2010)	Multiple regression	Reported water saving actions: R^2=0.08	Attitude to conserve water, Subjective norms	Attitude to conserve water (ß=-0.06**) and Subjective norms (ß=-0.07*)
Mondéjar-Jiménez et al. (2011)	PLS	Reported water saving actions: R^2=0.13	Environmental awareness; Lifestyle (Professional situation, Level of education, Home type, Income)	Environmental awareness (ß=-0.25**); Lifestyle (ß=-0.20**)
Gilbertson et al. (2011)	Descriptive and Chisquare test to analyse difference	Reported water conservation behaviour (conduct)	Contextual factor: Geographical location and the water situation at specific location (Malle, drought-affected vs. Darwin, non drought-affected location)	There were significant differences between locations for 16 of the 23 stated behaviours.
Spinks et al. (2011)	Multiple regression	Reported water saving actions: R^2=0.73	Past behaviour (conducts); Attitudes; Subjective norms; Self-efficacy; Perceived behavioural control; Moral norms; Descriptive norms; Community identification; Household culture; Self identity	Moral norms (ß=0.47, p<0.01), attitudes (ß=0.19**), household culture (ß=0.17*), self-efficacy (ß=0.10**) and past behaviour (full dishwasher ß=0.05*; washings car ß=0.07*; brushing teeth ß=0.06*) were significant.
Willis et al (2011)	Hierarchical cluster analysis	Actual water consumption (metered water household data): No report R^2 value	Environmental concern; Attitudes (Water conservation awareness and Practice)	Two clusters formed: Households with higher levels of environmental concern and attitude towards water conservation will consume significantly less water in total.
Dolnicar et al. (2012)	Multiple regression	Reported past water conservation behaviour: R^2=0.33	Pro-environmental behaviour; Active involvement in searching water information; Moral obligation; Behavioural change due to water restrictions; Previous use of recycled water; Extent of influence of others ; Likelihood of relocation; Previous use of desalinated water	All variables were significant: Pro-environmental behaviour (b=1.19**); Active involvement in searching water information (b=0.39**); Moral obligation (b=0.34**); Behavioural change due to water restrictions (b=0.79**); Previous use of recycled water (b=0.38**); Extent of influence of others (b=0.08*); Likelihood of relocation (b=0.12**); Previous use of desalinated water (b=-0.53**)

Author	Method	Dependent variable	Psychological variable analyse	Main findings
Adams et al. (2013)	Logistic regression	Reported past water conservation actions: 1) Indoor: R^2=0.63 2) Outdoor: R^2= 0.78	Importance of water to clean (1.IWClr, 2. IWCgw); Importance of water for (1.IWaq, 2.IWpwc, 3.IWhou); Importance of water conservation actions (IWCA); Information sources (1.ISext, 2. ISenv); Preferred learning (1.PLpas, 2. PLact); Like to learn about (1.LLcom; 2.LLper); Perceived protection from (1. PPfed; 2. PPsta; 3. PPct); Environmental attitude (EA).	1. In the case of indoor only ISext (ß=0.35**), ISenv (ß=0.44**), PLact (ß=0.29**), PPct (ß=0.15**) and EA (ß=0.07*) were significant. 2. Outdoor most of them were significant: IWClr (ß=0.28**), IWCgw (ß=0.22**), IWpwc (ß=-0.19*), IWhou (ß=0.12**), IWCA (ß=0.22**), ISenv (ß=0.48**), LLcom (ß=0.36**), LLper (ß=0.63**), PPfed (ß=0.17*), PPct (ß=0.16*)
Adams (2014)	Bivariate regression	Willingness to conserve water: No report R^2 value	Pro-environmental behaviours (recycle, energy conservation and willingness to sacrifice for environment) as environmental concern.	The three pro-environmental behaviours are significant (recycle: ß= 0.21**; energy ß=0.38** and Wts ß= 0.17**)
Wolters (2014)	OLS regression	Reported water conservation behaviour (conducts): R^2=0.09	Environmental concern ("NEP" scale); Concern over water quantity; Political ideology.	Environmental concern (ß= 0.06**) and Concern over water quantity (ß= 0.35**)were significant.
de Miranda-Coelho et al. (2016)	Correlation analysis	Reported water conservation behaviour (conducts): R^2=0.33	Negative emotions toward water wastage; Environmental attitudes (1. Preservation and 2. Utilization)	Emotions toward water wastage had the highest correlation (r=0.54**) follow by Environmental attitudes (1. Preservation, r=0.40**; and 2. Utilization, r=-0.23**)

Source: own elaboration

Appendix 2: List of publications in which this dissertation is developed

Appendix 2.1.: Article published in Psyecology

Sarabia-Sanchez, F.J., & Rodriguez-Sanchez, C. (2013). Attitudes towards saving water, household structural characteristics and water consumption. ***Psyecology***, *4*(2), 115-137. DOI: 10.1080/21711976.2013.10773869

Attitudes towards saving water, household structural characteristics and water consumption

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Abstract

The attitudes of households towards saving water must be known and understood in order to generate sustainable behaviour in the use of this resource, as currently this behaviour is not being seen. This study examines whether households (18% of total water distributed), of different sizes and spanning a range of ages in terms of the head of the household, display attitudinal differences towards saving water. It also examines the extent to which attitudes and the aforementioned structural variables affect consumption. Using a sample of 500 subjects from the "Vega Baja del Segura" district, a consistent, valid, reliable and parsimonious scale is constructed to measure attitude. The findings show that attitude encompasses two factors which act differentially. Similarly, it is found that attitude towards saving water and household size explained 23.5% of real consumption in households.

Keywords: Attitudes, water saving, household water consumption, Spain.

Actitudes hacia el ahorro de agua, características estructurales del hogar y consumo de agua

Resumen

Es de vital importancia conocer las actitudes hacia el ahorro de agua para generar comportamientos sostenibles en el uso de este recurso, dado que en la actualidad este comportamiento no se está produciendo. Este estudio analiza si los hogares (que consumen el 18% del agua total distribuida) con diferente tamaño y edad del cabeza del hogar muestran diferencias en las actitudes hacia el ahorro de agua. También analiza en qué grado las actitudes y las citadas variables estructurales influyen en su consumo. Usando una muestra de 500 sujetos procedentes en su mayoría de la Vega Baja del Segura, se construye una escala para medir la actitud que resulta consistente, válida, fiable y parsimoniosa. Los resultados muestran que la actitud tiene dos factores que actúan diferencialmente. Igualmente, se comprueba que la actitud hacia el ahorro y el tamaño del hogar explican un 23.5% el consumo real de los hogares.

Palabras clave: Actitudes, ahorro de agua, consumo de agua del hogar, España.

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INTRODUCTION

It is only in these last two decades that we have become aware of the importance of potable water as a critically scarce resource (Brown & Flavin, 1999). In 1992, the World Meteorological Organization concluded that its scarcity and misuse represented a serious threat to sustainable development. However, consumption still exceeds the rate of replenishment, and its prejudicial uses have created a major environmental problem. This implies that saving water is a key action, with a significant impact on the different areas of sustainability: economic, political, environmental and social (Corral-Verdugo & Pinheiro, 2004).

Although the 2008 Survey of Households and the Environment (carried out by the Spanish National Institute of Statistics –INE–, 2010) shows that 96.9% of households have adopted some kind of water-saving system, consumption figures remain very high. In 2009, average water consumption in Spanish households was 149 litres per capita per day (LPCPD), with major variations at a national level: whereas Santander consumed 180 LPCPD, in Barcelona the figure was 107 LPCPD (INE, 2011). To achieve sustainable levels of consumption, supply must be made more efficient (77.4% in 2009) and there must be a change in demand (modifying habits and reducing consumption). Therefore, the problem must be tackled from numerous fronts, focusing particularly on creating positive attitudes which allow for a modification in behaviour (Bustos, Flores & Andrade, 2004).

General proenvironmental vs. water-saving behaviours

Hines, Hungerford and Tomera (1987) concluded that people with more positive attitudes towards the environment are more likely to display proenvironmental behaviours. However, there is no clear relationship between general proenvironmental attitudes and the corresponding specific behaviours (Arreguín et al., 2009; Castro, 2001). Although the majority claim to be greatly concerned about the environment, their specific behaviour usually belies the general concern manifested (Laborín, Córdova, Vera, Arreguín & Velenzuela, 2004). For this reason, it is suggested that in order to obtain an adequate measure of said behaviour and optimize the prediction of specific behaviours, environmental attitude must be measured for each specific phenomenon (Dietz, Stern & Guagnano, 1998; González & Amérigo, 1999). For this purpose, specific models have been developed which measure the role played by attitudes in water-saving behaviours (Gregory & Di Leo, 2003).

Saving water is complicated because it requires a perception of a long-term environmental problem (Randolph & Troy, 2008), an important motivation, and because it refers to a resource the use of which could be interpreted as a right. Martimportugués, Canto, García and Hidalgo (2002) affirm that the best predictors of water-saving behaviours in the home are the attitudes that people form through that social context (normative) and their proenvironmental behaviours.

Attitudes of household members

The household is an organization with its own identity and rules. In most cases it coincides with the family unit, which regulates its behaviour as a whole, projecting shared attitudes and behaviours on the basis of the relationships maintained by its members. Espinal, Gimeno and González (2006) understand it as a *gestalt* which goes beyond the sum of individualities and constructs a

system of shared beliefs. Hence, it develops attitudes towards any external factor that conditions the relationships and behaviour of its members.

Structural characteristics of households and water saving

Household size

For Renwick and Archibald (1998), household size is a very significant factor in the explanation of water consumption, and Aitken, McMahon, Wearing and Finlayson (1994) found that water consumption depended chiefly on family size. Gregory and Di Leo (2003) observed that larger families use the washing machine more frequently (almost daily use with an average of 4.81 washing loads per week). However, these kinds of households tend to develop a greater intention to save and, indirectly, display more proenvironmental behaviour by washing mainly with a full load, thereby optimizing the consumption of water. This suggests that there might be a complex behaviour at work here: in larger households, there is a greater use of water, but there is also a greater intention to save. However, it is unclear whether this intention is derived from the fact that more members of a household generate a more proenvironmental attitude or whether it is the tendency to optimize the family budget which leads to a relative reduction in consumption. Furthermore, Sáez-Fernández and González-Gómez (2004) find that a larger household size implies greater consumption, although consumption per capita is probably not proportional, since there are economies of scale at work. This was noted by Arbués, Barberán and Villanúa (2008), who observed that the positive relationship between household size and total water consumption becomes negative when looking at consumption per capita.

Loh and Coghlan (2003), on the other hand, calculated the mean consumption of water using the measurement: litres/household members/day (L/H/D) and concluded that in single-person households, consumption is higher than in households where more than one person resides, reducing the average from 520 LHD to 360 LHD.

Age of household members

The OECD report (2002), citing the Dutch NIPO study of 1999, signals that the consumption of people aged 0-12 was lower than among the over 65s, with consumption peaking in the 18-24 age bracket, after which it gradually declines. Subsequently, Campbell, Johnson and Larson (2004) affirmed that at different ages, different amounts of water are used, showing that young adults (17-24 years of age) use more water than any other group. However, Sáez-Fernández and González-Gómez (2004) detected that certain children's activities (baths or longer showers) provoke greater consumption. Interestingly, Van Liere and Dunlap (1980) signal that younger people display a greater environmental attitude and concern for sustainability, which demonstrates a discrepancy between attitude and behaviour, and that older people are more likely to display proenvironmental behaviours (the NIPO study detected that consumption is very low).

Following these authors, the age of the household members should be related with their attitude towards saving water and, therefore, consumption. Hence, younger households should save less and use more than households made up of older people. Looking in another direction, Clarck (2005) indicated that households made up of older people display a greater attitude towards saving, explained through their memories of shortages and scarcity. However, no other

literature has been found in this regard, which seems to imply that it is yet to be established whether the age of household members is discriminatory of attitude towards saving water.

This paper aims to achieve three goals:

a) Establish a valid and reliable measure for attitude towards saving water from the perspective of sustainability.

b) Test whether different household sizes and ages display different attitudes towards saving water in the home.

c) Ascertain whether attitudes towards saving water and household variables influence consumption behaviour.

METHOD

Objective population

The target population encompasses households, assimilating the concepts of home and family, since a household is a group of people living in the same home, regardless of whether this is one or more people, and if they are related to each other or not. When dealing with the concept of families, on the contrary, there can be no single-person families and members must be related. This study takes single-person households into account since they consume water.

Participants

The initial sample is 500 households, interviewing those who were recognized as the head of the household by the other members. This individual is the leader with regard to creating and maintaining internal rules, and has a direct influence on the way the rest of the members think, feel and behave (Espinal et al., 2006). In non-family households, the person who establishes the rules of cohabitation was interviewed. Table I shows the sample profile for the structural variables.

TABLE I
Sample profile

Variables		*N*	%
Household size	1	36	7.2
	2	132	26.4
	3	109	21.8
	4	132	26.4
	5	72	14.4
	6 or more	19	3.8
Age of head of household	Mean	48.74	
	Standard Dev.	13.39	
	Asymmetry	0.20	

Instruments

Attitude towards saving water: there are various proposals to measure attitude towards saving water, but many consider dimensions which do not appear to have a direct relationship with the phenomenon studied [for example: Gilg and Barr (2006) include a recycling factor, Laborín, Arreguín and Valenzuela (2002) include a locus of control factor]. Other scales introduce specific items related with saving or conserving water, although there is no one scale designed

specifically to measure attitudes towards saving water in the residential sphere. Since such a scale has not been found in the literature, the focus of this research was to create one using the items outlined by other authors. The steps followed were:

– Compile items suggested in the literature (Aragonés & Amérigo, 1991; Arreguín et al., 2009; Martimportugués et al., 2002), as well as others taken from documents drafted by local councils, foundations and water distribution companies in advertising communications, or technical reports focusing on sustainability.

– Initial filtering of items carried out by the authors, based on similarity and parity of wording, choosing those where the content was closest to the concept of sustainability (Corral-Verdugo & Pinheiro, 2004). The filtered list is provided in appendix A.

– Application of principal components analysis, eliminating all items with a SAM (sampling adequacy measure) lower than 0.60 and those which present saturations below 0.50 in all factors.

– Application of confirmatory factor analysis for the remaining items in order to ascertain the dimensionality and quality of the resulting model.

Household size: measured as the number of individuals with stable residence in the home.

Age of household members: there is no standard measure pertaining to this construct; mean age can be used as well as other indicators which include age dispersion (for example). This paper uses the criterion "age of the head of the family/household".

Behaviour or water consumption: this was measured through real consumption, understood as the amount of water actually used based on the latest water bill paid, both in general for the household and in per capita terms (LPCPD). This data was obtained for the months of October or November (depending on the bill date), since these two months are representative of average annual water consumption, confirming this pattern using the monthly series of drinking water consumption in various Spanish cities.

Procedure

Personal interviews were conducted in the home, eliminating all questionnaires with incongruent or extreme responses. Households were only chosen if they were a residential home without a business based there or more than one family living there, since these display high levels of water consumption. 20% of the questionnaires were supervised on the phone. Participation in the study was voluntary and free.

The sampling procedure applied was two-stage. Firstly, the populations were chosen, divided into two levels (urban vs. rural), seeking to cover the largest possible population in the cities of Murcia and Alicante (the first was not included in our work), mainly in the area of Vega Baja del Segura. The final sample compiles data from 24 urban nuclei and 10 rural nuclei following the Eurostat criterion (2010) to differentiate between urban and rural nuclei. This area was chosen because Flores-Asenjo and Parra-Meroño (2011) state that there are two key factors which determine efforts to change water usage: the perceived information of water stress in the community and the importance of personal responsibility in the conservation of water. They are both high in the area studied in this case. Secondly, random sampling was used to choose households to be interviewed, fulfilling quotas for household size and type of property (house vs. apartment building).

RESULTS

Validation of the scale measuring attitudes towards water saving

Principal components analysis selected 6 items and a two-factor structure (see Appendix B). Following this analysis, a structural equations model was applied to confirm the structure of the scale proposed. Firstly, the existence of normality was tested (Mardia's K^2 test suggests accepting the existence of fit; k = 1.149). The matrix of covariances is provided in appendix C. The fit obtained was very good (Chi = 4.182; df = 8; p = .840), since all the fit indices were above 0.90 (BBNFI = 0.994; IFI = 1.000; AGFI = 0.993; CFI = 1.000) and the SRMR (0.013 < 0.05) and RMSEA (0.000 < 0.08) error coefficients were lower than the maximum recommended limits. Rho reliability was 0.802 > 0.70 and Cronbach's alpha coefficient was 0.751, higher than the threshold indicated by the literature (0.7).

Content and construction validities were fulfilled since the items were taken from the literature and the recommendations provided therein were followed. As for convergent validity, the average loading for the first factor was 0.70 and the second factor was 0.69, all of which were significant. To confirm discriminant validity, the correlations were compared where (a) the r values between the items must not exceed 0.9 and (b) the correlation coefficient between factors should be different from unity. All correlations were below 0.547 (p < .01), where the correlation between the factors was 0.393 (p < .000), thereby fulfilling discriminant validity. The t test for the two factors showed that the mean values were significantly different (t = -15.75, df = 491, p = .000) with bootstrap for 200 samples (mean = -2.00, bias = -0.00, p = .01 bilateral).

The definitive scale was made up of two factors (items in Appendix A):

Factor 1: Active Concern: items a07, a13 and a15

Factor 2: Social Concern: items a22, a23 and a26.

Descriptive results

The average household size in this study was 3.27 members and the mean age of the head of the household was 48.74 years old (see Table II). Furthermore, the average age of the members of the household aged over 12 was 39.88 years of age.

TABLE II
Descriptors for the variables used in the study

Structural variables	Minimum	Maximum	Mean (s.e.)	Standard Deviation
Household size	1	9	3.27 (0.06)	1.32
Age of head of household	19	97	48.74 (0.60)	13.39
Real consumption of household (m^3)	1.0	292	33.28 (1.26)	26.92
Consumpt. per capita (LPCPD)	2.5	80.35	10.58 (0.38)	8.19
Attitude: factor measuring...				
– Active Concern	6	18	14.40 (0.13)	2.81
– Social Concern	3	18	16.38 (0.10)	2.30

The data for water consumption, both generally in the household and, above all, the general calculation presented a strong dispersion (26.92 and 8.19

respectively). The high consumption observed in some cases is due to the fact that some of the properties have a garden and swimming pool. The value of the median (which eliminates the influence of households with high/low consumption) was 28.00 m^3 in real usage and 9.17 m^3 in usage per capita, the equivalent of 152.83 LPCPD (median), barely registering any differences with the national mean of 149 LPCPD in 2009.

In relation to attitude, high scores were observed for both attitudinal factors ("active concern" and "social concern"), with mean values close to the maximum (14.40 and 16.38 out of a maximum of 18 respectively).

Contrasting hypotheses

The ANOVA was applied to ascertain whether households of different sizes and over a range of ages for the head of the household present different levels with regard to favourable attitudes to saving water, and the *t* test was applied, comparing the first and last quartiles. For this purpose, the variables were nominalized depending on the quartiles obtained. The results are shown in table III.

TABLE III
ANOVA Results

Independent Variables	Attitudinal Factor (var.dep.)	*t* Test Mean	Test	Test *F*
Household size	Active Concern	Q1 = 14.55; Q4 = 13.78	2.046**	3.092**
	Social Concern	Q1 = 15.93; Q4 = 16.65	-2.220**	3.682**
Age of head of household	Active Concern	Q1 = 14.39; Q4 = 14.46	-.118	.509
	Social Concern	Q1 = 16.04; Q4 = 16.05	.326	4.150***

**$p < .05$; ***$p < .01$;

It was observed that households with few members displayed a higher level of "Active Concern" than larger households; the opposite was noted for the "Social Concern" factor. In the case of the first factor, this is due to the fact that with a larger number of members, the dispersion of opinions and attitudes is greater and impacts negatively on attitudes towards water savings.

As for age, householders with the youngest and oldest heads only displayed significant differences in the attitudinal factor "Social Concern". Subjects aged between 39 and 50 presented a more favourable attitude to water savings.

Finally, analysis was conducted to ascertain whether the characteristics of the households considered and the attitudinal factors are antecedents of consumption behaviour, homogenizing real consumption and making it linear. The regression models verified were:

$$\sqrt[3]{consump_{real}} = \alpha + \beta_1 AC + \beta_2 SC + \beta_3 Siz + \beta_4 Ag + e$$

$$LH = \alpha + \beta_1 AC + \beta_2 SC + \beta_3 Siz + \beta_4 Ag + e$$

Where ACF = Active Concern Factor and SCF = Social Concern Factor.

For real consumption, the goodness of fit of the regression was 23.5% (Table IV) and the ANOVA showed that the variability observed cannot be explained by chance ($F = 35.651$; $p < .000$). The "Social Concern" factor (as a social norm) and household size significantly contributed to explaining total water consumption in the household, whereas the attitudinal factor "Active Concern"

displayed a weak significance (p = .080). Age was not found to be significant. It was also observed that there was no risk of collinearity between the predictor variables, since the variance inflation factors (VIF) were very close to unity.

TABLE IV
Results of the regressions for household consumption

Variables	Real consumption (betas)	LPCPD consumption (betas)	VIF
Attitude. "Active Concern" Factor	-.080*	-.091*	1.187
Attitude. "Social Concern" Factor	.154***	.175***	1.190
Household size	.445***	-.239***	1.160
Age of head of household	.037	.069	1.142
Fits of the models			
n	451	451	
R corrected	.235	.064	
s.e. estimation	.592	.410	
ANOVA (*F*)	35.651***	8.708***	

*p < .1; **p < .05; ***p < .01; VIF = variance inflation factor

For LPCPD consumption, the goodness of fit decreased substantially (6.4%) with F = 8.708 (p < .000) concluding that the variability was also not random. The same variables as in the case of real consumption presented significant contributions, although the significance of the attitudinal factor "Active Concert" improved, albeit weakly. The beta corresponding to household size became negative (the more members, the lower the LPCPD), in line with the indications given by Arbués et al. (2008) when considering economies of scale in water consumption.

DISCUSSION AND CONCLUSIONS

It is widely accepted that a change in the water consumption behaviour of households is required in order to make their influence on the availability of this resource more sustainable. It is also accepted that the decisive factors of behaviour must be known and understood so that any attempt to improve current consumption behaviour might be successful. In this respect, not only are external stimuli required which promote a reduction in consumption (for example, by increasing price) but also mediational processes must be developed within the heart of the family. These processes are understood as the series of interaction, learning and support actions aimed at developing cognitions and attitudes which produce a (responsible) water consumption behaviour and which, ultimately, are psychological and situational determinants of this behaviour (Corral-Verdugo, 2003). It is here where positive attitude favours conservation behaviour; therefore a key question is knowing the level and attitudinal profile of the users, as well as their past conservation behaviour.

