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Abstract

Gaps in understanding what influences household water consumption has led water providers failing to convince their customers to report sustainable practices. To this end, the present study aimed to answer the question, "How do social and cultural factors influence water consumption in urban areas"? The response to this issue has been identified through an investigation that involved a group of selected socio-cultural factors, whose analysis was based on collected survey data from participants in Lagos-Nigeria, Salvador-Brazil, Sao Paulo-Brazil, London-UK and Los Angeles-USA. The Capability-Opportunity-Motivation-Behaviour (COM-B) model was used as a data analysis framework to identify influences. The investigation revealed that Motivation is the most reported driver of water consumption. In a scale from 0 (lowest) to 5 (highest), this component presented the most significant scores in Lagos (3.93), Salvador (4.13), Sao Paulo (3.88), London (4.13) and Los Angeles (3.59). The Capability dimension had the second-highest weight in Lagos, Salvador, Sao Paulo, and Los Angeles, with scores of 2.80, 3.60, 3.60 and 3.20, respectively. Participants from London have Opportunity (score= 2.88) as the second influential pillar in water consumption. These findings are aimed at helping to best drive water saving practices by gaining insight into factors underpinning water consumption in a structured manner.

Keywords: Social impact; Sustainability; Water supply

1. INTRODUCTION

In a water scarcity context, many water authorities have addressed this problem focusing on the supply-side. Actions includes construction of dams or implementation of seawater desalination (Rathnayaka et al., 2014; Lindsay, Dean and Supski, 2017), and reduction of demand through the imposition of financial incentives (Mini, Hogue and Pincetl, 2014), since water use efficiency programmes and efficiency-oriented tariffs help decrease customer demand.

Despite being important, these measures have limitations to deal with water shortage problems. Some reasons include: (a) an increase in drinking water volume is social, economic, and environmental costly; (b) water demand is price 'inelastic' (Worthington and Hoffman, 2008); (c) water conservation campaigns present a good performance when the perception of water scarcity is high, but they are less effective as a long-term instrument of curbing water consumption (Howarth and Butler, 2004).

This reality exposes the importance of identifying factors that determine household water consumption. Such a comprehension implies the necessity of in-depth assessment of consumer's needs, and preferences related to water. In this sense, Saurí (2013) argues that personal factors and external stimulus are components that shape urban waters users behaviour. Smith and Ali (2006) point out that household water consumption pattern has roots in standard norms and behaviours, which makes it different from other types of demand, characterized by conscious customer choices.

Although academic researchers support the correlation between human behaviour and consumer attitudes, currently the number of initiatives that investigate these influences in the field of water consumption is limited (Mini, Hogue and Pincetl, 2014).

Kim *et al. (*2007) analysed influence exercised by social, economic, and cultural parameters on water usage in the Republic of South Korea. Their approach was based on the idea that factors related to water consumption may be determined by simulation of trends. For example, they concluded that presence of children implies water consumption increasing.

Rathnayaka et al. (2014) studied factors with potential to affect residential water use in Melbourne (Australia). From a sample of 837 households, they found houses without children presented higher water consumption than those with children.

While Kim *et al. (*2007) identified that presence of children is a socio-cultural factor that influences water consumption in the Republic of Korea, Rathnayaka et al. (2014) got the conclusion that in Melbourne, such influence does not exist.

Although these two findings are important, they lacked analysis about interaction of people with the external environment.

In this sense, Sofoulis (2005) reinforces the observations made by environmental psychologists about the current gap of understanding people's attitudes and actual behaviour towards water conservation. Llang et al. (2017) also have carried out a study that consider social norms, and social identity to deal with water conservation.

In this sphere, behaviour change science offers a myriad of principles and models to understand the influences on people`s behaviour in a variety of contexts. Figure 1 shows the Capability-Opportunity-Motivation-Behaviour (COM-B) model (Michie et al., 2011; 2014) as an example of such tool.

COM-B has been applied to understanding a range of environmentally significant consumer behaviours e.g., water consumption (Addo et al., 2019), compostable plastic packaging consumption (Allison et al., 2021a), reusable and single-use cup use (Allison et al., 2021b), sustainable food consumption (Hedin et al., 2019), and plant-based diet adoption (Graça,

Godinho and Truninger, 2019). Due to it, the model was selected as the theoretical framework to support the investigation carried in this study, aiming to answer the question "How do social and cultural factors influence water consumption in urban areas"?

The research involved data collection from 50 people who live in 3 cities from Low and Middle-Income Countries (LMICs) and 2 cities from High-Income Countries (HICs). The study has 2 specific objectives: (i) identify which factors and determinants of behaviour are the strongest driver of household water consumption in each urban area; and (ii) identify which factors need focus of the water providers and governments to incentivize sustainable household water consumption.

2. METHODS

This research was approved by the Ethics Committee of University College London-UCL (approval number 18359/001).

2.1 Rationale of Factors

This study has involved analysis of 9 factors: 5 social and 4 cultural (Figure 2).

Social Factors refer to the power and social structures that shape or impact individual choices. According to Forgas and Williams (2001), social influence takes place when people's thoughts, actions and feelings are directly affected by what other individuals and social groups do or think. Such impact occurs via information, observation, social interaction, and result in the formations of people opinions (Aarts and Dijksterhuis, 2003).

Abrahamse and Steg (2013) mention social norms, social networks, modelling, social comparison and group performance feedback as the more frequently social influence insights described in the literature.

Cultural Factors embrace the habits and everyday practices of social groups such as families, religious institutions, schools, and other institutions (Hanges, Dorfman and Ashkanasy, 1999). They represent the shared ideals that individuals share within the society (Oreg and Katz-Gerro, 2006). Shane (1993) defends that cultural factors have essential implications on society and need to be considered by policymakers and managers.

Table 1 describes the rationale behind the selection of factors.

2.2 Theoretical framework
The COM-B Model (Michie *et al.,* 2014) aims at interventions and posits the principle that performs a behaviour an individual's needs:

- Capability (C): This can refer to psychological (e.g., knowledge) capability or physical capability (e.g., skills, stamina).

- Opportunity (O): This can refer to physical opportunity, such as the physical environment with which people interact, or social opportunity such as the sociocultural milieu in which people interact.

