

Article

# Does Water Context Matter in Water Conservation Decision Behaviour?

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**Abstract:** This study examines whether water scarcity context affects water conservation decision behaviour. We do this analysing a decision model that includes perceived message credibility, water consumption risk, and personal involvement variables. The sample consists of residents of more than 20 Spanish cities, and contexts of water scarcity (n = 420) and non-scarcity (n = 217) are compared. Spain was chosen because it is one of the most water-stressed (difference between consumption and reserves) countries in Europe, and water scarcity is a key factor affecting water conservation efforts. We employ regression analysis with partial least squares (PLS) and multi-group techniques. Two relevant findings can be highlighted. First, the most relevant variable in the model is personal involvement in water conservation practices. Second, although in general our model is not sensitive to the water scarcity context, we observe that individuals living in areas with water scarcity report greater levels of personal involvement and water conservation decision behaviour. We conclude by providing the implications for water managers and policymakers and suggesting avenues for future research.

**Keywords:** water context; conservation; involvement; perceived risk; credibility

## 1. Introduction

Studies warn of the likelihood of a shortage of water for consumption in the near future, and this shortage will affect all sectors and agents, as well as affecting the water supply to cities [1]. Although household water consumption accounts for only a small part of total consumption (approximately 14%), it is a priority in periods of drought, and forecasts show that domestic water demands will increase by 130% by 2050 [2]. There is also the problem that people perceive a moderate or low risk with regard to excessive water consumption [3]. It is necessary, therefore, to develop and manage strategies to achieve water sustainability.

Social sciences literature has identified that household water demand is influenced by a plethora of psychological, social/cultural factors, and socio-demographic characteristics, which should be taken into account when developing these water conservation strategies and policies [4–7]. In this sense, although conservation behaviour results from an intrinsic disposition to act, the water context may promote, encourage, or impose specific water conservation behaviours [8,9]. Thus, the climatic and hydrological characteristics of the region may be highly relevant. The literature shows that the water context can affect individuals' capacity to respond effectively to environmental conservation requirements [10], and can generate greater attitudes and conservation behaviours in areas of higher scarcity [11]. Nevertheless, few studies explore differences in factors to explain water conservation behaviour as a function of the water context [12,13].

This study therefore examines the moderating role of water context (water scarcity vs. water non-scarcity) in an intrapersonal decision-making model from individuals living in several Spanish cities. This model explains water conservation decision behaviour (WCDB) based on perceived credibility, risk perception, and personal involvement variables. The remainder of this paper is organised as follows. First, the theoretical framework and research hypotheses are presented based on a proposed model that has not been previously addressed in the literature. Second, the method, sampling techniques, measurement instruments, and the data collection process are described. Third, the results section outlines the validation and statistical properties of our proposed structural model, the results of our hypothesis testing, and a comparison between two water contexts (scarce vs. non-scarce). Finally, we discuss the findings and present the main conclusions, the limitations of our study, and future research lines.

## 2. Literature Review

In this section, firstly, we define WCDB based on previous studies and from a consumer behaviour perspective, which serves as a starting point for the development of the research hypotheses.

### 2.1. Water Conservation Behaviour

The environmental literature displays a lack of consensus on the definition of water conservation. For instance, some studies offer no definition [14,15], some use “water demand management” and “water conservation” as synonyms [12], and others equate water conservation to water consumption [16,17]. There is particular interest in studies that consider water conservation as an interaction process. For example, the U.S. Water Resources Council defines water conservation as the set of activities that aim to reduce demand, improve the efficiency of its use and promote conservation practices [18]. This vision is broadly shared by many water conservation institutions around the world.

Additionally, the literature does not offer a single method to measure WCDB. This is not only due to the wide variety of contexts where this behaviour can be measured, but also to how such conservation behaviour is reported. Similar to other areas (e.g., water quality [19], energy expenditure [20], or water resource management [21]), water conservation at the household level (excluding other water consumption such as agricultural, industrial, or public services) can be addressed from a subjective or an objective approach. From a subjective perspective, conservation can be referred to the interest in performing saving behaviours, and the perceptions as a result of actions carried out to conserve water. Regarding the objective approach, it is necessary to measure actual consumption as a basic reference. This has meant that the various published studies can be grouped into three categories according to the method used: (1) Studies using behavioural intentions related to saving water [14]; (2) studies using self-reported water conservation behaviours as independent actions [11]; and (3) studies using actual water consumption [22]. Measuring actual water consumption has been criticised because doing so fails to measure water saving, and instead measures consumption behaviour.

