Water Consumer Behaviors and Contextual Factors: Brazil and Canada Comparative Analysis

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Abstract

This study aims to more fully understand Sustainable Water Behaviour (SWB) and its contextual relationships in Brazil and Canada, taking into consideration the behaviour of water consumers in both populations, including their political, social, legal and economic differences, and their different water scarcity experiences. Data from a total of 1,027 usable surveys (746 from Brazil and 281 from Canada) were collected from university students at the Federal University of Viçosa (UFV), Brazil and the University of Regina (UofR), Canada, and from 16 interviews (7 from Brazil and 9 from Canada) undertaken with professors, students and employees of UFV and UofR. A linear regression was performed to test the relationship between contextual variables and the SWB. The qualitative data were analysed by content analysis to support the analysis. The research revealed a significant relationship between contextual and SWB present in different ways in Brazilian and Canadian samples. While Brazilian samples presented more influence by context, specifically because of Brazil's major experience with water scarcity, Canadian samples were influenced by variables such as ecological awareness and natural conditions. Therefore, this study pointed contexts that facilitate adoption of SWB; point out the relevance of contextual aspects to behavioural choices, specifically involving sustainable consumption.

Keywords: Water consumer behaviour; Sustainable water behaviour; Comparative studies; Context and sustainable behaviour

1. Introduction

Considering natural resources as an essential element to human and environmental life, sustainable consumption has been a current subject in governmental agendas around the world. Natural resources include water, which is crucial to providing food supply, hygiene, environmental balance and the maintenance and production of material assets. Beyond water management and water sustainable use it is important to ensure this resource for future generations. In this sense, promoting water sustainable use is a relevant government function. For this, we need to understand water behaviour consumers, aiming at favoured sustainable behaviours. Some consumer behaviour researchers have focused on understanding motivational factors for the adoption of sustainable behaviour (e.g. Fietkau & Kessel, 1981; Hines, Hungerford & Tomera, 1986; Stern, 2000; Kollmus & Agyeman, 2002; Leonidou, Leonidou & Kvasova, 2010; Thogersen & Schrader, 2012). Contextual variables are among the main variables in this regard (Thogersen & Schrader, 2012). The authors suggest social, economic, legal, political and natural conditions as contextual variables. Comparative studies to explore these factors in sustainable behaviour have been encouraged and developed (Corral-Verdugo, 2003; Rouwald & Moore, 2002; Vaccari, 2014).

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These types of investigations help to emphasise contextual aspect relevance and allow the understanding about which contextual designs stimulate sustainable behavioural adoption (Vaccari, 2014). Other researches have investigated environmental behaviour in different places or countries. They have found the contextual influence on behaviour intention and environmental awareness (Cordano, Welcomer, Scherer, Pradenas & Parada, 2010; Ferraz *et al.*, 2013) highlighted. Furthermore, they founded empirical bases to emphasise the relevance of norms, structural, environmental knowledge, and degrees of collectivity and individuality to sustainable behaviour adaption (Chan, 2001; Ferraz *et al.*, 2013).

Moreover, comparative studies focused on water consumer behaviour have had their value stressed by Corral-Verdugo (2003). According to this author, higher or lower levels of water availability change water behaviour between the populations. Taking into consideration the arguments of these authors, and expecting them to enrich these studies, this article's goal is to compare water consumer behaviour between populations with higher or lower levels of water scarcity experience. To do this, two populations with different contextual and water scarcity situations have been highlighted.

Brazil is classified as a country with lower life-quality positions when compared with developed countries (*Programa das Nações Unidas para o Desenvolvimento* [PNUD], 2015). Although recognized for its natural wealth, most of Brazil is subject to a serious water crisis. Since 2014, most of the Brazilian southeast region has been facing drought problems. On the other side, Canada, a highly-developed country with a high quality of life and education level, as well as high water availability, is one of the world's highest water consumers. While it has an abundance of water, some regions at Canada, such as The Prairies, have difficult accessing water because of a lower water quality.

Accordingly, two populations were selected: Viçosa (MG), representing the Brazilian southeast, and Regina (Saskatchewan), representing the Canadian Prairies. Both cities have important university populations that were our focus population. According to Straughan and Roberts (1999), university populations are an important public for this kind of study since they include current and future opinion leaders. Corral-Verdugo (2003) and Franco (2012) also used university populations in their sustainable behaviour investigation. This study endeavoured to contribute to the theoretical and empirical enrichment of this area, comparing SWB between Brazil and Canada.

2. Literature

2.1. Water consumer behaviour constructs

Consumer behaviour investigation involves understanding attitudes, needs, wishes and motivations regarding to people behaviour (Samara & Morsh, 2007). According to these authors, understanding consumer behaviour is a crucial area in marketing since it has the potential to predict consumer behaviour tendencies and preferences. Related to environmental behaviour, this area contributes to understanding the main motivations to sustainable behaviour adoption; it is important to encourage this type of behaviour (Kollmus & Agyeman, 2002). Therefore, some researchers elaborates environmental behaviour models to better explain the main variables that influence this behaviour. Between the factors pointed out by the authors, are individual and external factors. Individual factors include attitudes, environmental values and knowledge as cited by Fietkau and Kessel (1981), Hines *et al.*, (1986), Blake (1999), Stern *et al.* (2000), Kollmus and Agyeman (2002) and Leonidou, Leonidou and Kvasova (2010). These authors and Corral-Verdugo (2003) also describe the contextual factors (external) relevance. To these researchers, external factors are important to enable sustainable behaviour and promote individual factors more favourable to environmental behaviour preferences. Table 1 (below) shows the models regarding environmental behaviour and variables listed by authors.

