



## Encouraging others to save water: Using definitions of the self to elucidate a social behavior in Florida, USA

Laura A. Warner<sup>a,\*</sup>, John M. Diaz<sup>b</sup>, Dharmendra Kalauni<sup>a</sup>, Masoud Yazdanpanah<sup>c,d</sup>

<sup>a</sup> University of Florida, Department of Agricultural Education and Communication, P.O. Box 110540, Gainesville, FL 32611, USA

<sup>b</sup> University of Florida, Department of Agricultural Education and Communication, Gulf Coast Research and Education Center, 1200 N. Park Rd., Plant City, FL 33563, USA

<sup>c</sup> Department of Agricultural Extension and Education, Agricultural Sciences and Natural Resources University of Khuzestan, Mollasani, 6341773637, Iran

<sup>d</sup> Advanced System Analysis, International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria

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### ABSTRACT

The purpose of this study was to determine how social norms and definitions of the self in terms of individualism-collectivism related to engagement in a public-sphere behavior, encouraging others to conserve water. To achieve this, we examined the public sphere behavior of encouraging others to conserve water through the lens of the Theory of Planned behavior. Data were collected from residents in Florida, USA. Cluster analysis was used to assign respondents to individual subgroups according to five variables: horizontal individualism index, vertical individualism index, horizontal collectivism index, vertical collectivism index, and behavioral intent. Then, group membership was used as the independent variable to compare subjective and descriptive norms, personal norms, attitude, perceived behavioral control, demographic characteristics, past and current behavior. Of the resulting two clusters, the Interdependent Conservation Advocates had greater identification with collectivism indices and had stronger intent to encourage others to conserve water, as compared to the Unconnected By-standers. The former subgroup also reported significantly more positive subjective norms, descriptive norms, personal norms, attitudes, and perceived behavioral control. Perceived behavioral control marked the greatest practical difference between the groups. Interventions targeting this public sphere behavior should foster values of collectivism and increase perceived behavioral control by improving people's ability to encourage others to conserve water.

### 1. Introduction

Water is an irreplaceable resource needed for human subsistence and society. However, population growth, urbanization, changing lifestyles, economic and agricultural development, and climate change have caused the demand for water to exceed supply, triggering water shortages, and causing water crises in most parts of the world (Shahangian et al., 2021). Among the top 30 overall global threats (see World Economic Forum, 2019) water crises can impose severe economic, social, and environmental effects (Boazar et al., 2019) and risks to sustainable development (Mekonnen and Hoekstra, 2016). Over half of the world's inhabitants could suffer from water shortages (Jensen and Wu, 2018), and it is expected this will worsen through impending social and climate changes (Greve et al., 2018). Therefore, water has become a focal policy challenge for policy-makers, and reducing current water consumption is

a major concern worldwide (Koop et al., 2019).

There are a range of promising water demand management initiatives (see Adams et al., 2013; Beal et al., 2013) in which water conservation is considered the most important strategy to tackle water shortages globally (Tran et al., 2017). The success of these types of water conservation initiatives largely depends on voluntarily acceptance by residents (Yazdanpanah et al., 2016). An important obstacle to consider for the successful implementation of conservation initiatives is social acceptance. Water conservation is inherently a social issue given the consequences of water scarcity are borne by the greater society (Landon et al., 2016). Conversely, society benefits from an individual's sacrificial actions (e.g., water conservation) more than the individual themselves (Lapinski et al., 2007). For example, individuals may see small decreases in their water bills but the larger community benefits from a sustained water source when many people conserve. Therefore, water

\* Corresponding author. Department of Agricultural Education and Communication, University of Florida, Gainesville, FL, 32601, USA.

E-mail addresses: [lsanagorski@ufl.edu](mailto:lsanagorski@ufl.edu) (L.A. Warner), [john.diaz@ufl.edu](mailto:john.diaz@ufl.edu) (J.M. Diaz), [kalauni.d@ufl.edu](mailto:kalauni.d@ufl.edu) (D. Kalauni), [yazdanm@asnrkh.ac.ir](mailto:yazdanm@asnrkh.ac.ir) (M. Yazdanpanah).

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conservation is interesting to consider as a function of individuals' willingness to sacrifice for the greater good. Relatedly, people may be characterized by independent or interdependent definitions of the self which leads them to either seek out harmony with others or distinguish themselves as being unique from others, which is captured by concepts of collectivism and individualism (Triandis and Gelfland, 1998; Otterbring et al., 2022). Someone who defines themselves more in terms of independence, as opposed to interdependence, is considered more individualistic (Komatsu et al., 2019). We engaged in this study to explore how such concepts of individualism and collectivism related to communication about conservation. This study contributes to the literature by providing insight on engagement in a public sphere behavior which has received minimal attention, encouraging others to conserve water. Additionally, by pairing behavioral theory and cultural considerations, this research driven by the Theory of Planned Behavior paired with individualism and collectivism demonstrates a holistic picture of engagement in this behavior.

Generally, people in individualistic societies are prone to prioritizing the self while those in collectivist societies prioritize the needs and goals of larger social groups (Komatsu et al., 2019; Singelis et al., 1995). While these concepts are typically tied to specific cultures, globalization is affecting how individuals identify, with self-identification no longer consistently tied to traditional cultural expectations (Otterbring et al., 2022). These ideas have been used to demonstrate people's engagement in a wide variety of behaviors that benefit the greater good like natural resource conservation.