As an alternative of the above definitions and measures, water conservation behaviour can be understood as a process from a consumer behaviour perspective [23]. This approach goes beyond the perspective of consumption reduction and captures different aspects that relate to the decision to conserve water. This decision behaviour is a set of stages that correspond to the consumer decision-making process [24]. These stages are problem recognition (awareness of the factors driving current water consumption), information search (inquiring about ways to save water at home), evaluation of alternatives (recognising what must be done to conserve water), behaviour (implementing practices that contribute to the correct use of water), and post-behaviour (controlling the amount of water that is used). In the line of this approach, WCDB term is used to define and measure our dependent variable.

## 2.2. Perceived Message Content Credibility

Credibility is a multidimensional concept that covers different terms like: Trustworthiness, believability, accuracy, authority, or reputation. In fact, there is no consensus regarding the definition of this concept among disciplines, although it is always referred to the degree of trust that a person has in a given source. It can also be referred to the way a person generates a judgment [25]. In information science, credibility tends to be defined as the degree to which people trust the information they receive [26], whereas in the media literature, it is also considered a precondition of trust [27]. Therefore, in these research areas, both concepts are differently conceptualized [28]. Thus, in the media, the process of creating reliable, factual, and accurate information is controlled by the media themselves. However, person's trust is not controllable, since each one determines externally to the source whether the information received is true or not. Therefore, trust is more based on relational aspects than on the nature of the information transmitted by the source and received by the individual [27].

Since credibility is an attribute given by the individual, credibility will depend not only on the degree to which the individual is aware of environmental problems, but also on how she/he perceives these problems as risky and the context where they occur [29]. So, the credibility of a message about an environmental problem is related to three basic factors: The source or origin of the information, the content of the message, and the context in which the message is generated. Focusing on the content of the message, Appelman and Sundar [30] understand credibility as an individual's judgment of the truthfulness of the content of a piece of information (communication, notice, or news). In other words, credibility is the individual's perception of whether the content of the message is truthful, reliable, and accurate.

Regarding environmental problems, people give high credibility to climate change and its associated problems. For example, the World Economic Forum report [31] shows that 86% of people worldwide consider water-related crises to be a significant short-term risk that will be more problematic in the mid- and long-term. However, Sarabia-Sanchez and Bianchi [32] show this situation is not uniform, but varies greatly among countries. This variability refers to both the perceived importance of the environmental problem and its potential future effect. Although, we must be cautious because recent events have declined this vision. Covid-19 pandemic has placed health and survival problems at the forefront. For sure, the subsequent economic crisis will take environmental problems to the background, without reducing the risk involved.

In relation to water problems, although offering information on the importance of reducing current water consumption is important, merely providing this information on its own does not seem to be effective [33]. This is particularly true when individuals are overloaded with information and are unreceptive to additional information campaigns.

Research has shown that an important element to raise water scarcity awareness is to make certain that the problem is properly understood, and to ensure the information is credible [34]. In areas such as climate change and green consumption, there is a consensus on the negative association between scepticism about environmental problems and environmentally responsible behaviour [35]. Perceived message credibility therefore plays a key role, since it promotes behavioural intention and encourages people to act [36]. We therefore propose that:

**Hypothesis 1.** *The greater the credibility of the content of the message, the greater the WCDB.*

## 2.3. Risk perception of Water Consumption

Risk perception can be conceptualized as "the perceived likelihood of negative consequences to oneself and society from a specific environmental phenomenon" [37] (p. 462). Therefore, perceived risk refers to the judgements and assessments that individuals make. It is subject to both external factors (type of hazard, vulnerability, and timing and immediacy of impact) and personal factors (risk aversion, controllability of impact, knowledge, socioeconomic status, etc.).

According to the literature on water consumption, risk perception has three dimensions [38–41]: The impact of the danger, the immediacy of its impact, and the avoidability or controllability of the impact. According to these authors, the impact is related to the level of perception about the negative consequences that the hazard has for an individual or society as a whole. Moreover, immediacy of impact can be conceived as the perceived distance or proximity of such negative consequences. Finally, avoidability or controllability is understood as the perceived capability to control the hazard without generating losses. In this way, the greater the perceived negative consequences, the proximity of such consequences, and the lower controllability of the water scarcity hazard, the greater the perceived risk [41].

The way people perceive risk can be also conditioned by the credibility of information [32,42]. Studies that examine ecological risk perception show that certainty that the hazard will happen is an important feature for evaluating risk, and this certainty is the result of perceiving information as credible [38,43,44]. Accordingly, when information about a future hazard is perceived as credible, individuals have greater certainty that the hazard will take place. There is consensus therefore that a greater perception of certainty and so, the greater credibility that an environmental hazard happens, the greater the perceived ecological risk. Hence, Pereira et al. [45] claim that water awareness programmes should convey credible information in order to increase people's perceived risk of excessive water consumption. We therefore state that:

**Hypothesis 2.** *The greater the credibility of the content of the message, the greater the risk perception of water consumption.*