Table1 - Environmental behaviour models

| Models	Variables
Ecological Behaviour (Fietkau & Kessel, 1981)	Environmental attitudes and values; Possibility to act pro-environmentally; Behavioural incentives; Feedback on environmental behaviour and environmental knowledge
Environmental Behaviour (Hines *et al.*, 1986)	Attitudes; Control locus; Individual sense of responsibility; Knowledge of environmental issues; Knowledge of action strategies; Ability to act and verbal commitment; Situational Factors.
Value-Belief-Norms Model Theory (Stern, 2000)	Values, Beliefs, Personal norms
Barriers to Environmental Concerns and Actions (Blake, 1999)	Individuality, Responsability, practicality
Pro-Environmental Behaviour Model (Kollmus & Agyeman, 2002)	Knowledge, Feelings, Values and Attitudes, Infrastructure, Political, Social and Cultural Factors, Economic Situation
Ecologically Correct Attitude (Leonidou, Leonidou & Kvasova, 2010)	Historical (cultural, political and ethical), Factors of attitudes (internal and external), Behavioural factors and results.
Water consumer structural model Corral-Verdugo (2003)	Motivations, Skills to conserve; Utilitarian beliefs

Source: Elaborated by the authors (2017)

2.2. Contextual Factors and Sustainable Water Behaviour

Considering external factors relevant to environmental behaviour, such as those highlighted by the authors of this area, we endeavoured to better explain the relationship between contextual factors and SWB. We can understand water sustainable behaviour and water consumption habits to save water that are adequate to sustainability and environmental issues (e.g. save water on daily activities such as taking a shower, washing clothes or dishes, washing cars, landscape irrigation, etc).

Chan (2001) argues that the tendency to sustainable behaviour is viewed by how much a society is educated to think in an environmentally-responsible way. Kumar, Philip and Sharmar (2014), according to Ajzen and Fishbein (1975), expanded a model considering the influence of population characteristics on their environmental values. Font, Garay, and Jones (2016) highlight the importance of individual or collective values to create more empathy for sustainability. In addition, the authors argue that empathy for others (an individual trait) changes the influence level of individualism or collectivism on individual choices, as proposed in Figure 1.

Figure 1 - Sustainability empathy
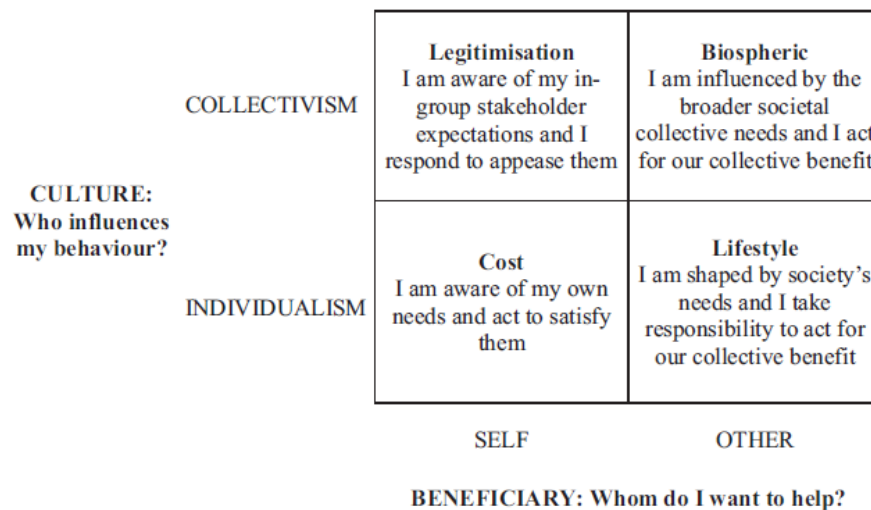
Source: Font, Garay and Jones (2016, p.74)

Individuals who act for the benefit of others are always more willing to act proactively in both cultures. Individuals most influenced by collectivist values tend to be concerned with people's expectations of their surroundings (Font, Garay & Jones, 2016). According to Hines *et al.* (1986), higher levels of "internal control locus" means people more able to act believing in the positive impact of their actions, independently of the other individuals, being people with high level of internal control locus the most proactive of all (Fonte, Garay & Jones, 2016).

Highlighting external factors, Blake (1999) lists social and institutional contexts such as behaviour prediction. Supporting this thinking, Laroche, Bergeron and Barbaro-Forleo (2001) argue that attitude and behaviour vary according to the context of each location. Similarly, Kollmus and Agyeman (2002) consider environmental awareness, infrastructure and political, social and economic factors as possible facilitators of sustainable behaviour. Regarding behaviour easiness, we can point to infrastructure. Thogersen and Schrader (2012) and Stern (2000) argue that this can be considered as structural aspects (urban space, infrastructure) that influence sustainable behaviour adoption. In the case of water, some technologies allow water re-use, recycling and consumption reduction (by low pressure mechanisms in a shower, for example) (Corral-Verdugo, 2003). Infrastructure is essential for more efficient water management, as well as the reduction of water consumption by domestic consumers.

Politic, social and economic factors are in direct relationship with sustainable behaviour. According to Franzen and Meyer (2009), developed societies tend to be more concerned with environmental issues, given that, for example, to overcome problems such as intense social inequality, poverty, health and education access, they have to prioritize issues such as sustainability and political freedom, among others. In addition, political conditions allow for greater stability, to avoid armed conflicts, or to create more confidence in public institution information (Kollmus & Agyeman, 2002; Vaccari, 2014). Corral-Verdugo (2003) points out that distrust in information provided by government influences water behaviour.

