Data Article

Recycled water acceptance: Data from two Spanish regions with opposite levels of scarcity

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A B S T R A C T

The dataset presented in this paper were collected for testing a perceptive-axiological model of recycled water acceptance for low and high contact uses. Participants were selected by proportional random sampling by sex and age the two Spanish communities with the most extreme values of water stress (Galicia, the rainiest region and Murcia, the driest). Data were collected by a company specialized in market research using an online survey housed on Qualtrics. Participants who matched the specified profile were contacted by email. The company compensated them financially. The final sample size consisted of 726 valid responses. The survey collected data on a variety of variables related to three conceptual dimensions: the diagnosis of the environmental situation, the axiological influence and the public perceptions regarding recycled water. The survey also collected demographic data from respondents. The survey was designed and reviewed by four experts in social psychology and two experts in methodology. The dataset featured in this article provides the raw survey data plus sociodemographic distribution, survey items, and other statistical data. This is the first and most comprehensive set of comparative data known to the authors on public acceptance of water reuse for high

and low contact uses comparing regions with and without water scarcity. The authors have published an open access paper based on this data set, which are linked to this paper. Water industry professionals, policymakers, researchers and other stakeholders aiming to implement wastewater reuse systems in society may be interested in using the data as a point of comparison for their own study on public acceptance of water reuse or examining the data for relationships not yet explored in the literature.

Specifications Table

Subject	Applied Psychology
Specific subject area	Social and Environmental Psychology. Public Acceptance of Recycled Water
Type of data	Table. Data SPSS.
How the data were acquired	Survey. A company that specializes in market research collected data using an online survey platform (Qualtrics). Citizens were contacted by email and compensated financially in exchange for their participation. Survey was based on a researcher-made questionnaire. URL to survey: https://doi.org/10.17632/k9pvh7rc9n.4
Data format	Raw. Analysed.
Description of data collection	Data were gathered through questionnaires (hosted in survey web platform) distributed by email.
	Participants were selected by proportional random sampling by sex and age in the two Spanish regions with the most extreme values of water stress (Galicia, the rainiest and Murcia, the driest).
	Those questionnaires completed in less than 425 s or with inconsistent responses to items were excluded.
	The final sample size consists of 726 valid responses.
Data source location	City/Town/Region: Galicia and Murcia (both regions)
	Country: Spain
	Latitude and longitude (and GPS coordinates, if possible) for collected samples: Galicia (42°45′18″N 7°51′58″O) and Murcia (37°59′10″N 1°07′49″O)
Data accessibility	Repository name: Mendeley data
	Data identification number: 10.17632/k9pvh7rc9n.5
	Direct URL to data: https://doi.org/10.17632/k9pvh7rc9n.5
Related research article	S. Vila-Tojo, J.M. Sabucedo, E. Andrade, C. Gómez-Román, M. Alzate, G. Seoane, From Scarcity Problem Diagnosis to Recycled Water Acceptance: A Perceptive – Axiological Model (PAM) of Low and High Contact Uses, Water Res. 217 (2022) 118380. https://doi.org/10.1016/j.watres.2022.118380

Value of the Data

- This dataset provides specific information on how the adequacy of the Perceptive - Axiological Model has been tested to predict the acceptance of recycled water for low and high contact uses in two regions with opposite levels of scarcity.
- This data is relevant for water industry professionals, policy makers, researchers and other stakeholders aiming to implement wastewater reuse systems in society.
- These data can help in the development of new hypotheses on the psychological factors involved in the public acceptance of recycled water. They also facilitate the replicability of the predictive model and its application to other contexts.

- To the authors' knowledge, this is the first large-scale survey conducted comparing the public acceptance of water reuse considering regions with different levels of water scarcity. Thus, the data will be a useful point of comparison for similar surveys conducted in other regions.
- The dataset and associated materials will provide researchers, water utilities and other interested entities with information and methods, providing a comprehensive set of variables that considers several psychosocial aspects needed for acceptance of water reuse.