Concepts of individualism and collectivism may provide insight about people's willingness to engage in practices that benefit the greater good, from wearing a mask during the COVID-19 global pandemic (Lu et al., 2021) to pro-environmental behavior (Cho et al., 2013; Chwialkowska et al., 2020; Saracevic et al., 2022), adoption of renewable energy (Higueras-Castillo et al., 2019), green purchasing behaviors (Zici et al., 2021), reduced energy consumption (Smith et al., 2012), acceptance of nuclear energy (Xia et al., 2019), consumer motivations in local organic food markets (Schrank and Running, 2018), climate change inaction (Xiang et al., 2019), landowner conservation norms (Pradhananga et al., 2017), water conservation (Lapinski et al., 2007; Pradhananga et al., 2017), residential recycling (McCarty and Shrum, 2001) and gender differences in urban residents' pro-environmental behavior (Xiao and Hong, 2010). On a global scale, Komatsu et al. (2019) found the most individualistic countries also had the greatest negative environmental impacts, asserting that the culture of highly individualistic western countries needed to be changed to avoid environmental catastrophe. The country under study, the United States, is the most individualistic nation in the world (Hofstede Insights, 2022), although the country's underrepresented populations tend to be less individualistic (Singelis et al., 1995), and thus these dimensions may be important to explore to better understand conservation practices.

Environmentally desirable behaviors have been classified into private- and public-sphere categories, where private-sphere actions occur in personal spaces such as the home (e.g., taking shorter showers) and public-sphere actions occur in public spaces (e.g., demonstrations, stating approval for environmental policies) (Stern, 2002). Many studies have focused on private-sphere water conservation behaviors such as lawn watering, showering, and toilet flushing (e.g., Gibson et al., 2021; Han and Hyun, 2018; Kumar Chaudhary et al., 2017; Lam, 2006; Warner and Diaz, 2022; Warner et al., 2022; Yue et al., 2022). However, practices in the public sphere have a prominent place in our understanding of conservation engagement that have drawn less consideration to date. In contrast to private sphere actions emphasizing pro-environmental practices, public sphere actions emphasize pro-environmental attitudes and may be perceived as being less beneficial. Engaging in public sphere practices is a way to demonstrate attitude towards and concern over environmental challenges and these behaviors can be grouped into extended actions (Lu et al., 2017). Furthermore, public sphere behaviors allow for expression of individual environmental commitment, which is

critical for effective execution of environmental policies (Liobikiene and Poškus, 2019). In this regard, Stern (2002) argued that while public sphere activities influence the situation indirectly (e.g., by shaping public policies), the consequences may be enormous, since public policies can alter the activities of many people and institutions at once. However, these actions may be more difficult to promote. Therefore, overlooking the public sphere could hinder the high potential in the protection of natural resources like water. It is crucial that both public and private activities to be given equal consideration because both forms of activities can promote pro-environmental behavior. Our research aims to extend current knowledge relating to the role of the public sphere in water conservation as such and we examine the public sphere behavior of encouraging others to conserve water. The purpose of this study was to determine how definitions of the self in terms of individualism-collectivism related to engagement in a public-sphere behavior, encouraging others to conserve water. Here, we examine this behavior through the Theory of Planned Behavior (TPB) (Ajzen, 1991).

### 1.1. Theoretical framework

The TPB has been leveraged across various contexts, including water conservation (Clark and Finley, 2007; Gibson et al., 2021; Lam, 2006; Shahangian et al., 2021; Trumbo and O'Keefe, 2005; Yazdanpanah et al., 2016), to understand and predict behaviors. This theory posits that an individual's behavioral intentions are influenced by their own attitudes toward the behavior, the perception of social support for the behavior among valued others (subjective norms), and their perceived ability to carry out the behavior (perceived behavioral control; Ajzen, 1991).

While the TPB is an effective framework for understanding behaviors, Ajzen (2005) asserted that the model can be enhanced by coupling additional variables to the core constructs to improve its predictive capabilities. Scholars have integrated additional variables such as personal norms (Arvola et al., 2008; Bamberg et al., 2003; Burton, 2004; Gao et al., 2017; Kaiser and Scheuthle, 2003; Yazdanpanah et al., 2016), descriptive norms (Curtis et al., 2018; De Leeuw et al., 2015; Forward, 2009; Gao et al., 2017; Greaves et al., 2013) and past behaviors (Forward, 2009; Han et al., 2017; Kumar Chaudhary et al., 2017), to increase the predictive power of the TPB. In this regard, we add constructs of personal norms, descriptive norms, current and past behaviors to the TPB variables. Personal norms relate to an individual's sense of moral obligation to carry out a certain behavior (Arvola et al., 2008; Simsekoglu and Lajunen, 2008), descriptive norms relate to perceptions of what people in general do (Gao et al., 2017; Han and Hyun, 2018) and past and current behaviors denote further engagement and experience with the behavior of interest (Kidwell and Jewell, 2008; Kumar Chaudhary et al., 2017).

Additionally, Ajzen (2005) asserted that the cultural context cannot be ignored, which has led to efforts to integrate cultural values into conceptual models to understand the mediating role that individualism and collectivism play toward attitudes and norms that influence behaviors. While philosophers agree on the basic tenets of individualism and collectivism, there are various conceptualizations of the overarching paradigm. Some scholars have viewed the constructs of individualism and collectivism as dichotomous, where an individual may either be purely individualistic or collectivist (Azuma, 2000; Kim et al., 1994). Others assert there is more nuance that exists, explaining that there are multiple dimensions to both constructs and that individuals may have both individualistic and collectivist attributes and views (Triandis and Gelfland, 1998). For this study, we utilized the conceptualization of individualism and collectivism provided by Triandis and Gelfland (1998) that encompasses either individual or mutual aspects of self (Markus and Kitayama, 1991; Triandis, 2001); prioritization of either individual or in-group goals (Triandis, 2001; Yamaguchi, 1994); relationships with others emphasizing exchange or connectedness (Kim et al., 1994; Mills and Clark, 1982); and social behavior more

significantly influenced by attitudes and norms.