Although risk perception is key to shaping behaviour, it has received scant attention from scholars as an antecedent of water conservation [46]. For instance, Lam [47] finds a positive association between individuals' perceptions of the likelihood of water shortage and intentions to install household water saving devices. In addition, Kiriscioglu et al. [40] report that individuals who have residential gardens that use less water are those who perceive a higher ecological impact due to droughts or excessive water consumption. Similarly, Mankad et al. [48] find that acknowledging a water scarcity hazard is a relevant motivational element to explain the intention to install rainwater tanks at home. Based on the above, we state that:

**Hypothesis 3.** *The more perceived risk of water consumption, the greater WCDB.*

#### 2.4. Personal Involvement

In the current study, personal involvement can be understood as individual's interest in carrying out water conservation practices [49]. In this sense, personal involvement is seen to be influenced by the credibility assigned by individuals to the information they receive [50]. This is because high-credibility messages are more persuasive and influence attitudes and interest in the object [50]. It is therefore coherent to assume that individuals must first perceive information about water shortage as credible before they become involved in water conservation practices. Although no study seems to have empirically tested this relationship, several studies emphasize the important role played by credibility on individuals' involvement regarding environmental issues [51,52]. Whilst the CAO [42] report affirms that any proposed tools should be based on credible information, Darnton [51] notes that credible information should be used as a cornerstone for producing effective guidance for public involvement. We therefore propose that:

**Hypothesis 4.** *The greater the credibility of the content of the message, the greater the personal involvement in water conservation practices.*

Water scarcity concern is crucial to encourage the interest of individuals in water conservation practices [53]. Consequently, if the water consumption of an individual is perceived as wasteful and there are perceived associated risks, this can become an intrinsic motivation that encourages the person to conserve water [54]. This idea is supported by Russell and Fielding [12], who affirm that ‘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, we hypothesize that:

**Hypothesis 5.** *The greater the risk perception of water consumption, the greater the personal involvement in water conservation practices.*

Lastly, it has been noted that being personally involved in water conservation practices is crucial to increase the saving behaviour of individuals or the cooperation with a conservation campaign [16]. For example, a study conducted in Australia finds a negative relationship between personal involvement in water practices and the daily rate of water consumption [22]. Furthermore, Holland et al. [7] supported by experiential learning theory [55] claim that people who are personally involved in a given issue, for example in an environmental problem such as drought, tend to act to conserve water. This involvement results from having experienced the problem in the past. According to experiential learning theory [55], the experience an individual has about an issue can influence different learning processes, which in turn can have an effect on the development of attitudes (i.e., positive perceptions towards conserve water) and behaviours (i.e., actual water conservation). Accordingly, Callison and Holland [13] find that people who were personally involved in a water crisis in the past were more concerned and more prone to behave favourably towards water than those who had not experienced this crisis. In the same vein in the Spanish context, Sarabia-Sanchez et al. [24] state that highly involved people are more prone to conserve water due to their high motivation to make water-saving decisions. Therefore, consistent with the scant literature on this topic, we finally propose that:

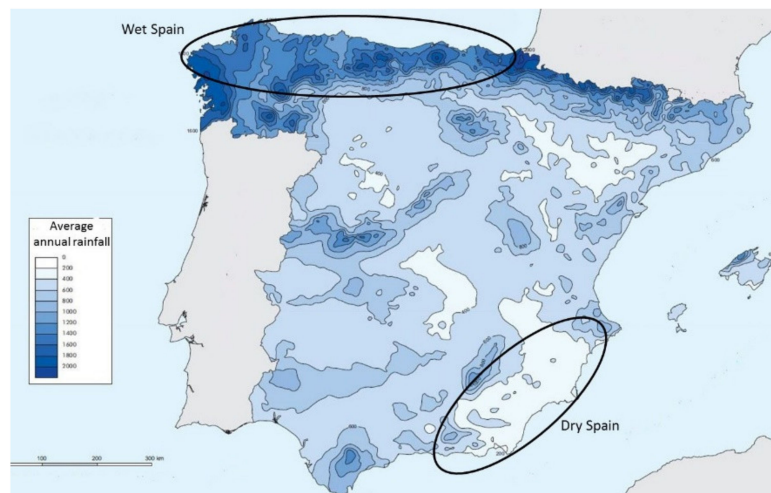
**Hypothesis 6.** *The greater the personal involvement in water conservation practices, the greater WCDB.*

### 2.5. Differences between Water Contexts in Spain: Scarcity vs. Non-Scarcity Areas

Water conservation studies should consider the nature of the context under study, since water scarcity is a key contextual factor that conditions water conservation efforts [10,13,56]. Although studies broadly overlook possible differences in water conservation factors depending on the water stress context, a clear understanding of water conservation behaviour is not possible without considering the geographical, climatic, or social contexts where individuals live [57].