- Motivation: This can be either automatic motivation (e.g., the psychological processes out of our consciousness, such as emotions and habits, that drive behaviour) or reflective motivation (e.g., the more cognitive evaluate processes, such as values, beliefs and attitudes, that energise and direct behaviour).

Table 2 summarises the references made in the extant literature, that link each factor (described in Table 1) to Capability, Opportunity, and Motivation. Figure 3 presents the factors framed into the COM-B Model.

2.3 Data Collection

The designed questionnaire (Figure S.1 Supplementary Information) was sent to 50 adults. Participants were asked to rate 16 statements about behavioural influences on a 5-point Likert scale.

Additionally, participants responded:

- 3 open-ended questions (factors influencing their water usage at home, perceptions about other people water-saving and water-wasting practices);

- 23 close-ended questions (individual profile, interactions with others etc); and

- 1 nominal question (children in household).

Data collection took place from 24/07/2020 to 16/08/2020 through an online survey.

2.4 Participants and Recruitment

Participants aged 18 and above and were recruited in:

- Lagos (Nigeria), Salvador and Sao Paulo (Brazil) – representing LMICs;

- London (UK) and Los Angeles (USA) – representing HICs.

The questionnaire was sent out, using WhatsApp and Emails, to authors' social and professional contacts. The participants were limited to those that could read and write in English. To avoid bias during data collection, it was not required that participants demonstrated neither some knowledge on water management issues nor a minimum education level.

2.5 Data Analysis

Data analysis was performed separately per urban area, according to the following:

- Phase 1: application of descriptive statistics for general characterization of population sample. For qualitative data, it was considered findings of frequency distribution. It was applied Data Analysis tools within Excel spreadsheets.

- Phase 2: Estimation of individual score on each factor were constructed by calculating the mean score based on the results of Phase 1.

- Phase 3: Identification of the mean scale scores obtained in Phase 2, by COM-B domain and by city.

- Phase 4: qualitative evaluation of findings from Phase 3.

3. RESULTS

This section presents a summary of the main study`s findings. For more detailed information see Figure S.1 (Supplementary Information).

3.1 Lagos (Nigeria)

- For half of participants informed, the last occasion they discussed about water-saving was in an interaction with friends/family's members/colleagues of work.

- Accounted for 70% of participants who informed a slight to relatively low influence of other household members, in their water consumption.

- Participants that experienced water shortage and informed that those events influenced their patterns of consumption, represented 90%.

- From the total, 70% people informed that they have the habit of monitoring their water consumption, and 80% informed that they think intentionally about their water consumption.

- All participants reported an absence of water meter at home.

Based on data collected, it was identified that for participants from Lagos, Environmental Consciousness (score= 4.05), Well-Being (score= 3.88), and Moral Identity (score= 3.85) are the factors that more influence household water consumption (Figure 4).

Level of Access to Technological Resources, with score equal to 1.00, is the less influential factor in people`s water consumption. It led Opportunity (score= 2.51) to be the domain less important in people`s behaviour.

On the other hand, results show that Motivation (score= 3.93) is the component of behaviour that drive people decisions about domestic water use in Lagos.

3.2 Salvador (Brazil)

- Half of participants informed that the last time they discussed about water-saving was in an interaction with friends/family's members/colleagues of work.

- Accounted for 90% of participants who informed a moderate to relatively high influence of other household members, in their water consumption.

- Participants that experienced water shortage and informed that those events influenced their patterns of consumption, represented 70%.

- Accounted for 80% participants who informed that there was a water meter in their household. From this total, 50% reported that they use water meter as a tool for water consumption reduction.

Based on data collected, for participants from Salvador, Moral Identity (score= 4.20), Well-Being (score= 4.13), and Financial Resource Availability (score= 4.10) are the factors that more influence household water consumption (Figure 5).

Level of Access to Technological Resources, with score equal to 2.60, is the less influential factor in people`s water consumption.

The results also show that Motivation (score= 4.13) is the strongest component of behaviour that drive the decisions of people about domestic water use. Capability come next with a score equals to 3.60.

3.3 Sao Paulo (Brazil)

- About the media outlets to receive update related to water consumption, the option most voted by the participants was social media (30.43% of preference). Water Provider App and Company Website were the second preferred choice (17.39% of votes, each).

- From the total, 70% people informed that they have the habit of monitoring their water consumption.

- Participants who declared that they did not know the amount of water required to meet the basic needs of household members, accounted for 60%.

- In 30% of the cases participants informed that there was a water meter in their household, and they use it as a tool to reduce water consumption.

- The quantity of participants who showed tendency to feel guilty due to water-wasting represented 70%.

Based on data collected, for participants from Sao Paulo, Well-Being, Environmental Consciousness and Role of Public and Private Institutions are the factors that more influence household water consumption – all of them presented the same score (4.10). Among the factors less influential, Level of Access to Technological Resources showed the lowest score (1.60) (Figure 6).

The results also show that Motivation (score= 3.88) is the strongest component of behaviour that drive people decisions about domestic water use. Opportunity (score= 3.11) has the least relevant impact.

3.4 London (UK)

- The habit of monitoring water consumption was confirmed by 80% of participants.

- While 100% of participants informed that the water provider engagement is essential for promoting changes in water consumption, only 30% of people have seen the water company incentivizing sustainable water practices

- Only 30% of participants somewhat agree that their household income impacts their water use, and 60% in total have the intention to keep their water bill low.

- Only 30% of participants informed that there was a water meter at home. From this total, 66.66% answered that they did not use water meter as a tool to reduce water consumption. Reasons to this included: a) they do not know where the water meter is located; b) the water meter is inaccessible.

Based on collected data for participants from London, Moral Identity (score= 4.30), Well-Being (score= 4.05) and Environmental Consciousness (score= 4.05) are the factors that more influence household water consumption. Among the less influential factors, Level of Access to Technological Resources presented the lowest score (1.40) (Figure 7).

The results also show that Motivation (score= 4.13) is the strongest component of behaviour that drive their decisions about domestic water use, and the less influential is Capability (score= 2.20)

3.5 Los Angeles (USA)

- When asked about the influence of external groups in their water usage, 50% of women informed that such influence exists. The men did not recognize such impact as relevant.