Individualism and collectivism can both be further distinguished as being vertical (valuing hierarchy) or horizontal (valuing equality) (Singelis et al., 1995; Triandis and Gelfland, 1998). Triandis and Gelfland (1998) contended that the relative emphasis on horizontal and vertical social relationships are the most important attributes that distinguish among the different types of individualists and collectivists. Horizontal patterns denote that an individual sees themselves like everyone else while vertical patterns contain hierarchies, where an individual sees themselves as competitive or different than others (Triandis and Gelfland, 1998). Thus, we can assign a typology to understand people’s sense of self as horizontal individualism (HI), vertical individualism (VI), horizontal collectivism (HC), or vertical collectivism (VC; Triandis and Gelfland, 1998). These typologies demonstrate how attitudes may be more influential toward an individual’s behaviors than norms in individualistic cultures, but norms may be more significant than attitudes in collectivist cultures (Trafimow and Finlay, 1996).

Scholars have demonstrated the influence that individualism and collectivism have on their ascription of local responsibility, which then influences their personal norms (i.e. sense of personal obligations) and ultimately their intentions and behaviors. Collectivists exhibited a positive perception of local ascription of responsibility thus producing higher feeling of personal obligation (i.e., personal norms), which individualists exhibited the inverse relationship (Pradhananga et al., 2017). This relationship and associated progression denote the importance of the personal norm activation process to behavior change (Harland et al., 2007 Pradhananga et al., 2017). Personal norms have demonstrated significant influence when considered in reference to a set of water conservation behaviors (Kumar Chaudhary et al., 2017) or when connected to a specific conservation behavior of interest (Warner and Diaz, 2022; Warner et al., 2022).

Beyond personal norms, evidence suggests that cultural values may also affect the influence of subjective and descriptive norms on behaviors, although the research demonstrates mixed results (Koop et al., 2019). In an energy conservation context, one study revealed subjective and descriptive norms had the strongest influence on behaviors over other TPB variables (Smith et al., 2012). Yet, another study suggested descriptive norms were the most powerful predictor of energy saving intentions while subjective norms had no effect (Gao et al., 2017). In a water conservation context, Yue et al. (2022) reported normative information was more effective at promoting household water conservation behavior compared to educational information. Also in the water conservation context, norms did not impact the attitudes or behaviors of individuals with strong group orientation (i.e., collectivists), while there was a negative relationship between descriptive norms, attitudes, and behaviors among those with a weak group orientation (Lapinski et al., 2007). This disconnect demonstrates the need for continued exploration of the influence that these norms play on conservation behaviors, especially those that are more social in nature, such as encouraging others to conserve water that seems to align more with collectivist

values than individualist. The theoretical framework for the study is presented in Fig. 1.

Alternately, those from individualistic cultures were less likely to ascribe to local responsibility to act and in some cases saw the behavior of interest as an inconvenience or a barrier to reaching their goals (Caputo et al., 2022; Lapinski et al., 2007; McCarty and Shrum, 2001 Pradhananga et al., 2017; Smith et al., 2012). For example, in a study by McCarty and Shrum (2001), while collectivists saw recycling as being more important and were likely to engage in the practice, those that were classified as individualists rated the practice of recycling to be significantly more inconvenient and were much less likely to recycle as a result. This same negative attitude toward conservation behaviors is evident across additional contexts including water conservation (Lapinski et al., 2007), energy consumption (Smith et al., 2012) and residential landscape conservation (Pradhananga et al., 2017). These preliminary insights into the influence that attitudes have on individuals from individualistic cultures aligns with their characteristics for goal setting and focus on personal gains.

Integrating cultural values into a TPB-based inquiry as a means of segmenting an audience holds much promise in informing intervention design (Lapinski et al., 2007; Pradhananga et al., 2017) which can provide practitioners with means of tailoring their educational offerings to appeal to the attitudes and norms that affectively influence the group’s behaviors (Ajzen, 2005; Lapinski et al., 2007). This study thus uses the four typologies presented above as a framework to explicitly delineate audience segments based on their cultural characteristics to generate an understanding of how future tailored interventions can be designed. Specifically, we explore the segments demographic differences and precursors to behavior (e.g., social and personal norms, attitudes, and perceived behavioral control) as informed by the theory. Lastly, we explore how segment membership relates to current and past behaviors. The inclusion of these prior and current behavioral variables provides a deeper and more nuanced understanding of the segments’ current and previous engagement that would not be achieved with behavioral intent alone, since behavioral intent does not perfectly translate to behavior (Conner and Norman, 2022).

## 2. Methodology

This study was part of a larger survey research project conducted annually beginning in 2013 to capture Florida residents’ perceptions and practices pertaining to water conservation and quality protection. The data (Warner and Kalauni, 2022) for this inquiry were collected from November 2021 through January 2022. Because there were human subjects involved in this research, our protocol was reviewed by the University of Florida Institutional Review Board before the study began (protocol #2021-02394). The protocol included an informed consent document which respondents reviewed prior to participating.

The purpose of the study was to determine definitions of the self in terms of individualism-collectivism related to engagement in a public-

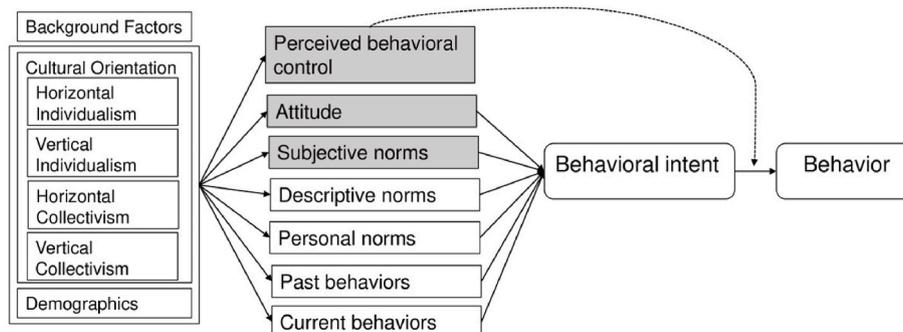


Fig. 1. Theoretical framework integrating Theory of Planned Behavior, additional normative and behavioral variables, and definitions of the self to elucidate a social behavior.

sphere behavior, *encouraging others to conserve water*. The specific research objectives were to: 1) segment the audience using definitions of the self (i.e., horizontal individualism, vertical individualism, horizontal collectivism, vertical collectivism) and behavioral intent; 2) characterize and compare the resulting segments' demographic characteristics; 3) characterize and compare the resulting segments' social norms (i.e., subjective and descriptive norms), personal norms, attitudes, and perceived behavioral control; and 4) characterize and compare the resulting segments' behavioral characteristics (i.e., past and present behavior).