Spain offers an ideal study setting due to its severe hydric imbalance between short- and long-term water supply and demand [58]. Water resources in Spain are highly non-uniformly distributed, with remarkable differences between the north-Atlantic area (‘wet Spain’) and the south-eastern area (‘dry Spain’) (Figure 1). The north-Atlantic area has an average annual rainfall of 1,800 mm, whereas the average annual rainfall in Spain is 636 mm. In contrast, in south-eastern Spain, average annual rainfall is 290 mm. This part of Spain therefore lies in the top quartile of the world’s driest countries [59].

To address this difference, we analyse two samples: One from areas of scarcity, and another from areas of non-scarcity. This distinction allows us to perform two different analyses. First, we check the validity and the reliability of the measurement instrument in both water contexts. Second, we compare the model fit in these two contexts to identify significant differences regarding the relationships described by the model. In this last case, we propose that the relationships described in our hypotheses may be affected by the water context (scarcity vs. non-scarcity) in several ways.



**Figure 1.** The two water scarcity contexts in Spain. Source: Adapted from National Geographic Institute [60].

First, in Spain, issues surrounding water scarcity and consumption are used as a political weapon by regional governments. Concretely, some Autonomous Communities (EU regions NUTS-2 level) have developed regulations to protect water in their basins at the expenses of other regions, particularly in high water scarcity regions [61]. This political use of water information can threaten the credibility of information perceived by people, since it decreases the ability to differentiate between truthful or untruthful information [24]. As noted by Holland et al. [7] political views strongly influence attitudes towards environmental issues, such as the lack of water availability and its perception as an environmental problem. A sound assumption, therefore, is that in areas of Spain where water is scarce, perceived message credibility has a weaker influence on both WCDB and risk perception (H1a and H2a). Likewise, Whitmarsh [62] finds that individuals living in regions with a high threat of danger rely more on their internal reasons than on external information when making decisions to reduce risk (H4a). Second, individuals who have personally experienced periods of drought perceive the negative consequences of excessive-water consumption as a salient problem [7,52,63]. In such situations, people are more concerned about water problems [64], which can increase the levels of involvement in water conservation activities (H5a), and make more frequent WCDB (H3a) [56]. For example, Callison and Holland [13] conducted a survey in the U.S. about overall concern and attitudes toward water scarcity among other issues. They found individuals that had experienced water crisis in the past were more concerned about water problems and more prone to act responsibly in the use of water than those without crises experience. Finally, it is reasonable to expect that higher involvement in water scarcity areas can lead to higher levels of WCDB compared to those individuals living in non-scarcity areas (H6a).

### 3. Materials and Methods

#### 3.1. Participants and Data Collection

We used a combination of online and traditional paper and pencil surveys aimed at Spanish residents aged over 18 years. Fieldwork was controlled as follows. For the online method, second or successive responses from the same Internet Protocol (IP) address were deleted (this was not recorded and it was the software itself that carried out the screening). For the paper and pencil method, fieldwork was controlled by means of a random telephone call (40% of the sample). For both methods, several cases were eliminated: (1) Cases with straightlining responses, (2) cases with missing data, (3) cases where respondents took less time than the minimum for a correct understanding (10 min), and (4) cases where respondents were below 18 years of age.

After this control and the statistical debugging of the database, our sample was divided into two groups. The first group consisted of individuals from Southeast Spain (scarcity sample:  $n = 420$ ; female = 60.2%; mean age = 34.70 years) while the second group from north-Atlantic Spain (non-scarcity sample:  $n = 217$ ; female = 57.6%; mean age = 30.83 years).

### 3.2. Measures

Perceived message credibility. Appelman and Sundar [30] point out that message credibility can be analysed as a state and an effect, rather than as a structure, process, cause, or mediator. Considering their definition of message credibility, we use Flanagin and Metzger's [65] approach. This one requires adapting the measurement of content credibility to the specificity of the phenomena under study. Therefore, we design a specific instrument using the following procedure:

1. We considered Jain and Posavac's [66] proposal for assessing the credibility of persuasive communications.
2. We built a list of eight items using statements describing future risks that appeared in reliable information sources and related to the Spanish and global situations, which are: (1) It is necessary 8000 litres of water to produce a pair of shoes; (2) in Spain, the rivers carry less water than a few years ago. Those in the south have lost more than other basins; (3) water supply problems will get worse in the near future; (4) we are facing a 'water bankruptcy', and there will be shortages in the major rivers of the Earth; (5) despite the rain, if it doesn't rain more in the next few months, there will be insufficient water reserves; (6) many Spanish Regions (NUTS 2 level) have significant problems with their drinking water supply; (7) the world's underground water reserves are at risk because of bad management and overexploitation; (8) in Spain, 23 out of every 100 L of water are lost due to breakdowns, breakages, or illegal use.
3. We presented this list to four groups with different sociodemographic characteristics to verify whether these items were suitable (i.e., understandable, clear, etc.).
4. We analysed each item in terms of its importance and the participants' knowledge of each item.