Consumption in the residential segment is significant because it accounts for almost 18% of the total water distributed, which has led many policies and actions to target this area. This consumption has a fixed element (for example: minimum consumption derived from cleaning and maintaining the home) and a variable component depending on its structural characteristics. Hence, larger households and lower social concern for water-related issues imply higher water consumption in total terms, although consumption per capita might be reduced owing to economies of scale.

This study was performed in the area of Vega Baja del Segura (areas of Murcia and Alicante) where water shortages have traditionally been a major economic and urban problem (due to the lack of supply during dry seasons, etc.) It should be noted that household size and attitudinal level are high. The large household size (3.27 people per household) results from the fact that in the area of Murcia and Vega Baja del Segura, the average household size is higher than the national average (3.15 in Murcia and Vega Baja del Segura in contrast to 2.85 in Spain as a whole, according to the figures from the latest census available, 2001).

A high positive attitude can be observed with regard to water savings. This level is coherent with the permanent concern regarding the risk of drought in Murcia and Alicante. Both areas stand out in terms of the very significant increase in water demands, given the increase in second homes in the Mediterranean and their higher consumption per capita (owing to the greater availability of gardens and swimming pools in detached villas). Differentiating by attitudinal factor, it is observed that the two attitudinal factors scored highly, although the "Social Concern" factor achieved a significantly higher score than "Active Concern".

The scale developed is reliable and valid, as well as parsimonious, since it uses a small number of items which can be entered in subsequent questionnaires without requiring a prolonged response time. Furthermore, the scale focuses more on sustainability and less on proenvironmental aspects, since the items reflect the five psychological characteristics which, according to Corral-Verdugo and Pinheiro (2004), sustainable behaviour should display: effectiveness, deliberation, anticipation, solidarity and austerity. Saving water in itself should be a conscious and intentional response to place limits on consumption, both with altruistic intentionality (towards others) and selfish intentionality (towards the family, achieving lower water bills, for example) of forward-looking present behaviour. Given that saving a resource as scarce as water has a major environmental, economic and social impact, the scale presented refers more to attitude from the perspective of sustainability than from a proenvironmental focus.

In the findings of this study, the variable "household size" yielded differences for the two attitudinal factors: a larger household implies a significantly lower active concern factor and higher social concern. The fact that a larger household is linked with lower active concern is in line with the affirmations of Gilg and Barr (2006), who point out that households with more members tend to be less environmentalist than smaller ones. As for social concern, larger households generate higher absolute consumption, which makes them more concerned with education and responsibility in consumption, as well as with using efficient domestic appliances.

Furthermore, the factors analyzed are predictors of real consumption and LPCPD, although the explanatory capacity of the models differs substantially, performing better for real consumption and more poorly for LPCPD consumption. These results are in line with those of Martimportugués et al. (2002), who observed that the best predictors of water-saving behaviours in the home are the attitudes of the people who are a part of that social context (normative), although the predictive capacity of the models proposed is more limited (not higher than 15%). Of particular note is the low significance of the attitudinal factor "Active Concern" and the high significance of "Social Concern". This indicates a certain passiveness of personal stance, since "Social Concern" is defined by its consideration that proenvironmental behaviours should be instilled in basic education and that this is the responsibility of everyone, which dilutes personal contribution/attitude.

This study has two basic limitations: (1) it was conducted in a region of Spain which has traditionally been subject to restrictions in periods of drought (this might imply a greater awareness regarding the importance of water and its correct use and consumption. To avoid the possible bias this fact might generate, the fieldwork had to be expanded to areas with a different climatology and history in terms of water availability), and (2) although the stages indicated for the creation of scales have been followed, the fit indicators should be validated in other contexts. These two matters should be investigated in future research.

Appendix A

List of items for the "attitude towards saving water" scale

Indicate your level of agreement or disagreement with the following statements:

In your family/household…
a01. … saving water is only very important when there is a shortage of water.
a02. … the amount of the water bill has never been a problem.
a03. … water consumption can be reduced without reducing quality of life.
a04. … the consumption of water should be rationalized even more.
a05. … your own water usage makes very little difference considering the total amount of water used in general.
a06. … there are behaviours to save as much water as possible.
a07. … you consider saving water to be important. (*)
a08. … if you found a broken water pipe in the street and water was gushing out, you would call the police to resolve the matter.
a09. … you believe that having a shower rather than a bath has an influence on the environment.
a10. … you believe that campaigns aimed at saving water are very necessary.
a11. … you teach that saving water benefits the environment.
a12. … you believe that there is social awareness about the need to save water.
a13. … you are concerned about wasting water. (*)
a14. … you believe that there are sufficient water reserves to use as much as we want.
a15. … you are aware of environmental problems. (*)
a16. … you believe that water is so essential that all means must be made available to ensure we have as much as is needed.
a17. … using as much water as you like is a problem.
a18. … you make the most of water.
a19. … you believe it is very difficult to do anything for the environment.
a20. … you think that the higher the quality of life, the higher the water consumption.
a21. … you believe that, because more water is lost through broken pipes than domestic use, the focus should be on fixing these breakages.
a22. … you think that basic education should foster proenvironmental behaviours. (*)
a23. … you think that it is the responsibility of each and every one of us to be careful with what we use (energy, water, non-recyclable materials). (*)
a24. … you believe that fines should be imposed for excessive water consumption.
a25. … you believe that soon there will be desalination plants, so it is not important to save water.
a26. … you believe in buying/having water-saving domestic appliances. (*)

Appendix B

Results of the principal components analysis

KMO Measure: 0.772
Determinant value: 0.233
Barlett test: Chi = 716.407 ($p < .001$)
Number of components extracted: 2
Total explained variance 65.079%
Rotation used: Varimax in accordance with the Kaiser criterion
Correlation between components:

	Components		MSA	Correlations				Cronbach's Alpha
Items	**1**	**2**		**a07**	**a13**	**a15**	**a22**	**a23**
a07	.792	.219	.766					.738
a13	.812	.109	.760	.515				
a15	.766	.165	.804	.479	.441			
a22	.188	.797	.756	.319	.237	.263		.727
a23	.207	.797	.752	.307	.279	.267	.547	
a26	.099	.764	.813	.248	.180	.232	.421	.438
% Var. Explained	45.515	19.564						

Appendix C

Variances-covariances used in confirmatory analysis (n = 500)

Items	**a07**	**a13**	**a15**	**a22**	**a23**
a07	1.359				
a13	.704	1.415			
a15	.651	.566	1.392		
a22	.300	.196	.292	.871	
a23	.294	.214	.284	.455	.803

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The role of personal involvement, credibility and efficacy of conduct in reported water conservation behaviour

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ABSTRACT

We analyse the influence of personal involvement, credibility given to water scarcity, and the perceived efficacy of conducts on reported water conservation behaviour (RWCB). Similarly, we analyse differences in this reported behaviour using age, sex and habitat. Using a Spain-wide survey ($n = 637$) conducted in 20 cities experiencing or not water scarcity. Data collection was undertaken using Web and paper-surveys. Instruments were validated, and measure invariance was tested using habitats. R^2 is small but the contribution of each variable resulted statistically significant, except for the credibility given to water scarcity.

Discriminant analysis groups 99.4% into two clusters with different RWCB. Credibility of facts and risks do not result significant in the creation of these groups. As involvement is significant and credibility of information is not, we conclude that informative aspects do not help to generate greater RWCB. We suggest possible explanations of the findings, and point out implications for further research.

1. Introduction

Research literature and public institutions recognise the need for adopting personal behaviours that promote water conservation and improve its uses (Hurlimann, Dolnicar, & Meyer, 2009; Jorgensen, Graymore, & O'Toole, 2009). IPCC (2008) studies shows that, despite time has passed it is still possible to mitigate (not avoid) problems concerning the future availability of water. In order to accomplish this objective, it is a requirement that there is both a clear political willingness and a strategic change in sensitive sectors (e.g. tourism, insurance, health, industry, agriculture) as well as a change in citizen behaviour. So that people actually adopt water conservation behaviours, it seems coherent that first they recognise the problem (both present and future). These behaviours should generate personal involvement that translates into believing that individual behaviours are indeed effective.

Throughout Spain, over 10 million people suffered daily water restrictions during some of years of the 1990s decade. During this period, the political solution was to increase water supply (if there was a scarcity problem, hydric resources would be transported from wherever they were available), ignoring demand culture and behaviour (Estevan & Viñuales, 2000).

The role of individuals (as demand) is a fundamental issue, as pointed out by the UN in 2005 when it launched the Decade of Education for Sustainable Development. This program considered essential that people should be active participants in the promotion and adoption of sustainable behaviours. This need for change has also been discussed in academic literature. As an example, affirmations such as '*…consumers can behave in a more environmentally friendly way by changing the patterns…*' (Haron, Paim, & Yahaya, 2005, p.426) have evolved towards statements such as '*…however, while there is little doubt that consumers must acknowledge that they have an obligation to conserve water…*' (Stewart, 2012, p.11). This is not a minor shift as it passes from a 'can do' approach to 'must do' or obligation.

This article presents the results of a study about the role that involvement, credibility and perceived efficacy play in reported water conservation behaviours, as well as the detection of groups of individuals related to these behaviours. We first portray the importance of the aforementioned variables and propose a model to be contrasted. Second, we describe the method utilised, the sampling techniques, the instruments and the data collection process. Third, we present the statistical results and, finally, we discuss findings and their implications.

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2. Literature background and research model

2.1. Credibility of water problems

Although climate change is one of the greatest recent challenges for humanity, an important part of the Western population is still sceptical about its reality and impact (Islam, Barnes, & Toma, 2013). This scepticism negatively affects the adoption of sustainable behaviours because citizens do not believe that many of the published claims and the severity of potential impacts announced are indeed true (Poortinga, Spence, Whitmarsh, Capstick, & Pidgeon, 2011). Of all dimensions of credibility (Trust, Authenticity, Transparency, Listening, Responsiveness, and Affirmation), trust in the truthfulness of information is considered as the most important one (Blackshaw, 2008).

Rieh (2010) defined credibility as '*people's assessment of whether information is trustworthy based on their own expertise and knowledge*' (p.1338), and considered that it depends on the source, the message, the medium and on the receiver. Concentrating on the message, White et al. (2010) stated that its credibility implies technical/scientific evidence, and the existence of strong arguments. In this direction, there is substantial literature that affirms that 'credible information' is perceived as true (Eisend, 2006; Mehrabi, Ali Abu Hassan, & Shahkat, 2009), and that credibility increases if it includes convincing data or details (Slater & Rouner, 1996). For instance, reality and truthfulness are a requirement for the development of credibility. Furthermore, Lowe et al. (2006) found that screening the film 'The Day after Tomorrow' did generate short-term changes in the assessment of climate change, but the inability of the audience to distinguish what was real and what was fictional reduced the credibility of the message.

Credibility (as perceived truthfulness) of water-related problems may work differently when taking into account current facts, or when discussing risks or likely future impacts. Affirmations on the current status are derived from objective, quantifiable, concise and transparent indicators that have 'scientific and technical credibility'. But the public can be uncertain about these affirmations either because they are relatively unknown (e.g.: water footprint, WEI-Water Exploitation Index, etc.) or because they are unexpected and even beyond belief. It is typical that questions may arise regarding the fact that 15,000 l of water are necessary for the production of just 1 kg of beef (Water Footprint Network, 2013), or when it is reported that a high percentage of the water injected into urban distribution systems does not reach households (due to losses in the distribution system).

As risks are an approximate estimation of what could happen in different scenarios, their credibility has a rather subjective component. When evaluating potential future events (risks), individuals might not only doubt the veracity of future negative impacts, but their interpretation is also (a) strongly influenced by culture (Dake, 1992), (b) conditioned by the relativity of the terms used[3] and (c) subject to the potential contradiction between what estimates indicate (long-term situation) and to the daily experience of people (short-term situation).[4]

2.2. Personal involvement

Credibility refers to the evaluation of information that has been received, and it can impact the way it is processed. If the information is not true, there is no impact or inhibition; but if the credibility is high, the information positively influences involvement (Gotlieb & Sarel, 1991). Literature has approached involvement from two different perspectives. The first is Zaichkowsky's (1985) who, in one of the most cited definitions, considered involvement as the degree of interest an individual shows towards concrete results of one or more external stimuli. The second approach considers involvement as the identification of a subject with an object or phenomenon and is given by a cognitive connection between the self and the object (Kyle, Absher, Norman, Hammitt, & Jodice, 2007) and by an emotional link (Bloch, 1982).

Moreover, two types of personal involvement may be differentiated: (a) *situational involvement*, where individuals show a transient involvement normally associated with very specific situations, and (b) *enduring involvement*, where there is a long-term and ongoing evaluation of the importance, identification or concern (Olsen, 2007). Involvement with the problem of water is an '*enduring involvement*' because it can be independent of use applications and it can also generate new habits.

In the context of sustainability, involvement has been studied, to its motivational force, in purchase decision processes and in the adoption of sustainable behaviours. Consumer's involvement generates greater motivation for increasing cognitive effort when searching for information, evaluating products, or when pursuing a reduction of dissonance (Hoyer & MacInnis, 2007). In addition, people involved in sustainability are more prone to do actions that, in many cases, go against their short-term interests. This occurs because '*environmentally friendly*' products are more expensive, harder to find, they require greater cognitive effort and even entail lifestyle changes. Involvement can also lead to the development of greater concern for a community's welfare, to the reduction of excessive consumption and even to boycotting unsustainable companies through organised actions (Friedman, 2002).

The involvement of individuals becomes necessary for attaining very different sustainability-related objectives. It is necessary to make users participate in the development of sustainable technologies through the evaluation of their usage behaviours (Heiskanen, Kasanen, & Timonen, 2005). Spaargaren and Oosterveer (2010) affirmed that it is fundamental that, in a globalised context, individuals behave like active change agents. Involvement is also necessary for conducting respectful consumption choices with the environment or for reducing unnecessary consumptions modifying them until responsible behaviours are achieved (Peattie & Peattie, 2009). In the context of water consumption, Gregory and Di Leo (2003) argued that different degrees of involvement can affect daily actions as highly involved people change their behaviour reducing their consumption (when showering, using washing machines, or irrigating). These authors consider that it is relevant and beneficial to measure the impact of involvement in saving behaviours (conservation).

2.3. Effectiveness of water conservation behaviours

The aim of all integral water conservation programs is to promote the adoption of different responsible citizen behaviours such as the development of savings habits, using of technologies for efficient water consumption, or monitoring and repairing water facilities (e.g. EPA, 2002; Estevan, 2004; Montaño, 2002). All these objectives cannot be achieved with one single action but with the combination of responsible activities such as household cleaning, personal hygiene, food preparation, gardening, leisure or maintenance of pipelines and water facilities.

We maintain that the efficacy of a conservation conduct or practice is the ability to reduce water consumption. It can be differentiated between objective and perceived efficacy (Ellen,

[3] The term 'scarcity' is a relative concept (Baumgärtner, Becker, Faber, & Manstetten, 2006; Noemdoe, Jonker, & Swatuk, 2006).

[4] As an example, this document was written in March 2013, the rainiest month in Spain since 1947, year when the rainfall records commenced.

Wiener, & Cobb-Walgren, 1991). Objective efficacy means that each practice/behaviour allows reaching a measurable and objective level of savings/water conservation. In turn, perceived efficacy refers to the fact that people's perception towards the efficacy of each action can differ greatly from the real or technical one.

Table 1 illustrates the main water conservation actions and the objective/technical results of their implementation. The actions have been grouped into two sets. The first set refers to actions carried out by an individual in the moment of use, and the second set groups the actions aimed at preventing future losses or inefficiencies in consumption, mainly as tasks performed on components of water distribution (Elizondo & Lofthouse, 2010).

It is obvious that some actions contribute technically more than others (greater efficacy) to water conservation. However, the perception of the degree to which each conservation behaviour/practice helps to achieve that goal might not coincide with each technical criterion, as shown by various conservation programs (e.g. SCWD, 2008). This also happens at a more general level. Although it is a common belief that individuals should develop behaviours that help mitigate climate change and its derived problems, GfK Roper Consulting (2011) shows that between 17% and 30% of Americans do not believe that their personal actions can indeed contribute to solving several general problems (water pollution, solid waste quantity, greenhouse effect, etc.). In fact, each individual has their own perception of what is real, and therefore a personal assessment of his/her conducts and their efficacy.

The interest of a person involved in water conservation can be demonstrated from both emotional ('feeling-related') and perceptual ('value-related') viewpoints. The latter, centered on value (object or behaviour), is the perspective that helps generate a perception of the effectiveness of various conservation behaviours. This perception is understood as a cognitive aspect related to the selection, organisation and interpretation of the environment (Armstrong & Overton, 1971; Robbins, Judge, Millet, & Jones, 2010). Similarly, the credibility of information on the impact of water conservation plays a direct role: the lower the credibility given to the impact of the actions outlined in Table 1, the lower the impact on the efficacy assigned to them.

Table 1
Water technical saving per action.

Actions	Estimated saving
Conducted directly during consumption	
Close the tap for personal hygiene	10–20 l[a]/each time
Showering instead of taking a bath	10–20 l/min
Flush only when it is necessary	10 l/flush
Use a dishwasher/washing machine only when full	25 l/wash
Washing up with the tap open	50 l/wash
Fill a private swimming pool	20,000–40,000 l
Thaw food in the refrigerator and not under water	10–20 l/unfreeze
Avoid using a toilet as a paper basket	55 l/day
Wash a car at a car wash and not with a hose	100–500 l/wash
Conducted on premises that require an installation	
Garden watering:	
Drip watering and not with a hose	56% each watering
Spray watering and not with a hose	30% each watering
Garden without grass and with native flora	80% each watering
Watering at night and not at day	30% each watering (due to evaporation)
Repair leaking taps and toilets:	
Dripping tap	1 l/h–~30 l/day
Leaking toilet	20–100 l/day
Recover 'grey water'	~35% in families of 4 people
Use dual flush in toilet cisterns	~7 l/use
Use flow restrictors on water taps	50–60%/day
Install rainwater tanks	Raining of 10 l/m^2 → Reservoir of 900 l.

[a] Measures in litres (l). One litre is equal to 0.26 U.S. gallons.
Source: Information from various municipal companies of water management and distribution for residential use.

2.4. Water conservation behaviour

Atkins (2003) defines water conservation as 'those activities designed to reduce the demand for water, improve the efficiency of its use, and reduce losses and waste'. Similarly, the U.S. Water Resources Council defines water conservation as the activities designed to (1) reduce water demand, (2) improve use efficiency and reduce losses and water waste, and (3) improve land management practices for water conservation (quoted by Alliance for Water Efficiency, 2010). Other definitions specify similar approaches, such as Mohsen's (2007) where, for the agricultural sector, he considered water conservation as the activities of water recycling, improvement of irrigation techniques and reduction of water losses. However, all these overlook the importance of being aware of their reach and the control individuals should perform on their actions.

We understand that these definitions are incomplete, as they only take into account the output of the behavioural process: conduct. This is the reason why in this article we define 'water conservation behaviour' as:

(1) Take personal consciousness of the ways to save water (2) understand what motivates present water consumption, (3) have a personal motivation for carrying out a correct use/consumption, (4) having a saving behaviour in daily actions and (5) take personal control of water use. Thus, while taking into account the specific actions of individual conservation behaviour, we compare conservation behaviour with a decision process. Its basic steps are problem recognition, decision-making and post-consumption evaluation.

In all this process, cognitive aspects play a key role, mainly 'knowledge', 'awareness' and 'personal control'. On the one hand, as indicated by Frick, Kaiser, and Wilson (2004) and Kaiser and Fuhrer (2003) knowledge and problem awareness are key aspects of environmental behaviour. Thus, for the specific case of water conservation, in real projects it has been found that providing information on water conservation methods helps individuals have a more efficient use (Sims, 2007). On the other hand, personal control positively affects environmentally responsible behaviour (Allen & Ferrand, 1999), implying an interest in maintaining a long-term commitment to conservation (Muraven & Baumeister, 2000). Our definition is consistent with Hungerford and Volk (1990) 'environmentally responsible citizen' and with the 'responsible environmental behaviour' model proposed by Hines, Hungerford, and Tomera (1987).

2.5. Do involvement, credibility and perceived efficacy affect individual water conservation behaviour?

Involvement affects decision-making process because it generates arousal and interest to react to certain situations (Mitchell, 1979). In addition, the most involved individuals are those who feel more motivated to make more active decision processes (Peter & Olson, 2002), whereas low involvement individuals tend to make repetitive decisions and do not activate conservation behaviours that force them to change habits and decisions. In the context of water consumption, Gregory and Di Leo (2003) argued that different degrees of involvement can affect daily actions as highly involved people change their behaviour reducing their consumption (when

showering, using washing machines, or irrigating). These authors consider that it is relevant and beneficial to measure the impact of involvement in saving behaviours (conservation).

Literature has addressed the credibility from the perspective of what should institutions do to make credible the water conservation programs. For example, in economic field, credible water management plans are an element that facilitate the results of water conservation programs (Willis, 2011). Related to environmental information, Vanderheiden (2010) affirms that it must be credible so that consumers can make choices whilst feeling informed. The same author claims that the measures related to the hydric footprint should be precise and believable.

Credibility must also reach public at large (and not just technicians and politicians). Individuals must perceive as true information on (a) the impact of uses given to water, (b) the high pressure that exists on the available resources and (c) the problems that address water conservation programs. This is critical since it is coherent to suggest that credibility is a construct associated with behavioural intention.

When people perceive that their actions contribute to solving a specific environmental problem they are more likely to engage in such conducts. Kim and Choi (2005) and Verhoef (2005) argued that consumer perceived efficacy has a direct and positive influence on the purchase behaviour of 'green products'. Similarly, Gardner and Stern (2009) suggested that the perceived efficacy of behaviours influence energy conservation behaviours and that, in most cases, they do not coincide with the technical efficacy. When people are faced with a long list of energy conservation tips, they feel overwhelmed and only conduct the one or two actions they perceive as the most effective. This can be counterproductive because although individuals perceive that their behaviours are effective and may even be satisfied with their conduct, in many cases their chosen actions have a very limited technical impact.

