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Assessing and Modelling Domestic Water Consumption Behavior

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Abstract: The UNICEF predicts severe water shortages and water scarcity worldwide. According to a water resources study conducted from 2000 to 2050, Malaysia is susceptible to potential water shortages in specific regions. These projections emphasized the importance of sustainable water management practices and proactive measures to mitigate potential water scarcity. It becomes crucial for Malaysia to implement effective strategies to address this issue. Therefore, this study aims to identify factors that influence sustainable water consumption behavior (SWCB) and establish a model for understanding consumer behavior in consuming water for domestic usage. Using the prominent theory of planned behavior (TPB) and reviewing the prior literature, this paper proposes a model to assess SWCB to understand consumer behavior on the water. This study found that attitudinal predictors significantly influence the SWCB. These predictors influence consumers' motivation, engagement, and views that may influence water intention and consumption behavior. Then, consumer intention mediates the relationship between attitudinal predictors and SWCB as it will evaluate consumers' favorable and unfavorable actions. Moreover, the model also found that socio-demographic traits (gender, household size, and income level) influence SWCB. These factors are the critical variables that significantly influence the SWCB. This paper contributes to policy implementation by modelling SWCB to help policymakers and urban planners develop effective policies and strategies to address water management challenges. By considering the drivers and barriers to sustainable behavior, policymakers can design targeted interventions, provide incentives, and implement regulations that promote water conservation at the household level.

Keywords: *Domestic Consumption, Sustainability, Sustainable Development Goals (SDGs), Water*

1. Introduction

Water is an important aspect of life. This precious resource is becoming increasingly imperative. It is reported that about four billion people worldwide are facing water scarcity (Leal Filho et al., 2022). It is also projected that about 1.8 billion people worldwide will face water shortage (Padder et al., 2023). Hence, responsible stewardship is required in water usage to guarantee long-term water resource viability for both the current and next generations.

The United Nations has shared a blueprint regarding Sustainable Development Goals (SDGs) to encourage peace as well as prosperity and tackle the issue of environmental preservation. Specifically, Goal 6 seeks to provide universal access to clean water and proper sanitation, while also promoting the responsible and long-term use of these resources. The objective is to achieve a substantial improvement in water usage efficiency across all sectors by 2030, while also guaranteeing sustainable freshwater withdrawals and supply to effectively address water scarcity and reduce the number of people impacted by it.

The SDG Report 2022 highlights that the 2030 Agenda for Sustainable Development and the existence of humanity are at significant risk owing to the interconnected and heightening problems (Sadoff et al., 2020). The Report emphasises the seriousness and scope of the issues we face. All of the SDGs are being impacted by the confluence of crises, which is dominated by COVID-19, climate change, and conflicts. The combination of these factors poses a substantial threat to the progress and implementation of the SDGs, highlighting the urgent need for coordinated and comprehensive action to address these interconnected challenges.

In addition, these crises are having a domino impact on several important domains, such as the provision of food security, education, the environment, society, and a great number of similar domains (Ortigara et al., 2018). The report outlines the years of progress in eliminating hunger and poverty, enhancing health and

education, delivering vital services, and other areas. Furthermore, the report stresses the importance of addressing the root causes of conflicts, promoting peace and stability, and fostering international cooperation. Undoubtedly, water is a critical resource that connects various landscapes, populations, and economic sectors. However, inadequate water management practices and increasing water demands have contributed to a global rise in water stress (Naik, 2017). This means that many regions are facing challenges in meeting their water needs due to scarcity, pollution or inefficient allocation and usage.

Furthermore, the effects of climate change, such as rising temperatures and altered precipitation patterns, exacerbate the situation (Hulme, 2005). Droughts and floods, increasingly frequent and severe in many regions worldwide, serve as prominent and tangible indicators of the escalating impacts of these challenges.