Corral-Verdugo (2003) and Vaccari (2014) emphasise that natural context is a factor in water consumption and is relevant in comparing populations with different experiences in relation to water scarcity. Besides these factors, the authors point out that price sensibility (water is cheap) influence positively water conservation. Furthermore, economic aspects are relevant to basic needs satisfaction, cited by Franzen and Meyer (2009), which need to be remedied before environmental awareness developments. With reference to legislation, it is an important contextual factor that intrudes on behavioural decisions, considering they indicate behaviours more or less adequate in certain societies (Blake, 1999). Sustainability legislation can establish sustainable standards for production and consumption, modifying market decisions, which enhance sustainable production (Souza & Madruga, 2014). The most cited contextual factors regarding SWB are social, structural, political (government), legal, resource availability and water management.

2.3. Water consumer behaviour concepts

The consumer behaviour literature was revised to explain constructs that represent variables influencing water sustainable consumption, as well as considering water conservation a part of pro-environmental behaviour (Wall, Wright & Mill, 2004). Among the selected variables are: Knowledge, Control Locus, Social Influence, Motivation and Natural Conditions.

Knowledge – Highlighted by many authors (Fietkau & Kessel, 1981; Hines *et al.*, 1986; Kollmus & Agyeman, 2002; Vaccari, 2014), knowledge is related to trust in the information provided by a government, as argued by Corral-Verdugo (2003). In environmental behaviour, knowledge is even more relevant, considering that it allows more or less awareness about environmental problems and responsibility (Kollmus & Agyeman, 2002; Vaccari, 2014).

Ecological awareness (ecological affection)– Regarding the environmental affection levels, as highlighted by Kollmus and Agyeman (2002), Vaccari (2014), Hines *et al.* (1986) and Corral-Verdugo (2003), this variable predicts water conservation. Some researchers maintain this variable a part of internal factors. But, considering the contextual relevance to create improved ecological awareness, we propose the relationship between context and environmental affection.

Social Influence (Collective level) – Cited by Vaccari (2014), classified by Ajzen and Fishbein (1980) as a subjective norm, and by Triandis (1977) as Social Factors. Social influence can be understood as the encouragement to sustainable behaviour received by social groups such as a family, friends and/or neighbours.

Laws and Regulations – Representing the legal context, Laws and Regulations mean legal incentives to save water. According to Blake (1999) legislation is an important contextual factor to modify behaviours.

Natural conditions -Natural conditions can be understood as part of external factors that influence sustainable behaviour (Vaccari, 2014). Corral-Verdugo considered a lot of water available; Thogersen and Schrader (2012) calls External Restrictions, which can be included in Situational Factors (Hines *et al.*, 1986). In sustainable water consumption, this can be motivated or restricted by rainfall scarcity or accumulation, for example.

Budget - It is assumed that budget variables can influence sustainable behaviour (Franzen & Meyer, 2009). On water behaviour, budgets should be a motivation to save this resource through reducing water bills, for example. On the other hand, Corral-Verdugo (2003) emphasized that the more some segments of the population think that water is a cheap resource, the less likely they are to economise.

Behaviour Easiness – Such as defended by Corral-Verdugo (2003); skills to conserve influence a population's water saving capacity. These skills can be simplified by infrastructural factors (Thogersen & Schrader, 2012; Stern, 2000).

3. Methodological approach

3.1. Place of Study and research Participants

Based on literature and our proposed goals wherein we intended to analyse water consumption behaviour in two populations with different social, economic, political and structural contexts, as well as with different water scarcity experiences, two university populations were included in the comparative study. They are: Viçosa - MG (headquarters of The Federal University of Viçosa in Brazil and Regina, Saskatchewan, Canada (Headquarters of The University of Regina). Therefore, teachers, students and employees of both universities were invited as participants. Brazil, a country rich in freshwater, faces water availability problems, specifically in the Southeast region. The Brazilian Water Alliance attributes the water crisis not only to the scarcity of rain, but also to waste, water mismanagement and an increased demand for water.

Located in the Southeast region, in Minas Gerais State, Viçosa has also been struggling with its water supply since 2014. The rainfall scarcity and growth population have led to a reduction in water availability. In this sense, the government of Viçosa has been working to reduce water consumption and encouraging practices to save and re-use water. The Federal University of Viçosa (UFV) is one of the largest universities in the country, recognized for its excellence in teaching, research and extension. Founded 90 years ago, the university's main campus is in the city of Viçosa-MG. Canada is among the world's top most developed countries, with extremely high levels of quality of life and education (PNUD, 2015). Like Brazil, Canada has high water availability levels, although water concentration is in north of the country, while 90% of the population is concentrated in the southern border corridor with the USA. In addition, Canada has one of the world's highest per capita water consumption rates (Cisneros & Tundisi, 2012). The City of Regina is located in region (Praires) with least low water availability of Canada (Cisneros & Tundisi, 2012). However, the City's restriction situations are related to water quality problems, which occasionally generate water supply restrictions (City of Regina, 2016). Table 2 presents some population and economic differences between the two cities.

Table 2 - Viçosa (MG) and Regina (SK) Data

Data	Viçosa (MG)	Source	Regina (SK)	Source
Population	78,381 (Estimate to 2017)	IBGE (2018)	247,631 (Data from 2016)	Statistics Canada (2016)
Demographic density (km²)	241.2		54.7	
Economy	Commerce		Industry and agriculture	
GDP*	435,938,803.30(U$) (Data from 2015)		11,891,041,132.50 (U$) (Data from 2017)	Government of Regina (2017)
Average Income*	761.95 (U$) (Data from 2015)		2.005,19 (U$) (Data from 2010)	Regina Chamber of Commerce (2010)
Converted to US dollars based on US dollar value for February / 2018				

Source: Elaborated by authors (2017)

3.2. Data collection

Data collection for this study was carried out with professors, researchers and employees of the University of Regina (UofR) and the Federal University of Viçosa (UFV). Quantitative and qualitative data were collected to discuss in-depth behavioural and contextual differences of both populations.