Regarding water conservation, results are contradictory. Whereas Chipp (2007) did not find a direct relationship between perceived efficacy and behaviour, ENRC's (2005) study showed that behaviour depends on the perception individuals have towards their own water use. Theodori and Fox (2009) also noted that such relationship is direct because individuals only perform behaviours they think are effective for the water conservation. From another perspective, these authors affirmed that when individuals are asked about the reasons that prevent them from saving water, only 10.2% reply that the reason lies in not knowing whether the effort to be done will actually be effective.

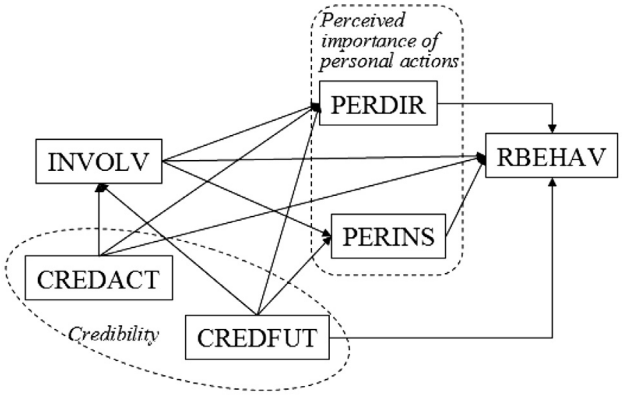
2.6. Aims of the work

The aim of this study is twofold. First, we shall analyse if the variables of interest (involvement, perceived credibility of water-related problems and efficacy given to the individual behaviours aimed at saving water) are predictors of responsible water conservation behaviour (in a consumer residential context). Fig. 1 illustrates the model to be tested. Second, we shall investigate if there are differences in behaviours based on the profiles developed from these explanatory variables.

3. Method

3.1. Country of study

Spain is a developed country with a history of significant water imbalances (Bosque Maurel, 2008). In 2009, WEI was 32% compared with the European average of 12% (EEA, 2009), with WEI reaching 164% in some southern areas. This demonstrates the existence of substantial pressure on the demand of the available resources,



CREDACT = Credibility of current phenomena; CREDFUT = Credibility of risks; INVOL= Involvement; PERDIR: Perception of efficacy of actions conducted during consumption; PERINS = Perceptions of the efficacy of actions conducted in the water installations; RBEHAV = Reported water conservation behaviour.

Fig. 1. Model of structural relations.

which is among the world's highest (Esty et al., 2005). It is a fact that in recent years there has been an improved use of urban water supplies. The average consumption is 144 LCD (INE, 2012) and in large cities such as Madrid and Barcelona consumptions are of LCD 131 and 110 respectively. These figures are well below the consumption of other cities such as Lisbon (LCD 159), Stockholm (LCD 178) or Calgary (LCD 237). However, this lower consumption is still high when considering that Spain is the EU country with the lowest water resources per capita (Garrido & Llamas, 2009).

3.2. Procedure

The target population is residents aged 18 and above; the sampling framework is comprised by people with Internet access (for conducting the Web survey) and senior/older people that attend educational centres. We used a sample design that combines viral dissemination in social networks (Tuenti, Facebook, Google+, LinkedIn and others) with e-mailings to addresses obtained in forums, targeted at students, faculty and school staff.

Fieldwork was conducted during November 2012, registering a total of 839 responses. Three biases were controlled:

1. Survey duplication fraud. We controlled the IP (logical identifier of the computer interface) eliminating any duplicates. Although it is possible that several people could answer the survey from the same computer without having the intention to cheat, the elimination of duplicate IPs ruled out the possibility of obtaining repeated questionnaires from the same subject.
2. Inconsistency bias in the answers, eliminating questionnaires with a fixed pattern of replies (answering on the same scale all '1's or all '4's, as well as replies with a high random pattern).
3. Time bias. We removed all subjects that completed the questionnaire in less than 10 min, which is the minimum estimated time in the pre-test for adequately completing the survey.

Additionally, we eliminated all subjects under 18 and those with missing responses (this occurred only in the paper survey, as it was not possible to have missing values in the Web survey). The final sample ($n = 637$) is comprised by a large urban profile (from 45 different towns, from which 15 show more than 10 responses each one), young adults (53.4% with an age below 30) and with a slight predominance of women (59.3% of total). Likewise, we have also differentiated areas within Spain with vs. without water shortages,

Table 2
Sample profile ($n = 637$).

Criteria		N (%)
Sex:	Male	259 (40.7)
	Female	378 (59.3)
Age:	18–29	340 (53.4)
	30–47	169 (26.5)
	48 or more	128 (20.1)
Area:	Without shortages	217 (34.1)
	With shortages	420 (65.9)

highlighting a greater presence of answers from this second area. Table 2 shows the profile of the final sample.

The questionnaire was pre-tested in two waves with 10 subjects each one, including youngsters and seniors older than 60, with different levels of education. For data collection we used both a Web survey and a administered paper survey. The combined use of both methods helps to promote honesty of responses – for the Web surveys (Babbie, 2008) – and to reach non-Internet users. Throughout the process we maintained legal and ethical reservations concerning personal data (ID card numbers and contact addresses for identity validation of the winner of the Tablet computer draw).

3.3. Measures

3.3.1. Involvement

We used Zaichkowsky's (1994) scale, adding the items suggested by Gregory and Di Leo (2003) as well as those suggested in the pre-test. We used a reflective semantic differential scale. This scale refers to water saving and conservation and contains 10 items measured on a 1–7 range.

3.3.2. Credibility

There are different information credibility scales in marketing, psychology and sociology, but none of these directly or indirectly relate to water. We therefore designed a scale following the suggestions of Gupta and Wilemon (1988) and Jain and Posavac (1999) for the construction of a 'credibility of water information' indicator. The tasks undertaken are as follows:

1. Creation a list of 14 items containing objective facts (e.g. water required to manufacture a product) and future risks (e.g. future water shortages due to overuse of hydric resources).
2. Presentation of the list to two groups of university students and to another group of people older than 60. Collection of their opinion about the truth assigned to each statement and about the relevance of the content of each item (Rieh & Danielson, 2007).
3. Deletion of non-discriminating items.
4. Development of a list of eight items (four for each type of veracity) based on that the phenomenon should be known and objectively important with regards to water problems. The final items show facts or estimates made in the scientific field that deals with water footprints, water shortages in towns, losses due to inefficient distribution and the lack of hydric resources. This scale is therefore of a formative nature (Diamantopoulos, Riefler, & Roth, 2008), as it emphasises the four most important issues of water use and availability problems. The response range is from 1 = totally false to 6 = totally true.

The measure used was the harmonic mean of the item responses, as it mitigates the influence of high values and increases the influence of the low ones, which reduces the acquiescence bias. In the pre-test it was inferred that the statistical distribution would be biased towards the higher values, due to the existing problems in Spain about the availability of water and the fact that it has been used on many occasions as a political weapon.

Perception of the efficacy of different water conservation behaviours. Items by the Ministry for the Environment (2009) were used as they are specifically focused on actions related to responsible water use or conservation behaviour (awareness, impact, current, future, and ability). We considered two types of behaviour: (a) related to personal/family use and (b) focused on reducing potential losses occurring in infrastructure – irrigation and distribution. We used a 6-point Likert scale (1 = nothing, 6 = total).

3.3.3. Reported water conservation behaviour

There are various proposals to measure water conservation behaviour measurement (e.g. Dolnicar, Hurlimann, & Grun, 2012). However, as our definition is different to these and other authors, we developed five items that directly express the five basic selected activities. We use a Likert-type scale ranging from 1 (strongly disagree) to 6 (totally agree) avoiding midpoint (Poulton, 1989) because conservation is not a topic that leave people indifferent and obliges them to take action (towards a saving or non-saving behaviour).

An initial pool of 15 items was developed from literature. This pool was tested with a sample of $n = 150$. Using Student's t-test 8 items were removed because the differences between quartiles 1 and 3 were not significant. A final pool of seven items was included in the questionnaire. Then two items were removed during analysis due to reliability problems. A final set of five items has been used as seen in Appendix A. The reliability of reported water conservation behaviour and its goodness of fit can be seen in the results section (4.1.1 and Table 3).

4. Results

4.1. Objective 1 results

Before conducting the analysis, all variables were transformed by means of their min–max normalisation using the formula $s_{norm} = (\text{value} - \text{min})/(\text{max} - \text{min})$ with the objective of avoiding

Table 3
Reliability and validities of the scales used.

Construct	α	CR	AVE	Minimum CFL	Discriminant validity			
					Factor combinations	r	SE	IC
INVOLV (F1)	0.90	0.91	0.71	0.74	F1–F2	0.38	0.04	0.31–0.46
PERDIR (F2)	0.84	0.84	0.57	0.72	F1–F3	0.42	0.04	0.35–0.50
PERINS (F3)	0.83	0.84	0.56	0.68	F1–F4	0.38	0.04	0.30–0.46
RBEHAV (F4)	0.82	0.83	0.49	0.67	F2–F3	0.72	0.03	0.67–0.78
					F2–F4	0.33	0.04	0.25–0.42
					F3–F4	0.36	0.04	0.27–0.44

CR, Composite Reliability; AVE, Average Variance Extracted; CFL, Confirmatory Factor Loading; r, Pearson Correlation Coefficient; SE, Standard Error; CI, Confidence Interval.

different ranges in the variables. This normalisation allows converting numeric values to a 0–1 range (Hsu & Chen, 2007).

4.1.1. Measurement model

We then applied a covariance structures analysis using EQS 6.1 to the variables that have a reflective nature (all the variables in the model except those related to credibility due to their formative nature). Appendix B shows the descriptive statistics and the variance–covariance matrix. The overall model presents a good fit ($\chi^2 = 379.79$; df = 113; $p = 0.00$; Normed $\chi^2 = 3.36$; BBNFI = 0.93; CFI = 0.95) with acceptable error indexes (SRMR = 0.04; RMSEA = 0.06) for the sample size used ($n = 637$). As the Chi-square test is sensitive to the sample size, we offer the normed Chi-square as it removes the effect of the sample size by dividing the statistic by the degrees of freedom of the model. The CFI indicators (Comparative Fit Index) and BBNFI (Bentler–Bonett Normed Fit Index) are greater than 0.90, whereas the error indicators SRMR (Standardised Root Mean-Square Residual) and RMSEA (Root Mean-Square Error of Approximation) are within the values recommended by literature (Brown & Cudeck, 1993). The model complies with the assumption of multivariate normality as Mardia's $\kappa = 0.46 < 1.96$, therefore the normality of the constructs considered may not be rejected.

The reliabilities are high, with a ρ coefficient of 0.92 and Cronbach's αs and Composite Reliability greater than 0.80 (see Table 3). Similarly, all constructs show convergent, construct and discriminant validity. Convergent validity was tested through confirmatory factor loadings (CFL) that must be significant and higher than 0.70, and with the Average Variance Extracted that must be greater than 0.5 (Fornell & Larcker, 1981; Hair, Black, Babin, & Anderson, 2009; Steenkamp & Van Trijp, 1991). Our results show that these conditions are met, except the AVE value related to behaviour that resulted 0.49, however very close to 0.50. Discriminant validity between constructs was calculated with the confidence interval method (CI), which should not contain the correlation value equal to one. We therefore conclude that the reflective variables have construct validity.

4.1.2. Measurement invariance

Corral-Verdugo (2002) affirmed that water scarcity is an important situational factor that affects water conservation efforts. The very different situations of water availability amongst areas without water shortages (northern and central Spain) and the dry south (Mediterranean area) (Bosque Maurel, 2008) represents a severe risk of inadequacy of the previous model. Therefore, the invariance assumption of the model is checked given the risk that the instruments used might not work the same way.

Results (Table 4) confirm that the two solutions have form and factor loadings invariance. The increase of the Chi-square is significant in the factor loadings invariance case, but the Chi-square depends on the sample size used. In order to eliminate this problem, we offer the normed Chi-squares, which are within the literature-recommended values (Carmines & McIver, 1981). In addition, there is multivariate normality (κ for zone without shortages = 0.33; κ for zone with shortages = 0.45), high reliabilities and convergent and discriminant validities for all the measures introduced.

4.1.3. Structural relations

Table 5 shows the results for the different linear regressions. We previously studied different non-linear relationships between variables, finding that is it the linear one that can explain a greater percentage of the total variance. We offer Cohen's D (for effect size measurement), the adjusted coefficient of determination (R^2 overestimates the proportion of variance explained by referring to the sample data and not to the population) (Leach & Henson, 2007), the regression coefficients and the F and t values.

For involvement, its two predictors are significant, although 'Credibility of actual facts' has a relative unimportance close to zero ($\beta = 0.08$; $t = 2.01$; $p < 0.05$) and a very small effect size. It is the 'Credibility of future risks' ($\beta = 0.27$; $t = 6.53$; $p < 0.01$) that is more important in the formation of the involvement, as its effect size is between moderate and large ($D = 0.52$).

Concerning construct 'Perception of the behaviour efficacy', we observe that INVOLV is the most important variable as it shows high effect sizes ($D_{\text{PERDIR}} = 0.63$ and $D_{\text{PERINS}} = 0.68$). This occurs both within the context of the direct actions of individuals (PERDIR) and within water distribution facilities (PERINS). Thus, in the case of the PERDIR, variable INVOLV presents a coefficient $\beta = 0.30$ ($t = 7.88$; $p < 0.01$) and in the case of PERINS the coefficient results almost equal ($\beta = 0.33$; $t = 8.58$; $p < 0.01$). The second variable in importance is the 'Credibility of future risks' as Cohen Ds are moderate ($D_{\text{PERDIR}} = 0.35$ and $D_{\text{PERINS}} = 0.33$) with a regression coefficient for PERDIR of $\beta = 0.18$ ($t = 4.45$; $p < 0.01$). 'Credibility of current facts' is not significant (equal to zero) in both cases.

INVOLV and PERINS variables are the ones that explain the reported water conservation behaviour (RBEHAV). INVOLV is the variable that has, by far, greater relative weight ($\beta = 0.27$; $t = 6.57$; $p < 0.01$), with a moderate Cohen $D_{\text{INVOLV}} = 0.52$, followed by a $D_{\text{PERINS}} = 0.24$ ($\beta = 0.14$; $t = 3.03$; $p < 0.01$).

4.2. Objective 2 results

Our objective is to find out whether there are differences in reported behaviour based on the profiles developed from the previous explanatory variables. We applied a discriminant analysis where the first step was to form groups based on the predictor variables. The second step contrasts the formed groups and seeks to maximize the percentage of cases effectively assigned to its expected group. Discriminant analysis can be used to check on a n-dimensional chart if the groups to which observations belong are, and to predict which group an observation will belong to. Discriminant analysis offers in its confusion matrix the proportion of well-classified individuals.

Table 4
Test for measurement invariance.

	χ^2	df	$\Delta\chi^2$	Δdf	χ^2_{normed}	p	RMSEA	SRMR	CFI	NNFI
Solution for independent groups										
Wet	247.58	113			2.19	0.00	0.07	0.06	0.92	0.91
Dry	274.86	113			2.43	0.00	0.06	0.05	0.96	0.95
Measurement Invariance: Equals …										
Forms	522.43	226			2.31	0.00	0.06	0.06	0.95	0.94
Factor loadings	555.06	243	32.64	17	1.92	0.01	0.06	0.06	0.94	0.94

Note: $n = 637$. RMSEA, Root Mean-Square Error of Approximation; SRMR, Standardised Root Mean-Square Residual, CFI, Comparative Fit Index; NNFI (Bentler–Bonnet non-normed fit index) $^{**}p < 0.01$.

Table 5
Results of the regressions for the variables of interest.

Depend. Var.	Independ. Var.	r	SE	D Cohen	R^2 adjusted	F	β	t
INVOLV	CREDACT	0.315	0.15	0.16	0.10	34.89**	0.08	2.01*
	CREDFUT			0.52			0.27	6.53**
PERDIR	INVOLV	0.404	0.12	0.63	0.16	41.11**	0.30	7.88**
	CREDACT			0.03			0.01	0.36
	CREDFUT			0.35			0.18	4.45**
PERINS	INVOLV	0.426	0.12	0.68	0.18	46.81**	0.33	8.58**
	CREDACT			0.09			0.04	1.10
	CREDFUT			0.33			0.17	4.14**
RBEHAV	INVOLV	0.405	0.17	0.52	0.16	24.73**	0.27	6.57**
	CREDACT			0.18			−0.09	0.53
	CREDFUT			0.04			0.02	−2.22*
	PERDIR			0.16			0.09	2.01*
	PERINS			0.24			0.14	3.03**

**$p < 0.01$; *$0.01 < p \leq 0.05$.

4.2.1. Discriminant analysis

We have conducted several cluster analysis with the k-means method considering two–four groups. The best result is obtained with two groups whose population covariance matrices are different (Box $M = 282.34$; $p = 0.00$). We chose the stepwise method as it allows the selection of variables as they are introduced.

The discriminant function shows a canonical correlation of 0.82 and Wilks' lambda is 0.34 ($\chi^2 = 690.40$; do $= 5$; $p = 0.00$). This implies that the function obtained is significant and that the discriminating power is high, grouping correctly 99.4% of subjects in their original groups. Table 6 shows the results revealing that the variables related to credibility are eliminated because they are not discriminant. Fisher coefficients can be used to assign a subject to a group where he/she has the higher score (Hair et al., 2009) therefore the discriminant equations are:

$$\text{RBEHAV} = 3.09\text{INVOLV} + 3.15\text{PERDIR} + 3.19\text{PERINS} - 91.78$$
$$\text{RBEHAV} = 4.00\text{INVOLV} + 3.56\text{PERDIR} + 3.96\text{PERINS} - 136.89$$

4.2.2. Typologies of reported water conservationists

Once identified the two groups that best discriminate the predictor variables, we shall describe the profile of each group from two perspectives: sociodemographic and according to specific situations related to reported water conservation behaviour (RBEHAV). Table 7 shows how there is no difference in the average age, but there is a difference for sex and area of origin. Therefore, the most involved group that gives greater importance to conservation behaviour (Group 2) is comprised of citizens living in the water-scarce area of Spain.

Group 1 consists of people with a greater male than female proportion, who score lower than Group 2 in all reported behavioural variables (RBEHAV) and live mainly from the area without shortages. The variable 'frequently tries to use water correctly' offers the highest scores in both groups, whereas the variable corresponding to the control of the amount spent is the one with the lowest score. For all variables, differences are significantly high, revealing that Group 2, the most numerous of the sample (70.8%) is perceived as more responsible and water saving.

5. Discussion

Water conservation as a sustainable behaviour is one of the strategies for mitigation of the problem of current levels consumption and future availability of this resource. This will become one of the biggest problems of climate change (Brown & Flavin, 1999). Literature has previously affirmed that water conservation can not only be achieved from a supply management perspective, but also it needs to be addressed from a demand viewpoint in order to encourage citizens to engage in a more rational consumption (Valencia-Sáiz, Arias-Maldonado, & Vázquez-García, 2010). Rational conservation behaviour derives from that facts that individuals should be aware that excessive water consumption and scarcity does indeed exist, they should believe that it is a real problem (present or future), they should involve in the benefits that it reports at personal and community levels and should adopt the most efficient conservation decisions. Our proposal introduces these three variables (credibility of the problem, perceived efficacy of behaviours and personal involvement) that have not been addressed previously in water conservation behaviour literature, although they have been considered in other contexts (behaviour towards climate change, waste separation behaviour, purchase of 'green products').

Results show that, although the measurement model is valid, reliable and invariant with regards to the differentiation zone (shortage vs. no shortage), the structural model provides a moderate level of explanation of water conservation behaviour. However, the explanatory power of the model is very similar to other studies that analyse this type of behaviour. For example, the work of Martimportugués, Canto, García, and Hidalgo (2002), that considered attitudes and social context as predictor variables, obtained an $R^2 = 0.16$. Using time orientations as predictors of conservation behaviour, Corral-Verdugo, Fraijo-Sing, and Pinheiro (2006) obtained an $R^2 = 0.14$. Finally, as a third example, Frick et al. (2004)

Table 6
Results of the discriminant analysis.

Variables	Group 1 ($n = 186$)		Group 2 ($n = 450$)		λ Wilks	F	Discri. Coeff.	Fisher coefficients	
	Mean	SD	Mean	SD				Group 1	Group 2
INVOLV	19.52	3.56	25.46	2.23	0.50	644.53**	0.79	3.09	4.00
PERDIR	19.59	3.03	22.66	1.63	0.70	272.80**	0.28	3.15	3.56
PERINS	18.84	2.97	22.62	1.70	0.61	406.17**	0.54	3.19	3.96
Constant								−91.79	−136.89

Fisher coefficients, standardised Fisher coefficients of the classification function. **$p < 0.01$.

Table 7
Characteristics of each reported water conservationist group.

Variables	Group 1 ($n = 186$)		Group 2 ($n = 450$)		t (Z)
	Mean	SD	Mean	SD	
Average age	32.75	14.87	33.65	13.16	Not significant
Sex: Female	51.10%		62.74%		Group 1: 2.50**[a]
(Sample mean = 0.593)					Group 2: 1.64[a]
Habitat: Dry area	59.67%		68.51%		Group 1: 2.30**[a]
(Sample mean = 0.659)					Group 2: 0.94[a]
Frequently tries to use water correctly.	4.30	1.07	5.00	0.97	7.83**[b]
Aware of the ways to save.	4.25	1.15	4.66	1.08	4.22**[b]
Controls the amount of water used.	3.55	1.22	4.16	1.30	5.38**[b]
Knows the causes of his/her levels of consumption.	4.11	1.08	4.56	1.08	4.79**[b]
Thinks he/she has a correct behaviour.	4.11	0.98	4.76	1.01	7.60**[b]

[a] Z-test for difference between a mean and a specific value (Sachs, 1978).
[b] U Mann–Whitney non-parametric test. **$p < 0.01$.

analysed the influence of three types conservation behaviour knowledge, obtaining an $R^2 = 0.15$. However, the R^2, the size of the effect is significantly different to zero, therefore cognitive aspects have a moderate influence.

However, the significance of relations is a more interesting result as their absence indicates the lack of relationship between the variables. Therefore, contrary to what was expected, the credibility of the problem regarding the existence of objective facts does not influence conservation behaviour. This may occur because conservation behaviour might be a set of conducts where an individual thinks or acts 'pro-future' without being influenced about what happens at present, although future risks derived from shortages will eventually become important. It may also be explained based on the fact that traditionally, scarcity issues, water availability and consumption have been used in the Spanish political arena as an electoral weapon, both locally and nationally, leading to social conflicts (Mairal Buil, 2005).