- Accounted for 80% participants who reported that they did not know the amount of water required to meet the basic needs of household members.

- While 100% of participants informed that the water provider engagement is essential for promoting changes in water consumption, only 10% of them have seen the water provider incentivizing sustainable water practices.

- The intention to keep their water bill low was mentioned by 70% of participants

- The existence of a water meter in household was reported by 70% of participants. From total, 71.42% people informed they use water meter as a tool for water consumption reduction.

Based on data collected, for participants from Los Angeles, Environmental Consciousness (score= 3.95), Moral Identity (score= 3.75) and Role of Public and Private Institutions (score= 3.30) are the factors that more influence household water consumption. Among the factors less influential, Interpersonal Relationships and Reference Groups presented the lowest score (2.85) (Figure 8).

The results also show that Motivation (score= 3.59) is the strongest component of behaviour that drive their decisions about domestic water use, and the less influential is Opportunity (score= 3.04).

3.6 Limitations of the study

The study was limited to consumers perspective. Application of specific questionnaire to identify measures that water providers have implemented to foster sustainable water consumption among customers is necessary in future researches.

For Brazilian cities another constraint was the language requirement (fluency in English) to answer the online survey. Previously, it had been considered the questionnaire translation to Portuguese. However, due to the Covid-19 Pandemic, it was not possible to obtain, in a reasonable timeline, the ethical approval from a Brazilian University to apply the questionnaire in Portuguese.

4. DISCUSSION

The discussion of results was structured in accordance with the COM-B model. Figure 9 contains the summary of the scores in the five cities.

4.1 Motivation

In all cities, Motivation is the strongest determinant that drives the water consumption behaviour. Following is presented the main considerations about findings related to factors that are grouped in this component of behaviour:

C2.2 Environmental Consciousness

This factor ranked in the top in Lagos (score= 4.05), Sao Paulo (score= 4.10), and Los Angeles (score= 3.95), with participants showing a clear understanding of their role in environmental protection and conservation.

Nonetheless, this result raises observations about implications of one variable of the population sample from whom took place data collection: 'educational level'. Out of 50, 48 participants from these countries informed that they had a higher degree.

Orr (1992) defends that there is a connection between pro-environmental behaviour and level of individual literacy. When people have access to environmental education, this may increase their environmental consciousness (Nazir and Pedretti, 2016).

In Nigeria (Lagos), the movement towards the incorporation of environmental teaching in the educational curriculum dated back to 1970s, as an initial response to the world conferences on ecological problems. But, according to Abubakar (2014), there is still a huge necessity of improvement of such teaching, especially for those who only have access to primary or secondary education in the country.

In the USA (Los Angeles), in 1970, an Environmental Education Act was approved, and this gave a welcome to fostering environmental awareness in the country (Palmer, 2002). Fasolya (2016) defends that environmental education in the USA has a considerable variety of methodological approaches to promote individual environmental literacy.

The results here show environmental education has a key influence on the level of people`s awareness about their impact on the environment. Environmental education therefore provides knowledge that supports and guides to more conscious and pro-environmental choices.

C2.1 Well-Being

In all cities, this factor achieved a high score in terms of influence in household water consumption (Lagos= 3.88, Salvador= 4.13, Sao Paulo= 4.10, London= 4.05 and Los Angeles= 3.08). It was relatively high the percentage of participants from Lagos, Salvador, Sao Paulo, and London, who declared that the weather conditions influence their water consumption habits.

In the case of cities from the LMICs, this result may be explained by the fact that all of them are situated in the global tropical zone, with a predominance of a high level of solar radiation and humidity during all year. This finding is aligned with the idea defended by Shove (2003) that outdoor climate has implications on individual decision about consumption, in order to achieve or maintain patterns of comfort, cleanliness, and convenience.

- C1.1 Moral Identity

The data collected from participants from Lagos, Salvador and Los Angeles revealed a dichotomy in responses of the two variables of the factor 'Moral identity. Most of participants declared that they consider water-saving as a priority, but the quantity of those who expressed feeling of guilt when wasting this resource was relatively smaller.

The analysis of moral regulation aspects may explain such discrepancy. In this sense, although Jordan, Mullen and Murnighan (2011) defend the idea that sense of self-completeness is the driver that guide the desire of individuals to see themselves as moral actors, in reality, people are continually being tempted to behave in a way that will make them feel the opposite (Merritt *et al.*, 2012). So, data collected from those cities leads to the understanding that people want to do what is right, but not all of them want to pay the price associated to it (Tiefenbeck *et al.*, 2013).

4.2 Opportunity

Social factors analysed under the determinant Opportunity presented the lowest score among all urban areas analysed. The only exception was London in which this component of behaviour was ranked as the second most influential. Below is presented the main considerations about the findings.

S3.2 Level of Access to Technological Resources

Based on the participants answers, it was identified that 'Level of Access to Technological Resources is the factor with the lowest influence in the household water consumption in Lagos (score 1.0), Salvador (score 2.6), Sao Paulo (score 1.6) and London (score 1.4).

One reason for the low impact of water meter on participant`s behaviour is correlated with its absence. The totality of participants from Lagos and 70% of participants from Sao Paulo and London reported that that there was not water meter in their household.

In Salvador, although 80% of participants reported the presence of a water meter in their household, only half of them (4 out of 8) informed that they use the device to reduce water consumption.

The only exception was identified in participants from Los Angeles, where 'Level of Access to Technological Resources` had a score 3.0 (out of 5.0). Although this result is the highest among all cities of this study, in Los Angeles this factor holds the 7th position in a raking of all 9 factors investigated. Besides this, only 50% of participants from this city reported that they use water meter as a tool for water consumption reduction.

The water meter is an essential technological device, not only to be used by the utilities but also to provide people with the most basic information to effectively monitor and control water consumption (Mutikanga, Sharma and Vairavamoorthy, 2011). When there is a water meter in the household, and this is appropriately accessible, understandable, and monitored by household members, it may substantially influence water consumption.