1. Data Description

This dataset includes six elements with relevant information in the testing of the Perceptive-Axiological Model (PAM) of Low and High Contact Uses of Recycled Water [1]. Each of these elements is detailed below.

Table 1 refers to the socio-demographic information of the sample in relation to the socio-demographic values of the target population. Detailed values are also given for each of the sub-samples corresponding to Galicia and Murcia. Of the 726 participants (Galicia = 359, Murcia = 367), data are given on the distribution of the variables in terms of sex, age, level of education attained, employment status and monthly income.

Table 1
Sociodemographic information of the sample by region.

| | Sample | | | | | | Population[b] | | |
| | | | Galicia | | Murcia | | | Galicia | Murcia |
	N[a]	%	N	%	N	%	N (%)	%	%
Overall	726	100	359	49.5	367	50.5	3,459,166	2,314,532	1,144,634
Sex									
Men	364	50.1	175	48.7	189	51.5	48.4	47.6	49.9
Women	362	49.9	184	51.3	178	48.5	51.6	52.4	50.1
Age									
18-45	403	55.7	183	51.0	220	60.3	42.3	38.9	49.4
46-74	302	41.7	161	44.8	141	38.3	43.9	44.6	42.4
74+	19	2.6	15	4.2	4	1.1	13.8	16.5	8.2
Education									
Compulsory	59	8.1	31	8.6	28	7.6	n/a	39.4	47.5
High School	141	19.4	77	21.4	64	17.4	n/a	22.7	21.0
Vocational	192	26.5	89	24.8	103	28.1	n/a		
University	334	46.0	162	45.1	172	46.9	n/a	37.9	31.5
Employement									
Unemplo.	119	16.4	56	15.6	63	17.2	7.1	6.3	8.7
Studying	38	5.2	12	3.3	26	7.1	7.1	6.5	8.1
Working	467	64.3	231	64.3	236	64.3	48.1	46.9	50.4
Retired	73	10.1	42	11.7	31	8.4	19.4	22.3	14.0
Other	29	4.0	18	5.0	11	3.0	18.3	18.0	18.8
Mthly Income							National Average (2015)		
-1500€	241	33.4	114	31.7	127	34.6	45.7		
1500-3000€	368	50.6	192	53.5	176	48.0	40.2		
+3000€	102	14.0	50	13.9	52	14.2	14.2		

Note. n/a = no disponible.
[a] The sum for some variables will be lower than the total sample due to missing values.
[b] The population data refer to people aged 18 and over and, unless a different source is specified, were extracted from the database of the Instituto Nacional de Estadística (INE) between 2018 and 2019.

The PAM comprises three conceptual dimensions: (a) the diagnosis of the environmental situation, (b) the axiological influence and (c) the perception of recycled water. Table 2 shows how these dimensions were operationalized in the survey. For the first dimension we included questions related to Threat Perception (TP) and Attribution of Responsibility (AR). For the second dimension we asked about Water-related Identity (I) and Moral Obligation. The scale of Moral

Table 2
Variables, items and source.