Droughts reduce water availability, affecting agriculture, ecosystems, and communities that rely on water for their livelihoods. Crop failures, livestock losses, and water shortages can lead to food insecurity, economic losses, and social unrest. On the other hand, floods can cause devastating damage to infrastructure, homes, and lives, leading to displacement, economic disruption, and loss of life. Understanding the trend of water resources and addressing water management issues effectively would promote sustainability and resilience in water resource management (Nikolaou et al., 2020).

Additionally, proactive efforts regarding climate change and conserving natural habitats are crucial to ensure water resource security. This includes transitioning to cleaner and more sustainable energy sources, promoting conservation and water-use efficiency measures, and encouraging awareness about water safety and stewardship (Lopez-Villalobos et al., 2022). Collective action at local, regional, and global levels is necessary to tackle these challenges effectively and ensure a sustainable and resilient water future for all.

Increasing urbanization and industrialization result in higher water requirements for domestic use, agriculture, manufacturing, and energy production (Anang et al., 2019; Flörke et al., 2013). The World Resources Institute (WRI) has examined fresh data from its aqueduct platform, demonstrating that home water consumption climbed by 600% between 1960 and 2014 despite slower growth in water withdrawals from other sectors (Novo, 2020). Additionally, improved public health and welfare standards often involve increased water usage for sanitation and hygiene purposes.

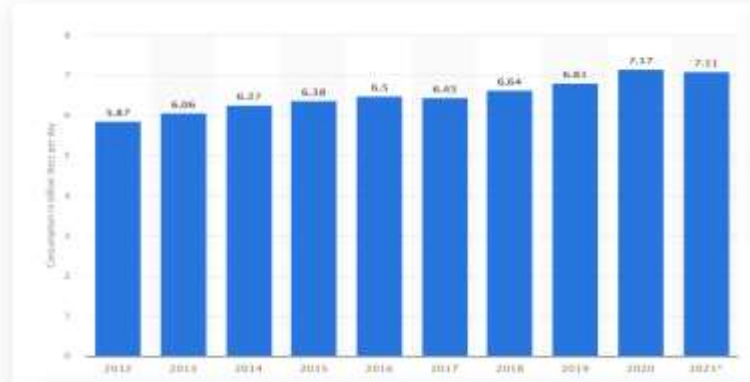
Predicting water use is essential to managing and planning for water resources. Building a highly accurate water consumption forecast model is crucial for advancing regional water resource planning and high-quality socio-economic development. To support the effective development of municipal infrastructure, adequate water demand forecasts are required due to the current water shortage. However, the rapid environmental and societal changes present a barrier to developing water consumption models (Garcés-Ayerbe et al., 2019).

Freshwater is in more demand than ever, and there is high competition for it due to rising food and energy crop demands. Due to this demand, there is now greater worry about water shortages and a decline in water quality brought on by agricultural practices (Hanafiah et al., 2019). Water demand is increasing alarmingly, causing intensity in water resource management. This puts high pressure on the water supply. This problem is intensified by the industrial activities, urbanisation and population growth. This further escalates the pressure on existing scarce water resources.

The projections from the Water Resources Study conducted for the years 2000 to 2050 highlight the expected water shortages in specific regions of Malaysia. A few states, including Perlis, Kedah, and Penang, are anticipated to face water scarcity ranging from 221 million to 246 million cubic meters (mcm). Similarly, Selangor and Melaka could experience water shortages of 1,000 mcm and approximately 200 mcm to 336 mcm, respectively.

In 2021, Malaysian domestic metered water usage accounted for about 7.11 billion litres. The figure is 5.87 billion litres in 2012. This reflects an increase of 1.24 billion litres, or about a 21% increase over 10 years (Statista, 2024). As for domestic water consumption, Peninsular Malaysia and Labuan recorded a home water consumption of 237 LCDs in 2022. Compared to 2018, the usage is only 225 LCDs. This shows an alarming increase of 12 LCDs or a 5.3% increase over 5 years (National Water Services Commission (SPAN), 2023).