Of all the model's variables, involvement is the one shown to have the greatest influence on conservation behaviour, highlighting the importance of establishing actions for increasing the involvement of individuals. We consider it is very important to ensure that individuals perceive the real impact of their conduct, which in turn may allow the development of pro-environmental feelings. This is where social marketing can play an important role in water conservation, as it has tools for the promotion of individual behaviour change for the benefit of society (Kotler, Roberto, & Lee, 2002). To this end, efforts, marketing strategies and tools should be different (Peattie & Peattie, 2009) since the goal is not to obtain a greater consumption but to reduce it.

In this regard, we believe that the concept of 'demarketing' introduced by Kotler and Levy (1971) is fully up-to-date. This can be understood as the marketing approach that wishes to discourage consumption on a permanent basis, with the aim of reducing it to a level where current consumption does not compromise the availability of reserves for future generations. This reduction can be accomplished, for instance, conducting advertising campaigns and advertisements on water consumption during periods of excess demand in order to reduce it (Gerstner, Hess, & Chu, 1993). However, this demarketing will not be effective if key psychological elements are not used: persuasion, motivation and generation of stable attitudes (De Young, 1996; Mondéjar-Jiménez, Cordente-Rodríguez, Meseguer-Santamaría, & Gázquez-Abad, 2011; Syme, Nancarrow, & Seligman, 2000).

As for the discriminant analysis, it appears that a good classification is possible therefore it allows predicting to which group an individual will join. It also allows knowing which conservation behaviours are much more prominent in dry areas than in wet zones, confirming previous studies (Gilbertson, Hurlimann, & Dolnicar, 2011).

5.1. Limitations and future research

We highlight two main limitations. The first refers to the way to responses were captured, as this took place as a combination of a Web survey and administered paper questionnaires, although there was a predominance of online responses. This implies that the sample is biased towards the audience that used the online medium more (young adults and urban). To avoid this bias we believe that it is suitable to extend the fieldwork in order to capture another wider audience. Concerning the second limitation, it was a fact that it did not stop raining during the fieldwork period. Considering that the survey was focused on water conservation, it is very possible that this situational factor mattered. Therefore, it would be interesting to do the next fieldwork during a dryer season instead of during more humid periods.

Finally, as the model presented a moderate explanatory level using cognitive variables, we have designed a new wave in which we shall enter emotional/affective variables in order to test the influence of this type of predictors.

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Appendix A

Construct: Credibility
Variable: From information on actual facts (Code: CREDACT)
Range: 1 = Totally false to 6 = Totally true

Items:
G1. Shoe manufacturing water footprint.
G2. Loss of river flow.
G6. There are supply problems.
G8. Losses in the distribution systems.

Construct: Credibility
Variable: From information on future risks (Code: CREDFUT)
Range: 1 = Totally false to 6 = Totally true

Items:
G3. There will be increasing supply problems.
G4. The planet faces a water shortage disaster.
G5. If it does not rain, there will be no reserves.
G7. Over-exploitation of resources.

Construct: Involvement
Variable: Involvement (Code: INVOLV)
Range: 1–7 (Differential Semantic Scale)

Items:
I05. Useless vs. useful.
I06. Valuable vs. worthless. (R)
I07. Matters to me vs. Does not matter. (R)

I08. Vital vs. superfluous. (R)
I09. Essential vs. nonessential. (R)

Construct: Perception of the efficacy of different water conservation behaviours
Variable: In personal uses (Code: PERDIR)
Range: 1 = Nothing; 2 = Very little; 3 = Little; 4 = Somewhat; 5 = A great deal; 6 = Totally

Items:
Q01. Close tap during personal hygiene.
Q02. Shower and not take a bath.
Q03. Reduce shower length.
Q04. Load washing machine.

Construct: Perception of the efficacy of different water conservation behaviours
Variable: In infrastructures (Code: PERINS)
Range: 1 = Nothing; 2 = Very little; 3 = Little; 4 = Somewhat; 5 = A great deal; 6 = Totally

Items:
Q09. Use automatic watering systems.
Q10. Monitor leaks in infrastructures.
Q11. Use flow restrictors at home.
Q12. Use dual flush systems in toilets.

Construct: Reported water conservation behaviour
Variable: Reported water conservation behaviour (Code: RBEHAV)
Range: 1 = Totally disagree to 6 = Totally agree

Items:
O1. Usually tries to save water.
O2. Is aware of saving methods.
O3. Controls the amount of water used.
O4. Is aware of the cause of his/her consumption levels.
O7. Thinks that he/she has a correct behaviour.

Construct: Sociodemographic variables
Variable: Age (Code: AGE) as number of years
Variable: Town where he/she lives (Code: HABITAT) as postal code
Variable: Sex (Code SEX) as male vs. female.

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Appendix B. Means and variance–covariance matrix for the predictive variables

Items	Mean	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. I5	6.06	1.23																	
2. I6	6.07	0.81	1.12																
3. I7	6.02	0.63	0.78	1.08															
4. I8	5.79	0.63	0.78	0.75	1.23														
5. I9	5.84	0.67	0.81	0.76	1.06	1.22													
6. O1	4.54	0.18	0.31	0.38	0.31	0.32	1.10												
7. O2	5.08	0.20	0.22	0.30	0.26	0.27	0.51	1.24											
8. O3	3.98	0.22	0.28	0.36	0.31	0.36	0.71	0.74	1.72										
9. O4	4.43	0.23	0.23	0.24	0.22	0.25	0.51	0.62	0.82	1.21									
10. O7	4.57	0.22	0.26	0.35	0.27	0.26	0.59	0.52	0.65	0.49	1.09								
11. Q01	5.39	0.26	0.23	0.22	0.24	0.22	0.23	0.12	0.12	0.15	0.19	0.64							
12. Q02	5.59	0.20	0.18	0.19	0.18	0.16	0.16	0.11	0.10	0.09	0.17	0.33	0.51						
13. Q03	5.28	0.27	0.25	0.23	0.23	0.20	0.22	0.10	0.09	0.11	0.19	0.35	0.35	0.72					
14. Q04	5.50	0.26	0.24	0.26	0.24	0.23	0.20	0.15	0.16	0.16	0.18	0.32	0.31	0.39	0.54				
15. Q09	5.47	0.25	0.26	0.27	0.26	0.24	0.21	0.12	0.14	0.14	0.21	0.24	0.24	0.30	0.29	0.68			
16. Q10	5.53	0.21	0.24	0.22	0.24	0.24	0.21	0.10	0.18	0.10	0.16	0.26	0.23	0.24	0.25	0.41	0.56		
17. Q11	5.22	0.28	0.26	0.24	0.28	0.28	0.29	0.14	0.26	0.20	0.23	0.28	0.22	0.34	0.27	0.41	0.40	0.83	
18. Q12	5.30	0.25	0.20	0.25	0.27	0.30	0.25	0.10	0.16	0.12	0.21	0.30	0.24	0.31	0.30	0.35	0.34	0.45	0.80

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Perceived risk of urban water consumption: Scale development, validation and characterisation in Spain

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ABSTRACT

The objective is to develop a measure of perceived risk underlying urban water consumption (UWC) that is applicable in situations of drought and strong rainfall. First, we analyse existing scales and the dimensions involved in perceived risk related to UWC. Second, we test our proposed scale using two studies. Study 1 was carried out in Spain in 2012 (n = 701) during a period of heavy rains. Study 2 was performed in 2014 in the semi-arid area of Spain (n = 477) during a long drought period. The proposed scale has three dimensions (impact, time-related and control) and high reliabilities (0.86–0.89), validities (convergent, discriminant, construct) and is invariant between both rainy and dry periods. UWC Perceived Risk Scale fits into a Pearson 'Type VI distribution', which can serve scholars and technicians in measuring urban water perceived risk in their researches and urban water management projects.

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1. Introduction

Increasingly urban populations, levels of consumption higher than the speed of replenishment and climate change, are adversely affecting the availability of water for urban uses and consumption. These problems, together with the rapid expansion of cities and the current periods of drought and flooding have made water scarcity a major urban problem in the early 21st Century (Miller 2006).

Unlike many natural risks, the ones related to urban water consumption can be regarded as unbound and invisible (Wachinger and Renn 2010) affecting individuals, their quality of life and surrounding territory. In most countries, residents consume water from distribution networks under public and private management. The general public believes that water is readily available and is unconcerned about water supply issues and the process of getting water to its faucets (Solomon *et al.* 2014). However, the public also perceives latent risks in its own levels of consumption and the uses of available water (Domènech *et al*. 2010).

It is important to quantify and characterise this risk perception because depending on how risks are perceived (low/high), individuals will be more or less likely to (a) collaborate with hazard reduction (McCaffrey 2004) and (b) demand that distribution managers take steps to ensure supply. Therefore, understanding public perception of the risk related to urban water consumption (and the ways in which water is consumed) can help improve water management (Kiriscioglu 2010). Additionally, the gap between the perceptions of the residents and the decisions taken by the water managers could be reduced (Dobbie and Brown 2014). Similarly, to conduct adequate communication actions, policy-makers must have information on how the public perceives the risks (Willis *et al.* 2004). Finally, it has been argued that citizen participation is necessary to design and implement public policies on water concerns and that the different evaluations of real and perceived risks must converge.

However, we have not found any instrument that measures the public's perception of the risk underlying urban water consumption. Additionally, we have not found a characterisation of citizens grounded on declared perceived risk. Therefore, the objective of this study is to develop an instrument to measure this perception. We also aim to design an instrument that is easy to implement in questionnaires, commonly used by municipalities, other institutions and in a wide range of water research projects.

To achieve our objectives this research starts by defining what hazards and risks are, and analysing their dimensions. We present two studies in two different contexts within the same country (Spain). The first one was conducted in 2012 in a strong rainfall period while the second one in 2014 in a drought period. This allows us to check the invariance assumption of the proposed scale confirming that our scale is not sensitive to climate context (rainy vs. dry period). We describe the method used: participants, the method of contacting them and how the materials and questionnaire were constructed. We then present the results, the goodness of fit, reliability and validities of the proposed scale. Finally, we discuss the findings and the utility of the proposed scale for perceived risk analyses.

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2. Background

2.1. Definitions

Urban water consumption comprises the 8–11% of worldwide water that is used for domestic and urban uses, in contrast to the 19–22% used by industry and the 70% used in agriculture (FAO 2015). However, this 8–11% is very important because it is the water that directly reaches citizens, which they use for personal health, sanitation, leisure, household cleaning and feeding. At the same time this water requires exhaustive treatment to achieve sufficient quality for consumption. Additionally, 'hazard' can be defined as the 'intrinsic ability of an agent or situation to cause adverse effects to a target such as people, environment, etc.' (Scheer *et al.* 2014, p. 2) while 'risk' as a function of the likelihood of an event actually occurring, its intensity, the extent of the damage it causes and the vulnerability of the people it affects (Godfrey and Howard 2005). Therefore, 'hazard' exists by itself as a contingency or source of (real or potential) damage, whereas, 'risk' refers to the potential for this source to cause real damage (Kaplan and Garrick 1981).

Although 'hazard' and 'risk' are two different concepts, they are often misused interchangeably (Scheer et al., 2014). Literature has also shown that the public does not differentiate between them because they do not understand the concept of probability (Lofstedt 2011), the language they use is non-technical and non-discriminatory, or they associate the concept of hazard with the 'impact' it may produce (Wiedemann *et al.* 2010).

2.2. Water consumption hazards in urban environment

Hazards can be classified as natural (floods, droughts), technological (mainly related to the quality of drinking water and the use of recycled water) or mixed (e.g. 'scarcity' because it combines drought with infrastructures – as technological). There are, however, two issues that are less visible to the public but that generate significant problems like water shortage: water consumption levels and the use of available water (McDonald *et al.* 2014). This scarcity is increased by the effects of climate change on coastal cities (e.g. McGranahan *et al.* 2007) and because of changes in urban models, which have promoted an increase in water consumption. For example, Southern Europe and North African countries have switched from a traditional compact urban model to a more dispersed urban model with higher water consumption (Kasanko *et al.* 2006). This situation, combined with a more and more reduced availability, increases the water stress hazard, posing greater problems for water management and quality of life.

2.3. Risk perception and its measurement

There are two major approaches to study and measure risk: the objective and subjective approaches. The first one assumes that risk is the most likely variation based on actual experiences, and is determined by measurable physical facts (Hansson 2010). The second one maintains that a risk represents an uncertainty based on each individual's vision. Therefore, objective or expert (scientific) measurements are insufficient for evaluating it properly (Slovic 1999). It has been affirmed that what matters is the perception of risk rather than the statistical probability or 'expected technical impact'. This is because such perception may better help understand human behaviour (Renn 2008).

Lazo *et al.* (2000) showed that the public generally perceives greater ecological risk than experts. Slimak and Dietz (2006) found that experts are more concerned about high-impact long-term ecological risks, whereas the public is more concerned about risks that produce serious consequences, although the likelihood of them actually occurring is low. In turn, the public tends to underestimate high-risk events and to overestimate small-risk ones.

In their study, Kiriscioglu *et al.* (2013) found no differences between experts' and the public's urban water consumption risk assessments. Nevertheless, other researchers found divergent viewpoints between the public and experts (policymakers and scientists) regarding risks in potable water safety, and water demand supply at regional level – the public's perceived risk was higher (Larson *et al.* 2009). In this regard, Po *et al.* (2003) affirmed that the public's risk perception of water reuse is generally higher despite the treatment guarantees given by experts and authorities.

The question of how the public perceives risks has generated discussion in the literature. Thus, Starr's (1969) seminal work suggested that it is not sufficient to just calculate the number of fatalities to analyse the risk of a particular hazard. It was Fischhoff *et al.* (1978) who initially used the psychometric paradigm to identify the factors/dimensions influencing perceived risk. In these early investigations, respondents were presented with a long list of potential hazards which they had to evaluate according to various attributes.

Since the nineties, several studies have included water hazards as part of potential ecological hazards (e.g. McDaniels *et al.* 1995, Lazo et al., 2000). Subsequently, hazards and risks were restricted to 'specific topic areas', which has reduced the list of attributes analysed and introduced new attributes to improve risk characterisation [in supplementary materials Table A shows some scales used to measure perceived risks including water-related hazards]. These scales are based on the two main approaches used in the literature to measure risk perception: the psychometric and the socio-cultural. The first one assumes the characteristics of risk influence the individuals' judgments of risk. It uses psychophysical scaling methods and multivariate analysis to create quantitative representations of the attitudes and perceptions of risk based on its attributes at individual level. However, the socio-cultural approach suggests that perception of risk is formed in the context of a range of social, cultural and political factors (Bickerstaff 2004).

2.4. Dimensions of urban water consumption perceived risk

Perceived risk is not a one-dimensional construct. Its dimensions vary depending on the phenomenon or event. The literature highlights six dimensions: social, financial, psychological, performance, time-related and physical (e.g. Hoyer and MacInnis 2008). However, this list increases or decreases according to the product, type of risk and consumption situation.

We have found few studies analysing perceived risks in environmental and water topics. McDaniels et al. (1995) characterised ecological risks using a sample of students (n = 68). Sixty five ecological risks (both natural and man-made) were presented and assessed using 30 scales or tests[1] (e.g. certainty, scope of impacts,

destructiveness, etc.) all of them seven point ranged. They found that the 'ecological risk' construct had five dimensions (hidden factors not directly measurable and observable), where the dimensions 'impact of the hazard' and 'availability' almost explained two thirds of the total information contained in the construct measured –variance. Among all the statements that describe the 'ecological risk' construct, they only introduced two related to water in urban environment: urban water uses and housing. Subsequently, Lazo et al. (2000) compared expert perceptions (n = 26) and public perceptions (n = 24), using 13 hazards from McDaniels *et al.*'s (1995) study. They found four latent variables or dimensions that explained 95.4% of the total information contained in the obtained scores – variance. In this study the dimensions of 'impact' and 'avoidability/control' are also very important. Additionally, this study did not introduce any water-related hazards.

Previously, McDaniels *et al.* (1997) analysed the perception of ecological risk to water environments using a sample of 183 people. They found four factors where the impact dimension (including immediacy of impacts) explained more than 50% of the original information of the perceived risk variable and controllability 10% approximately. Recently, Kiriscioglu *et al.* (2013) conducted a study with a sample of 115 people. They found three dimensions: ecological impact (including immediacy of impacts), benefits and controllability of hazards, which explain 57.2% of the total variance.

2.5. Evaluation of previous instruments

The described instruments in Section 2.4 analyse a wide variety of hazards, involving long lists of attributes to provide a minimal characterisation of each one. The problem with extensive risk lists is that it is not clear if respondents actually know about the risks they are evaluating (Weyman and Kelly 1999). Moreover, Axelrod *et al.* (1999) introduced rest periods while questionnaires were being completed, although it is known that lengthy lists are fatiguing, produce rejection and missing data. Additionally, long lists do not guarantee better results as their length can be reduced without reducing the predictive validity (Burisch 1997).

For the above reasons we decided to develop a new instrument to measure the public's perception of the risk underlying urban water consumption.

3. Method

Two studies have been performed. Study 1 was conducted during November 2012, but this month was one of the rainiest months of the past 30 years (more than double the averages for the more drought prone areas of the south and southeast). Then, a Study 2 was conducted in May 2014, during a drought period, to avoid possible systematic bias in the responses of Study 1. From January to May 2014 rainfall was 25% of what is usual for that period in Southeastern area.

3.1. Country and context

Both studies were conducted in Spain, a country with the lowest water resources per capita and the largest Water Exploitation Indices[2] (30.2 in 2010) in Europe. A significant part of Spanish territory has high water stress, which will increase in the coming decades. It also has very severe environmental problems produced by the overexploitation of aquifers, uncontrolled urban construction, and highly politicised water management that has promoted conflicts between citizens from different regions. However, Spanish citizens do assume the problems derived from water scarcity, resulting in low litres per capita per day consumption (LCD) compared to other countries. Madrid, Barcelona and Valencia (major cities in Spain) consume 131, 110 and 113 LCD respectively, while other European cities such as London, Stockholm or Oslo consume 158, 178 and 197 LCD, respectively (IWA 2010).

3.2. Dimensions under consideration

To characterise the perceived risk of urban water consumption, we have taken into account three dimensions that are consistent throughout the risk perception literature:

(1) Impact of the hazard, determined by the subjective importance of consequences for individuals. As the severity and duration of the impact on individuals or their social groups (low availability and quality of the resource) increases, so does perception of the hazard (Hoekstra *et al.* 2012). Previous literature on perceived ecological risks (e.g. McDaniels et al., 1997) has shown that impact is the most important factor when evaluating this construct. Therefore, in risk situations where individuals could directly experience negative consequences, as in the case of hazards associated with urban water practices, the perceived importance of the risk exceeds the information they can obtain from other people, organisations or the media (Takács-Sánta 2007).
(2) Immediacy of negative impacts. This is a time-related dimension of the consequences and refers to the perceived proximity of the negative consequences of hazards related to urban water consumption. In the case of environmental hazards, this dimension typically has a high level of uncertainty, and its consequences are perceived as very distant in time (Gattig and Hendrickx 2007). This situation suggests that hazards that seem distant are perceived as less serious, while their negative consequences increase as they are perceived as more present (see Vlek and Keren 1992).
(3) Avoidability/controllability of impacts or perceived capacity for controlling a hazard, ensuring that it does not generate problems. In the case of urban water, this refers to the public's belief that (a) their actions can help prevent the problem and (b) water managers will be able to prevent the hazards (O'Connor *et al.* 1999). There is an inverse relationship between perceived control and perceived risk. In the case of natural hazards, this control is not only perceived individually, but is also related to trust in the perceived ability to manage the resulting risk (Weyman and Kelly 1999).

3.3. Item and scale development

We considered the three factors explained in Section 3.2. Researchers created a list of eight adjectives for each factor with

their corresponding antonyms. Two focus groups discussed the three lists to discard the adjectives that were likely not to be understood within the context of 'risk relating to urban water consumption'. Each focus group had six individuals: Group 1 consisted of people in the 18–25 age range, and group 2 consisted of seniors (60-older).

The question and initial items were developed in Spanish. To fully ensure that the full text presented in this paper evokes the same semantic fields in both Spanish and English, the terms used have been transcribed with the back translation system. The researchers translated the Spanish terms into English and then a bilingual professor translated them back from English to Spanish, proving the term meanings remained the same. Following we present the accepted items in the Spanish language with their equivalent in English:

Question: How would you qualify the risk associated with current water consumption (in Spain)? Semantic differential scale from 1 to 7 is used.

Factor 1 (Impact):

F1a. Non-important vs. very important (*No importantes vs. importantes*).

F1b. Non-dangerous vs. very dangerous (*No peligrosos vs. peligrosos*).

F1c. Inoffensive vs. hazardous (*Benignos vs. graves*).

Factor 2 (Time-related):

F2a. Long term vs. short term (*Largo plazo vs. corto plazo*).

F2b. Distant vs. close (*Lejanos vs. inminentes*).

F2c. Non-urgent vs. very urgent (*No urgentes vs. urgentes*).

Factor 3 (Control and management)

F3a. Manageable vs. non-manageable (*Gestionables vs. imposibles de gestionar*).

F3b. Governable vs. non-governable (*Manejables vs. inmanejables*).

F3c. Easily surmountable vs. non-surmountable (*Fácilmente superables vs. no superables*).

3.4. Participants

For Study 1 target population comprises Spanish citizens aged 18 and over. We obtained 701 participants: 298 men (42.5%) and 403 women (57.3%), ranging from 18 to 73 years of age. The average age was 32.6 years (SD = 12.7): 34.8 for men (SD = 13.3) and 30.8 for women (SD = 12.4). 51.1% of respondents had a high school education or lower and 48.9% were university graduates. The sample comes from 48 cities throughout Spain.

For Study 2, the target population comprises all residents aged 18 or over in the provinces of Murcia and Alicante, where the drought was more intense in the period studied. We obtained valid and accurate responses from 477 participants from 44 towns: 243 men (50.9%) and 234 women (49.1%), all between the ages of 18 and 60. The overall average age is 38.3 years (SD = 13.1). The average for men is 38.2 years (SD = 12.9) and 38.4 years for women (SD = 13.3). 79.9% of respondents have a high school education or lower, and 20.1% are university graduates.

3.5. Fieldworks

For Study 1 we used two survey methods. First, a Web questionnaire was disseminated on social networks and via email. Second, because the Spanish population over the age of 60 has limited access to the Internet, we used traditional paper-and-pencil survey with this segment. For Study 2, to minimize self-selection bias, we designed a unique traditional paper-and-pencil questionnaire conducted by interviewers in face-to-face interviews. Participants were approached in public places using a systematic random procedure.