### 2.1. Sampling and respondents

The target population was Florida residents 18 years of age and older. Purposive sampling was used to access individuals meeting these criteria. Since random sampling was not used, quota sampling was employed to balance the sample (Taherdoost, 2016) in alignment with the state's age, gender, race, and ethnicity proportions according to U.S. Census data (U.S. Census Bureau, 2020).

Respondents were 49.56 ( $SD = 18.68$ ) years of age on average. Gender was reported as 57.1% female 40.8% male, 0.6% non-binary, and 1.5% opted not to share. Participants could select as many race/ethnicity categories as they wanted, and identified with the following: 22.6% as Hispanic or Latino/a, 2.1% American Indian or Alaska native, 20.3% Black or African American, 3.3% Asian or Pacific Islander, 70.8% white, and 5.2% other. 24.4% had lived outside the country and 13.9% came to the United States as a resident of another country. Respondents were evenly split between renting (44.5%) and owning (49.1%) their residences. The most common 2020 family income categories reported (in USD) were \$25,000 - \$49,999 (32.1%), less than \$24,999 (29.2%), and \$50,000 - \$74,999 (18.8%). Some college (28.8%), high school (25.7%), a 4-year college degree (17.8%), or a masters degree (8.7%) were the most common education levels.

A professional survey sampling company was used to contact potential respondents with details about the study shared through electronic mail. Those who opted to participate could click on a link which directed them to the approved informed consent information and Qualtrics instrument. The desired sample size was 385 given a state population of 21 million residents, 95% confidence level, and 5% margin of error. 847 individuals opted into the survey; of these, 330 were assigned to a separate substudy, with the remaining 517 assigned to the present study. We excluded any individual who did not complete all items ( $n = 253$ ). A total of 264 respondents provided complete responses and comprised the study sample.

### 2.2. Instrumentation and measures

After agreeing to participate, respondents advanced to screening questions which confirmed they were residents of Florida aged 18 years or older. The demographic questions used to establish quotas were placed at the beginning of the instrument so data were not collected from respondents representing quotas that had already been filled. A quality control question in the form of a commitment request asking, *Do you commit to providing your thoughtful and honest answers to the questions in this survey?* was used to exclude those who did not commit to providing their best answers (Hibben et al., 2022).

The measures used to inform the cluster analysis for segmentation were horizontal individualism index, vertical individualism index, horizontal collectivism index, vertical collectivism index, and behavioral intent. Once cluster analysis was conducted (Objective One), group membership was used as an independent variable for Objectives Two - Four. The comparisons by group considered demographic characteristics (Objective Two), social norms (i.e., subjective and descriptive norms), personal norms, attitude, and perceived behavioral control (Objective Three), and past behavior and current behavior (frequency) (Objective Four).

The measures were designed to align with a specific time-bound target behavior (i.e., encourage others to save water in the next month) (Ajzen, 1991; Branscum et al., 2017). The individualism-collectivism variables were adapted from Triandis and Gelfand (1998). Attitude, perceived behavioral control, subjective norms, personal norms, and descriptive norms were measured using a series of semantic differential and Likert-type scales according to Ajzen's (2002) recommendation with modifications informed by other reliable instruments (Kumar Chaudhary et al., 2017; Park et al., 2009; Warner et al., 2018; Warner, 2019). Cronbach's alpha was computed for all indices (see Table A1) and indicated the measures were suitable for use ( $\alpha > .70$ ; Cortina, 1993).

### 2.3. Data cleaning and analysis

Data cleaning included descriptive analyses and case sorting to identify missing data and ensure there were no unexpected values. Data were recoded from the assigned values (e.g., 1 to 5) to a standard range (e.g., -2 to +2) with a coding scheme that corresponded to response items presented to respondents (e.g., strongly disagree to strongly agree). Value labels were updated to correspond with the new values. Descriptive analyses were run again to compare assigned and recoded values and ensure accuracy.

Cluster analysis was used to conduct audience segmentation (Objective One) according to five variables: horizontal individualism, vertical individualism, horizontal collectivism, vertical collectivism, and behavioral intent. This exploratory data analysis technique is especially useful for partitioning data into meaningful groups by maximizing similarity within each group and maximize the differences between groups (Burns and Burns, 2008). First, hierarchical cluster analysis was used to assess the appropriate number of subgroups (IBM Corporation, 2021a). This procedure begins with all cases (i.e., respondents) considered a unique one-member "group" and uses an algorithm to combine the most similar cases systematically until all cases are assigned to a single group (IBM Corporation, 2021; Yim and Ramdeen, 2015). There is a certain number of groups for every data set where the groups can be as different from one another as possible, where having a greater or lesser number of groups results in either too much homogeneity between groups or too much heterogeneity within groups. We specified Squared Euclidean distance, the squared difference between a pair of cases on the specific characteristic being compared, to measure how similar or dissimilar cases were from one another (Yim and Ramdeen, 2015). The resulting agglomeration table was inspected for a demarcation point indicating the appropriate solution, and this number was specified in a subsequent k-means cluster analysis to assign respondents to the individual subgroups (IBM Corporation, 2021b).