3.2.1. Quantitative Data

Data was collated through a questionnaire using a 11-point Likert scale in which respondents could choose between totally agreeing, to totally disagreeing, with each statement. The11-point scale was chosen to capture the widest possible variation of responses. Data collection was based on variables emphasized by Literature (Knowledge, Campaigns, Control Locus, Social Influence, Ecological Awareness, Behaviour Ease and Natural Conditions). Each construct was composed of at least 3 affirmations, as shown onTable3.

Table 3 - Questionnaire Composition

Constructs	Statement
Ecological Awareness	I am aware of actions to reduce water consumption and I adopt them in my day-to-day life.
	I save water because I am concerned with the availability of this resource.
	I save water because I care about environmental conservation.
	Whenever I can, I save water and encourage others to do so.
Social Influence (Collective Level)	The community around me encourages me to save water.
	I put into practice my family's advice for water saving.
	I follow people's advice when they ask me to save water.
Knowledge	I seek out information about water issues.
	I discuss water problems regarding my city.
	I accept the information published about water is true.
	Generally, I follow the instructions of advertising campaigns that encourage water saving.
	Advertising campaigns that I have seen have changed my water behaviour.
	I see advertising campaigns water saving in the various media that I access.
	The campaign messages that I saw are informative.
Laws and Regulations	I should receive discounts on my water bill if I reduce my consumption.
	I accept being penalized with additional fees on my water bill if I waste water.
	I accept being penalized if I do not comply with water consumption regulations.
Budget	I save water to have a cheaper water bill.
	I save water regardless of financial issues.
	If optional, I accept to pay additional amounts for water use, depending on the purpose.
Natural conditions	Regardless of environmental circumstances, I am concerned about water consumption and I adopt practices to save water.
	During the period of water scarcity, I adopted new practices to save water.
	When the period of water scarcity ended, I continued using water consciously.
Behaviour Easiness	In my opinion, it is easy use water to attend to my needs without wasting.
	In my opinion, it is easy to adopt new behaviours to reduce water consumption.
	I believe that I save enough water
Water Sustainable Behaviour (WSB)	When I wash my car, I fill up a bucket instead of leaving the hose running. (BR and CA)
	I turn off the tap while I am brushing my teeth. (BR and CA)
	I prefer to take a shower rather than a bath in order to save water. (CA)
	I try to keep my shower under 5 minutes. (BR and CA)
	I only use the washing machines or dishwasher with a full load. (BR and CA)
	I turn off the tap while I am washing the dishes (BR)

Source: Elaborated by authors (2017)

Data from the Federal University of Viçosa was collected in 2015 from all segments of the UFV population and secured a significant return of 746 participants (5% error and 95% confidence level).

This is considered a population equivalent to 20,000 people (information provided by UFV). According to Equation 1 (below) the minimum number of respondents for a significant sample was equivalent to 315 individuals. The *p value* considered was 50%, assuming that this value would provide the maximum sample number.

To collect data from University of Regina, the instrument was adapted on behavioural construct (Water Behaviour), in order to address habits more common to the UofR population. The data were collected about 2016, October. The sample calculation for UofR was performed considering an error of 5% and a confidence level of 90%. The studies in applied social sciences usually use values at the confidence level between 5 and 10% (Hair, Black, Babin, Anderson & Tatham, 2009). UofR population size is around 17,000 people (University of Regina [UofR], 2015), thus the representative sample confidence is equivalent to 267 observations. The formula used is described in Equation 1.

$$n = \frac{\sigma^2.p.q.N}{e^2(N-1) + \sigma^2.p.q} \qquad (1)$$

n = Sample size; σ^2 = confidence level; p = Percentage that phenomenon is verified; q = complementary percentage; N = population size e e^2 = Maximum allowed error.

For both UFV and UofR data collection, questionnaires were applied online, through the Google Forms tool. E-mails were sent to the entire UFV population and all students, but only to professors and staff who consented at UofR (according to UofR Ethics Committee requirements). The questionnaire application was completed in UofR on October/2016, when 296 questionnaires were returned, which after a preliminary analysis of data quality, resulted in 281 valid observations. Considering data provided by UofR (2015) about their population and characteristics of the sample obtained, they presented similar profiles to the UFV sample.

3.2.2. Qualitative Data

Qualitative data were obtained from 7semi structured interviews performed with professors, employees and students of the Federal University of Viçosa, as well as 9 semi structured interviews performed with the same public related to the University of Regina. The basic interview script[6] was elaborated to consider the main results of quantitative research, literature and the role of each interviewee. The interviews were conducted during July 2015 at the UFV and during October, 2016 at the University of Regina. The snowball technique was used to identify the main actors involved, due to the constant use of this technique in cases of unawareness of the focus population (Albuquerque, 2009). The approach was by email or telephone. All interviewees agreed to use their information and recorded the interview.

3.3. Data Analyse

3.3.1. Hypothesis

In light of the author's considerations in literature, claiming that contextual factors such as economics, politics, legislation, social and natural conditions are determinant on sustainable behaviour, our theoretical expectation was: the water behaviour will be influenced by different constructs in the UofR and UFV samples. Table 4 presents all research hypotheses.