Figure 1: Domestic water consumption metered water consumption in Malaysia from 2012 to 2021(in billion litres per day)



Source: Statista 2024. https://www.statista.com/statistics/796354/domestic-metered-water-consumption-malaysia/

If this is compared to the standard consumption set by the World Health Organisation (WHO), the figure diverges considerably. WHO recommended the usage of 165 LCDs. In 2022, this divergence accounted for a difference of 72 LCDs or about 44% higher than the recommended usage of WHO. Therefore, urgent effort is required to manage water resources effectively and also intensive promotion is needed towards water conservation practices to prevent water shortage and ensure sustainability (Khairi et al., 2022).

Figure 2: Malaysian domestic consumption per capita per day (LCD)

DOMESTIC CONSUMPTION PER CAPITA PER DAY (LCD)

Unit LCD	2018	2019	2020	2021	2022
Johor	216	222	229	232	216
Kedah	251	253	263	269	258
Kelantan	89	86	89	89	89
F.T. Labuan	179	179	168	202	196
Melaka	226	225	231	246	226
N.Sembilan	259	260	282	290	254
Pulau Pinang	278	281	301	308	307
Pahang	200	203	219	232	238
Perak	265	270	281	280	277
Perlis	313	315	306	313	276
Selangor	229	239	260	272	245
Terengganu	208	213	227	237	241
Pen. Malaysia & F.T. Labuan	225	230	244	251	237

Source: (National Water Services Commission, 2023); Water and Sewerage Fact Book 2022 page 45

Ultimately, it is of paramount importance to encourage water stewardship and sensible water usage. Understanding domestic water consumption behavior would provide reciprocal benefits to the water supplier and the consumers. Understanding the attitudinal predictors would improve water resource management and assist in identifying inefficiencies. Thus, corrective action and interventions could be designed to promote water savings and encourage more sustainable usage practices.

Additionally, water consumption has environmental implications, including energy consumption for water treatment and distribution, habitat degradation due to excessive water extraction, and the release of wastewater into ecosystems. Promoting sustainable consumption behavior can minimize these environmental impacts and help preserve water ecosystems and biodiversity.

Further, sustainable domestic consumption behavior models consider the linkages between water use and climate change. By promoting water conservation, reducing energy consumption related to water supply and treatment, and adopting practices that increase resilience to climate change impacts (such as drought), households can contribute to climate change mitigation and adaptation efforts.

Besides that, efficient and responsible water use would result in cost savings for households. Households can lower their water bills and achieve long-term savings by reducing water waste through behavioral changes and adopting water-saving technologies and practices. This is particularly relevant in areas where water prices are high or where water scarcity leads to increased costs for water supply (Jiang, 2009).

Promoting SWCB can have positive social and community impacts. A culture of sustainability can be built by raising awareness about water conservation and fostering a sense of responsibility among individuals and communities (Miller & Buys, 2008). This can strengthen community bonds, improve social cohesion, and contribute to communities' overall well-being and resilience (Franco & Tracey, 2019).

Finally, understanding SWCB's model helps policymakers and urban planners develop effective policies and strategies to address water management challenges. By considering the drivers and barriers to sustainable behavior, policymakers can design targeted interventions, provide incentives, and implement regulations that promote water conservation at the household level.

This paper assesses the various sustainable domestic consumption behavior models for water. It can serve as a resource for regional water consumption analysis and water resource planning and management. These models aim to understand and influence individual and household behaviors toward more efficient and responsible water use.

In addition, this paper also proposes a model to assess sustainable domestic consumption behavior for water by employing the prominent theory of planned behavior (TPB). This is crucial for promoting responsible water usage and achieving sustainable water management. This can offer valuable insights into the factors influencing individual behavior and choices. By understanding people's attitudes, subjective norms, and perceived behavioral control regarding water consumption, interventions and campaigns can be tailored to address specific barriers and promote sustainable practices effectively.

Specifically, about the local context, understanding the factors that influence water conservation behaviour is crucial because it helps us effectively promote sustainable water use and mitigate water scarcity risks. Hence, the citizens would conserve natural resources and safeguard ecosystems for future generations. This would ultimately contribute to achieving the WHO's recommended water consumption target of 165 LCDs and the 180 LCDs goal set by the National Water Services Commission (SPAN).