This procedure allowed us to exclude four items (1, 2, 6, and 8), and the remaining four items (3, 4, 5, and 7) conformed the final instrument (e.g., "Water supply problems will get worse in the near future" or "The world's underground water reserves are at risk because of bad management and overexploitation"), rated using a six-point scale (1 = totally false; 6 = totally true). This scale captured the degree to which each statement (i.e., each item) was perceived as credible. The average score was 4.88 (Standard error of the mean, SEM = 0.038) for the scarcity sample, and 4.80 (SEM = 0.049) for the non-scarcity sample.

Personal involvement: We used Zaichkowsky's [49] and Gregory and Di Leo's [22] instruments for assessing personal involvement in water conservation practices. The instrument used consisted of nine-items 7-point semantic differential scale (e.g., "Important vs. Unimportant" or "Useless vs. Useful"). The average score for personal involvement was 5.97 (SEM = 0.042) for the scarcity sample, and 5.83 (SEM = 0.056) for the non-scarcity sample.

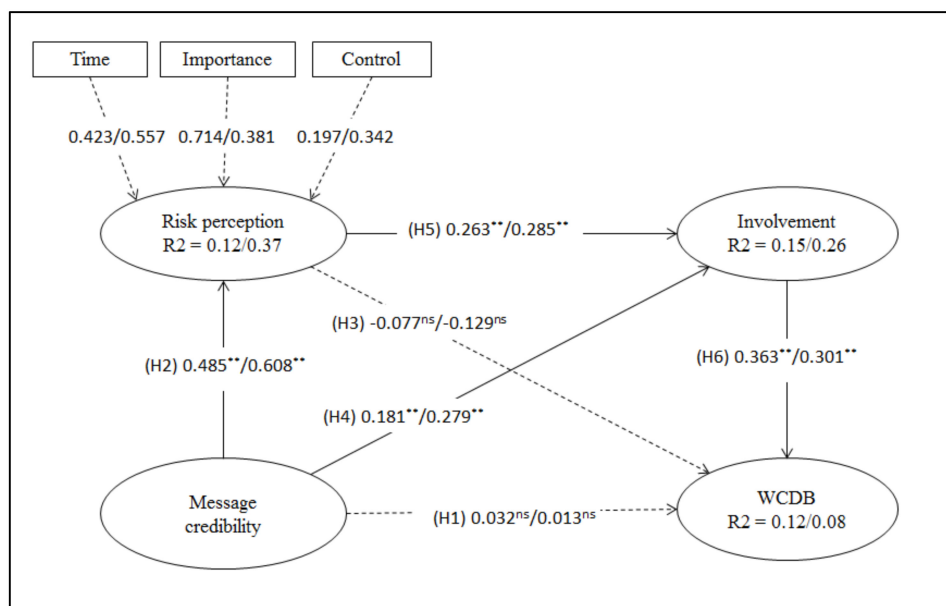
Water conservation decision behaviour (WCDB): We used the scale from Sarabia-Sánchez et al. [24]. The measurement instrument was composed of 5 items (e.g., "You are aware of the causes of your current consumption" or "You recognize what you have to do to conserve/save water"), in a six-point Likert scale anchored by 1 = fully disagree and 6 = fully agree to 5 items. The average score for WCDB was 4.52 (SEM = 0.042) for the scarcity sample, and 4.18 (SEM = 0.060) for the non-scarcity sample.

Risk perception of current water consumption: We used the scale proposed by Rodríguez-Sánchez and Sarabia-Sánchez [41]. This scale has three dimensions: 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 a 7-point semantic differential scale. Furthermore, each dimension has three items (e.g., "non vs. very important" for impact dimension; "long term vs. short term" for time-related dimension, or "manageable vs. non-manageable" for control dimension).

The average score for risk perception was 14.33 (SEM = 0.108) for the scarcity sample, and 14.09 (SEM = 0.178) for the non-scarcity sample.

### 3.3. Data Analysis

To assess the psychometric properties of the model, firstly risk perception of current water consumption construct is analysed [67,68]. This is because risk perception is considered as a second-order Type II factor (reflective first-order and formative second-order factor model) according to Jarvis et al.'s [69] taxonomy. The items that conform each risk perception dimension (time, importance, and control) are reflective in nature, but these dimensions are formatively related to the overall “perceived risk” construct. Therefore, high correlations between risk dimensions are not expected [69]. Figure 2 shows the model. The confirmatory factor analysis (CFA) of risk perception for both samples (scarcity and non-scarcity) yielded acceptable global adjustment levels (scarcity: S-B  $\chi^2$  (17df) = 53.25 ( $p < 0.01$ ); Normed  $\chi^2$  = 3.13; BBNFI = 0.95; CFI = 0.97; IFI = 0.97; RMSEA = 0.07; non-scarcity: S-B  $\chi^2$  (17df) = 35.76 ( $p < 0.01$ ); Normed  $\chi^2$  = 2.10; BBNFI = 0.95; CFI = 0.97; IFI = 0.97; RMSEA = 0.07). Convergent validity was ensured since all factor loadings were significant and above 0.6, and all composite reliability (CR) and average variance extracted (AVE) indexes were above the recommended levels (reliability) in both samples [70]. Finally, discriminant validity was confirmed, since none of the estimated correlations between factors include the unity, and because the squared root of the extracted variance was greater than the estimated correlations between factors in all cases [71].