S3.1 Financial Resource Availability

The 'Financial Resource Availability' was pointed as an influencer in water consumption, and it is likely a consequence of the current economic recession faced by the countries (caused by internal politics problems and worsened by the outbreak of the COVID-19 pandemic). Such a crisis has drastically reduced economic activity and has scaled up the numbers of unemployed globally, but the LMICs undoubtedly perceive its worst effects. For example, in Brazil, the current unemployment rate represents 13.3% of the total economically active population (IBGE, 2020) and the regions Northeast (where is the city of Salvador) and Southeast (where is the city of Sao Paulo), present the highest percentage of people without a formal job, 16.1% and 13.9%, respectively. In Nigeria, according to the National Bureau of Statistics (2020), the current unemployment rate is 27.1%. This rate is also expressive in age-groups in which a significant part of participants of this study from Lagos belong to: 34-45 years old (20.36%) and 45-54 years old (17.13%).

Another relevant finding is that in Lagos, London, and Sao Paulo the 'Financial Resource Availability' factor was classified by participants as having intermediate impact in their household water consumption (in comparison to the influence exercised by this factor in the participants from Salvador). The explanation to this may be related to the fact that most participants from these three cities declared they do not have a water meter in the household.

In the absence of water meter, it is not possible to precisely measure the water consumption. Therefore, the usual action adopted by the water supply regulatory agencies is to establish a specific fixed volume, to orient the water providers in the calculation of the water bill price of customers (ARSEP, 2009). In this situation, regardless the volume of water used, the value of water bill will not alter, and thus, the impact of this item in the income of household tends to be stable in the time.

S2.1 Role of Public and Private Institutions

In all cities, most of participants declared that water providers engagement is essential to induce changes in water usage.

In the online survey applied for this research, 4 questions (Q36, Q37, Q38 and Q39) were carefully designed to understand participants perceptions about the engagement of water providers towards this objective. Among them, there are two important highlights:

- From the analysis of answers given to Q36 – "Does your water provider incentivise sustainable water consumption from its customer base (i.e. you)?", in all 5 cities it was identified a massive gap in water providers performance regarding their function of supporting sustainable water consumption. The proportion of people who responded to this question as neither they do not see water providers engagement to sustainability nor they do not have information about such a crucial water companies function, were 32% and 42%, respectively.

- In Q37 it was asked participants to rate the degree to which they agree with the statement "The engagement of water providers is important for promoting changes in water consumption amongst the public". Data analysis shows that 47 out of 50 (94%) of people strongly agree or somewhat agree with it.

This finding not necessarily means that water companies are not involved with sustainability actions for domestic water consumption. However, it highlights that if they are doing working on it, at the minimum, they are failing in the effective communication to their customers. According to Ashley, et al. (2004), it is essential that water providers promote 'Public Environmental Awareness' in terms of willingness to change behaviour.

S2.2 Interpersonal Relationships and Reference Groups

In the online survey it was identified that for 27 out of 50 participants, other people who live in same household influence their water consumption. On the other hand, only 19 out of 50 participants responded that external groups influence their water consumption.

Among the 9 factors analysed in this study, Interpersonal Relationships did not play a significant role in terms of power to influence water consumption. It held: 7th position in the cities of Salvador, Sao Paulo and London; 8th position in Lagos; and 9th (last) position in Los Angeles.

In this sense, Vallerand (1997) pointed out that social factors are the producer of individual motivation, and their impacts are mediated not only by relatedness (connection to relevant people) but also through perceptions of competence (interaction with the environment). In addition, Smith and Ali (2006) defend that the pattern of water consumption at household has roots in standard norms and behaviours, what makes it different from other types of demand, characterized by the customer conscious choices.

<u>C3.1 Cultural Patterns of Consumption</u>

The events of water shortage experienced by almost all participants from the LMICs led them to change their water consumption pattern. Such shortcomings indirectly led them to report a more conscious attitude about water consumption.

Additionally, although it was identified that most participants monitor their water consumption, this action seems to be intuitive, because there is no water meter in many of household analysed. Ornaghi and Tonin (2019) defend that metering is a powerful mechanism to provide consumers with information necessary to promote efficient water usage.

4.3 Capability

The only factor analysed under the determinant Capability overall ranked as the second most influential of the household water consumption in Lagos, Los Angeles, Salvador, and Sao Paulo. In London, this factor is the last most influential as discussed below.

<u>S1.1 Informational Influence (Communication)</u>

Results show the massive preference of participants for communication means that involve no in-person interaction. It is evidenced by the fact that personal meetings with representatives of water providers was ranked as the last option by the people from Lagos and was not even considered as an option by participants from London, Salvador, and Sao Paulo.

As the online survey to this study took place during the outbreak of the COVID-19 pandemic, the answers to the 'Informational Influence (Communication)' questions (see Figure S.1 - Supplementary Information, questions 26 and 39) also may be strongly influenced by the new global order that has been imposed to deal with virus threats (e.g. social distancing).

5. CONCLUSION

Under the analysis carried out with the support of COM-B model, it was identified that Motivation is the most reported driver of behaviour in household water consumption.

Motivation presented the highest results in all analysed cities: Lagos (score= 3.93), Salvador (score= 4.13), Sao Paulo (score = 3.88), London (score= 4.13) and Los Angeles (score= 3.59)

In this domain, Environmental Consciousness was the factor with highest impact in the overall results in Lagos, Sao Paulo, and Los Angeles, with scores 4.05, 4.10, and 3.95 respectively. On the other hand, Moral Identity, with scores 4.20 and 4.30, impact most of the decisions of people towards household water consumption in Salvador and London. Well-being also ranked in the top for participants from Sao Paulo (score= 4.10).

The socio-cultural factors grouped in the domain Capability presented the second highest weight in people`s water usage attitude in Lagos (score= 2.80), Salvador (score= 3.60), Sao Paulo (score= 3.60), and Los Angeles (score= 3.20).

In London, Opportunity (score= 2.88) is the second most influential pillar of behaviour that determine people`s choice regarding water consumption.