Variable	Item	Source
TP	TP1 - I think there is a serious water crisis TP2 - The water shortage is so serious that it should be considered a top priority for the government TP3 - I am concerned that the water shortage will affect me personally TP4 - I am concerned that the water shortage will affect future generations	Miller & Buys [2]; Dean et al. [3]
AR	AR1 - If there is a shortage of water, I would consider myself partly responsible AR2 - Each person is responsible for consuming less water to avoid shortages AR3 - If I do not reduce my consumption, I will be partly responsible for the lack of water for the next generations	Feather [4]
I	I1 - I consider myself a person interested in the subject of water I2 - I have a lot in common with groups that promote efficient water use I3 - People who know me well would define me as a person who is aware of water problems I4 - Engaging in actions that involve good water use is an important part of who I am	Olivos & Aragonés [5]; Schultz & Fielding [6]; Yazdanpanah et al. [7]
LMO & HMO	L/HMO1 - Using recycled water constitutes a Moral Obligation towards oneself L/HMO2 - Using recycled water would make me proud of myself L/HMO3 - Not using recycled water would make me feel guilty L/HMO4 - I feel morally obligated to use recycled water even if it means confronting people close to me L/HMO5 - Regardless of what others think, I feel morally obligated to use recycled water	Sabucedo et al. [8]
TS	Statement: Express your degree of agreement with the following statements, referring to scientists ... TS1 - I trust that they guarantee the safety and quality of water TS2 - I believe they provide information that can be trusted TS3 - I think they act honestly	Hurlimann et al. [9]; Ross et al. [10]
CB	Statement: Please indicate if you consider that the use of recycled water could be harmful or beneficial for ... CB1 - The environment CB2 - The economy CB3 - Future generations	Hurlimann et al. [9]; Mankad et al. [11]
R	Statement: Please indicate if you consider that there is any type of risk to human health when using recycled water for the following uses ... R1 - Street cleaning (LR) R2 - Watering public gardens (LR) R3 - Emptying toilet cistern (LR) R4 - Watering fruits and vegetables (HR) R5 - Washing clothes (HR) R6 - Showering and bathing (HR) R7 - Drinking (HR)	Nancarrow et al. [12]; Fielding & Roiko [13]

Table 2 (*continued*)

Variable	Item	Source
A	Statement: Would you agree to use recycled water for the following uses? A1 - Putting out fires (LCA) A2 - Street cleaning (LCA) A3 - Watering parks and gardens (LCA) A4 - Irrigating cattle pastures (HCA) A5 - Cleaning the car (LCA) A6 - Emptying toilet cistern (LCA) A7 - Cleaning the house (HCA) A8 - Filling public swimming pools (HCA) A9 - Washing clothes (HCA) A10 - Watering fruits and vegetables (HCA) A11 - Doing the dishes (HCA) A12 - Showering and bathing at home (HCA) A13 - Bathing a baby (HCA) A14 - Cooking at home (HCA) A15 - Brushing your teeth (HCA) A16 - Drinking (HCA)	Po et al. [14]; Dolnicar & Schäfer [15]; Dolnicar et al. [16]
Region	In which Autonomous Community do you currently reside? (2) Murcia / (1) Galicia	
Sex	Check if... (2) Female / (1) Male	
Age	How old are you? *Open question*	
Education	Please select here the studies you have completed: (1) Compulsory / (2) High School / (3) Vocational / (4) University	
Employment	Please indicate your current employment status: (1) Unemployed / (2) Studying / (3) Working / (4) Retired / (5) Other	
Income	Select the monthly income of your household: (1) Less than 500 € / (2) From 500 to less than 1.000 € / (3) From 1,000 to less than 1,500 € / (4) From 1,500 to less than 2,000 € / (5) From 2,000 to less than 2,500 € / (6) From 2,500 to less than 3,000 € / (7) From 3,000 to less than 5,000 € / (8) From 5,000 to less than 7,000 € / (9) From 7,000 to less than 9,000 € / (10) 9,000 € or more	

Note. TP = Threat Perception; AR = Attribution of Responsibility; I = Water-related Identity; TS = Trust in Scientists; LMO = Low-risk Moral Obligation; HMO = High-risk Moral Obligation; CB = Costs-Benefits; R = Perceived Health Risks; LR = Perceived Health Risks in Low Contact Uses; HR = Perceived Health Risk in High Contact Uses; A = Recycled Water Acceptance; LCA = Recycled Water Acceptance for Low Contact Uses; HCA = Recycled Water Acceptance for High Contact Uses.