After cluster analysis was conducted, group membership was used as the independent variable to compare subjective and descriptive norms, personal norms, attitude, perceived behavioral control, demographic characteristics, past behavior, and current behavior (frequency). To conduct these comparisons, independent *t*-test and chi-square analyses were used for interval and ordinal dependent variables, respectively. We used partial Cohen's *d* and Cramer's *V* as measures of effect size when *t*-test or chi-square analyses, respectively, were significant. Interpretations of *d* were 0.20 = small, 0.50 = medium, and 0.80 = large (Cohen, 1988). Interpretations of Cramer's *V* were: <0.10 = negligible effect, 0.10 to 0.19 = weak effect, 0.20 to 0.39 = moderate effect, 0.40 to 0.59 = relatively strong effect, 0.60 to 0.79 = strong effect, 0.80 to 1.00 = very strong effect (Rea and Parker, 1992). We analyzed all data using SPSS (version 27.0, IBM Corp., Armonk, NY).

## 3. Results

Objective 1: segment the audience using definitions of the self (i.e., horizontal individualism, vertical individualism, horizontal collectivism, vertical collectivism) and behavioral intent.

Examination of the agglomeration table from the cluster analysis output revealed a clear demarcation point between two and three clusters, indicating little value in a solution of three or more clusters. Thus, two was specified in a subsequent *k*-means cluster analysis to assign respondents to individual subgroups (see Table 1). Cluster 1 (*n* = 127; 48.1%), hereafter referred to as the *Interdependent Conservation Advocates* (ICAs) was characterized by significantly stronger identification with HC and VC and greater behavioral intent. Cluster 2 (*n* = 137; 51.9%), hereafter referred to as the *Unconnected Bystanders* (UBs) was characterized by weaker identification with HC and VC and lower behavioral intent. HI and VI were not significantly different between the groups.

3.1. Objective 2: characterize and compare the resulting segments' demographic characteristics

There were a few significant differences between the two segments (see Table 2). There was no significant relationship between group membership and gender or rural-urban continuum. There was a weak association between group membership and coming to this country as a resident of another county, with more ICAs saying they had done so. There was also a weak association between group membership and race/ethnicity, with more individuals identifying as Black or African American in the ICA group. There were significantly more individuals identifying as white in the UBs group.

Independent *t*-tests revealed the number of years living in the state was not significantly different between the ICAs (see Table 3). There was a significant relationship between the age of respondents and group membership with ICAs being relatively younger. The effect size associated with this relationship was medium.

Objective 3: characterize and compare the resulting segments' social norms (i.e., subjective and descriptive norms), personal norms, attitudes, and perceived behavioral control.

Findings showed that subjective norm, descriptive norm, personal norm, attitudes, and perceived behavioral control significantly differed between the groups (see Table 4). Individuals belonging to ICAs reported higher mean for all TPB and normative variables compared to UBs. A large effect size was observed for perceived behavioral control, while effect size was approaching large across the rest of TPB and normative variables.

Objective 4: characterize and compare the resulting segments' behavioral characteristics (i.e., past and present behavior).

There was a moderate association between group membership and past behavior (see Table 5), with more ICAs reporting that they had encouraged others to save water in the past. Relatedly, there was a moderate association between group membership and current behavior. Findings revealed that ICAs are more likely to *Always* or *Often* encourage others to save water. Individuals reporting *Sometimes* were at par.

**Table 1**  
Comparison of clusters based on clustering variables according to independent *t*-test (*N* = 264).

Variables	Interdependent conservation advocates ( <i>n</i> = 127; 48.1%)		Unconnected bystanders ( <i>n</i> = 137; 51.9%)		<i>p</i>	<i>t</i>	<i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
VI	-.075	.835	-.193	.716	.215	1.242	-
HI	1.158	.643	1.021	.693	.100	1.652	-
HC*	.950	.652	.752	.544	.007	2.701	.333
VC*	1.006	.656	.819	.683	.024	2.268	.279
Intent**	1.265	.510	-.593	.746	<.001	23.780	2.889

Note. Cohen's *d* interpretation: 0.20 = small, 0.50 = medium, 0.80 = large (Cohen, 1988).

\**p* < .05, \*\**p* < .001

**Table 2**  
Chi-square table comparing categorical demographic variables between clusters (*N* = 264).

Demographic variable	Interdependent conservation advocates ( <i>n</i> = 127; 48.1%)		Unconnected bystanders ( <i>n</i> = 137; 51.9%)		<i>p</i>	$\chi^2$	Cramer's <i>V</i>
	% ( <i>f</i> )	% ( <i>f</i> )	% ( <i>f</i> )	% ( <i>f</i> )			
Gender					.318	2.290	-
Male	39.370 (50)	45.985 (63)					
Female	59.843 (76)	51.825 (71)					
Prefer not to say	0.787 (1)	2.190 (3)					
Race/Ethnicity					.778	.079	-
American Indian or Alaska native	2.362 (3)	2.920 (4)					
Black or African American*	19.685 (25)	9.489 (13)			.018	5.560	.145
Asian or Pacific Islander	0.787 (1)	1.460 (2)			.607	.265	-
White*	70.866 (90)	85.401 (117)			.004	8.225	.177
Other	7.087 (9)	2.190 (3)			.056	3.642	-
Hispanic/Latino (a)/Chicano(a)*	32.283 (41)	17.518 (24)			.005	7.742	.171
Living outside of US							
Yes, I came to this country as a resident of another county*	14.961 (19)	5.839 (8)			.015	5.972	.150
Yes, I lived outside the country as a United States citizen	8.661 (11)	16.058 (22)			.069	3.297	-
No	76.378 (97)	80.292 (110)			.440	.596	-
Rural Urban Continuum					.349	4.448	-
Metro-Counties in metro areas 1 million population or more	53.543 (68)	50.365 (69)					
Metro-Counties in metro areas of 250,000 to 1 million population	27.559 (35)	37.226 (51)					
Metro-Counties in metro areas of fewer than 250,000 population	7.087 (9)	5.839 (8)					
Nonmetro-Urban Population of 20,000 or more, adjacent to be a metro area	7.874 (10)	3.650 (5)					
Nonmetro-Urban population of 2500 to	3.937 (5)	2.920 (4)					