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[6] Available on https://docs.google.com/document/d/1z6U73oVAI7M80okg8XpWDNdZZsCNUdqW4EEV_l-PY40/edit?usp=sharing

Table 4 – Hypothesis

Constructs	Hypothesis	Source
Social Influence (SI)	H1: Higher degree of Social Influence will influence positively water sustainable behaviour (WSB).	Vaccari (2014); Ajzen and Fishbein (1980); Triandis (1977); Font, Garay, and Jones (2016)
Ecological Awareness (EA)	H2: Higher ecological awareness will influence positively WSB.	Kollmus and Agyeman (2002); Vaccari (2014); Hines *et al.* (1986); Corral-Verdugo (2003)
Natural Conditions (NC)	H3: Hight levels of scarcity experience means more concern about WSB.	Vaccari (2014); Corral-Verdugo (2013); Thogersen and Schrader (2012); Hines *et al.* (1986)
Laws and Regulations (LR)	H4: To know and agree with laws and regulations created to save water will influence positively on water sustainable consumption.	Blake (1999)
Knowledge (KN)	H5: More knowledge about water and environmental issues will influence positively on WSB.	Fietkau and Kessel (1981); Hines *et al.*, (1986); Kollmus and Agyeman, (2002); Vaccari (2014); Corral-Verdugo (2003)
Budget (BUD)	H6: To worry about the amount paid for the water bill will reduce water waste.	Corral-Verdugo (2003)
Behaviour Easiness (BE)	H7: Think that save water is easy will influence positively on WSB.	Corral-Verdugo (2003); Thogersen and Schrader (2012); Stern (2000)

Source: Elaborated by authors (2017)

3.2.2. Water behaviour comparative analysis

Initially, to validate the constructs, Cronbach's alpha was calculated for each of them (Maroco & Garcia-Marques, 2006). The exploratory data analysis was performed for all validated constructs with the purpose of calculating the mean, standard deviation, and minimum and maximum value of each construct. To test the influence of each construct on Sustainable Water Behaviour, the linear regression technique was used. First, the normality data test was performed using the Shapiro-Wilk and Kolmogorov-Smirnov test (Fávero, Silva & Belfiore, 2009). Due to the non-normality of data, the Spearman correlation was performed to test the correlation of each construct with SWB. Once the correlation outcome was known, a linear regression technique was performed. According to Fávero *et al.* (2009), regression is a technique that analysis a set of explanatory variables (X1, X2, ..., Xn) as a function of a dependent variable (Y). In this case, the researcher is responsible for choosing the explanatory variables and the dependent variable, always based on literature indications (Fávero *et al.*, 2009). Thus, the equation regarding linear regression performed in this study is equivalent to:

$$SWB = \beta_1 SI + \beta_2 EA + \beta_3 NC + \beta_4 LR + \beta_5 KN + \beta_6 BUD + \beta_7 BE + \varepsilon_i$$

To respond to the objective proposed by this study, we compared significant influences of the constructs on Sustainable Water Behaviour in Canadian and Brazilian samples according to linear regression results. Identifying the main differences between two results, we sought to discuss the results obtained based on the data provided by interviews.

The interviews were analysed by a content analysis technique. Following the arguments of Cappelle, Melo and Gonçalves (2003) and Bardin (1979), even if there isn't a single model of content analysis, some procedures were followed in both the analysis process of interviews collected in Brazil and in interviews collected in Canada. Among these steps we highlighted the pre-analysis, the exploitation of material, and the treatment of results obtained. The pre-analysis dealt with the organisation of collected data and of indicators that guided the interpretation. The exploration included material codification based on pre-established categories and the final analysis consisted in discussing possible explanations of the results obtained by quantitative analysis.

4. Results and discussion

4.1. Descriptive analysis of constructs: Findings and discussion

Considering the results from Cronbach's alpha (Table5), only Budget was not validated since it did not reach the minimum value of 0.6. Accordingly, it not was considerate in the analysis.

Table 5 - Chrombach's Alpha

Social Influece		Eco Affect		Knowledge		Laws and Regulations		Natural Conditions		Behaviour	Easiness	Budget		WSB	
BR	CA	BR	CA	BR	CA	BR	CA	BR	CA	BR	CA	BR	CA	BR	CA
0,64	0,74	0,84	0,89	0,78	0,78	0,60	0,66	0,83	0,60	0,78	0,60	0,44	0,33	0,68	0,61

Source: Research Results (2017)

The data in Table 6 presents the descriptive statistics for each construct.

Table 6 - Descriptive Statistics

Descriptive Statistics				
Constructs	Min.	Max.	Mean	Std. Deviation
Social Influence BR	0	30	20,97	5,900
Social Influence CA	0	30	16,65	6,387
Ecological Awareness BR	0	40	32,75	6,911
Ecological Awareness CA	0	40	27,14	8,799
Knowledge BR	0	70	44,99	11,894
Knowledge CA	4	70	33,71	12,802
Laws and Regulations BR	4	40	26,84	7,214
Laws and Regulations CA	0	40	27,45	6,977
Natural Conditions BR	0	30	23,70	5,996
Natural Conditions CA	0	30	16,86	5,709
Behavior Easiness BR	0	30	21,83	6,377
Behavior Easiness CA	6	28	19,61	4,889
Water Sustainable Behavior BR	0	50	41,03	8,742
Water Sustainable Behavior CA	0	50	37,54	8,818

Source: Research Results (2017)

As shown in the Table 6, we could understand that UFV (BR) have considerable collectivity levels. Typically, as theorised, people with more community levels are more willing to act in favour of the community (Vaccari, 2014; Font, Garay & Jones, 2016). Regarding collectivity degrees in the Canadian sample, it presented an average equivalent to 16, 65 thereby indicating that family and community in the Canadian sample have less influence on their behaviour. Although the individuals from the U of R sample present a lower degree of collectivity, this may be more conducive to acting independently of their community and depending also on their Internal Control Locus (Vaccari, 2014; Font, Garay & Jones, 2016). Regarding ecological care, UFV respondents showed greater ecological care than UofR respondents. However, it can be observed in all cases, the tendency of Brazilian respondents to mark more extreme values by disagreeing or totally agreeing with a statement (0 or 10). Furthermore, both publics present substantial levels of ecological care and the standard deviation of the Canadian sample is higher (8,799).