Obligation was presented to participants twice in succession. First, participants had to answer a question about what degree of Moral Obligation they have, thinking about recycled water uses that they had previously classified as low-risk, named as Low-risk Moral Obligation (LMO). Second, they answered the same question but were asked to consider the uses that they had previously classified as high-risk, named as High-risk Moral Obligation (HMO). Finally, for the third dimension we incorporated questions about Trust in Scientists (TS), Costs-Benefits Perception (CB) and Health Risk Perception, which was divided according to the level of personal contact with recycled water: Perceived Health Risks in Low Contact Uses (LR) and in High Contact Uses (HR). We also explicitly asked for Recycled Water Acceptance and the socio-demographic questions mentioned above were recorded. "Recycled Water Acceptance" was also divided into two categories according to the level of personal contact with recycled water: Recycled Water Acceptance for Low Contact Uses (LCA) and for High Contact Uses (HCA). Each item was named with the label of the variable to which it belongs followed by the corresponding number (i.e., TP is

Table 3

Means, standard deviations and correlations by region.

	TP	AR	I	TS	LMO	HMO	CB	LR	HR	LCA	HCA	*M*	*SD*
TP[a]	-	.472***	.263***	.123*	.262***	.225***	.034	.014	-.053	.051	.077	3.56	.95
AR[a]	.263***	-	.374***	.193***	.451***	.308***	.182**	-.044	.043	.111*	.017	3.65	.81
I[a]	.291***	.186***	-	.140**	.491***	.287***	.134*	-.130*	.029	.086	.006	3.46	.82
TS[a]	-.008	.157**	.111*	-	.195***	.009	.219***	-.335***	-.198***	.140**	.143**	3.97	.92
LMO[a]	.249***	.335***	.475***	.155**	-	.499***	.269***	-.199***	-.085	.246***	.139**	3.47	.80
HMO[a]	.172***	.264***	.322***	.034	.581***	-	.162*	-.031	-.142**	.168**	.303***	2.92	.99
CB[b]	.135*	.185***	.296***	.131*	.363***	.217***	-	-.303***	-.167**	.366***	.250***	7.98	2.20
LR[b]	-.014	-.024	.002	-.064	-.127*	-.052	-.209***	-	.353***	-.440***	-.135*	1.12	1.55
HR[b]	-.026	-.024	.007	-.096	-.145**	-.156**	-.159**	.486***	-	-.305***	-.714***	4.72	2.42
LCA[b]	.073	.154**	.195***	.155**	.220***	.131*	.329***	-.461***	-.334***	-	.330***	9.27	1.21
HCA[b]	.075	.099	.149**	.071	.251***	.264***	.151**	-.170**	-.634***	.285***	-	4.78	2.72
M	4.33	3.68	3.73	3.68	3.61	3.12	7.76	1.58	5.37	9.06	4.19		
SD	.58	.73	.78	1.06	.79	1.00	2.19	2.01	2.53	1.42	2.52		

Note. Lower triangular values correspond to Murcia's sample; upper triangular values correspond to Galicia's Sample. TP = Threat Perception; AR = Attribution of Responsibility; I = Water-related Identity; TS = Trust in Scientists; MO = Moral Obligation; LMO = Low-risk Moral Obligation; HMO = High-risk Moral Obligation; CB = Costs - Benefits; LR = Perceived Health Risks in Low Contact Uses; HR = Perceived Health Risk in High Contact Uses; LCA = Recycled Water Acceptance for Low Contact Uses; HCA = Recycled Water Acceptance for High Contact Uses; *M* = Mean; *SD*: Standard Deviation.

[a] Scale range from 1 to 5.
[b] Scale range from 0 to 10.
* *p* < .05.
** *p* < .01.
*** *p* < .001.

composed of TP1, TP2, TP3 and TP4). Table 2 also refers to the sources on which we based to elaborate the items for each variable.

Table 3 shows the mean scores (*M*) of the participants for each of the variables recorded, the standard deviations (*SD*) and the Pearson correlation coefficients between variables for each of the regions.

Finally, the survey (.pdf) and the raw data (.dat, .xlsx, and .sav) are available in Mendeley data, including the specific responses of each of the participants to each of the items. We also include in this same repository a file (.pdf) with two tables providing a detailed summary of the estimated regression coefficients (β) for each of the relationships established in the multiple-group analysis (unconstrained and constrained models) and the standard errors.