The remainder of the paper is as follows. The second section reviews the literature on the sustainable domestic water consumption behavior model. The third section describes the various sustainable domestic water consumption models. It then proposes a model based on the theory of planned behaviour, a prominent social psychology theory widely used to explain and predict human behaviour. Finally, discussions, conclusions, and limitations are elaborated in the final section. Recommendations are also made on the way forward for water sustainability.

2. Literature Review and Underpinning Theories

The second section reviews existing literature on sustainable domestic water consumption behaviour. It explores previous studies, research findings, and theoretical frameworks related to the topic. This section builds the knowledge base, identifies gaps in the current literature, and lays the groundwork for proposing a new model or approach.

Water Sustainability: Undeniably, for humans, water is a necessary resource. The global imbalance between supply and demand for water resources has worsened with economic development and population rise. In this regard, the demand for water resources is increasing due to factors like climate change, population growth, industrialization, and urbanization, while the limited water supply is being compromised by water pollution (Xu et al., 2020). The increasing gap between water supply and demand in recent years highlights the worsening problem of water shortage (An et al., 2021). Understanding this gap and its primary causes would significantly aid in developing an effective water protection strategy.

Freshwater is a finite resource, and because of the financial and social responsibilities that come with it, enterprises must control how it is used. The availability of freshwater resources and their equitable distribution across various sectors has become a frequent concern among decision-makers due to the effects of globalization, rapid population growth, urbanization, and climate change. Various environmental elements, including climate factors, impact water use.

Water is seen as a renewable resource with limitations. While water itself is constantly being recycled through the Earth's natural processes, the usable freshwater available to us is finite and limited (Qadri & Bhat, 2020). This is because most of the Earth's water is saline, making it unsuitable for human consumption or any other purposes without desalination, which is a resource-intensive process.

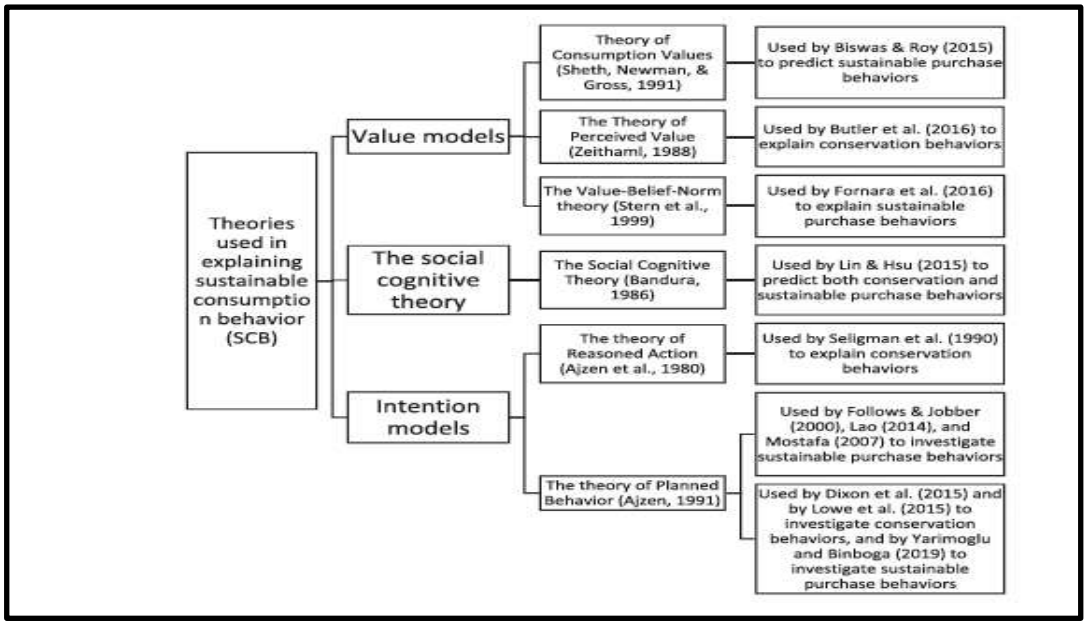
Water Consumption Pattern: Water consumption patterns refer to how water is used and consumed by individuals, households, industries, and other sectors. These patterns can vary depending on various factors, including geographic location, climate, cultural practices, socio-economic conditions, and access to water resources. The World Health Organization (WHO) defines domestic water as water used for all household purposes, including drinking, bathing, and food preparation.