On Knowledge, likewise, the Brazilian sample had a higher average if compared to Canadian statistics although neither value was high considering that the maximum value is equivalent to 70. This can be explained by taking into consideration that this construct was composed of some statements about access to water awareness campaigns and the quality of these campaigns, as well as the reliability of information received from the governments. In the Brazilian sample, and analysing each statement separately, we could see that the lower averages (disagreeing partially or totally) were attributed to the statements, "I accept the information published about water is true."; "The campaign messages that I saw are informative." This result shows the Brazilian public partially distrust of information from its government (Average = 4,7). In the Canadian case, the average of the same affirmative is 5.90 (Max.10), which shows partial agreement regarding trust in government information. The interviews contributed to clarify this issue.

CI3 – They *(Canadians)* **believe, really trust in government"** *(own tap)*

CI6 -Normally the information provided by the government is the most trusted, right?
The government is involved in a variety of social issues, not only the environment, right? And it is serious trusted research based information there on the websites, available for everybody. (*own tap*)

As pointed out by Franzen and Meyer (2009), cultural and political aspects can interfere in the acceptance of certain behaviours and could lead to less effort to change actual behaviour. The same is highlighted by Hines et al. (1986), Kollmuss and Agyeman (2002) and Corral-Verdugo (2003). Thus, we can reflect about how the different political contexts on Brazil and Canada (government configuration and political stability) interfere with the acceptance of new behaviour propositions.

However, partial agreement with this same assertion among Canadian respondents is related to less confidence in local government than in the federal government, "Regional management of water here (Saskatchewan) is very problematic (CI4)." It is important to take advantage of trust as well as recognising the constraints in cases where context is not conducive to trust. In this sense, one possible strategy in dealing with distrust is the union of technique and the "political" aspect (government), as suggested by one Brazilian interviewee: "I realise that the population has more confidence in technical information, on university professors and students', than in information provided by the city. Then, I believe that a partnership with city government and university would benefit "(BI1).

Regarding campaign information, the Canadian sample had less averages on these statements: "I see advertising campaigns (on) water saving in the various media that I access"; "The campaign messages that I saw are informative." Demonstrating that both Brazilian and Canadian samples pointed to problems for the quality of water campaigns. These comments indicate that water campaigns receive greater exposure by the media in emergency situations, while in Viçosa (MG) and UFV the populations are more exposed by such campaigns. However, there are problems in this campaign' explanations to considering that it is not efficient to change water consumption, or to improve the attitudes related to this subject.

CI3 – Look, at all open municipal events the water agency is always there handing out pamphlets [...] it doesn't change anyone's behaviour. Everyone picks up the pamphlets and throws it in the trash. And the campaigns, in the case, focus on that? They basically concentrate on that.

The structural problems of these campaigns were highlighted in the interviews of both UofR and UFV participants. Thus, there is a lack of persuasiveness on campaigns in both contexts. On Laws and Regulations, in which the statements dealt with receiving discounts or fines (penalties) in cases of economy or water waste. Both populations agreed in part to receive discounts and to be penalised in the case of waste. Nevertheless, it is relevant to point out, as defended by Brazilian interviewees, that in certain cases the domestic consumer is punished for an irresponsibility that is not only theirs, but also that of water managers. "BI5 - I think the consumer is the least guilty guy on this, and he's now paying the price." BI7- "The responsibility is multifactorial. Certainly, the City has its fault, obviously that population can help, because it is obligation of all. "In addition, interviewees of the Canadian sample draw attention to the need to differentiation the water use before charging the domestic consumer.

CI2 – I think the water has almost two different products. One: the water you need to stay alive and sanitation, right? you have no choice, no choice. You have to have that. Rich, poor, doesn't matter. You have to have that. I don't know... three hundred liters a day, right? That's a lot, but that's, you know? So, you've got that. After that, it's a different type of water after that, it's water that you don't need to stay alive, right? That water, I think you can pay more".

Regarding Natural Conditions, the results show modified water consumption, both in the Canadian and Brazilian samples. These results indicate the possibility of a significant relationship between behaviour and natural conditions, to be confirmed in the linear regression test (Vaccari, 2014; Corral-Verdugo, 2013; Thogersen & Schrader, 2012; Hines *et al.*, 1986).

Behaviour Easiness presented values that demonstrated the partial agreement with the statements that make up this construct. Even though the average in the Canadian sample indicates greater difficulty in adopting water saving behaviours, the minimum sample value was equivalent to 6, which showed less tendency to totally disagree with the constructive statements.

It is worth mentioning that the lower mean values of this construct were attributed to the statement "I believe that I save enough water", in which the respondents of both samples partially disagreed to this statement, demonstrating that they can still save more water than already saved. As for SWB, the averages point to a high or medium-high water sustainable behaviour, the modal value being equivalent to 10 for both populations in all statements, demonstrating that the respondents claim to save water in their daily activities. The highest average on UFV can is attributed to greater experience with the water scarcity of this population. The situations with water restriction may have implied changes in habits (Corral-Verdugo, 2003). In general, although perhaps in an unconscious way, habits to save water have been incorporated in both populations. Specifically, on water consumption in Regina, interesting results have been obtained. According to Regina's municipal government, as far as water saving habits are being incorporated by population, per capita water consumption has been reduced over the years. This reinforces the importance of the domestic consumer as a key player in this process.