4. Results

4.1. Model measurements

For Study 1 confirmatory factor analysis (CFA) for three-factor structure was used applying robust methods for the assumption of non-standard estimator corrections. The result reveals a poor fit for the CFA model (Satorra-Bentler chi-squared or SBχ^2 = 156.89 with 24 degrees of freedom (df), Incremental Fit Index or IFI = 0.94, Comparative Fit Index or CFI = 0.94, Standardised Root Mean-Square Residual or SRMR = 0.06, Root Mean-Square Error of Approximation or RMSEA = 0.09). The loading factor obtained for the item 'Non- vs. very-urgent' recommended its elimination, because its factor loading is 0.56 < 0.70 and compromises the instrument's convergent validity. After removing item F2c, goodness of fit is good (SBχ^2 = 59.75 with df = 17 $p <$ 0.01, normed chi-squared = 3.51, IFI = 0.98, CFI = 0.98, SRMR = 0.04, RMSEA = 0.06, 90% confidence interval of RMSEA ranges from 0.04 to 0.08). Table 1 shows the results.

Convergent validity is tested using the factor loadings, which are over 0.7 and significant in all cases. We confirmed discriminant validity using Average Variance Extracted (AVE) and correlation coefficients between factors. Our analyses confirm that each factor retains over 50% of the AVE (information) and none of the

Table 1. Validities and reliabilities for Studies 1 and 2.

		Study 1				Study 2			
Factors	Items descriptors	FL	CR	AVE	Correlations F2 F3	FL	CR	AVE	Correlations F2 F3
Impact (F1)	Important	0.75	0.83	0.63	0.43 0.20	0.68	0.84	0.64	0.46 0.18
	Dangerous	0.81			(0.04) (0.04)	0.88			(0.04) (0.04)
	Hazardous	0.82				0.82			(0.04)
Time–related (F2)	Short term	0.82	0.89	0.80	0.27	0.82	0.89	0.77	0.09
	Close	0.96			(0.04)	0.93			(0.04)
Control & Management(F3)	Manageable	0.80	0.81	0.60		0.83	0.86	0.66	
	Governable	0.71				0.76			
	Surmountable	0.79				0.85			

FL = Factor loadings, CR = Composite reliability,
VE = Variance extracted, in brackets standard error of correlations.

Table 2. Descriptive results for factors and global scale (for Study 2; ***n*** = 477).

Factor/scale	Mean (95% CI)[a]	SD (95% CI)[a]	Skewness (95% CI)[a]
Factor_Impact	0.79 (0.78; 0.81)	0.177 (0.16; 0.19)	−1.082 (−1.33; −0.81)
Factor_TimeRelated	0.55 (0.53; 0.58)	0.248 (0.23; 0.26)	−0.206 (−0.34; −0.07)
Factor_Control	0.46 (0.44; 0.48)	0.233 (0.22; 0.24)	0.085 (−0.06; 0.22)
Urban Water ConsumptionScale (UWPR)	0.61 (0.59; 0.62)	0.147 (0.14; 0.16)	−0.397 (−0.70; −0.10)

All data are normed using 0–1 normalisation.
(a) Confidence interval (CI) values based on 1000 bootstrap samples.

confidence intervals of the correlation coefficients between factors contain the perfect correlation. Hence, we concluded that the factors, as dimensions of the 'perceived risk' construct, are different from each other and that the conditions of validity (convergent and discriminant) are met. All composite reliabilities are between 0.81 and 0.89, over the minimum of 0.70 usually required in the literature.

For study 2, and using CFA we obtained a good model fit (SBχ^2 = 54.25 with df = 17 p < 0.01, normed chi-squared = 3.19, IFI = 0.97, CFI = 0.97, SRMR = 0.05, RMSEA = 0.06, the 90% confidence interval for RMSEA ranges from 0.04 to 0.08). Results are shown in Table 1. Reliabilities measured with the composite reliability are higher than those obtained in Study 1, varying within a 0.86 to 0.89 range. Although the item 'non-important vs. very important' has a factor loading of 0.68 < 0.70, this does not affect convergent validity, as the average of the factor loadings for this factor is 0.79 > 0.70. Discriminant validity was also confirmed because none of the confidence intervals of the correlation coefficients between factors contain the perfect correlation.

4.2. Measurement invariances

Invariance is especially important when the instrument is based on self-reported responses, and when it is developed as a multi-factorial scale with several items per factor. In fact, a lack of invariance may prevent proper measurement and correct interpretation of the data. In our research we analyse two types of invariance: Configural invariance, and metric invariance. We do not analyse scalar invariance because it is not our goal to compare mean levels of latent variables or factors, given the two very different situations in which the fieldwork was conducted.

Configural invariance states that the number of factors and items that load on each factor must be equal in the groups where the instrument is applied. In empirical studies it is common to use individual CFAs for each group (in our case, for 2012 – a period of strong rainfall, and 2014 – a period of drought). Metric invariance makes the restriction that the factor loadings for both periods must be equal or very similar. This would mean that each item contributes similar information in the two periods considered, and therefore, the factor loadings would not depend on when the study was conducted.

For configural invariance, although the χ^2 statistic is significant, the fit of the model is good, the error indices are <0.08, and the fit indicators are >0.90 (RMSEA = 0.06, SRMR = 0.06, CFI = 0.98). In the case of metric invariance the results are good (SBχ^2 = 146.97 with df = 42 p < 0.01, normed chi-squared = 3.5, Incremental χ^2 = 35.12 with df = 8, CFI = 0.94, SRMR = 0.01, RMSEA = 0.06, the 90% confidence interval for RMSEA ranges from 0.05 to 0.07). In addition, it is observed that the resulting model worsens because the increase in robust chi-square is significant (Co = 1.92; C1 = 1.81; Cd = 1.38; TRd = 35.12), after using Satorra and Bentler's correction, where the corrected chi-square is distributed with 8 degrees of freedom. However, upon a slight reduction of goodness of fit indicators, the error indicators remain within the recommended levels. We therefore conclude that metric invariance is supported.

4.3. Statistic behaviour

Prior to the analyses, all the factors were normed using the Hsu and Chen (2007) method that converts the original range of the different factors into a new 0–1 homogeneous range.

After testing the invariances, we proceed to create the Urban Water Consumption Perceived Risk Scale (UWPR), which is a Type II reflective first-order and formative second-order factor model. In these type of models, Impact, Time-Related, and Control factors are considered to be reflective, but their relationship with the global construct is formative. Thus, the factors do not act as a representative sample of perceived risk factors, but are relevant based on the analysis of specific water-related literature (see Section 2.4). To keep the UWPR within the 0–1 range, the formula to apply is:

$$\mathrm{UWPR} = 0.36\mathrm{F}_{\mathrm{Impact}} + 0.28\mathrm{F}_{\mathrm{TimeRelated}} + 0.36\mathrm{F}_{\mathrm{Control}} (0 \leq \mathrm{UWPR} \leq 1)$$

In this formula the weight of each factor comes from their 'explained variances' because the higher the percentage of explained variance, the greater the importance of this factor (de Gruijter and van der Kamp 2007). As the three factors have formative nature and they should explain 100% of the total information, factor weights are calculated using each explained variance divided by total explained variance. Table 2 shows the descriptive statistics for the 2014 sample, which has been used as an evaluation sample. Factor Impact has the highest score and factor Control has the lowest. The first of them is strongly asymmetric towards the right (high scores). Factor control can be understood as symmetrical as the population interval contains a zero (perfect symmetry). UWPR has a mean significantly different to the median (Me = 0.50) because t = 15.92, p = 0.00, and 95%. Confidence Interval for the difference between the empirical mean and the theoretical median is CI = 0.09–0.12. Applying 1000 bootstrap samples we obtain mean differences DM = 0.11, bias = 0.00, SE = 0.01, p = 0.00.

We finally estimate if UWPR follows a statistical distribution applying EasyFit 5.5 software. The empirical data fits into a Pearson 'Type VI distribution', with parameters α1 = 145.04, α2 = 0.03542, and β = 0.0037. The Anderson-Darling test AD = −20.49

(AD Critical Value = 2.50, $p > 0.05$) suggests there are no differences between the theoretical and empirical distributions. Thus, as the probability density function (PDF) for a Three-Parameter distribution of UWPR is known, it is possible to calculate the likelihood of variable UWPR taking a specific value.

5. Discussion and conclusions

Hazards related to urban water consumption affect millions of people; hence, risk assessment of water issues has become a topic of interest for stakeholders involved in water management (Baggett *et al.* 2006). It is important to know both the 'objective' assessment (based on indicators and expert knowledge) and also the public's perception of risk so that people can participate in decisions for improving water conservation and consumption (Brody *et al.* 2008). The difference between what the indicators show and public perception is a gap that needs to be addressed and closed. The literature, however, contains no measure of the perceived risk associated with urban water consumption. Orr *et al.* (2011) warned that one of the great hazards facing humanity is that water will be an increasingly scarce resource. To reduce consumption and adopt more strongly conservationist behaviours, the public should perceive the risk of higher and higher levels of consumption. This perception of risk can help to guide behaviour (Slovic and Weber 2002).

Our UWPR scale presents several advantages over existing scales in the literature. First, while the research we previously described uses a range of 5 to 65 simultaneous hazards, our scale focuses on one single problem ('urban water consumption'). Additionally, the number of attributes or items has been reduced from between 14 to 30 to only 8, whilst maintaining high levels of reliability and validity. This permits more parsimonious measurement of the construct to be assessed, is easy to administer and can also be used together with other scales within one single questionnaire. Second, we have used two large samples (a test sample and a validation sample), which allow the proportional representation of different population groups (by gender, habitat, age, income and education). Third, we have taken into account the situational context of the study (a period of strong rainfall, 2012 and a period of drought, 2014). In this sense, because the UWPR test is invariant, comparisons can be made knowing that the scores obtained come from a test that is not affected by variations in perception of situational context of water scarcity. UWPR, as a perceived risk construct, maintains the same structure and metric (not score) in scarcity vs. non-scarcity situations. Finally, derived from invariance, the UWPR scale provides equivalent scores in those situations, minimizing the influence of acquiescence bias.

The UWPR distribution fits into a statistical distribution that suggests perceived risk phenomenon requires a multi-parameter distribution. Its highly asymmetric function not only involves the existence of non-normal behaviour; future research should also take into account the importance of unconventional sampling. This Pearson distribution, a well-known distribution, has been used to model different phenomena (e.g. environmental extreme events). Therefore, assuming that perceived risk measurement can be adjusted to this distribution, it is possible to make inferences about the population, reduce the bias that occurs when variables are added, facilitate the understanding of phenomenon and calculate probabilities.

Finally, studies based on the psychometric approach to the measurement of risk perception only take into account the characteristics of the risk rather than the processes underlying its perception (Sjöberg 2002). This limitation opens a potential new research stream into how risk perceptions are created and developed and how, in turn, they influence behaviour.

Notes

1. A scale/test is a set of statements that describes and allows developing reliable and accurate measurement of a phenomenon under study.
2. The Water Exploitation Index (WEI) describes how total water use puts pressure on water long–term resources. WEI < 20% means no water stress, 40% < WEI < 20% means water stress and WEI > 40% means severe water stress.

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Table A. Scales that include water–related hazards

Authors	Water hazards included	Scale form
McDaniels *et al.* (1995) (*) Axelrod *et al.* (1999) (*)	- Drought (natural). - Floods (natural). - *Urban water use.*	- Likert (7–point). - 93 items.
McDaniels *et al.* (1997) (*)	- Drought (natural). - Floods (natural). - *Urban water consumption.* - Water use (irrigation). - Water exports.	- Likert (7–point). - 85 items.
Lazo *et al.* (2000) (*)	- Drought (natural).	- Likert (7–point). - 31 items.
Pahl *et al.* (2005) (*)	- Water shortage.	- Likert (7–point). - 2 items.
Willis *et al.* (2005) (*)	- Floods (natural). - Water pollution. - Water runoff agricultural. - Water runoff cities.	- Likert (7–point). - 156 items.
Leiserowitz (2005) (**)	- Water shortage.	- Likert (4–point). - 2 items.
Baggett *et al.* (2006) (*)	- Risks related to reused water.	- Likert (5–point). - 17 items.
Adeola (2007) (**)	– Water pollution.	- Likert (6–point). - 13 items.
Carlton and Jacobson (2013) (*)	- *Drinking water loss.* - Drought.	- Rating Scale (10 points). - Most–least rating method. - 2 items.
Tang *et al.*(2013) (*)	- Water scarcity.	- Likert (5–point). - 8 items.
Kiriscioglu *et al.*(2013) (*)	- Drought (natural). - Interbasin water transfer. - *Urban water consumption.* - Water–intensive landscaping.	- Likert (7–point). - 56 items.
Note: (*) psychometric approach (**) socio–cultural approach.		

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Appendix 2.4.: Article under review in JASP

Rodriguez-Sanchez, C., Sarabia-Sanchez, F.J. Impact of credibility, risk perception and involvement on reported water conservation awareness and practice. A contextual study. ***Journal of Applied Social Psychology*** (under review)

JOURNAL OF APPLIED SOCIAL PSYCHOLOGY

Impact of credibility, risk perception and involvement on reported water conservation behavior. A contextual study.

Journal:	*Journal of Applied Social Psychology*
Manuscript ID	Draft
Wiley - Manuscript type:	Original Article
Keywords:	Water, Conservation Behavior, Situational Context

Title:

Impact of credibility, risk perception and involvement on reported water conservation behavior. A contextual study

ABSTRACT

This study analyzes the moderating effect of water stress context ("scarce" vs. "non–scarce" regions) in the relationships between message credibility, risk perception of water consumption, personal involvement and reported water conservation behavior (RWCB). A Spanish sample (n=637) from more than twenty cities is used. Results show that the proposed measurement model is reliable and valid for both situational contexts with very similar explanatory power. Likewise, the evidence supports the high external validity of the model, although the level of some variables presents differences between contexts. Most of the relationships are statistically significant except two antecedents of RWCB (message credibility and risk perception of water consumption) which are not significant. In this regard, the relationship between message credibility and RWCB is mediated by personal involvement.

Keywords

Water, Conservation Behavior, Situational Context

1. Introduction

Water is a fundamental resource for any human activity and it is becoming increasingly necessary to develop responsible water consumption and conservation. Although this conservation can be managed from the supply perspective (e.g. by improving distribution systems), a drop in current levels of consumption must also be encouraged, and this is a basic objective in water policies (Werner et al., 2012). To design appropriate policies and management of water, as a resource, it is necessary an understanding of individual motivations and behaviors associated with water conservation (Jorgensen et al., 2014). This is because any public policy must account for what people think and feel if it is to influence behavior (Donahue et al, 2014). Moreover, it can help to identify key variables for designing environmental strategies that seek a long term reduction in consumption (Peattie and Peattie, 2008).

Both the technical and the scientific literature warn that a future shortage of water for consumption is very likely (e.g. Intergovernmental Panel on Climate Change, 2015). As an important part of this consumption takes place in urban areas, the conservation behavior by denizens is a key question. In these areas there is an excessive and increasing urban water consumption combined with moderate to low perceived risk in that excessive consumption (Axelrod et al., 1999).

There has been established a positive relationship between credibility of information about risk and its public acceptance (McComas, 2006) such that the lack of credibility implies that the public does not develop a perception of risk. This fact may produce little or no involvement and may inhibit water conservation behavior, generating lack of interest and affecting this pro–conservation behavior (Po et al., 2003). Despite the importance of this situation, it is noteworthy that no previous work has examined together the role of credibility, involvement and perceived risk in the development of water conservation behavior.

The present study, therefore, aims to describe and find out whether these variables have a relevant influence on reported water conservation behavior. First, this paper analyzes the importance of these variables in the literature proposing a set of hypotheses not addressed previously. Second, there is a description of the method, sampling techniques, measuring instruments and the data collection process. Third, following Corral–Verdugo (2002) account is taken of the country's water context (with scarcity and without scarcity). In this regard, few studies have explored differences in water conservation factors in relation to geographical locations and water context (Russell and Fielding, 2010). Finally, a discussion of results is offered based on the proposed theoretical model in these two situational contexts, analyzing for any significant differences between them. This approach also may increase the generalizability of findings of this research.

2. Theoretical framework

2.1 Water conservation behavior and its psychological determinants

In the environmental psychology literature how water conservation behavior is defined or how to approach it is far from conclusive. For instance, while Baumann et al. (1998) and Russell and Fielding (2010) use "water demand management" as a synonym of water conservation behavior, Corral–Verdugo et al. (2003) and Campbell et al. (2004) use actual water consumption employing observational data and water meters respectively. However,

as water conservation is a different concept from water consumption or water demand (conservation involves a reduction of consumption) it seems coherent to define and measure them in a different way. It is also important to highlight that even in the case of analyzing actual water consumption using water meters, there is currently a debate on the possible inconsistency of many of these studies (see Jorgensen et al., 2014) since most of them use psychological variables (individual level) to explain household water consumption (household level).

In addition, most studies that examine water conservation behavior offer no definition (e.g. Clark and Finley, 2007; Dolnicar et al., 2012) or definitions only take into account the output of the consumer behavior process: conduct (uses, activities, actions…) (Sarabia–Sanchez et al., 2014). For instance, Atkins (2003) points out that water conservation is a set of three actions: (1) reduction of demand, (2) improved efficiency of use and (3) prevention of losses during use. Similarly, the U.S. Water Resources Council defines water conservation as the activities designed to (1) reduce water demand, (2) improve use efficiency and reduce losses and water waste, and (3) improve land management practices (cited by Alliance for Water Efficiency, 2010). Nevertheless, as Pereira et al. (2009) point out, water conservation behavior aims to preserve the resource and combat its degradation in order to achieve sustainability at long–term while other concepts such as water saving or water conservation practice are punctual conducts with the aim of limiting or controlling water demand and use for any specific purpose. Thus, these definitions seem to be more related to the concept of "water conservation practices" (see e.g. Gauley et al., 2015) than to "water conservation behavior".

In this study, reported water conservation behavior (RWCB) is defined following the approach of Pereira et al. (2009), Willis et al. (2011) and Sarabia–Sanchez et al. (2014) where conservation behavior is understood as a decision process where the basic steps are the recognition of the problem, decision making and evaluation of post–consumption (Hoyer and McInnis, 2007). Thus, it is defined here as: (1) Be aware of ways to save water (2) understand what motivates present water consumption, (3) be personally motivated to use/consume correctly (4) engaging in water saving behavior in daily actions and (5) taking personal control of water use. In a more general way, this definition is also consistent with Hungerford and Volk's (1990) 'environmentally responsible citizen' and with the 'responsible environmental behaviour' model proposed by Hines et al. (1987).

Finally, in the area of water conservation, existing studies have identified a wide range of psychological factors such as attitudes, environmental concern, personal involvement, environmental knowledge, values, perceived behavioral control and habits that influence both household as well as individual water conservation behavior (for a systematic review see Dolnicar et al., 2012; Jorgensen et al., 2009; Russell and Fielding, 2010).

2.2 Content–message credibility

In the literature credibility has mainly been studied from the perspective of "source credibility" while "message credibility" has been seen as less important. Message or content credibility can be defined as "*people's assessment of whether information is trustworthy based on their own expertise and knowledge*" (Rieh, 2010, p.1338). It is therefore, an individual's subjective perception of the level of certainty or truth in the

information. Thus, *"message credibility typically examines how message or information characteristics influence perceptions of believability"* (Flanagin and Metzger, 2008, p.9).

This concept is very relevant to the water topic since developing information campaigns on the need to save water and efficient ways of consumption is one of the most common actions for increasing water conservation behavior. These campaigns usually seek voluntary changes in behavior and the adoption of technologies that reduce consumption or improve water–use efficiency (Syme et al., 2000). For instance, Hassell and Cary (2007) state that the most common strategies for changing attitudes and norms to conserve water are to provide general information, information on the consequences and opportunities for comparison with other people. Recently, Fielding et al. (2013) have concluded that supplying information to households on how to save water in different areas of the house enables water savings and van der Linden (2013) maintains that providing information on a variety of water problems improves conservation.

Although it is important to offer information on how to achieve savings in urban water consumption, the mere provision of information does not appear to be sufficient or useful (Jackson, 2005). Especially when the target public itself, overloaded with information, considers that it does not need any more information campaigns or leaflets. Awareness of the scarcity issue can be generated by ensuring the problem is understood and by making the information credible. This is because credibility is the most important element when building confidence (Poortinga and Pidgeon, 2003), confidence in the reality of water scarcity and the need to encourage behavior that reduces its impact. Although no conclusive evidence has been found in water conservation field, there is evidence of a negative association between skepticism of environmental problems and pro–environmental behavior in topics such as climate change (e.g. Whitmarsh, 2011) or green purchase behavior (e.g. Albayrak et al., 2011). The credibility of the message is therefore essential because it increases behavior intention and has a high impact on people's responses (MacInnis and Jaworski, 1989). Problems with the credibility of messages about water usually stem from the fact that small actions or certain changes in habits can produce major savings. For example, mending a dripping tap can save up to 700 liters a day and washing the car in a professional car wash rather than with a hosepipe can save 50 to 450 liters per wash. These situations must be seen as true and reliable for the information to be credible and act as a dissuasive element (Shimshack and Ward, 2005). Based on the above reasoning, it is logical to propose that the more credible the content of messages on future water availability problems, the greater the reported water conservation behavior.

2.3 Risk perception of urban water consumption

In the environmental psychology field, risk perception can be defined as the perceived likelihood of negative consequences to oneself and society from one specific environmental phenomenon (O'Connor et al., 1999). Therefore, perceived risk is a set of judgments and valuations individuals make and is subject to both external factors (type of hazard, vulnerability, moment it occurs, immediacy of impact) and other more personal factors (risk aversion, controllability of impact, knowledge, socio–economic status, among others). The main risk in water arena is its scarcity, arising out of natural hazards (e.g. drought and floods) and caused by human activity (e.g. level of consumption). Although natural hazards are more visible, scarcity or shortage due to human activity is becoming increasingly important due to major urban growth and patterns of water use.

Literature on urban water consumption has not analyzed it independently but includes it along with other risks in the perception of risk to water environments (e.g. Kirisciogluet al., 2013; McDaniels et al., 1995, 1997). These authors characterize the hazard by impact or significance of the danger, the immediacy of impact and the avoidability or controllability of impact. Here, “impact” refers to the perceived level of impact of the negative consequences of the hazard (low availability and quality of the resource) on individuals or their social groups. “Immediacy of impact” refers to perception of how distant (or close) those consequences are and “avoidability” or “controllability” corresponds to the perceived ability to control the hazard and not generate losses. Thus perception of risk is greater when there is a greater perception of its negative consequences (Hoekstra et al., 2012), the nearer they are (Vlek and Keren, 1992) and the lower the perceived control over the hazard, in this case, water scarcity (Williamson and Weyman, 2005).