(continued on next page)

**Table 2 (continued)**

Demographic variable	Interdependent conservation advocates (n = 127; 48.1%)		Unconnected bystanders (n = 137; 51.9%)		p	$\chi^2$	Cramer's V
	% (f)	% (f)	% (f)	% (f)			
19,999, adjacent to a metro area							

Note. Cramer's V effect size interpretations: 0.10, negligible; 0.10 to 0.19, weak; 0.20 to 0.39, moderate; 0.40 to 0.59, relatively strong; 0.60 to 0.79, strong; 0.80 to 1.00, very strong (Rea and Parker, 1992). Race/Ethnicity and Living outside of US categories add up to >100% because respondents could select multiple answers.

\*p < .05, \*\*p < .001.

**Table 3**

Independent t-test table comparing continuous demographic variables between clusters (N = 264).

Variable	Interdependent conservation advocates (n = 127; 48.11%)		Unconnected bystanders (n = 137; 51.9%)		p	t	d
	M	SD	M	SD			
Years living in state	29.32	17.904	33.18	18.769	0.89	-1.707	-
Age in years**	47.16	17.154	56.05	17.938	<.001	-4.110	-.506

Note. Cohen's d interpretation: 0.20 = small, 0.50 = medium, 0.80 = large (Cohen, 1988).

\*p < .05, \*\*p < .001.

**Table 4**

Independent t-test table comparing TPB and normative variables between groups (N = 264).

Variable	Interdependent conservation advocates (n = 127; 48.11%)		Unconnected bystanders (n = 137; 51.9%)		p	t	d
	M	SD	M	SD			
Subjective Norm**	.646	.728	-.085	.814	<.000	7.668	.776
Descriptive Norm**	.858	.739	-.029	.846	<.000	9.045	.797
Personal Norm**	.850	.687	-.119	.806	<.000	10.478	.751
Attitudes**	1.656	.553	.865	.847	<.001	8.913	.721
Perceived Behavioral Control**	1.395	.805	.327	.978	<.001	9.646	.899

Note. Cohen's d interpretation: 0.20 = small, 0.50 = medium, 0.80 = large (Cohen, 1988).

\*p < .05, \*\*p < .001.

**4. Discussion**

This study highlights the intersectionality and gradient and composite nature of individualism and collectivism in environmental behavior and socially encouraging water conservation in particular. When segmenting the respondents of this study based on perceptions of self (i.e., collectivism and individualism) and behavioral intentions, intent was the biggest discriminating factor between ICAs and UBs, with ICAs more likely to intend to encourage others to conserve water. ICAs demonstrated significantly higher levels of horizontal and vertical

collectivism. This means that ICAs view themselves as being like others and emphasize mutual goals that advance their community (Triandis and Gelfland, 1998). Interestingly, horizontal and vertical individualism were not different between the groups, implying people can identify with both individualistic and collectivist perceptions of self, and in the case of this study, people can identify with components of individualism and also be conservation advocates. Although the present study is focused on encouraging water conservation, these results may be useful in encouraging environmental behaviors in other contexts.

Despite concerns that the individualistic nature of western cultures is linked to negative environmental consequences, our findings demonstrate the value of identification with collectivism in a traditionally individualistic country. It is expected that such findings would differ greatly among cultures and contexts. Here, our findings demonstrate the importance of embracing a nontraditional identity (i.e., collectivism) in the United States, while regions with traditionally collectivistic cultures have the opportunity to nurture their conventional identities to foster conservation. Our findings align with Ghazali et al. (2023), who reported a relationship between collectivism and a preference for water faucets that encouraged conservation.

Within the demographic characteristics ICAs were more likely to be black or African American or Hispanic/Latino, while UBs were more likely to be white. ICAs were also significantly younger than UBs and more likely to have come to the United States as a resident of another country. These significant differences exhibited small and medium effects on the respondents' group membership and thus on their perceptions of self and their intentions to encourage others to conserve water.

When evaluating the relationship between group membership and the theoretical TPB variables, all were different between the groups and stronger among ICAs, all with large or nearly large effect sizes. PBC exhibited the largest effect size, suggesting that self-efficacy and controllability, two important constructs within PBC, should be given priority in water conservation programs focused on change beyond the individual-level (Ajzen, 2002). As a result, it is important to teach people the interpersonal skills involved in encouraging others to save water to influence the possibility of neighbourhood-level change, for example. Further inquiry is necessary to understand if the effect of PBC found in this study results from an ability to approach others (i.e., confidence), technical knowledge (e.g., how to conserve) or a combination of the two.

ICAs' greater perceptions of behavioral control may be influenced by their current or past engagement in the behavior. ICAs were twice as likely to have encouraged others to conserve water in the past, with 87% of ICAs, in comparison to 34% with UBs, currently engaging with the behavior at least somewhat regularly (i.e., always, often, or sometimes). Given the significance of PBC and its relationship with past and current engagement with encouraging others to conserve water, conservation education programs should leverage curricula that allow their participants to gain experience encouraging others to conserve water. Programs that involve members of a local community interacting closely with others, for example through landscape site visits conducted by members of Master Gardener Volunteer programs represent such opportunities that would allow its participants to build both the technical and social skills of encouraging water conservation. People acting as community ambassadors need to be able to connect with others and approach the topic of water conservation using message frames salient to the recipient before they can share knowledge on the technical aspects of water conservation. More development may be needed in these types of programs to offer additional educational activities that focus on building skills in areas such as social marketing that can be used for encouraging others to conserve water.