2. Experimental Design, Materials and Methods

The survey was designed and reviewed by four experts in social psychology and two experts in methodology, based on the sources described in Table 2. The online questionnaire was administered in two regions of Spain characterised by opposite levels of scarcity. Galicia is the rainiest region in Spain, and Murcia the driest region. The data collection period covered from 2 October to 23 October 2019. A proportional random sampling by sex and age was followed for each region. That is, quotas were implemented to avoid under- or over-representation in the sample of women/men or of any age group relative to the population.

The online platform for the survey was Qualtrics platform and the recruitment of participants was performed by an external company specialised in market research, which compensated participants for their participation. The company contacted participants via email. At the beginning of the survey, information was provided about: the nature of the study, the confidentiality and anonymity of the data and the privacy and data protection policy. The informed consent was then requested from participants with the following dichotomous question: *Do you wish to continue? Click next after answering the question. By answering and submitting the questionnaire you*

give the informed consent to participate in this study (No/Yes). Only participants who checked the "yes" had access to the rest of the survey. The estimated duration of the questionnaire according to the online platform was 15 min. Participants who responded in less than 425 s or who showed inconsistency in their answers were excluded. The final sample consisted of 726 participants, 359 in Galicia and 367 in Murcia. All participants reported being over 18 years of age.

Participants responded on a Likert scale, ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*), to: TP (four items), AR (three items), LMO (five items), HMO (five items) and TS (three items). LR (three items) and HR (four items) had to be responded on a scale from 0 (*No risk*) to 10 (*Very high risk*). CB (three items) had to be responded on a scale from 0 (*Harmful*) to 10 (*Beneficial*). Finally, LCA (five items) and HCA (eleven items) had to be responded on a scale from 0 (*Strongly disagree*) to 10 (*Strongly agree*). No items were reverse-coded. The composite variables have been calculated from the average of raw scores on the indicators measured. For instance, TP is the result of the average of the scores on TP1, TP2, TP3 and TP4.

The analyses carried out are described below. First, descriptive statistics (means, standard deviations and percentages) and Pearson correlation coefficients were calculated. IBM SPSS Statistics 25 software was used for this purpose. Secondly, four Structural Equation Models were tested using Mplus Version 7.4. We used the following reference values to assess the fit of each model [17]: .95 for CFI (Comparative Fit Index) and for TLI (Tucker-Lewis Index), .06 for RMSEA (Root Mean Square Error of Approximation), and .08 for SRMR (Standardized Root Mean Square Residual). Finally, we performed a multiple-group analysis to test the equivalence of the model in both regions (Galicia and Murcia). The invariance was evaluated at several levels, following an incremental strategy. As evaluation criteria for the unconstrained and constrained analysis of the models we used the Chi-Square difference statistic [18] together with the change in CFI [19]. This analysis was performed with software Mplus Version 7.4. using Microsoft Excel 2016 to calculate the Chi-Square difference.

Ethics Statements

This study was carried out in accordance with the Declaration of Helsinki and was approved by the bioethics committee of the University of Santiago de Compostela (No. USC-01/2018) and the participants received information on the terms and objectives of the study. They subsequently gave consent for data processing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

Recycled Water Acceptance: Data from Two Spanish Regions with Opposite Levels of Scarcity (Original data) (Mendeley Data).

CRediT Author Statement

Sergio Vila-Tojo: Conceptualization, Writing – original draft, Writing – review & editing, Formal analysis; **Jose-Manuel Sabucedo:** Conceptualization, Writing – review & editing, Funding acquisition; **Elena Andrade:** Methodology, Formal analysis; **Cristina Gómez-Román:** Writing – original draft, Writing – review & editing; **Mónica Alzate:** Writing – review & editing; **Gloria Seoane:** Methodology.

Acknowledgments

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