Analysis performed in this study also revealed gaps that should be the focus of water authorities and governments to attain the goal of incentivize water saving practices among the population. Based on this, it is recommended the implementation of measures that will:

a) increase the Level of Access to Technological Resources, since data demonstrated a current pattern of low impact of this factor on participant`s behaviour towards water consumption. This study identified that people with a water meter at household are more likely to use it as a tool to reduce water consumption.

b) enhance customer`s engagement to foster sustainable 'Cultural Patterns of Consumption'. It should include sharing of information about threats of water scarcity. Overall water shortage events experienced by the participants from the LMICs

influenced their water consumption pattern and helped develop a conscious attitude about

water consumption.

Further research is essential to build a statistical model that enables the aggregation of all the

variables analysed in the context of social and cultural factors.

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Table 1 Rationale Behind the selection of Factors.

Category	Sub-category	Factor	Reason to study the Factor
Social	S1. Social Network	S1.1 Informational Influence /Communication	Communication is a complex factor that has power to influence behaviour (Hasson, 2019).
	S2.Modelling	S2.1 Role of Public and Private Institution	Public and private institutions that deal with water provision are crucial to influencing social behaviour.
		S2.2 Interpersonal Relationships and Reference	Individual behaviour is affected by relationships they built, by groups they join or by the presence of other people.
	S3. Social Norm	S3.1 Financial Resource Availability.	According to Schumacher (1973), economics, dealing with the man in his environment, plays a pivotal role in activities and decisions of individuals.
		S3.2 Level of Access to Technological	Technology is a factor that may influence household decision about water consumption.
Cultural	C1. Belief	C1.1 Moral Identity	Moral identity is a self-regulatory mechanism that establishes considerations for a person behaviour and stimulates moral action.
	C.2 Value	C2.1 Well-Being	Well-being involves mental, psychological, and physical health, happiness, and pleasure.
		C2.2 Environmental Consciousness	It refers to the idea that environmental beliefs that people possess.
	C.3 Attitude	C3.1 Cultural Patterns of	This factor is based on the assumption that development of awareness about consumption may be an agent for changing habits and

Note: S and C stand for 'Social' and 'Cultural".

Table 2 Correspondence between factors and COM-B domains.

Factor	Correspondence with COM-B domains	Reference
S1.1 Informational Influence /Communication	Capability	Robeyns, 2005; Mayne, 2016; Hasson, 2019.
S2.1 Role of Public and Private Institutions	Opportunity	Mayne, 2016; Fuchs & Lorek, 2005; Darnton, 2008.
S2.2 Interpersonal Relationships and Reference Groups.	Opportunity	Mayne, 2016; Darnton,2008; Robeyns, 2005.
S3.1 Financial Resource Availability.	Opportunity	Mayne, 2016; Schumacher,1973

Factor	Correspondence with COM-B domains	Reference
S3.2 Level of Access to Technological Resources.	Opportunity	Mayne, 2016; Mutikanga, et al., 2011
C1.1 Moral Identity	Motivation	Reynolds and Ceranic, 2007; Gatersleben et al., 1998
C2.1 Well-Being	Motivation	Darnton, 2008; Nogueira, 2002
C2.2 Environmental Consciousness	Motivation	Fuchs & Lorek, 2005; Poortinga et al., 2004; Willis *et al.*, 2011.,
C3.1 Cultural Patterns of Consumption	Opportunity	Mayne, 2016; Robeyns, 2005; Valle *et al.*, 2012.

Note: S and C stand for 'Social' and 'Cultural'

Figure captions

Figure 1 The Capability-Opportunity-Motivation-Behaviour (COM-B) model (Michie et al., 2011; 2014).

Figure 2 Socio-cultural factors selected to analysis.

Figure 3 Organization of Social and Cultural Factors according to COM-B Model (Adapted from Michie et al., 2011; 2014).

Figure 4 Score of Social and Cultural Factors - Lagos (Nigeria).

Figure 5 Score of Social and Cultural Factors - Salvador (Brazil).

Figure 6 Score of Social and Cultural Factors - Sao Paulo (Brazil).

Figure 7 Score of Social and Cultural Factors - London (UK).

Figure 8 Score of Social and Cultural Factors - Los Angeles (USA).