Descriptive norms exhibited the second highest effect size, with ICAs believing their peers are more engaged in encouraging others to save water. This finding aligns with previous work on direct conservation behaviors and demonstrates how the exposure to, and awareness of, descriptive norms can significantly influence conservation behaviors related to water (Han and Hyun, 2018; Onyenakeya et al., 2015;

**Table 5**  
Chi-square table comparing past behavior and current behavior between groups (N = 264).

	Interdependent conservation advocates (n = 127; 48.11 %)	Unconnected bystanders (n = 137; 51.9%)	p	$\chi^2$	Cramer's V
	% (f)	% (f)			
Past behavior (Have you encouraged others to save water in the past?) **			<.001	64.628	.495
Yes	85.039 (108 <sub>a</sub> )	36.496 (50 <sub>b</sub> )			
No	14.960 (19 <sub>a</sub> )	63.503 (87 <sub>b</sub> )			
Current behavior (How often do you encourage others to save water?) **			<.001	92.408	.593
Never	3.937 (5 <sub>a</sub> )	31.618 (43 <sub>b</sub> )			
Rarely	8.661 (11 <sub>a</sub> )	29.412 (40 <sub>b</sub> )			
Sometimes	37.008 (47 <sub>a</sub> )	33.824 (46 <sub>a</sub> )			
Often	35.433 (45 <sub>a</sub> )	4.412 (6 <sub>b</sub> )			
Always	14.961 (19 <sub>a</sub> )	0.735 (1 <sub>b</sub> )			

Note. Cramer's V effect size interpretations: 0.10, negligible; 0.10 to 0.19, weak; 0.20 to 0.39, moderate; 0.40 to 0.59, relatively strong; 0.60 to 0.79, strong; 0.80 to 1.00, very strong (Rea and Parker, 1992). Each subscript letter denotes a subset of column proportions that do not differ significantly from each other at the 0.001 level.

\*p < .05, \*\*p < .001.

Richetin et al., 2016; Warner et al., 2022). Applied to the current behavior of interest, the more individuals witness others encouraging people to conserve water (i.e., become aware of a descriptive norm), the more likely those individuals are to do the same. This also aligns with Lapinski et al. (2007) who identified a negative relationship between descriptive norms and behaviors among people with weak group orientation or strong individualistic orientation, meaning descriptive norms are more powerful among those identifying with collectivism. Findings such as these underscore the importance of considering the full cultural dynamic including both group orientation (individualistic/collectivistic) and norms (i.e., descriptive). The most effective implementation policy in this regard is to embed education and other provisions into policies that encourage the target audience to encourage water conservation in society. It is also very important to provide the grounds for these reference people to openly encourage water conservation to strengthen and increase the descriptive norm among the target group.

The significance and effect of subjective norms, personal norms and attitudes also contributes to a somewhat divided body of literature. While some studies found some of these three predictors were not significant (Kumar Chaudhary et al., 2017; Perren and Yang, 2015; Untaru et al., 2016; Yazdanpanah et al., 2016), our study aligns with those that did identify a significant relationship that must be considered when promoting behaviors that would lead to the conservation of water (Kumar Chaudhary et al., 2017; Perren and Yang, 2015; Untaru et al., 2016), demonstrating the ongoing utility of the TPB in this area. Therefore, targeting improvement of these three variables in the target community can play an effective role in encouraging others to protect water.

From a policy standpoint, decisionmakers need to understand the factors that influence their constituents' behaviors and integrate such factors into policy development. Our research highlights that information campaigns alone will be insufficient to achieve long-term water conservation and affirms the presence of inherent distinctions among individuals hailing from diverse cultures or cultural ideologies, reflected in their attitudes, personal norms, social norms, and perceived behavioral control. Program planners and policymakers should acknowledge such existing differences to leverage the efficacy of interventions aimed at encouraging residents to conserve water. The findings underscore the significance of culturally tailored educational initiatives, particularly in the face of globalization. Policies should incorporate more comprehensive strategies that go well beyond one-time information transfers. Specifically, they should aim to increase consumers' sense of self-efficacy and given the behavior of interest here they must include a social component to build individuals' beliefs that they can encourage others to implement water-saving actions.

Additionally, policies should leverage social norms by

communicating descriptive norms about community members who encourage others to conserve. Repeated exposure to such normative messages may activate personal norms. Finally, gaining consumer buy-in will likely require appeals to both rational and emotional motives and a comprehensive communications strategy to support the formation of these social habits.

Additional inquiries are needed to continue to understand the influence of individualism and collectivism across conservation-based behaviors. Are more private sphere or more technical conservation behaviors going to have a different relationship than the overtly social behavior of encouraging others to conserve water? Is individualism and collectivism only relevant to more social behaviors and those with more public good than private good (e.g., water conservation)? Future inquiries should consider integrating these research questions into their design to continue to advance the scholarship of conservation-based behavior change.

Limitations of the study include the nature of self-reported measures which carry the risk of certain biases such as social desirability bias. The anonymous format of our protocol should have reduced this risk to an extent. While we emphasize there is value in using cluster analysis to explore the intersectionality of variables which inform grouping, there is also an opportunity to directly analyze the variables of interest to understand encouraging others to conserve water from another (i.e., variable-focused) perspective. Additionally, despite achieving the desired sample size, the exclusion of individuals who did not complete all items reduced the sample below the target, and this should be considered in interpreting the findings. There is an opportunity to improve the representativeness of this work with a larger sample in the future, ideally with random sampling.