Credibility of the information also affects the way people perceive risk (Trumbo and McComas, 2003), and may refer to both the source and content of the message. Studies that have analyzed ecological risk perception (e.g., Axelrod et al., 1999; McDaniels et al., 1995) find that an important characteristic for evaluating risk is "certainty" (certainty that the hazard will happen). This characteristic is directly related to the credibility of information, because if an individual perceives information about a future hazard as credible, she/he has a high certainty that the hazard will occur. These studies state that the greater the perception of credibility/certainty about the occurrence of an environmental hazard, the greater the ecological risk perception. In line with this, Pereira et al. (2009) suggest that for individuals to perceive the risk of excessive water consumption, the water awareness programs should contain credible information on scarcity. This is because individuals may only consider the risk of possible personal and social harm due to the lack of water availability if the information is credible (Bustos et al., 2004). Based on this logic, it is reasonable to expect that the more credible the content of messages on future water availability problems, the greater the risk perception of urban water consumption.

The variable ‘risk perception’ as an antecedent of water conservation has been paid scanty attention in the literature (Kirisciogluet al., 2013). But risk perception is the key to guiding behavior. For example, Lam (2006) finds a positive relationship between individuals' perception of the possibility of a drought and their intentions to retrofit their household water appliances. More recently, Jorgensen et al. (2009) consider that perceiving water scarcity and being aware of the risk it involves is an antecedent of intention to conserve water in an integrated theoretical model of the social and economic determinants of water conservation. Furthermore, various studies analyzing water consumption hazard point to a positive relationship between this hazard and conservation efforts. For example, Kirisciogluet al., (2013) show that individuals who perceived higher ecological impact to water environments due to most relevant hazards in this regard (e.g. drought, urban water consumption or water-intensive landscape) had landscape types in their residential gardens that use less water. In addition, Mankad et al. (2013) find that the perception of the urban water shortage threat is an important motivational indicator to explain adaptive behavioral intentions regarding the installation of rainwater tanks at home. Therefore, it is coherent to propose that the more perceived risk of urban water consumption, the greater reported water conservation behavior.

2.4 Personal involvement

Personal involvement can refer to a stimulus regarding a specific object, situation, or action. In this study, "personal involvement" refers to an individual's interest in conserving water. The credibility individuals attach to the information they receive can influence their personal involvement. As many authors state (e.g. Pornpitakpan, 2004), high credibility message/source are more persuasive, and this persuasion, in turn, influences attitudes increasing interest towards the object (Petty and Wegener, 1998). For instance, van der Linden (2013) suggests that a message of future risks (persuasive information about health, taste, and quality concerns) may lead to higher motivation to buy less bottled water. Following this idea, it is logical to think that before individuals get involved in water conservation, they must first perceive information on its scarcity as credible. Although there does not appear to be any scientific work to test this relationship empirically, various reports highlight the importance of credibility on citizens' involvement in environmental issues. One example is the UK's Department for Environment, Food and Rural Affairs – DEFRA– (Darnton, 2004) on the impact of sustainable development on public behavior. This report recommends that all proposed tools should be supported by credible information to present a specific message that will involve the community. Another example is the proposal from the Compliance Advisor/Ombudsman (CAO, 2008) to use credible information as a key element for producing effective public involvement guides. Thus, it is expected that the more perceived credibility of messages on future water availability problems, the greater the personal involvement in water conservation.

In the environmental studies examined, none of them analyze the relationship between risk perception and personal involvement. However, concern over water availability is a key element in awakening individual interest in its conservation (Wang et al., 2005). This concern is determined by perceived risk of use, as wastage can generate problems of scarcity (Hassell and Cary, 2007). Thus, perception of excessive water consumption and the associated risk can act as an intrinsic motivation that awakens interest in conserving it. This idea is supported by Russel and Fielding (2010) when they claim: "*Commitment to water conservation is also underpinned by water specific beliefs, such as thinking of water as a finite resource and feeling vulnerable to drought*" (p.9). Based on this reasoning, it is coherent to propose that the more risk perception of urban water consumption, the greater personal involvement in its conservation.

Finally, as Corral–Verdugo et al. (2003) note, personal engagement in water conservation practices is important for people to save water or to cooperate with a conservation campaign. Gregory and Di Leo (2003) show that people with higher personal involvement in water use decisions have lower rates of water consumption for daily activities like the use of washing machines, irrigation, showers and so on. Similarly, Sarabia–Sanchez et al. (2014) suggest that individuals with greater levels of involvement show behaviors more oriented towards water conservation as they are more motivated to take water saving decisions. These authors consider that personal involvement in water conservation has the greatest influence on reported water conservation behavior. Thus and finally, in line with the scanty literature, it is expected to find that the more personal involvement in water conservation, the greater reported water conservation behavior. Figure 1 shows the structural model proposed for testing.

< Figure 1. about here>

3. Method

3.1 The context

This study has been conducted in Spain because of its severe imbalance between short–term and long–term water demand and supply (European Environment Agency EEA, 2010). Its water resources are distributed in a very irregular manner, with a marked difference between northern ("Wet Spain") and southern areas ("Dry Spain"). This difference is important because water scarcity is a key situational factor that affects water conservation efforts (Corral–Verdugo, 2002; Fielding et al., 2013).

Spain is also a country where political "battles" have occurred around water availability, its management, and has even seen the passing of regulations to safeguard water in certain basins to the detriment of demand in other regions. This situation has meant public awareness in favor of retaining water resources against the needs or demands of other regions and the importance of saving water, with government action to encourage the switch from old household appliances (washing machines) to ones that consume less water (and energy).

3.2 Participants and system used to collect information

A two–stage procedure was implemented. First, a pretest was conducted using two in-depth group interviews (group 1 = young people aged from 18 to 25; group 2 = people over 60) where each group was made up of ten individuals with different educational levels and gender. The objective was to identify problems with the questions that might lead to biased answers in the questionnaire. Specifically it was tested the comprehensibility of all items, the total length of the questionnaire and the time needed to answer all questions. The second stage consisted of a fieldwork with the final questionnaire addressed to residents in Spain over the age of 18, using two different methods to collect data of interest:

1. Online questionnaire: The link was diffused virally in social networks (Linkedin, Google+, Facebook, and others). It was also emailed to teachers, administrative and research staff and students at various educational establishments in Spain.
2. A traditional paper–and–pencil (p&p) questionnaire was used to obtain responses from people over the age of 60 because this collective has little access to Internet.

The fieldwork was conducted in November 2012 and 839 responses were obtained nationwide. The final sample was obtained after controlling for possible bias sources and frauds. First, only the first online questionnaire from the same IP (Internet Protocol) address was taken into account to avoid duplications. Second, questionnaires that were answered in less than 10 minutes were eliminated (minimum time according to the pretest). Third, inconsistency bias was analyzed in the responses, eliminating questionnaires completed with a fixed pattern of response. Fourth, individuals under the age of 18 and questionnaires with a missing response (in the case of p&p) were excluded. The final sample comprised 637 individuals (40.7% are men and 59.3% women). 53.4% of individuals were aged between 18 and 29, 26.5% between 30 and 47 and 20.1% were 48 and over. Finally, the total sample was divided into two according to area to give a set of

420 individuals from southern and eastern Spain and one of 217 from northern and northeastern Spain, denoted by "Scarcity" ($n_{scarcity}$ = 420; men = 39.8%, women = 60.2%; age:18–29 = 48.1%, 30–47 = 29.5%, 48 ≥ 22.3%; educational level finished: 2.6% primary education, 49.3% secondary education, 34.3% graduate, 13.8% post–graduate) and "Non–scarcity" ($n_{non–scarcity}$ = 217; men = 42.4%, women = 57.6%; age18–29 = 63.6%, 30–47 = 20.7%, 48 ≥ 15.7%; educational level finished: 1% primary education, 59% secondary education, 24% graduate, 16% post–graduate) respectively.

3.3 Measures

All the scales used to measure the different variables of the proposed model (Figure 1) are presented in Appendix A.

Message credibility. There are two approaches for measuring "content credibility". The first is general and is based on asking about the main characteristics of credible information (e.g. Eastin, 2006). The second is specific and adapts measures to concrete phenomena (e.g. for internet, Flanagin and Metzger, 2000). Given the specific nature of water conservation, an ad hoc instrument was designed for this research. The procedure was as follows:

1. Take into account the proposal from Jain and Posavac (1999) for measuring the credibility of persuasive messages.
2. Establish a list of 8 items with statements that describe future risks (e.g. "Water supply problems will get worse in the near future ").
3. The list was presented to four groups of individuals (two groups of young people and two of people over 60) who evaluated the appropriateness of each statement.
4. Analyze the non–discriminating items in relation to their importance and knowledge of each of them.

After eliminating four items, the final scale comprised the remaining four (ranging from 1 = Totally false to 6 = Totally true). Referred to the degree to which each item is understood as credible.

Personal involvement. Zaichkowsky's (1994) scale was used after excluding the items that do not contextualize for water conservation (e.g. boring, exciting, appealing). Items proposed by Gregory and Di Leo (2003) were added if they were specifically related to water. In this scale respondents have to indicate their level of personal involvement or interest in the decision to conserve water for 9 sets of anchored responses using a 7–point semantic differential scale.

Reported water conservation behavior (RWCB). There are different approaches in the literature to the measurement of water conservation behavior (see Clark & Finley, 2007; Russell & Fielding, 2010), water-use diaries (e.g. Harriden, 2012), observational data (Corral-Verdugo et al., 2002) and reported behavior (e.g. Randolph & Troy, 2008). Present research uses reported behavior based on items from the "*awareness and practice*" scale in Willis et al., (2011), and items from the contributions indicated in Section 2.1. (definition of water conservation behavior). The measurement used is a Likert-type scale of five items ranged from 1=Totally disagree to 6=Totally agree.

Risk perception of urban water consumption. A semantic differential format has been used because this scaling type allows one to assess people's reactions to stimulus concepts in terms of ratings on bipolar adjectives. Following proposals from McDaniels et al.

(1995;1997) and Kiriscioglu et al. (2013) three dimensions were considered: subjective importance or severity of the hazard (impact dimension), immediacy of its negative impact (time–related dimension), and perceived ability to avoid it (control dimension). In the first instance, a list of eight adjectives by dimension was created using those from cited literature. All of them were tested by two focus groups in order to discard the adjectives not well understood within the context of 'perceived risk in urban water consumption'. After removing the unrelated items, the remaining nine were included in the questionnaire. All of them were rated using a 7–point rating scale.

4. Results

When studying the adoption of water conservation behavior, it is important to contextualize the analyses in relation to the area where the individuals live (Dolnicar and Hurlimann, 2010; Russell and Fielding, 2010). Thus, different environments (scarcity vs. non scarcity) may not only lead to different start points but also to different elasticity when responding to pro–water saving stimuli. Therefore the analyses were conducted on two samples, "areas of scarcity vs. areas of non–scarcity", called in this study "Scarcity" and "Non–scarcity" respectively. This differentiation permits twofold analyses. First, verification of whether the measurement instrument is valid and reliable in both samples. And second, comparison of model fit in two different situations in order to determine any significant differences between the two.

4.1 Validation of the risk perception of urban water consumption scale

The perceived risk construct responds to a second–order Type II factor (reflective first–order and formative second–order factor model) according to the denomination in Jarvis et al. (2003). Each risk dimension (time, importance and control) is reflective because the items are a sample from the universe of items that could be constructed. However, these dimensions have a formative relationship with the global construct 'perceived risk', because the dimensions produce or cause that perception. High correlations in the various risk dimensions are not to be expected therefore (Jarvis et al, 2003). Figure 2 shows the model.

To find out whether the model shown in Figure 1 has good psychometric properties, firstly the construct risk perception of urban water consumption is independently verified (Figure 2). Analyses of the other constructs including risk perception are presented below. This methodology has been proposed and defended by other authors such as Ulaga and Eggert (2005) and Sanchez–Franco and Roldan (2005).

< Figure 2. about here>

4.1.1 Statistical properties of the risk perception of urban water scale

Exploratory factor analysis (EFA) shows that both samples have a three–factor structure that explains 75.06% of the total variance (for "Scarcity") and 77.48% (for "Non–Scarcity). KMO coefficients are 0.76 and 0.80 respectively and no MSA (measures of sample adequacy) is below 0.70.

Convergent validity was analyzed by running confirmatory factor analysis (CFA) using robust maximum likelihood estimation with EQS.6.1 software. The global fit results are not acceptable for any sample because the Lagrange multipliers suggest a relationship of item Lt3 ("Time") with a factor other than the one assigned ("Importance"). Therefore item Lt3 was eliminated from the dimension "Time" in both samples. After running CFA again the results suggest goodness of fit for both samples (Appendix B, Table B.1). The large sample size makes the Satorra–Bentler Chi–squared significant and not very reliable. In contrast, normed indicators (dividing chi–squared between its degrees of freedom) are admissible (Hair et al., 2009). Fit indicators (BBNFI, CFI and IFI) exceed the cutoff value of 0.90 and error (RMSEA) is within the values recommended in the literature. Internal consistency of the scales was measured with the composite reliability index which in all cases exceeds the minimum acceptable value of 0.70. Similarly, the average variance extracted (AVE) is over 0.50 which ensures that the variance captured by the factor analyzed is greater than the variance due to the measurement error of its items.

Two procedures were used to analyze discriminant validity. First, it was checked that the confidence interval for the correlation between pairs of factors did not contain the perfect correlation (r=1) (Anderson and Gerbing, 1988). Then, it was followed the recommendations of Fornell and Larcker (1981) (Appendix B, Table B.2). Finally, as can also be seen in Table A.2, the low correlations between dimensions, including the non–significance between the dimensions "Importance" and "Control" in the "Scarcity" sample confirm the formative nature of the construct perceived risk.

4.1.2 Properties of the structural model

Following the proposal of Ulaga and Eggert (1995) the three dimensions of perceived risk become manifest variables (indicators) of the second order construct in a formative way through the sum of their indicators.

The technique of regression with partial least squares (PLS) was chosen rather than analysis with structural equation models. As Henseler et al. (2009) note "…distinguish between two families of SEM techniques: covariance–based techniques, as represented by LISREL, and variance–based techniques, of which partial least squares (PLS) path modeling is the most prominent representative" (p.277). PLS has generated much interest in the field of marketing in general and consumer behavior in particular, with studies published in top–tier Social Sciences journals in general (Henseler et al., 2009). This technique was chosen for two main reasons. First, it is appropriate when there are one or more formative constructs in the structural model or when the measurement instrument is analyzed with formative and reflective indicators (Diamantopoulos and Winkholfer, 2001). Second, the variables do not fulfill any of the assumptions established by Jarvis et al. (2003) for estimating models with formative variables using structural equations analysis. The assumptions are: 1) that the formative construct also has a minimum of two reflective indicators; 2) the formative construct is independent in its structural relationship with the other constructs and loads on at least two reflective constructs and 3) a combination of 1 and 2. Accordingly, partial least squares via SmartPLS 2.0 were used.

Convergent validity of the reflective constructs in the model in Figure 1 (all except risk perception) was analyzed following the procedure described in paragraph 4.1.1. Tables C.1 and C.2 (Appendix C) show that factor loading, Cronbach's alpha, CR and AVE are

appropriate for the two samples. The scale indicators do not have to be correlated with each other for the formative construct, so the above procedure is not applicable. Therefore the weights have been calculated to find the relative importance of each indicator in the formation of perceived risk. The significance of the factor loading and these weights was obtained using bootstrapping re–sampling procedure (500 sub–samples of the size of the original sample) in order to test the stability of the estimates (t–statistic values). Finally, discriminant validity in both samples was confirmed using PLS (Appendix C. Table C.3).

4.2 Relationships in the structural model

Standard errors and t–values were used to examine the relationships between constructs in each sample with bootstrapping of 500 subsamples in each sample. These indicators, together with the evaluation of whether to support or reject each proposed relationship are shown in Table 1.

< Table 1. about here>

The empirical evidence suggests that message credibility and risk perception of urban water consumption have no significant influence on reported water conservation behavior in either of the two samples. Personal involvement has the greatest influence on reported water conservation behavior of all the variables in the model. Similarly, the influence of message credibility on risk perception of urban water consumption is the highest in the model for both situational contexts ($\beta = 0.485$; $t = 11.261$; $p < 0.01$ for the "Scarcity sample" and $\beta = 0.608$; $t = 11.442$; $p < 0.01$ for the "Non–scarcity sample"). Additionally, the two antecedents of involvement are significant, with risk perception of urban water consumption having the greatest influence. All these significant relationships have positive signs, in keeping with the theoretical considerations. Finally, the coefficients of determination were estimated for both samples ("Scarcity sample": Risk perception, $R^2 = 0.24$; Involvement, $R^2 = 0.15$; Reported water conservation behavior, $R^2 = 0.12$. "Non–scarcity sample": Risk perception, $R^2 = 0.37$; Involvement, $R^2 = 0.26$; Reported water conservation behavior, $R^2 = 0.08$).

In addition, it was calculated the possible mediating effect of personal involvement on the relationship between message credibility and RWCB. Also, the mediating effect of personal involvement on the relationship between risk perception and RWCB was calculated. To do so, it was followed the approach of Hair et al. (2014). They use de VAF (Variance Accounted For) indicator which establishes the criteria according to which part of the total effect of the independent variable on the dependent is due to mediation. Results show that in the "scarcity sample" there is a partial mediating effect of personal involvement (VAF = 67%) in the relationship between message credibility and RWCB, whereas in the "non-scarcity" sample this mediating effect is fully (VAF = 87%). In the case of the relationship between risk perception and RWCB there is not a mediating effect of personal involvement since the direct relationship between risk perception and RWCB is not significant in either of the two samples ($\beta = 0.074$; $t = 0.702$; $p > 0.10$ and $\beta = -0.081$; $t = 0.791$; $p > 0.10$ for "scarcity" and "non-scarcity" samples respectively). Therefore, it can be concluded that in both cases the relationship between these two variables is indirect instead of mediated.

4.2.1 Comparison between "Scarcity" vs "Non–scarcity" samples

Following Russell and Fielding (2010), it is important to consider intra–personal and contextual factors in the analysis of pro–environmental behaviors. Thus, after confirming that the model and its measurement instruments were appropriate for both samples three analyses were run to find any significant differences between the two situational contexts (water scarcity vs. non–scarcity) in: 1) the structural relationships of the model 2) the levels of the key variables and 3) the explained variance of the dependent variable (R2).

As regards message credibility on future water risks, Spain is a country where the issues of water availability and consumption have been used as a political weapon, especially in areas of high scarcity (Mairal–Buil, 2005). Thus many people may not perceive future water risks as credible because they no longer distinguish whether the information being offered is truthful or not (Sarabia–Sanchez et al., 2014). It is logical to maintain that in the areas of Spain with greater water scarcity, the message credibility variable could have less influence on risk perception (see relationship A in Table 2). Similarly, as Whitmarsh (2008) points out, in areas with a high threat of danger individuals are more mistrustful of the external information being provided and their motivations for reducing the risk are more related to internal reasons (see relationship B in Table 2).

Furthermore, Gooch (1996) argues that account must be taken of any local environmental problems when analyzing how the public perceive this type of risk. Individuals who directly experience the negative consequences of a risk have a heightened perception of its importance (Takács–Sánta, 2007). Thus individuals who live in areas with high risk of drought perceive the danger of engaging in high water consumption as a "here and now" problem (Willis, 2011). They may therefore be more involved in water conservation (Domènech et al., 2010) (see relationship C in Table 2).

Finally, the variable involvement is expected to have a more important role in the context of water scarcity than non–scarcity due to its motivational role in environmentally–friendly behavior and reduced resource use. In areas with severe drought individuals are more involved with the issue because their concern is greater (Trumbo et al., 1999) and this may influence their efforts to conserve the resource (Fielding et al., 2013) (see relationship D in Table 2).

< Table 2. about here>

To find out whether the differences in the structural relationships between the two situational contexts are significant a multigroup analysis was conducted using different approaches. Firstly, using the parametric approach proposed by Chin (2000). This technique compares the intensity of differences in path coefficients between constructs for the samples analyzed. This comparison is run using a t–test, unlike earlier studies which simply looked at the numerical values of path coefficients (e.g. Thompson et al., 1994). However, with this approach the data must be distributed normally and/or the variances of the two samples must not be too different from one another. Thus in the case of assuming different variances for the two samples, a Welch–Satterthwait test can be applied (Sarstedt et al., 2011). In this study both tests were applied and they yielded similar results (Table 3, see $t_{param(EV)}$ and $t_{param(NEV)}$ respectively). The result of the non–parametric approach is also presented, Henseler's PLS multi–group analysis (Henseler et al., 2007). This method has

the advantage of not relying on distributional assumptions (Sarstedt et al., 2011). As can be seen, the results of the three approaches are consistent, given that significant differences only exist between the two situational contexts for the relationship between message credibility and perceived risk of urban water consumption (Relationship A).

< Table 3. about here>

In addition, as it was stated, a comparison at levels of the relevant variables (message credibility, risk perception, involvement and RWCB) has been performed. It yields further information between both situational contexts. Regarding message credibility and risk perception of urban water consumption there is no empirical evidence to reject the difference in means (there is no evidence to reject normal distribution for message credibility and risk perception using Kolmogorov–Smirnov test, hence a standard t–test is performed to compare both means) between the two situational contexts (t_{MC} = 1.20, p = 0.23; t_{RP} = 1.23, p = 0.22). However, there are statistical differences in means (since the distribution of involvement and reported water conservation behavior is non–normal, means are compared by non–parametric k–means test) for both involvement and reported water conservation behavior under different scarcity context (p_{INV} = 0.04, p_{RWCB} = 0.003).

Finally, it was tested if there were significant differences between the two explained variance ($R^2_{scarcity}$ = 0.12, $R^2_{non–scarcity}$ = 0.08). Fisher transformation for two independent models with the same variables was used and z=0.83 (df = 635, p = 0.40 for two–tailed probability). This result indicates that the predictive power of the independent variables for the two independent populations is basically the same.

5. Discussion and conclusions

Recent years have shown the need for further research into responsible consumer behavior (Naderi & Strutton, 2014). In the conservation field, a deeper study is needed of a variety of responsible behaviors like water conservation (Fielding et al., 2016). The literature points to the importance of cognitive factors in this type of behavior because it is principally a rational decision (Jackson, 2005). For this reason, the present study has focused on analyzing the relationship between three cognitive factors little studied in the literature on water (message credibility, personal involvement and risk perception) and reported water conservation behavior.