Figure 9 Comparative of Determinants of Behaviour COM-B among the 5 Urban Areas (Low- and Middle-Income Countries)
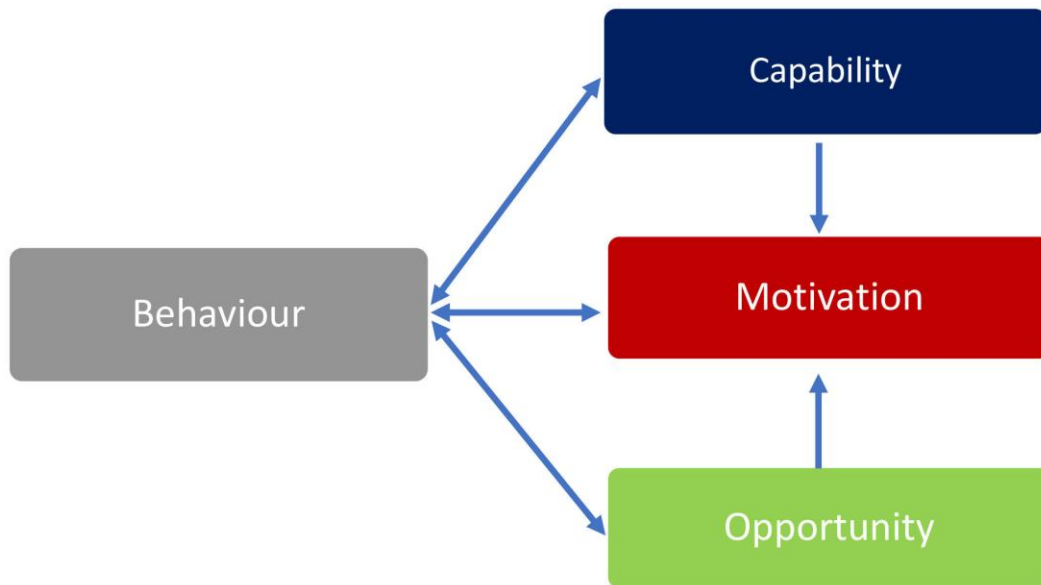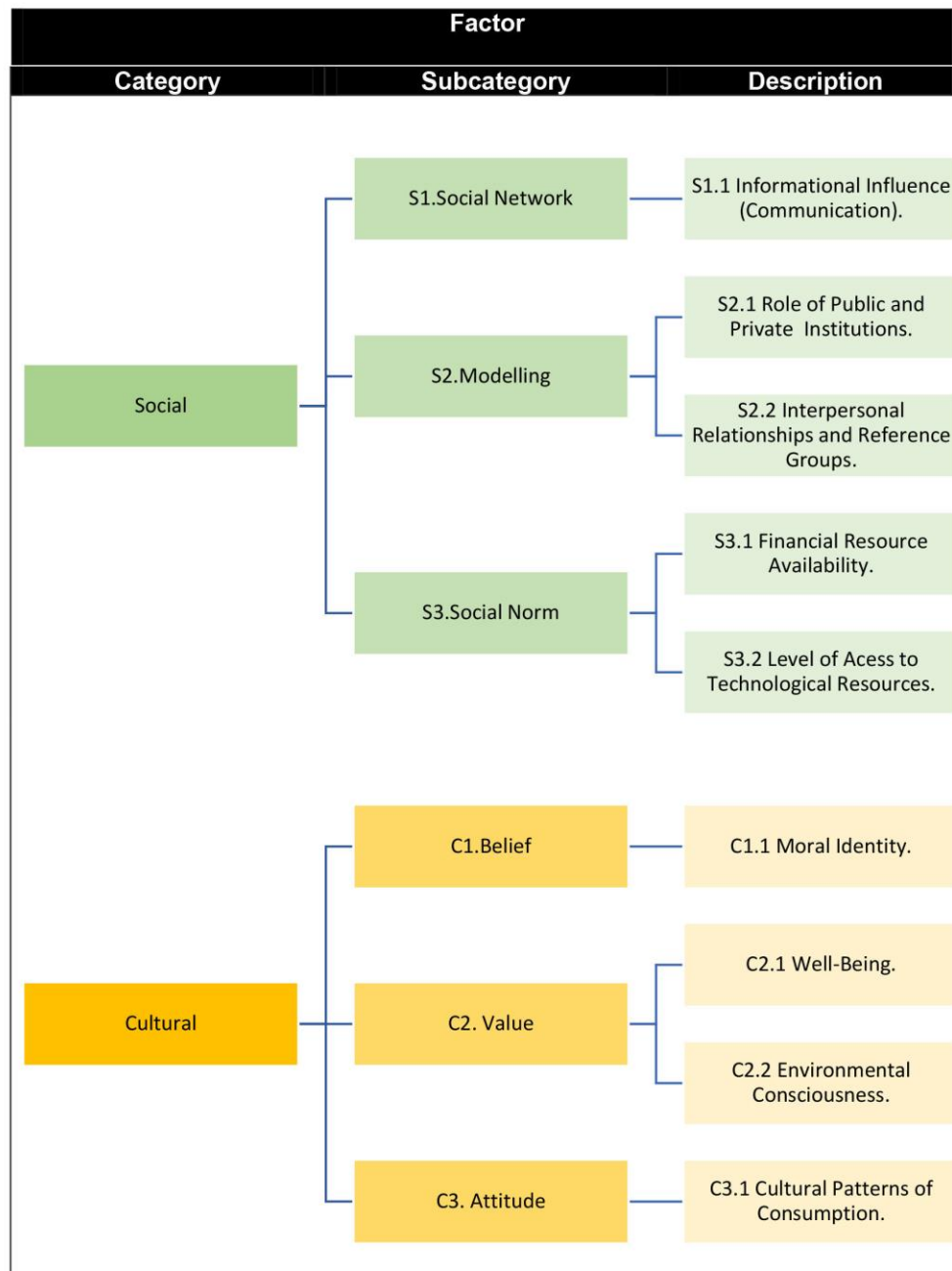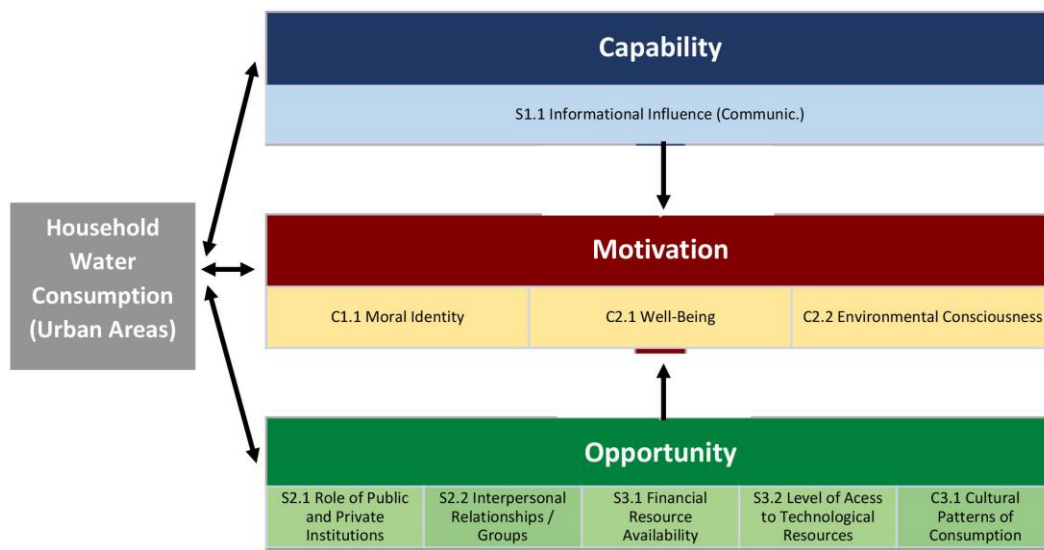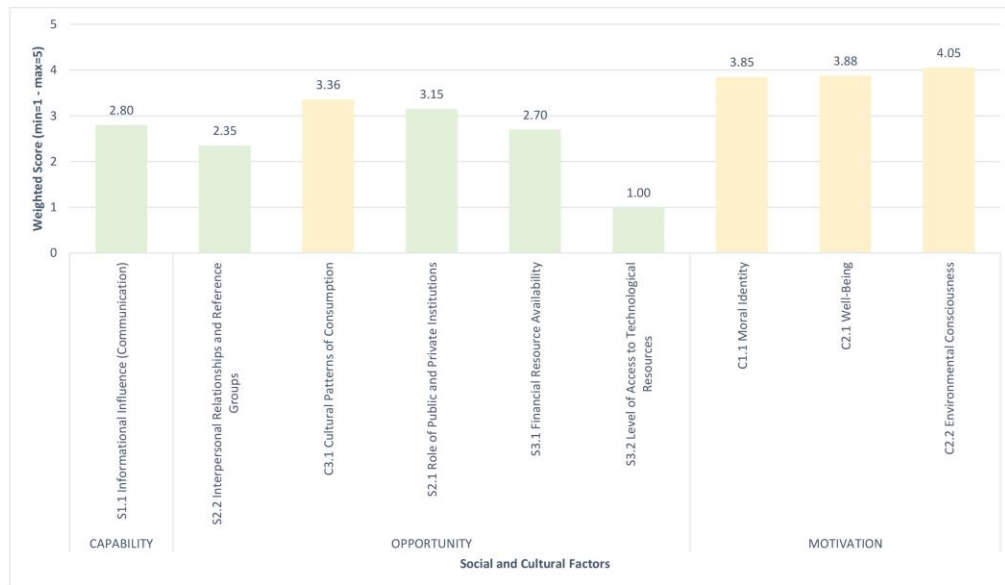
Figure 1