**Figure 2.** Structural model results for the scarcity/non-scarcity samples. Notes: \*\*  $p < 0.01$  ( $t > 2.56$ ); \*  $p < 0.05$  ( $t > 1.96$ ); ns = non-significant. WCDB = Water conservation decision behaviour.

Second, the three dimensions of perceived risk were considered as manifest variables and used as formative indicators [67,68] (see Figure 2). Third, partial least squares (PLS) method was used to assess convergent and discriminant validities of the reflective constructs (except risk perception) of our model. PLS method is a suitable technique when a model includes formative constructs, as it is the case of risk perception construct. Factor loadings, composite reliability (CR), and AVE values were acceptable for the two samples, according to Hair et al. [72] (see Table 1). Moreover, indicators which confirm discriminant validity in both samples are presented in Table 2. Finally, both standard errors and t-values were used to test the relationships among constructs. To do so, we used bootstrapping of 500 subsamples in SmartPLS 2.0 (SmartPLS, Hamburg, Germany) [73].



**Table 1.** Reliability and convergent validity: Scarcity vs. non-scarcity sample.

Factors	Items	Scarcity sample							Non-scarcity sample						
		Factor load	Weight	SE	Robust t	$\alpha$	CR	AVE	Factor load	Weight	SE	Robust t	$\alpha$	CR	AVE
Message Credibility:	Item MC1	0.75 **		0.04	19.42				0.80 **		0.03	25.10			
	Item MC2	0.83 **		0.02	46.00	0.77	0.85	0.59	0.85 **		0.03	34.75	0.70	0.82	0.54
	Item MC3	0.74 **		0.03	25.28				0.65 **		0.06	11.67			
	Item MC4	0.75 **		0.03	23.76				0.60 **		0.06	10.06			
Risk Perception:	Time		0.42 **	0.10	4.30					0.56 **	0.010	5.69			
	Importance		0.71 **	0.08	8.81	n/a	n/a	n/a		0.38 **	0.13	3.04	n/a	n/a	n/a
	Control		0.20 *	0.09	2.26					0.34 **	0.10	3.46			
Involvement:	Item I1	0.74 **		0.05	16.24				0.66 **		0.060	10.91			
	Item I2	0.70 **		0.04	17.11				0.68 **		0.084	8.12			
	Item I3	0.68 **		0.04	18.33				0.72 **		0.042	16.86			
	Item I4	0.75 **		0.04	18.97				0.78 **		0.046	17.02			
	Item I5	0.84 **		0.03	33.37	0.92	0.94	0.62	0.81 **		0.024	33.45	0.91	0.93	0.58
	Item I6	0.84 **		0.02	37.59				0.83 **		0.026	31.30			
	Item I7	0.84 **		0.02	39.14				0.79 **		0.023	34.35			
	Item I8	0.86 **		0.02	52.35				0.83 **		0.028	30.03			
	Item I9	0.81 **		0.04	20.00				0.77 **		0.059	12.94			
WCDB:	Item W1	0.79 **		0.03	30.71				0.73 **		0.05	13.54			
	Item W2	0.82 **		0.02	37.10				0.81 **		0.04	22.79			
	Item W3	0.79 **		0.03	28.83	0.84	0.89	0.61	0.79 **		0.05	17.13	0.84	0.89	0.61
	Item W4	0.70 **		0.04	19.45				0.78 **		0.04	18.00			
	Item W5	0.79 **		0.03	30.23				0.78 **		0.04	20.35			

\*\*  $p < 0.01$  ( $t > 2.56$ ); \*  $p < 0.05$  ( $t > 1.96$ ); n/a = not applicable. WCDB = Water conservation decision-behaviour.

**Table 2.** Discriminant validity between factors for both samples.

Dimension	Scarcity Sample				Non-Scarcity Sample			
	MC	RP	INV	WCDB	MC	RP	INV	WCDB
MC	<b>0.77</b>	0.31	0.49	0.11	<b>0.73</b>	0.45	0.61	0.07
RP		<b>n/a</b>	0.35	0.34		<b>n/a</b>	0.45	0.25
INV			<b>0.76</b>	0.07			<b>0.76</b>	0.02
WCDB				<b>0.78</b>				<b>0.78</b>

MC = Message credibility; RP = Risk perception; INV = Involvement; WCDB = Water conservation decision-behaviour. Diagonal: Squared root of the extracted variance. Above the diagonal: Estimated correlation between factors. n/a= not applicable (formative construct).