The results show that although the structural model presents a modest explanation of reported water conservation behavior, the proposed measurement model is reliable and valid for the two different situational contexts (water scarcity and non–scarcity). This modest explanatory power is not exclusive to this work and is in keeping with the findings in other studies. For example, Ortega-Egea and García-de-Frutos (2013) obtain R^2 = 0.11 for European citizens' environmentally motivated consumption reduction behavior. Corral–Verdugo et al. (2008) obtain R^2 = 0.13 in their study of the "New Human Interdependence Paradigm" (NHIP) as predictor of water conservation behavior. Even after introducing the "New Environmental Paradigm" (NEP) and "Human Exception Paradigm" (HEP) they only managed to increase R^2 to 0.17. Another example is the work by Marandu et al. (2010) who obtain R^2 = 0.078 using the Theory of Reasoned Action as a predictor of water conservation behavior. Finally, it is interesting to highlight that studies that report a high explanatory power of water consumption (or conservation) do so because they usually measure actual

water consumption (using household consumption data) and use as predictor household characteristics or composition such as number of people in the household (e.g. Gregory and Di Leo, 2003; Fielding et al., 2012).

All the structural relationships between the model variables are significant except the influence of message credibility and risk perception of urban water consumption on reported water conservation behavior for both situational contexts. The non–significance of the relationship between risk perception of urban water consumption and reported water conservation behavior is in line with works in the field of risk evaluation. As Lo (2013) points out, evidence of the perceived risk–behavior relationship is still far from consistent. In addition, the non-relationship between message credibility and reported water conservation behavior may show the limited relevance of this variable to explain this type of behavior in a country like Spain, where water problems are used as a political weapon (Sarabia–Sanchez et al., 2014). The result in this last case also suggests a mediating effect (partial in the case of "scarcity" sample and fully in the "non-scarcity" sample) of personal involvement between these two variables. That is, although individuals perceived certain water problems as credible, they must be personally involved in water conservation practices to engage in such behavior

This finding may be explained by the attitudinal approach of personal involvement. Individuals who get personally involved with an issue, object or person develop an attitude if they perceive it is important for them. Thus attitudes themselves can be personally involving, which generates a person's motivation to state more stable attitudes over time. Individuals with a positive attitude towards water conservation are more likely to engage in behaviors to reduce water consumption (Göckeritz et al., 2010). Similarly, Griffin and Dunwoody (2000) suggest that the low relationship between risk perception of lead in tap water, credibility of mass media information and other cognitive variables with preventive behavior may be explained by low levels of interest and motivation (involvement) with this issue. Fielding et al. (2013) also point out that personal involvement is essential for achieving long term reductions (conservation of the resource) even when individuals perceive they are already making conservation efforts. And as Schultz and Zelezny (2003) note, citing Jane Elder (The Biodiversity Project), "*We don't need an informed and depressed public; we need an informed public that believes it can be part of effective solutions*" (p.127). Finally, due to the high relationship between message credibility and risk perception of urban water consumption, the proposed model shows that it is important for individuals who perceive the risk of water issues to perceive the truthfulness of the information they receive.

Additionally results support the high external validity of the proposed model, which allows its use in different water stress environments (areas of scarcity vs areas with abundant water), but with certain differences. According to the multigroup analysis performed, the effect of message credibility on risk perception of urban water consumption is lower in the areas with water scarcity. This situation may be due to the discretionary characteristics of the Spanish context: as already noted, in Spain water problems are used as a political weapon (Mairal–Buil, 2005; Sarabia–Sanchez et al., 2014). Regarding comparison at levels of the relevant variables, it is found differences in involvement and reported water conservation behavior. In areas with water scarcity people report greater level of these variables than in non–scarcity areas. This result is in agreement with past

research (e.g. Fielding et al., 2012) because in areas of water scarcity, individuals are significantly more likely to declare that they participate in this kind of behavior. Moreover, it has been detected that the levels of credibility attached to messages on future water risks are similar in both contexts. The logic of this situation resides in the globalization of information. Thus, most of the information individuals receive on environmental problems comes from the mass media (Sampei and Aoyagi–Usui, 2009) and given that both samples come from the same country, the information tends to be uniform. The fact that no differences have been detected in risk perception of urban water consumption in the two contexts can be explained through a "habit effect". The data in the scarcity context were mainly collected in areas of Spain which often experience periods of drought. Thus, individuals living in these areas get used to the risk and show greater tolerance towards it (Baxter, 2009). Although the literature points out that risk perception is greater in areas where individuals experience risk directly (Domènech et al., 2010), this "habit effect" may lead to the elimination of significant differences.

The findings are useful for managers concerned with the promotion of water conservation behavior and academics. First, communication strategies must be developed on the lines of messages that enable individuals to become personally involved in this type of behavior. Additionally, these messages must also transmit the idea that everybody can be part of effective solutions. Similarly, as people who have experienced water shortages directly are much more involved and have a greater reported water conservation behavior, communication should also consider the situational contexts in which it takes place and differentiate between areas of high and low water scarcity. Second, the results show the importance of performing contextual analyses in water conservation field of research. Additionally, the results show a modest explanatory value of reported water conservation behavior, which indicates that the variables analyzed may be necessary but not sufficient to explain it. Thus, unreasoned influences (Gregory and Dileo, 2003) or resistance to changing habits and lifestyles that generate high levels of resources consumption may be candidate variables for consideration by academics to be tested as future antecedents. In the case of changing behaviors, there is an important body of theory on the factors that contribute to successful lifestyle change in areas like education and health (e.g. NICE, 2007) which would be interesting to explore in the field of resource conservation behaviors. It is important to note that human psychology is not intended to seek “the truth” but to find “truths” that strengthen previous convictions (confirmation bias), therefore individual conviction and its role in inertial behavior may be a future variable of interest. Finally, another interesting research line (see e.g. Price et al., 2015) is to analyze, using an experimental methodology, which type of messages are most effective in order to reinforce or promote water conservation behaviors.

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7. Appendix

7.1. Appendix A: Measurement items for variables proposed in the model

< Table A.1. about here>

7.2. Appendix B: Convergent and discriminant validity of Risk perception scale

< Table B.1. about here>

< Table B.2. about here>

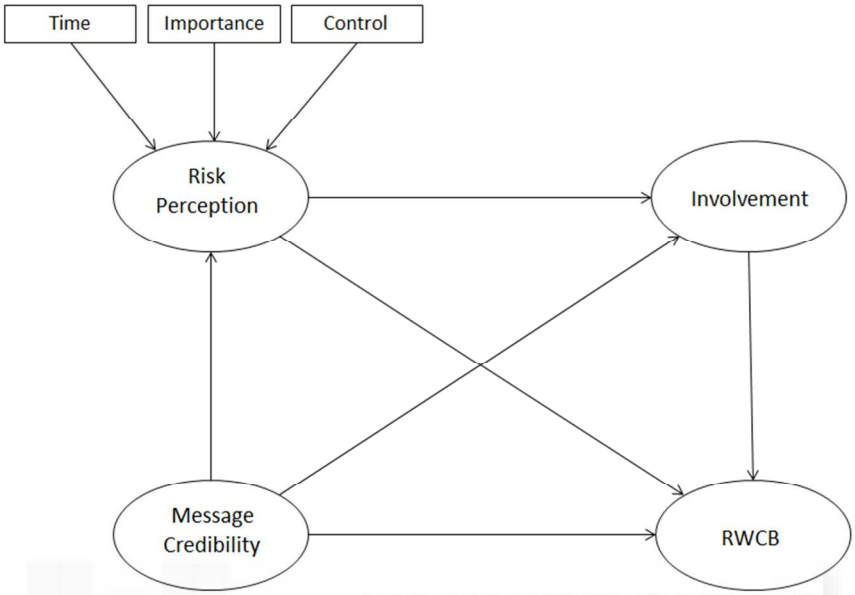
7.3. Appendix C: Convergent and discriminant validity of proposed model

< Table C.1. about here>

< Table C.2. about here>

< Table C.3. about here>

Figure 1. Proposed theoretical model



Note: RWCB = Reported water conservation behavior

Figure 2: Model for measuring risk perception

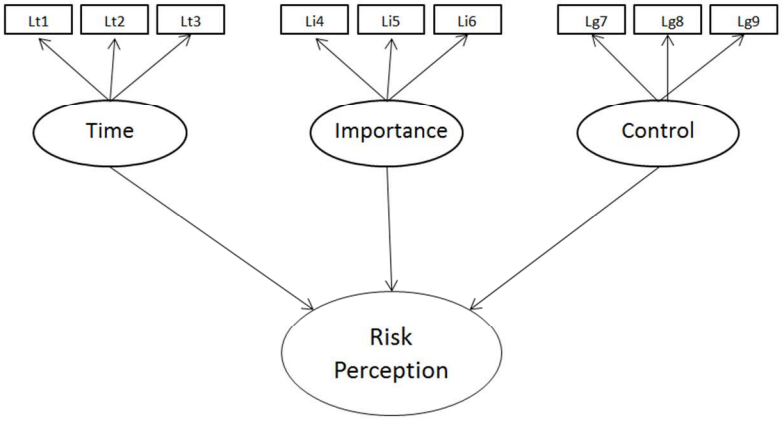


Table 1. Relationships testing

	$N_{scarcity}$ = 420		$N_{non–scarcity}$ = 217		
Relationships	**β**	**t–statistic (bootstrap)**	**β**	**t–statistic (bootstrap)**	**Acceptance**
Message Credibility → RWCB	0.032^{ns}	0.504	0.013^{ns}	0.121	Rejected
Message Credibility → Risk Perception	0.485**	11.261	0.608**	11.442	Supported
Risk Perception → RWCB	$–0.077^{ns}$	1.292	$–0.129^{ns}$	1.026	Rejected
Message Credibility → Involvement	0.181**	3.662	0.279**	3.492	Supported
Risk Perception → Involvement	0.263**	4.991	0.285**	3.698	Supported
Involvement → RWCB	0.363**	7.073	0.301**	3.409	Supported

** p<0.01 (t>2.56); *p<0.05 (t>1.96); ns=non–significant
RWCB = Reported water conservation behavior

Table 2. Relationships between Scarcity Sample (S) vs. Non–scarcity Sample (NS)

Relationships	Expected result
A: Message Credibility →Risk Perception	S<NS(*)
B: Message Credibility →Involvement	S<NS
C: Risk Perception →Involvement	S>NS
D: Involvement →RWCB	S>NS
(*) relationship between Message Credibility →Risk Perception is lower in scarcity sample. RWCB = Reported water conservation behavior	

Table 3. Multigroup analysis

Paths							
Relationships	**Expected Results**	**$n_{scarcity}$**	**$n_{non-scarcity}$**	**Diff. (s–ns)**	**$T_{parametric(EV)}$**	**$T_{parametric(NEV)}$**	**$P_{Henseler}$**
A: Message Credibility →Risk Perception	S<NS	0.485	0.608	–0.123	–1.698*	–1.798*	0.038**
B: Message Credibility →Involvement	S<NS	0.181	0.279	–0.098	–1.007	–0.983	0.151
C: Risk Perception →Involvement	S>NS	0.263	0.285	–0.021	–0.227	–0.223	0.589
D: Involvement →RWCB	S>NS	0.363	0.301	0.062	0.708	0.680	0.258

* p<0.10 (one–tail t distribution); ** p<0.05 (one–tailed test)
RWCB = Reported water conservation behavior

Table A.1. Measurement items for variables proposed in the model

Message credibility	**Q. Imagine the following headlines in any media (e.g. newspapers or TV). To what extent do you perceive each headline to be credible?**
	G1. Water supply problems will get worse in the near future.
	G2. The world is facing "water bankruptcy". There will be scarcity in the Earth's main rivers.
	G3. Despite the rain, if it doesn't rain more in the next few months, there will be insufficient water reserves.
	G4. The world's underground water reserves are at risk because of bad management and overexploitation.
Personal involvement	**Q. Please mark the position that best shows your personal opinion about conserving water (domestically).**
	I01. Important vs. Unimportant.
	I02. Irrelevant vs. Relevant
	I03. Means a lot to me vs. Means nothing.
	I04. Useless vs. Useful.
	I05. Valuable vs. worthless.
	I06. Matters to me vs. Does not matter.
	I07. Vital vs. superfluous.
	I08. Essential vs. nonessential.
	I09. Not needed vs. needed.
RWCB	**Q. Indicate your level of agreement or disagreement with the following statements.**
	O1. You know what your current water consumption is due to.
	O2. You know what you have to do to save water in the home.
	O3. You are aware of the different ways to save water in the home.
	O4. With your behavior you contribute to the correct use of the water you use.
	O5. You usually control the amount of water you use.

Risk perception

Q. Please mark the position that best shows your opinion about the risks of current water consumption (general of the whole society).

Time	Importance	Control
Lt1. Long term vs. short term.	Li4. Non vs. very important.	Lg7. Manageable vs. non–manageable.
Lt2. Distant vs. close.	Li5. Non vs. very dangerous.	Lg8. Governable vs. non–governable.
Lt3. Non–urgent vs. very urgent.	Li6. Inoffensive vs. hazardous.	Lg9. Easy vs. non–surmountable

Table B.1. Risk perception scale for both samples. Reliability and convergent validity

	Scarcity Sample(n=420)			**Non–scarcity Sample (n=217)**		
Dimension	Factor loadings (t)	CR	AVE	Factor loadings (t)	CR	AVE
Dimension: Time						
Item Lt1	0.87* (15.82)	0.88	0.79	0.84*(13.34)	0.91	0.84
Item Lt2	0.91*(18.25)			0.99*(16.32)		
Dimension: Importance						
Item Li4	0.77* (14.03)	0.86	0.67	0.73*(9.61)	0.86	0.67
Item Li5	0.85* (17.16)			0.80*(12.44)		
Item Li6	0.84* (16.80)			0.91*(15.88)		
Dimension: Control						
Item Lg7	0.82*(14.56)	0.75	0.51	0.89*(13.49)	0.78	0.55
Item Lg8	0.64*(11.93)			0.70*(10.34)		
Item Lg9	0.66*(11.75)			0.60*(7.97)		
Model adjust indicators	S–B $\chi 2$ (17df)= 53.25 (p<0.01); Normed Chi–squared=3.13; BBNFI= 0.95; CFI= 0.97; IFI= 0.97; RMSEA= 0.07			S–B $\chi 2$ (17df)= 35.76 (p<0.01); Normed Chi–squared=2.10; BBNFI= 0.95; CFI= 0.97; IFI= 0.97; RMSEA= 0.07		
* p<0.01 (t>2.56); CR= Composite Reliability; AVE= Average Variance Extracted						

Table B.2. Risk perception scale: Discriminant validity

	Scarcity Sample			Non–Scarcity Sample		
Dimension	Time	Importance	Control	Time	Importance	Control
Time	*0.89*	0.44**	0.20**	*0.92*	0.48**	0.47**
Importance	(0.34, 0.53)	*0.82*	0.12	(0.37, 0.58)	*0.82*	0.47**
Control	(0.08, 0.32)	(–0.01, 0.251)	*0.71*	(0.31, 0.62)	(0.35, 0.58)	*0.74*

* p<0.01 (t>2.56); Note: Diagonal: Squared root of the extracted variance.
Below the diagonal: Confidence interval of the correlation between factors.
Above the diagonal: Estimated correlation between factors.

Table C.1. Reliability and convergent validity for the "Scarcity sample"

Factors & Items	Factor loading	Weight	SE	T–test robust	Alpha Cronbach	CR	AVE
Message Credibility							
G1	0.75**		0.04	19.42			
G2	0.83**		0.02	46.00	0.77	0.85	0.59
G3	0.74**		0.03	25.28			
G4	0.75**		0.03	23.76			
Risk Perception							
Time (Lt1+Lt2)		0.42**	0.10	4.30			
Importance (Li4+Li5+Li6)		0.71**	0.08	8.81	n/a	n/a	n/a
Control (Lg7+Lg8+Lg9)		0.20*	0.09	2.26			
Involvement							
I01	0.74**		0.05	16.24			
I02	0.70**		0.04	17.11			
I03	0.68**		0.04	18.33			
I04	0.75**		0.04	18.97	0.92	0.94	0.62
I05	0.84**		0.03	33.37			
I06	0.84**		0.02	37.59			
I07	0.84**		0.02	39.14			
I08	0.86**		0.02	52.35			
I09	0.81**		0.04	20.00			
RWCB							
O1	0.79**		0.03	28.83			
O2	0.79**		0.03	30.23	0.84	0.89	0.61
O3	0.79**		0.03	30.71			
O4	0.82**		0.02	37.10			
O5	0.70**		0.04	19.45			

** p<0.01 (t>2.56); *p<0.05 (t>1.96); n/a = not applicable
RWCB = Reported Water Conservation Behavior

Table C.2. Reliability and convergent validity for "Non–scarcity sample"

Factors & Items	Factor loading	Weight	SE	T–test robust	Alpha Cronbach	CR	AVE
Message Credibility							
G1	0.80**		0.03	25.10			
G2	0.85**		0.03	34.75	0.70	0.82	0.54
G3	0.65**		0.06	11.67			
G4	0.60**		0.06	10.06			
Risk Perception							
Time (Lt1+Lt2)		0.56**	0.010	5.69	n/a	n/a	n/a
Importance (Li4+Li5+Li6)		0.38**	0.13	3.04			
Control (Lg7+Lg8+Lg9)		0.34**	0.10	3.46			
Involvement							
I01	0.66**		0.060	10.91			
I02	0.68**		0.084	8.12			
I03	0.72**		0.042	16.86			
I04	0.78**		0.046	17.02	0.91	0.93	0.58
I05	0.81**		0.024	33.45			
I06	0.83**		0.026	31.30			
I07	0.79**		0.023	34.35			
I08	0.83**		0.028	30.03			
I09	0.77**		0.059	12.94			
RWCB							
O1	0.79**		0.05	17.13			
O2	0.78**		0.04	20.35	0.84	0.89	0.61
O3	0.73**		0.05	13.54			
O4	0.81**		0.04	22.79			
O5	0.78**		0.04	18.00			

** p<0.01 (t>2.56); *p<0.05 (t>1.96); n/a = not applicable
RWCB = Reported Water Conservation Behavior

Table C.3. Discriminant validity between factors for both samples

	Scarcity Sample				Non–Scarcity Sample			
Dimension	MC	RP	INV	RWCB	MC	RP	INV	RWCB
MC	0.77				0.73			
RP	0.31	n/a			0.45	n/a		
INV	0.49	0.35	0.76		0.61	0.45	0.76	
RWCB	0.11	0.34	0.07	0.78	0.07	0.25	0.02	0.78

n/a= not applicable
Diagonal: Squared root of the extracted variance
Below the diagonal: Estimated correlation between factors.
MC = Message Credibility; RP = Risk Perception; INV = Involvement; RWCB = Reported Water Conservation Behavior

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Appendix 3: List of questionnaires used in this dissertation

Appendix 3.1: Questionnaire fieldwork 2011

CUESTIONARIO SOBRE ACTITUDES HACIA

EL AHORRO DE AGUA POR LAS FAMILIAS

Núm. Cuestionario

A. Por favor, indique hasta què punto està de acuerdo con las siguientes frases MOSTRAR TARJETA "A"	Muy en desacuerdo					Muy de acuerdo	No sabe
a01. Ahorrar agua es muy importante sólo cuando hay falta de agua.	1	2	3	4	5	6	9
a02. El gasto de agua nunca ha sido un problema en mi casa.	1	2	3	4	5	6	9
a03. Se puede reducir el consumo de agua sin reducirla calidad de vida.	1	2	3	4	5	6	9
a04. Se deberia racionalizar aun mas el consumo de agua.	1	2	3	4	5	6	9
a05. Es muy poca la influencia que tiene el gasto de agua de las familias considerando el total de agua que se gasta.	1	2	3	4	5	6	9
a06. Tengo comportamientos para ahorrar el máximo de agua posible.	1	2	3	4	5	6	9
a07. En mi familia se considera importante ahorrar agua.	1	2	3	4	5	6	9
a08. Si descubriese una tuberia rota en la calle por la que sale mucha agua, llamaría a la policía para que lo solucionaran.	1	2	3	4	5	6	9
a09. Influye en el medio ambiente ducharse en vez de bañarse.	1	2	3	4	5	6	9
a10. Creo que las campanas para ahorrar agua son muy necesarias.	1	2	3	4	5	6	9
a11. Me han ensenado que ahorrar agua beneficia al medio ambiente.	1	2	3	4	5	6	9
a12. Creo que existe conciencia social de que hay que ahorrar agua.	1	2	3	4	5	6	9
a13. Mi familia se preocupa por el gasto de agua innecesario.	1	2	3	4	5	6	9
a14. Hay reservas suficientes de agua para gastarla que queramos.	1	2	3	4	5	6	9
a15. En mi casa tenemos conciencia de los problemas medioambientales.	1	2	3	4	5	6	9
a16. El agua es tan necesaria que hay que habilitar todos los medios para tener toda la que necesitemos consumir.	1	2	3	4	5	6	9
a17. En mi casa es un problema gastar el agua que queramos.	1	2	3	4	5	6	9
a18. En mi casa el agua se aprovecha al máximo.	1	2	3	4	5	6	9
a19. Es muy difícil que una persona como yo pueda hacer algo por el medio ambiente.	1	2	3	4	5	6	9
a20. Cuanto mayor es la calidad de vida, mayor es el consumo de agua.	1	2	3	4	5	6	9
a21. Como se pierde más agua por conducciones rotas que por el gasto doméstico, creo que primero deberían centrarse en arreglar lo roto.	1	2	3	4	5	6	9
a22. En educacion basica hay que inculcar comportamientos proambien-tales.	1	2	3	4	5	6	9
a23. Es responsabilidad de todos y de cada uno ser cuidadosos con lo que consumimos (energía, agua, materiales no reciclables).	1	2	3	4	5	6	9
a24. Se deberian imponer multas por gastar agua de forma excesiva.	1	2	3	4	5	6	9
a25. Como pronto habrá desaladoras, no es importante ahorrar agua.	1	2	3	4	5	6	9
a26. Hay que comprar o tener electrodomésticos de bajo consumo de agua.	1	2	3	4	5	6	9

B. Por favor, señale la frecuencia con la que en su domicilio se…

MOSTRAR TARJETA "B"