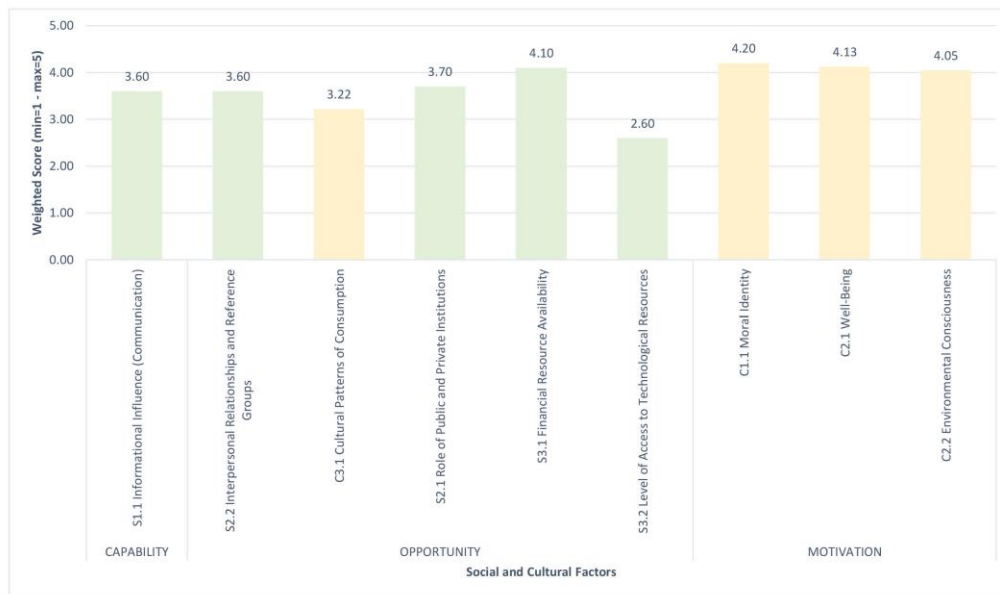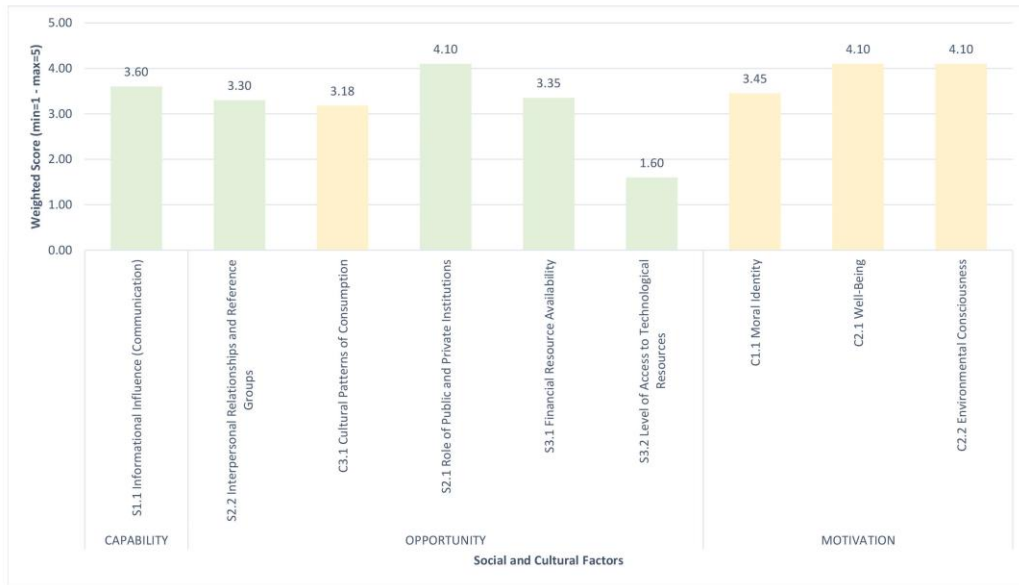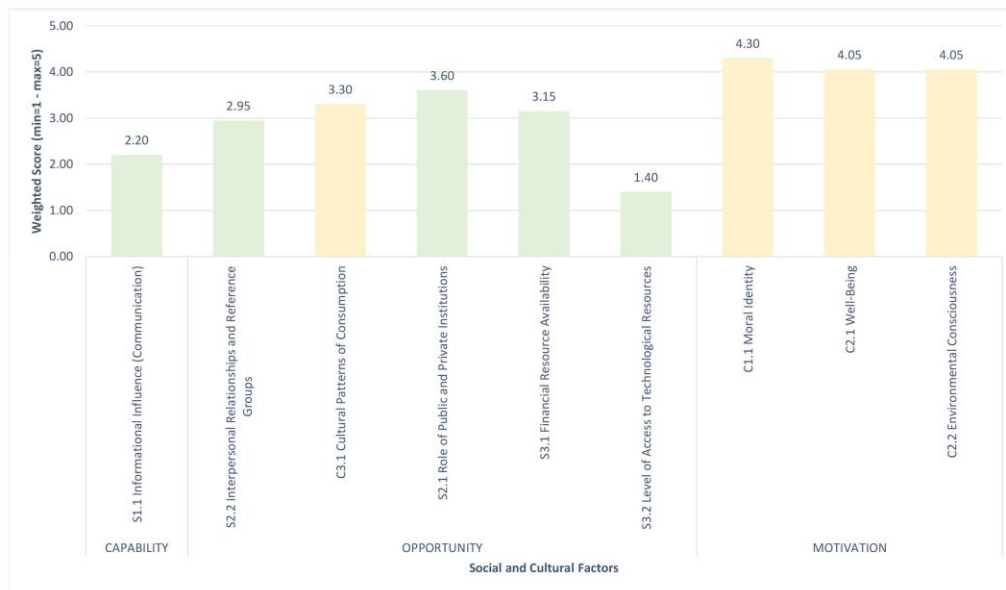| Factor		
Category	**Subcategory**	**Description**
Social	S1.Social Network	S1.1 Informational Influence (Communication).
	S2.Modelling	S2.1 Role of Public and Private Institutions.
		S2.2 Interpersonal Relationships and Reference Groups.
	S3.Social Norm	S3.1 Financial Resource Availability.
		S3.2 Level of Acess to Technological Resources.
Cultural	C1.Belief	C1.1 Moral Identity.
	C2. Value	C2.1 Well-Being.
		C2.2 Environmental Consciousness.
	C3. Attitude	C3.1 Cultural Patterns of Consumption.