The population of Regina has grown significantly in the last four years, while per capita water consumption has been halved compared to 20 years ago. As an example, the population grew by 34,749 inhabitants from 2011 to 2015 (Statistics Canada, 2016). It is worth noting that not only sustainable habits are encouraged, but also infrastructure changes on water management in the city have been carried out, such as technologies for water re-use.

4.2. Sustainable Water Behaviour and contextual variables

Once the descriptive results were known, Spearman correlation was performed to obtain evidence of the variables that most influence the SWB construct in each sample, as presented in Table 7.

Table 7 - Spearman's Correlation (Brazil and Canada)

Spearman's Correlation (Brazil)								
		WSB	Beh. Easiness	Natural Conditions	Laws and Regulations	Knowledge	Eco Affect	Social Influence
WSB	Correlation Coefficient	1,000	0,446[**]	0,503[**]	0,184[**]	0,492[**]	0,448[**]	0,275[**]
	Sig. (2-tailed)		0,000	0,000	0,002	0,000	0,000	0,000
Spearman's Correlation (Canada)								
		WSB	Beh. Easiness	Natural Conditions	Laws and Regulations	Knowledge	EcoAffect	Social Influence
WSB	Correlation Coefficient	1,000	0,007	0,536[**]	0,373[**]	0,390[**]	0,546[**]	0,463[**]
	Sig. (2-tailed)		0,952	0,000	0,000	0,000	0,000	0,000

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
Source: Research Results (2017)

Correlation results initially corroborate the theoretical expectations for all constructs in the Brazilian sample. Similarly, Natural Conditions, Laws and Regulations, Knowledge, Ecological Awareness and Social Influence presented significative correlation with SWB in the Canadian sample. This demonstrates the relevance of context for both populations. However, before making the decision to not reject the hypothesis, we performed linear regression, presented in Table 8.

Table 8 - Linear Regression Results

Regressão Linear	Brazil			Canada		
	B	Std. Error	Sig	B	Std. Error	Sig
Constant (WB)	14,894	2,070	0,000	13,959	2,805	0,007
Beh. Easiness	0,206	0,079	**0,010**	0,016	0,165	0,924
Natural Condition	0,287	0,096	**0,003**	0,900	0,208	**0,000**
Lawsand Regulations	-0,025	0,052	0,636	0,179	0,125	0,157
Knowledge	0,136	0,041	**0,001**	-0,068	0,093	0,466
Eco. Affect	0,283	0,104	**0,007**	0,381	0,177	**0,002**
Social Influence	0,061	0,071	0,396	-0,126	0,183	0,493
R²	0,433			0,463		

Source: Research Results (2017)

Linear regression presents different results for Brazilian and Canadian samples with significant explanatory power, considering the complexity of human behaviour. The following equations summarise the regression result:

$$\text{SWB(UFV-BR)} = 0{,}206\ EA + 0{,}287\ NC + 0{,}136\ KN + 0{,}206\ BE + \varepsilon_i$$
$$\text{SWB(UFV-BR)} = 0{,}177\ EA + 0{,}208\ NC + \varepsilon_i$$

The results demonstrate that Ecological Awareness, Natural Conditions, Knowledge and Behaviour Easiness are variables with high correlation to the SWB in the UFV sample, allowing us to not reject H2; H3; H5 and H7 for this public. However, in the Canadian sample, only Ecological Awareness and Natural Conditions presented a significant relation to explain the sustainable water behaviour, which allowed us to not reject only H2 and H3.

The construct with the highest correlation intensity in both populations was Natural Conditions, as expected according to Vaccari (2014); Corral-Verdugo (2013); Thogersen and Schrader (2012); Hines *et al.* (1986) argues. This result indicates that climatic conditions significantly influence water consumption, as defended by the theory.

As explained previously, the water shortage caused by drought has made people change their behaviour and their way to thinking about water issues. "BI7 – So, I believe and I hope that, yes, after this crisis people become more aware, I do not believe that we should return to the same wasteful situation as before. "Although the UofR population occasionally experiences water restrictions when water quality is compromised, natural conditions presented high correlation with SWB. In this sense, interviewee comments were similar to those from Brazilian respondents, both of whom recognize the impact of climatic conditions on behaviour.

Ecological Awareness was the second one with more intensity correlation with SWB in both populations, such as predicted by Kollmus and Agyeman (2002), Vaccari (2014), Hines et al. (1986) and Corral-Verdugo (2003). According to these authors, ecological affection influences the sustainable behaviour because it is related to how much an individual is concerned with their environmental impact. In the Brazilian case, ecological care seems to be developed in individual's from childhood, mainly by school. In this way, we highlight school importance to create environmental awareness. IB7 - "When you can have an education and a (good) base for the child, you can have beneficial modification to saving water". Likewise, the Canadians highlights the importance of school, and points to a new generation more environmentally conscious than their past generations.

IC7 - But when I talk to my son, listening, you know, he and his... he is young and he is in school, I was driving that, and he was talking with his friends, and I heard that they said, well, which car is good? [...] I would buy this car because it's more, it has better efficiency. So, for me that was really surprised! I never think about that! I was thinking about, you know, biggest car, powerful car! But this guy is differently. That's why I'm more hopeful about the future, because the young generation, in this sense, is much smarter than my generation.