	Muy a menudo	Normal-mente	A veces	Rara-mente	Nunca	No sabe o no hay
b01. Llena la bañera para bañarse en vez de ducharse.	1	2	3	4	5	9
b02. Lava el coche para tenerlo limpio.	1	2	3	4	5	9
b03. Tira de la cadena del aseo cuando no es necesario.	1	2	3	4	5	9
b04. Riega el jardín mediante manguera, sin sistema de ahorro de agua y sin controlar el tiempo de riego.	1	2	3	4	5	9
b05. Abre el grifo innecesariamente (al fregar, al lavarse los dientes).	1	2	3	4	5	9
b06. Vacía y vuelve a llenar la piscina cada vez que el agua se ensucia.	1	2	3	4	5	9
b07. Llena totalmente la lavadora a la hora de lavar.	1	2	3	4	5	9
b08. Llena totalmente el lavaplatos a la hora de ponerlo en marcha.	1	2	3	4	5	9
b09. Usa el inodoro para tirar comida o papelera.	1	2	3	4	5	9
b10. Cierra el grifo de la ducha mientras me/nos enjabono/enjabonamos.	1	2	3	4	5	9

C. ¿En qué grado cree usted que las diferentes cuestiones permitirían un mayor ahorro de agua en la familia

MOSTRAR TARJETA "C"

	Mucho ahorro	Bastante ahorro	Poco ahorro	Muy poco ahorro	Ningún ahorro	No lo sabe
c01. Multa o sobreprecio por gastar por encima de x cantidad de agua	5	4	3	2	1	9
c02. Más información y formación en la escuela	5	4	3	2	1	9
c03. Aumentar el precio de agua	5	4	3	2	1	9
c04. Poner restricciones al consumo familiar (por encima de x consumo)	5	4	3	2	1	9
c05. No regar con agua potable o poner césped artificial	5	4	3	2	1	9
c06. Reducir el caudal de agua que llega a casa (reducir presión)	5	4	3	2	1	9
c07. No regar los jardines con agua potable y poner césped artificial	5	4	3	2	1	9
c08. Prohibir campos de golf y empresas con consumo muy elevado	5	4	3	2	1	9
c09. Usar dispositivos de ahorro en grifos, para reducir el consumo	5	4	3	2	1	9
c10. Otro sistema. ¿Cuál? _____	5	4	3	2	1	9

D. ¿En qué grado cree que los siguientes motivos llevan a no ahorrar agua?

MOSTRAR TARJETA "D"

	Mucho	Bastante	Poco	Muy poco	Ningún	No lo sabe
d01. Simple dejadez o no dar importancia al ahorro de agua	5	4	3	2	1	9
d02. Falta de conciencia del problema o de cultura ecológica	5	4	3	2	1	9
d03. Tener dinero para pagar la factura del agua	5	4	3	2	1	9
d04. Los hábitos	5	4	3	2	1	9
d05. Rechazo a que se imponga el ahorro como obligación	5	4	3	2	1	9
d06. Que el agua es barata	5	4	3	2	1	9
d07. Otro motivo. ¿Cuál? _____	5	4	3	2	1	9

E. ¿Cuántos miembros tiene su familia? _____ Para cada uno, le ruego que indique:

Persona del hogar	P1	P2	P3	P4	P5	P6
Sexo (1= hombre; 2= mujer)						
Edad						
¿Quién responde?						
H. Estado civil (Tarjeta E)						
I. Estudios acabados (Tarjeta F)						

G. En su domicilio, ¿cuánta agua se gasta mensualmente?
[4] Mucha [3] Bastante [2] Ni mucha ni poca [1] Poca

Por favor, mire los últimos recibos de agua (el/los más actual/es posible)

	recibo1	*recibo2*	*recibo3*	*recibo4*	*recibo5*
g1. m3 gastados					
g2. periodo/año					

MUCHAS GRACIAS POR SU AMABLE COLABORACIÓN

ENTREVISTADOR: EXPLICAR QUE ES PARA UNA POSIBLE COMPROBACIÓN TELEFÓNICA

Nombre de pila	Teléfono de contacto	Población

[z] ¿Considera las respuestas dadas son creíbles?
(1) Sí (2) Tengo dudas (3) No

Appendix 3.2: Questionnaire fieldwork 2012

CUESTIONARIO SOBRE

COMPORTAMIENTO PROAMBIENTAL Y AHORRO DE AGUA

Núm. Cuestionario

1. Suponga que se analiza su consumo de agua y resulta ser excesivo. ¿En qué grado estaría de acuerdo con las siguientes frases?

	Total desacuerdo					Total acuerdo
En realidad cree que su consumo no es excesivo por mucho que lo diga el estudio.	1	2	3	4	5	6
Comprobaría en qué aspectos gasta más de la cuenta y cambiaría sus hábitos de consumo de agua.	1	2	3	4	5	6
Estaría conforme con el resultado y haría por reducir su consumo.	1	2	3	4	5	6
Su consumo actual de agua le da una calidad de vida a la que no desea renunciar.	1	2	3	4	5	6
Introduciría en su hogar sistemas de ahorro de agua para reducir así el consumo.	1	2	3	4	5	6
Usted es una persona de hábitos estables y le costaría cambiar su actual nivel de consumo.	1	2	3	4	5	6
No cambiaría nada pues esos estudios no ofrecen resultados significativos.	1	2	3	4	5	6
Usted reduciría su consumo de agua si también lo hacen los demás porque el ahorro de uno más o menos no se nota.	1	2	3	4	5	6
La problemática medioambiental no está clara. Mejor esperar a que se sepa a ciencia cierta qué pasa.	1	2	3	4	5	6

2. Suponga los siguientes titulares en periódicos y la televisión ¿En qué grado cree que son ciertos dichos titulares?

	Totalmente falsa	Muy falsa	Algo falsa	Algo cierta	Muy cierta	Totalmente cierta
"Son necesarios 8.000 litros de agua para producir un par de zapatos".	1	2	3	4	5	6
"Los ríos de la península llevan menos agua que hace unos años. Los del sur han perdido más que otras cuencas".	1	2	3	4	5	6
"Los problemas de abastecimiento de agua se acentuarán en un futuro próximo".	1	2	3	4	5	6
"El planeta se enfrenta a una 'bancarrota de agua'. Habrá escasez en los principales ríos de la Tierra".	1	2	3	4	5	6
"Pese a las lluvias, si no llueve más en los próximos meses, no habrá reservas de agua suficientes".	1	2	3	4	5	6
"Muchas poblaciones tienen importantes problemas de abastecimiento de agua potable".	1	2	3	4	5	6
"Las reservas de aguas subterráneas del mundo están en riesgo por su mala administración y por su sobreexplotación".	1	2	3	4	5	6
"En España, de cada 100 litros de agua 23 se pierden por averías, roturas o usos ilegales".	1	2	3	4	5	6

3. Señale su grado de acuerdo o desacuerdo con las siguientes frases

	Total desacuerdo					Total acuerdo
Usted es consciente de las diversas formas de ahorrar agua en el hogar.	1	2	3	4	5	6
Usted cree que se puede reducir el consumo de agua mediante dispositivos para el ahorro.	1	2	3	4	5	6
Usted controla habitualmente la cantidad de agua que gasta.	1	2	3	4	5	6
Usted sabe a qué se debe su actual consumo de agua.	1	2	3	4	5	6
Usted sabe lo que tiene que hacer para ahorrar agua en el hogar.	1	2	3	4	5	6
Los comportamientos individuales a la hora de consumir agua son importantes.	1	2	3	4	5	6
El consumo excesivo de unos pocos se diluye en el consumo de toda una población.	1	2	3	4	5	6

¿A qué plazo considera que se producirían/producirán problemas de escasez de agua?

[] Nunca [] A largo plazo [] A medio plazo
[] A corto plazo [] De forma inminente [] Ya se han producido esos problemas

¿A cuántos años se refiere al pensar en el plazo que ha marcado en la pregunta anterior?

[____]

4. Para el plazo que ha indicado anteriormente ¿Qué posibilidades cree que hay de que ocurran las siguientes cuestiones?

	Ninguna	Muy baja	Media	Alta	Muy alta
Que no haya reservas suficientes en pantanos o de aguas subterráneas.	1	2	3	4	5
Que no se puedan usar las reservas (por contaminación, no depuración, etc.).	1	2	3	4	5
Que haya más demanda de agua que oferta disponible.	1	2	3	4	5
Que las desaladoras no puedan generar tanta agua como sea preciso.	1	2	3	4	5
Que en la distribución de agua se generen pérdidas de agua potable que impidan un normal abastecimiento.	1	2	3	4	5
Que se dé mal uso al agua y se pierda la disponible.	1	2	3	4	5
Que haya restricciones generales de agua	1	2	3	4	5
Que sólo se prohíba usar agua para determinados usos (piscinas, jardines).	1	2	3	4	5

5. Por favor, señale la posición que mejor muestra su opinión sobre los riesgos del actual consumo de agua (general de toda la sociedad). *Cuando más a la izquierda señale, su posición se acercará más a lo indicado en esa zona. Por el contrario, cuando más a la derecha señale, más cercana estará su posición personal de lo indicado en esa zona.*

Rodee con un círculo el número que mejor represente como percibe los riesgos sobre el actual consumo y forma de consumir agua

Cuanto más se acerque a una opción (o su contraria) más intensa debe ser su percepción

A largo plazo	1	2	3	4	5	6	7	Inmediatos
Lejanos	1	2	3	4	5	6	7	Inminentes
No urgentes	1	2	3	4	5	6	7	Urgentes
No importantes	1	2	3	4	5	6	7	Importantes
No peligrosos	1	2	3	4	5	6	7	Peligrosos
Benignos/No serios	1	2	3	4	5	6	7	Graves/Serios
Manejables	1	2	3	4	5	6	7	Inmanejables
Fácilmente superables	1	2	3	4	5	6	7	Difícilmente superables
Gestionable	1	2	3	4	5	6	7	Imposible de gestionar

6. Señale su grado de acuerdo o desacuerdo con las siguientes frases

	Total desacuerdo					Total acuerdo
Le interesan más los beneficios a corto plazo que a largo plazo.	1	2	3	4	5	6
Cuando usted toma decisiones le preocupan sus consecuencias a largo plazo.	1	2	3	4	5	6
En el mundo en el que vivimos lo mejor es vivir "el momento".	1	2	3	4	5	6
Usted se interesa sobre todo por "el aquí y el ahora".	1	2	3	4	5	6
Usted es una persona que se fija metas a largo plazo.	1	2	3	4	5	6
Piensa que el futuro es demasiado indeterminado como para pensar en lo que ocurrirá entonces.	1	2	3	4	5	6
Usted prefiere resultados inmediatos. Y mejor cuanto más inmediatos.	1	2	3	4	5	6
Cree que es imprudente no tener en cuenta lo que pueda suceder a largo plazo.	1	2	3	4	5	6
Usted admira a quienes adquieren fama y dinero con rapidez.	1	2	3	4	5	6

7. Señale su grado de acuerdo o desacuerdo con las siguientes frases

	Total desacuerdo					Total acuerdo
En temas medioambientales, usted no cambia fácilmente de opinión.	1	2	3	4	5	6
La administración hace todo lo posible para resolver los problemas de agua.	1	2	3	4	5	6
Sus opiniones sobre el medioambiente son estables en el tiempo.	1	2	3	4	5	6
En relación al medio ambiente, con frecuencia cambia de opinión.	1	2	3	4	5	6
Una vez que llega a una conclusión sobre temas medioambientales, es poco probable que cambie de opinión.	1	2	3	4	5	6
El que una persona ahorre agua (o no) tiene poco peso a la hora de ahorrar entre todos.	1	2	3	4	5	6
El que usted consuma más o menos no afecta al consumo global de agua en su zona.	1	2	3	4	5	6
La escasez de agua no es un problema en mi zona/pueblo/ciudad.	1	2	3	4	5	6

8. Para mantener el actual estatus de calidad de vida, ¿qué efecto cree usted que tendría ...?

	Ninguna	Muy baja	Media	Alta	Muy alta
Que no haya reservas suficientes en pantanos o de aguas subterráneas.	1	2	3	4	5
Que no se puedan usar las reservas (por contaminación, no depuración, etc.).	1	2	3	4	5
Que haya más demanda de agua que oferta disponible.	1	2	3	4	5
Que las desaladoras no puedan generar tanta agua como sea preciso.	1	2	3	4	5
Que en la distribución de agua se generen pérdidas de agua potable que impidan un normal abastecimiento.	1	2	3	4	5
Que se dé mal uso al agua y se pierda la disponible.	1	2	3	4	5
Que haya restricciones generales de agua	1	2	3	4	5
Que sólo se prohíba usar agua para determinados usos (piscinas, jardines).	1	2	3	4	5

9. Por favor, señale la posición que mejor muestra su opinión personal sobre reducir el consumo de agua (a nivel doméstico). *Cuando más a la izquierda señale, su posición se acercará más a lo indicado en esa zona. Por el contrario, cuando más a la derecha señale, más cercana estará su posición personal de lo indicado en esa zona.*

Importante	1	2	3	4	5	6	7	No importante
No me afecta	1	2	3	4	5	6	7	No me afecta
Irrelevante	1	2	3	4	5	6	7	Relevante
Significa mucho para mí	1	2	3	4	5	6	7	No significa nada para mí
Inútil	1	2	3	4	5	6	7	Útil
Valioso	1	2	3	4	5	6	7	Sin valor
Me importa	1	2	3	4	5	6	7	No me importa
Vital	1	2	3	4	5	6	7	Superfluo
Esencial	1	2	3	4	5	6	7	No esencial
Innecesario	1	2	3	4	5	6	7	Necesario

10. Señale su grado de acuerdo o desacuerdo con las siguientes frases

	Total desacuerdo					Total acuerdo
Con su comportamiento usted contribuye a un uso correcto del agua que gasta.	1	2	3	4	5	6
La conservación del agua es una cuestión a largo plazo.	1	2	3	4	5	6
Es necesario controlar el consumo de agua en el hogar.	1	2	3	4	5	6
Tirar productos a las aguas (ríos, playas, embalses) reduce la calidad del agua.	1	2	3	4	5	6
Es necesario que las futuras generaciones disfruten del agua al menos con la misma calidad que tiene ahora.	1	2	3	4	5	6
Nadie tiene derecho a utilizar el agua sin control y para verter residuos, aunque no sean contaminantes.	1	2	3	4	5	6
Es importante que cada persona contribuya al ahorro general de agua.	1	2	3	4	5	6
El consumo de los hogares es pequeño comparado con los del campo o las industrias, por lo que un ahorro en los hogares tendrá poca importancia.	1	2	3	4	5	6

11. Señale su grado de acuerdo o desacuerdo con las siguientes frases

	Total desacuerdo					Total acuerdo
La escasez de agua está sobrevalorada. No falta tanta como se dice.	1	2	3	4	5	6
Normalmente pienso como usar bien el agua y trato de ahorrar siempre que puedo.	1	2	3	4	5	6
Me preocupa el consumo excesivo de agua en mi ciudad/pueblo.	1	2	3	4	5	6
Las personas deben tener derecho a utilizar tanta agua como deseen.	1	2	3	4	5	6
La escasez de agua es sólo un problema temporal y NO un problema crónico.	1	2	3	4	5	6
La administración está haciendo todo lo posible para hacer frente a los futuros problemas del agua.	1	2	3	4	5	6
Los usuarios que gasten más agua o la cuiden menos deben pagar más por ella.	1	2	3	4	5	6
Sólo un incremento sustancial del precio del agua podría reducir mi actual consumo.	1	2	3	4	5	6

12. Para ahorrar agua ¿En qué grado cree que es importante...?

	Ninguna	Muy baja	Media	Alta	Muy alta
Cerrar el grifo cuando se lava los dientes o enjabona las manos.	1	2	3	4	5
Ducharse en vez de bañarse.	1	2	3	4	5
Reducir las duchas a una duración máxima de 6-8 minutos.	1	2	3	4	5
Lavar la ropa sólo cuando la lavadora esté llena.	1	2	3	4	5
Lavar el coche sólo en lavaderos en lugar de hacerlo con manguera.	1	2	3	4	5
Usar agua reciclada y purificada para beber.	1	2	3	4	5
Re-usar el agua (p.ej.: regar con agua depurada tras ser usada para limpiar la casa).	1	2	3	4	5
Regar menos el jardín (menos frecuencia y menos duración).	1	2	3	4	5
Utilizar un sistema de riego eficiente bien programado (de riego por goteo, por ejemplo).	1	2	3	4	5
Vigilar las fugas de agua y repararlas rápidamente.	1	2	3	4	5
Usar sistemas reductores de caudal de agua en grifos.	1	2	3	4	5
Usar sistemas de doble pulsado en inodoros y aseos.	1	2	3	4	5
Usar un tanque para recoger el agua de lluvia y reutilizarla.	1	2	3	4	5
Evitar tener (o no usar) piscina privada y sí acudir a una pública.	1	2	3	4	5

13. Finalmente, sólo necesitamos unos pocos datos

¿Cuál es su edad actual?	
¿Qué formación ha terminado?	[1] Básica/Primaria [2] Secundaria Obligatoria [3] Bachillerato o similar [4] Está haciendo una carrera universitaria [5] Graduado o licenciado [6] Máster o doctorado
Escriba la población donde reside	
¿Es usted hombre o mujer?	[1] Hombre [2] Mujer
Escriba su DNI (para identificarle si gana la Tablet). Si no quiere ser identificado, déjelo en blanco.	
Escriba su número de teléfono o de email (para poder localizarle y comunicarle el premio, en su caso). Si no desea ser localizado, déjelo en blanco.	

Muchas gracias por su colaboración

Appendix 3.3: Questionnaire fieldwork 2014

CUESTIONARIO SOBRE

RESISTENCIA AL CAMBIO Y AHORRO DE AGUA

Núm. Cuestionario

Z1. **¿Qué edad tiene?**

A continuación le diré unas frases relacionadas con el agua como un recurso que todos utilizamos. Por favor indique su grado de acuerdo o desacuerdo con cada una de ellas. Mirando la TARJETA 1 me debe decir el número que mejor se acerque a su respuesta.

RI1. Se siente preocupado por las consecuencias que tendría una época de escasez de agua. ____

RI2. Las consecuencias negativas de la escasez de agua le afectarían personalmente. ____

RI3. Se siente vulnerable sobre la posibilidad de que a usted o su familia le afecte la escasez de agua. ____

RI4. La escasez de agua afectaría a su negocio, hogar, nivel de vida o posesiones. ____

RI5. El impacto de una sequía será severo en el lugar donde vive. ____

MU1. **Siguiendo con la TARJETA 2, señale** Hasta qué punto es posible que el próximo año intente consumir menos agua que ahora _____

Mire la TARJETA 3 e indíqueme cómo percibe usted los riesgos que genera el actual tren de consumo y forma de consumir agua

Cuanto más se acerque a una opción (o su contraria) más intensa debe ser su percepción

¿Cómo son los riesgos que genera el actual nivel de consumo de agua?

Lt1	A largo plazo	1	2	3	4	5	6	7	Inmediatos
Lt2	Lejanos	1	2	3	4	5	6	7	Inminentes
Lt3	No urgentes	1	2	3	4	5	6	7	Urgentes
Li4	No importantes	1	2	3	4	5	6	7	Importantes
Li5	No peligrosos	1	2	3	4	5	6	7	Peligrosos
Li6	Benignos/No serios	1	2	3	4	5	6	7	Graves/Serios
Lg7	Manejables	1	2	3	4	5	6	7	Inmanejables
Lg8	Fácilmente superables	1	2	3	4	5	6	7	Difícilmente superables
Lg9	Gestionable	1	2	3	4	5	6	7	Imposible de gestionar

Usando la TARJETA 1, por favor, indíqueme su nivel de acuerdo con las siguientes frases

IN1. Intenta gastar menos agua que el pasado año. ____

WC1. Usted es consciente de las diversas formas de ahorrar agua en el hogar. ____

WC2. Usted cree que se puede reducir el consumo de agua mediante dispositivos para el ahorro. ____

WC3. Usted controla habitualmente la cantidad de agua que gasta. ____

WC4. Usted sabe a qué se debe su actual consumo de agua. ____

WC5. Con su comportamiento usted contribuye a un uso correcto del agua que gasta. ____

HA1. Ahorrar agua es algo que hace con frecuencia. ____

HA2. Ahorrar agua es algo que hace sin esfuerzo. ____

HA3. Se siente raro cuando no ahorra agua. ____

HA4. Ahorrar agua forma parte de su rutina diaria (semanal, mensual). ____

HA5. Ahorrar agua es algo "típicamente suyo". ____

HA6. Ahorra agua desde hace tiempo. ____

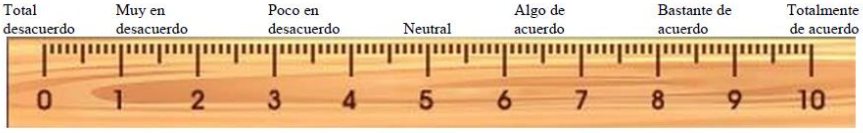
Z6. **Si usted decidiera ahorrar agua (más de lo que ahora hace) ¿Hasta qué punto su ahorro estaría condicionado por lo que hicieran otras personas de su entorno (0= nada; 10 = máximo)?** _____

Finalmente necesito unos datos rápidos

Z2. **Sexo**	Z3. **Nivel educativo más alto**	Z4. **Población residencia**	Z5. **Nivel de ingresos**
[1] Hombre [2] Mujer	TARJETA 4 _____	_____	TARJETA 5 _____

El profesor controlará que le he hecho esta encuesta. ¿Es tan amable de decirme… *(el profesor seleccionará aleatoriamente 3 cuestionarios por estudiante)*		X. ¡Encuestador! ¿Le ha parecido sincero el entrevistado?
SÓLO el nombre de pila	Teléfono /email de contacto	[1] Sí [2] Poco [3] No

TARJETA 1



TARJETA 2

TARJETA 3

A largo plazo	1	2	3	4	5	6	7	Inmediatos
Lejanos	1	2	3	4	5	6	7	Inminentes
No urgentes	1	2	3	4	5	6	7	Urgentes
No importantes	1	2	3	4	5	6	7	Importantes
No peligrosos	1	2	3	4	5	6	7	Peligrosos
Benignos/No serios	1	2	3	4	5	6	7	Graves/Serios
Manejables	1	2	3	4	5	6	7	Inmanejables
Fácilmente superables	1	2	3	4	5	6	7	Difícilmente superables
Gestionable	1	2	3	4	5	6	7	Imposible de gestionar

TARJETA 4 **Nivel educativo más alto**
[1] Hasta primaria o similar
[2] Hasta secundaria o similar
[3] Hasta bachillerato/similar
[4] Estudia en la universidad
[5] Titulado universitario

TARJETA 5 **Nivel de ingresos**
[1] Menos de 650 euros
[2] de 650 a 1200 euros
[3] de 1201 a 1700 euros
[4] de 1701 a 2100 euros
[5] Más de 2100 euros

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