Figure 2

Figure 3

Figure 4

Figure 5

Figure 6

Figure 7

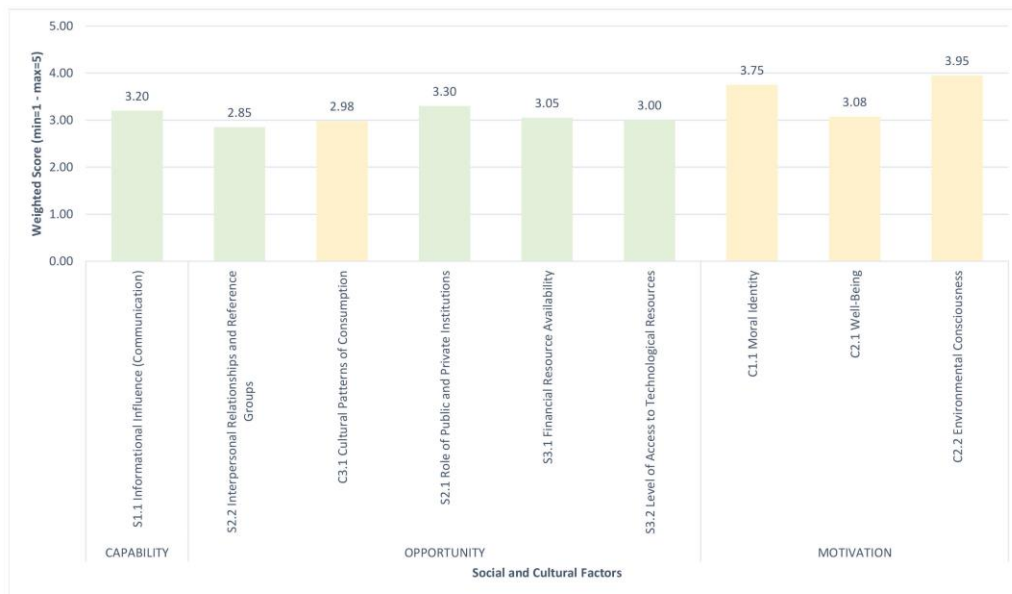Figure 8

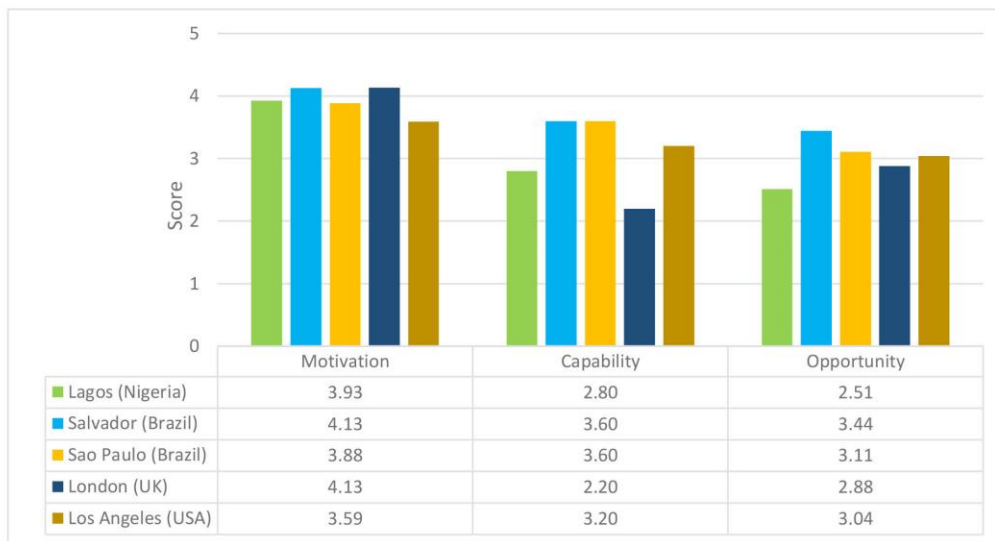|	Motivation	Capability	Opportunity
Lagos (Nigeria)	3.93	2.80	2.51
Salvador (Brazil)	4.13	3.60	3.44
Sao Paulo (Brazil)	3.88	3.60	3.11
London (UK)	4.13	2.20	2.88
Los Angeles (USA)	3.59	3.20	3.04

Figure 9 in Excel