As for Hypothesis 5, confirmed in the Brazilian sample and rejected in the Canadian, the interviews contributed to explain the expectations defended by Fietkau and Kessel (1981), Hines et al. (1986), Kollmus and Agyeman, (2002), Vaccari (2014) and Corral-Verdugo (2003). It is believed that both the Canadian and Brazilian public received information about environmental issues and about the importance of saving water. However, it is assumed that a long period of water scarcity experienced by the UFV public, caused such information to have a greater impact on people's behaviour. It is an important highlight that results point to a negative relationship between knowledge and behaviour in the Canadian sample, pointing out that greater access to information and campaigns result in lower SWB.

According to one of UofR's interviewees, "IC3 - **No doubt, information everyone has. Here everyone has**"*(own highlight)*. The possible justification, in this sense, is based on the arguments of interviewee IC1, who points to a gap between attitude and behaviour, that is, the gap between information received and awareness, to behaviour adopted. This attitude-behaviour gap has been explored by other authors, such as Vaccari (2014) and Kollmus and Agyeman (2002), as well as by us in similar studies.

IC1 –I think there's in, probably most areas there is an attitude behavior gap. And part of that is because our behaviour is not entirely controlled from inside us, **we are strongly impacted by our context, our physical context and social context**. *(own highlight)*

In this sense, as Corral-Verdugo (2003) argues, the context of serious water shortage experienced by the UFV sample has impacted not only the results regarding Natural Conditions and behaviour, but also the relationship between behaviour and other constructs, such as Knowledge and Behaviour Easiness.

This fact was probably a relevant factor that differentiated the results, which, again, proves the importance of contextual variables on sustainable behaviour. With respect to Behaviour Easiness, defended by Corral-Verdugo (2003), Thogersen and Schrader (2012), and Stern (2000), as a facilitator to behaviour adoption, it is also significant for behaviour in the UFV sample and not significant to the UofR sample. These results again point to an attitude-behaviour gap pointed out by IC1. Sometimes individuals think that it is easy to adopt certain behaviours (attitudes), although they do not necessarily undertake such actions (behaviours).

Laws and Regulations did not present significant explanatory power for either the UFV sample or the UofR sample. Considering that the construct was limited to an agreement with fines and penalties to reduce water consumption, these statements could not be enough to explain legislation and the WSB relationship. As anticipated, the relationship between Social Influence and Behaviour, pointed out by Vaccari (2014), Ajzen and Fishbein (1980), Triandis (1977) and Font, Garay, and Jones (2016), could not be verified in any population. It suggests that not only the Canadian population, but also the Brazilian population, has individualistic characteristics, as defended by Font, Garay and Jones (2016).

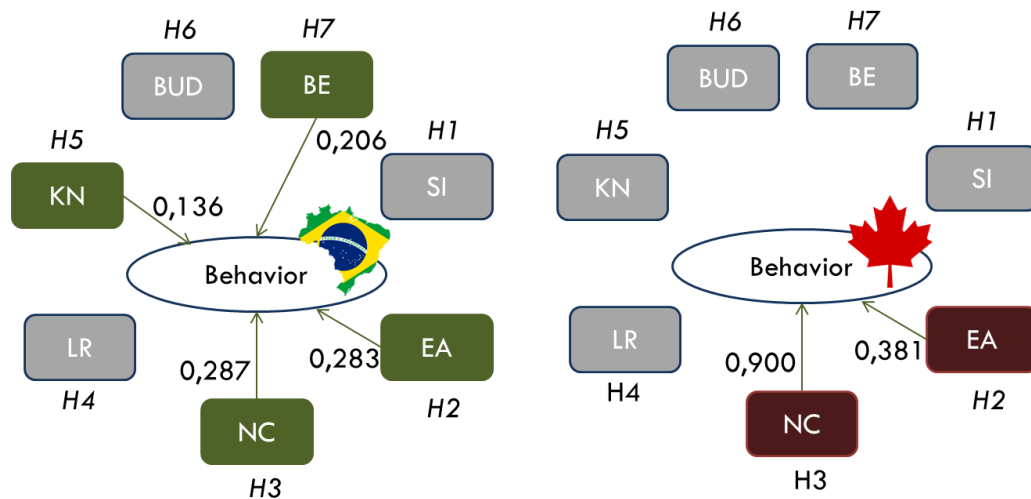Figure 2 present an overall summary of research results.

Figure2 - Linear Regression Summary
Source: Elaborated by authors based on research results (2017)

5. Final Considerations

Considering the study's goals: to test the relationship between sustainable water behaviour (SWB) and context, and to compare the sustainable water behaviour in two populations with different water scarcity experiences, the results indicate the relevance of contextual aspects as influencers on water consumption, specifically natural conditions and ecological awareness.

As expected, samples from Brazil and Canada presented different configurations in the behaviour and contextual relationship. Knowing this relationship, it is possible to favour contexts that facilitate the choice by sustainable behaviours and highlight certain factors that contribute to ecological awareness. In this sense, the role of the elementary and high school and other educational institutions stand out.

In addition, it is worth remembering that the domestic consumer plays an important part in water consumption, albeit domestic consumers alone do not have much power to modify water scenarios. In this sense, water management is one of the important roles developed by governments regarding the water context. In future research we suggest a better exploration of legislation, collectively societies and the water consumption relationship. These aspects were not clarified in the results of this study. We emphasize the importance of comparative studies to better understand solutions in different contexts. Moreover, there are interesting ways to understand how relevant the context is for the adoption or non-adoption of some behaviours. Specifically, climatic, cultural, social, economic and legal aspects are very important variables for understanding the pro-environmental behaviour complexity.

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