## 4. Results

### 4.1. Results for our Hypotheses

Figure 2 depicts  $\beta$  path coefficients and R2 values for the dependent variables for each sample, finding that our model performs similarly for both samples. Accordingly, perceived message credibility and risk perception have no significant influence on WCDB in either of the two samples (H1 and H3 rejected), while personal involvement has the greatest influence on WCDB (H6 supported). Similarly, the influence of perceived message credibility on the risk perception has the strongest influence in the model for both water contexts (H2 supported). The two precursory variables of personal involvement are significant, risk perception being the variable with the greatest influence (H4 and H5 supported). Moreover, all the coefficients of the analysed relationships are positive, which is consistent with our theoretical framework.

### 4.2. Comparison between Scarcity and Non-Scarcity Samples

To determine whether the relationships described by the proposed model differ significantly depending on the water context (scarcity or non-scarcity), we conducted multi-group analysis with PLS. The hypotheses that were non-significant in the structural model were not included in subsequent analyses. In this regard, we have used three approaches: The parametric t-test, the Welch–Satterthwaite test, and the Henseler test [74]. As can be seen in Table 3, equivalent results have been obtained, which highlights the robustness of the results. There are only substantial differences between both water scarcity contexts for the relationship between perceived message credibility and perceived risk of current water consumption (i.e., the relationship in H2a).

**Table 3.** Multi-group analysis.

Relationships	Expected Results	n <sub>scarcity</sub>	n <sub>non-scarcity</sub>	Diff. (s–ns)	t <sub>parametric(EV)</sub>	t <sub>parametric(NEV)</sub>	PHenseler
H2a: MC →Risk Perception	S < NS	0.485	0.608	−0.123	−1.698 *	−1.798 *	0.038 **
H4a: MC →Involvement	S < NS	0.181	0.279	−0.098	−1.007	−0.983	0.151
H5a: Risk Perception →Involvement	S > NS	0.263	0.285	−0.021	−0.227	−0.223	0.589
H6a: Involvement →WCDB	S > NS	0.363	0.301	0.062	0.708	0.680	0.258

Notes: \*  $p < 0.10$  (one-tail t distribution); \*\*  $p < 0.05$  (one-tailed test). MC, message credibility; WCDB, water conservation decision behaviour.

In addition, we compared the level (i.e., means) of perceived message credibility, risk perception, involvement, and WCDB of each sample to provide further insight into the role of water context. For perceived risk and the credibility of messages about the currently excessive water consumption, we cannot reject the assumption of difference in means between the two water contexts ( $t_{MC} = 1.20, p = 0.23$ ;  $t_{RP} = 1.23, p = 0.22$ , normality assumption not rejected). However, there are statistical differences in means for both personal involvement and WCDB between the two water contexts ( $p_{INV} = 0.04$ ,  $p_{WCDB} = 0.003$ , normality assumption rejected).

Finally, we tested for significant differences between the two explained variances of WCDB variable of each sample ( $R2_{scarcity} = 0.12$ ,  $R2_{non-scarcity} = 0.08$ ). Fisher's transformation for the two independent models shows  $z = 0.83$  ( $df = 635, p = 0.40$ ) value, which indicates that the independent variables have the same predictive power to explain WCDB in water scarcity and non-scarcity contexts.

## 5. Discussion

Our results suggest that personal involvement plays a key role in explaining water conservation decision behaviour (WCDB) in both contexts and, with the exception of two relationships for both samples (i.e., H1 and H3), all relationships in the model are significant. The non-significant relationship between risk perception and WCDB suggests that this perception alone may not lead to greater water conservation behaviour, although people may perceive the risks of current water consumption. This result corroborates previous findings [75], which show that the relationship between perceived risk and behaviour is far from conclusive. The absence of perceived message credibility-WCDB association indicates that even if people believe media reports about future risks of water scarcity, this belief may not directly lead people to conserve water.

It is a fact that, in many countries, information on how to deal with periods of droughts, and most campaigns in the media are made in scarcity periods (and in a reactive way to these droughts events) [76]. However, we believe this situation is not fully applicable to the case of Spain for two reasons. First, because in the southern region of Spain there is a constant state of opinion among citizens on the need to save water. Second, national media often insist that Spain is one of the most affected countries by climate change, which can be observed in the gradual decline of water resources. Nevertheless, we believe that this result could be affected by the Spanish context. Additional studies are needed to further validate this relationship. Furthermore, we find that personal involvement in water conservation practices plays a key role in explaining WCDB. This result highlights the importance of taking actions to increase the involvement of individuals when making decisions, which is consistent with consumer behaviour theories. These theories suggest that involvement represents personal engagement in a decision-making process, and it can be empirically proven that decisions are made with involvement [77]. For example, Fielding et al. [56] find that although people perceive they have been making water conservation efforts, personal involvement is required to achieve long-term reductions (water conservation). Finally, focusing on the strong association between perceived message credibility and risk perception, we find that individuals' belief in the veracity of media reports about future risks of water shortages may be important for these individuals to develop a perceived risk of current consumption.