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## CRedit authorship contribution statement

**Laura A. Warner:** Writing – review & editing, Writing – original draft, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **John M. Diaz:** Writing – review & editing, Writing – original draft, Conceptualization. **Dharmendra Kalauni:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Data curation, Conceptualization. **Masoud Yazdanpanah:** Writing – review & editing, Writing – original draft.

**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**

Data available through public repository which is cited in the manuscript.

**Appendix**

**Table A1**

Key study variables

Variable	Definition	Description
Horizontal individualism $\alpha = .777$ $M = 1.087$ $SD = .672$	Latent variable representing a definition of the self which values independence and equality	Mean of four items measured with 5-point Likert scale with possible responses ranging from $-2 = Strongly disagree$ to $+2 = Strongly agree$ I'd rather depend on myself than others. I rely on myself most of the time; I rarely rely on others. I often do "my own thing." My personal identity, independent of others, is very important to me.
Vertical individualism $\alpha = .804$ $M = -.136$ $SD = .776$	Latent variable representing a definition of the self which values independence and hierarchy	Mean of four items measured with 5-point Likert scale with possible responses ranging from $-2 = Strongly disagree$ to $+2 = Strongly agree$ It is important that I do my job better than others. Winning is everything. Competition is the law of nature. When another person does better than I do, I get tense.
Horizontal collectivism $\alpha = .787$ $M = .848$ $SD = .605$	Latent variable representing a definition of the self which values interdependence and equality	Mean of four items measured with 5-point Likert scale with possible responses ranging from $-2 = Strongly disagree$ to $+2 = Strongly agree$ If a coworker gets a prize, I would feel proud. The well-being of my coworkers is important to me. To me, pleasure is spending time with others. I feel good when I cooperate with others
Vertical collectivism $\alpha = .775$ $M = .909$ $SD = .676$	Latent variable representing a definition of the self which values interdependence and hierarchy	Mean of four items measured with 5-point Likert scale with possible responses ranging from $-2 = Strongly disagree$ to $+2 = Strongly agree$ Parents and children must stay together as much as possible. It is my duty to take care of my family, even when I have to sacrifice what I want. Family members should stick together, no matter what sacrifices are required. It is important to me that I respect the decisions made by my groups.
Attitude $\alpha = .884$ $M = 1.357$ $SD = .777$	Latent variable representing individuals' assessment as to the outcome of engaging in the behavior	Mean of six semantic differential items as a response to the prompt, <i>please indicate your attitude toward the phrase "Encouraging others to save water in the next month is..."</i> with five points between each set of words: Good: Bad Important: Unimportant Foolish: Wise Beneficial: Harmful Positive: Negative Unnecessary: Necessary
Perceived behavioral control $\alpha = .905$ $M = .957$ $SD = 1.035$	Latent variable representing individuals' perception of their ability to engage in the behavior.	Mean of five semantic differential items as a response to the prompt, <i>please indicate how you feel about the phrase "Encouraging others to save water in the next month is..."</i> with five points between each set of words: Possible for me: Not possible for me Easy for me: Not easy for me In my control: Not in my control Up to me: Not up to me Practical for me: Not practical for me
Subjective norm $\alpha = .850$ $M = .407$ $SD = .907$	Latent variable representing individuals' perceptions that others expect engagement in the behavior	Mean of three items measured with 5-point Likert scale following the prompt, <i>please indicate your level of agreement or disagreement with the following statements</i> , with possible responses ranging from $-2 = Strongly disagree$ to $+2 = Strongly agree$ Most of the people who are important to me expect me to encourage others to save water in the next month. Most of the people who are important to me would have a good attitude if I encouraged others to save water in the next month. Most of the important people in my life would react positively if I encouraged others to save water in the next month.
Descriptive norm $\alpha = .949$ $M = .540$ $SD = .948$	Latent variable representing perceived engagement in the practice by others	Mean of three items measured with 5-point Likert scale following the prompt, <i>please indicate your level of agreement or disagreement with the following statements</i> , with possible responses ranging from $-2 = Strongly disagree$ to $+2 = Strongly agree$ Most of the people who are like me would encourage others to save water in the next month. People like me, on average, would encourage others to save water in the next month. The average person who is like me would encourage others to save water in the next month.
Personal norm $\alpha = .881$ $M = .501$ $SD = .953$	Latent variable representing personal obligation to engage in the practice	Mean of three items measured with 5-point Likert scale following the prompt, <i>please indicate your level of agreement or disagreement with the following statements</i> with possible responses ranging from $-2 = Strongly disagree$ to $+2 = Strongly agree$ I feel a personal obligation to encourage others to save water in the next month. I should be responsible for encouraging others to save water in the next month. It would be good for me to encourage others to save water in the next month.

(continued on next page)

Table A1 (continued)

Variable	Definition	Description
Past behavior <i>M</i> = .640 <i>SD</i> = .480	Binary variable representing previous engagement in the behavior	One item measured with prompt, <i>have you encouraged others to save water in the past?</i> With responses <i>yes</i> (1) and <i>no</i> (0)
Current behavior <i>M</i> = 1.920 <i>SD</i> = 1.234	Ordinal variable representing frequency of engaging in the behavior	One item measured with 5-point Likert scale, <i>how often do you encourage others to save water?</i> With possible responses <i>Never</i> (0), <i>Rarely</i> (1), <i>Sometimes</i> (2), <i>Often</i> (3), <i>Always</i> (4).
Future behavior (intent) <i>α</i> = .977 <i>M</i> = .500 <i>SD</i> = 1.179	Latent variable representing behavioral intentions	Mean of three items measured with 5-point Likert scale with the following statements, with possible responses ranging from <i>-2 = Very unlikely</i> to <i>+2 = Very likely</i> : How likely are you to encourage others to save water in the next month? In the next month, what is the likelihood you will encourage others to save water? What is the likelihood you will encourage others to save water in the next month?

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