Focusing on the relationships between variables and the explanatory power of the model, we observe no major differences due to water context (scarcity vs. non-scarcity). The slight moderating role of the water context supports the external validity of our model. Our model can therefore be used in areas with different water stress level, albeit with certain differences. As derived from multi-group analysis, the perceived message credibility-risk perception relationship is weaker in areas with water scarcity. Thus, in water shortage areas, the role of credibility in the perception of risk is less pronounced, probably because people in these areas are more used to receive such messages [61]. In addition, we also observe differences in the levels (i.e., means) of our key variables (i.e., personal involvement and WCDB) in relation to the water context. In regions where there is water scarcity, respondents show higher levels of involvement and WCDB compared to areas of non-scarcity. This result supports prior

studies [7,13,56], which show that in regions with water shortage people are more likely to be part of water conservation behaviours. However, we find that the credibility and risk perception are similar in both water contexts. Regarding the former, we believe that this result is due to the country-scale information globalisation of information at national-scale. Individuals receive most of their information about environmental problems from the mass media [78]. Because both samples were drawn from the same population (Spanish residents), this information is broadly uniform. However, the absence of differences in terms of risk perception is an unexpected result, although this finding could be due to the presence of a habit effect. Data regarding the scarcity sample mainly comes from Spanish areas that have usually experienced drought periods. Thus, individuals living in these areas are used to the risk and show greater tolerance [79]. Although previous literature shows risk perception to be greater in those areas where individuals experience risk directly [80], this habit effect may cancel out any significant differences.

Finally, from a methodological perspective, although our structural model provides a modest explanation of water conservation decision behaviour, it shows good psychometric features (reliability and validity) in two different water contexts (scarcity and non-scarcity). This limited explanatory power is usual and is consistent with previous studies that have used intrapersonal variables to explain environmental behaviour [81,82]. Particularly, research reporting a high explanatory power of water conservation (or consumption) usually measures actual water consumption (using household consumption data) and includes household features or composition as predictors [22,83].

## 6. Conclusions

Research shows that considering water stress context in water studies is crucial, since water shortage context is a key factor when individuals make water conservation efforts [11,13]. In this sense, the context is a complex phenomenon built from social, political, economic, and hydroclimatic interactions that influence demand (water use and conservation practices) [11]. As pointed out in previous research, water context can affect the ability of people to respond effectively to the need to conserve water, considering a context focused on areas with different levels of water scarcity due to their geographical location. Thus, people residing in greater water scarcity areas have been shown to be more willing to have a greater WCDB than those living in non-scarcity areas [84].

Although our results go in that direction, it is also true that the model we have presented and discussed is not particularly sensitive to water scarcity or abundance context. Our findings suggest that in the case of Spain, water context (scarcity vs. non-scarcity) does not play a key role in the relationships between variables. The only relationship that is different, greater for the non-scarcity context, is the relationship between perceived message credibility and risk perception. Thus, in water shortages areas, the role of credibility in the perception of risk is less pronounced, probably because people in these areas are more used to receive such messages. Furthermore, considering the importance of the factors in our model, our results show that personal involvement has a key role in explaining WCDB in both contexts.

Our findings are valuable for managers and policymakers who seek to promote water conservation behaviour. Thus, communication strategies should use messages that personally involve people to perform water conservation practices. Similarly, because people who experience periods of drought seem to be more involved and to have greater levels of WCDB, communications should be tailored to high vs. low scarcity areas. For academics, the modest explanatory power of our model may indicate that the variables in this study (primarily cognitive variables) might be considered in future models along with other type of variables to explain water conservation behaviour. Accordingly, this finding provides opportunities for further research. For instance, further studies could examine the role of unreasoned influences such as habits or affective variables [22].

Lastly, this research has several limitations. The first relates to the sample, which is slightly biased towards women, young people, and people with secondary education, to the detriment of seniors and university graduates. These biases arise from biases that are inherent in the online collection systems.

The second limitation relates to the country context. Although Spain has significant imbalances in hydroclimatic variables between different areas, our findings may not be generalizable to other countries with similar water imbalance but different geographical and social contexts. Finally, regarding the use of decision behaviour as an approach to measuring actual water conservation behaviour. Although this method is less-intrusive and time-intensive than observational measurements, it may not accurately reflect actual behaviour.

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