As identified earlier, the domestic water consumption pattern in Peninsular Malaysia and the Federal Territory of Labuan is increasing. The levels of usage in 2018 and 2022 were 225 LCDs and 237 LCDs, respectively. This is extremely high compared to the WHO's recommendation of 165 l/c/d and the 180 LCDs target set by the National Water Services Commission (SPAN) for 2020.

Typically, the understanding of domestic water consumption patterns can assist households in identifying opportunities for water conservation, reducing wastage, and promoting sustainable water use practices. By adopting water-saving measures and technologies, individuals can contribute to water conservation efforts, reduce water bills, and ensure the long-term availability of this vital resource (Novo, 2020).

Behavioral Influence: A Conceptual Framework: The behavioral influences on water consumption refer to the factors that shape and affect how individuals and households use water. Understanding these influences is crucial for promoting sustainable water consumption practices. According to Marzouk and Mahrous (2020), sustainable consumption behavior can be analyzed using three primary models: value models, social cognitive theory, and intention models. For this study, the intention model is being adopted as it better suits the individual motivation and commitments to water conservation that further drive behavioral change. Finally, it can influence individuals to protect the environment and adopt water-saving habits. The intention model is based on two main theories: reasoned action theory (TRA) and planned behavior theory (TPB).

Figure 3: Theories used in explaining sustainable consumption behavior



Source: Marzouk and Mahrous (2020): Theories employed to explain sustainable consumption behavior

Theory of Reasoned Action: The theory of reasoned action (TRA), developed by Martin Fishbein and Icek Ajzen in the late 1960s, is a social psychology theory. It aims to elucidate and forecast human behavior by considering an individual's attitudes and subjective norms. According to the theory of reasoned action, people's behaviour is guided by their intentions, which are influenced by two primary factors which are their attitudes toward the behaviour and the subjective norms surrounding the behaviour.

Attitude (ATT) pertains to an individual's positive or negative evaluation of participating in a specific behavior. This evaluation is shaped by their beliefs about the outcomes of the behavior and their assessment of those outcomes (Untaru et al., 2016). Positive attitudes towards a behavior enhance the likelihood of intending to perform that behavior, whereas negative attitudes diminish it.

Subjective norms (SN) denote an individual's perception of societal influence to either engage or refrain from behavior (Goldenhar & Connell, 1993). It encompasses the person's beliefs about whether important others think they should engage in the behavior and the person's motivation to comply with those beliefs. Subjective norms play a crucial role in shaping intentions, as individuals tend to be more inclined to engage in a behavior if they perceive it to be expected or socially approved by others (Minton et al., 2018).

The TRA posits that intentions are the best predictor of behavior. The stronger an individual's intention to perform a behavior, the more likely they are to engage in that behavior. However, intentions are not the sole determinant of behavior, as other factors such as external constraints or limitations may also come into play (Corbett, 2002).

The TRA has been widely used in various fields to study and predict human behavior, such as health behaviors, consumer behavior, and social behavior. It has also laid the groundwork for the development of other theories, such as the theory of planned behavior (TPB), which incorporates the additional factor of perceived behavioral control. In summary, the TRA offers a framework for understanding how attitudes and subjective norms influence human behavior, highlighting the significance of incorporating both individual beliefs and social influences.

Theory of Planned Behavior (TPB) The TPB developed by Icek Ajzen is a social psychology theory that extends the earlier theory of reasoned action. It seeks to elucidate and forecast human behavior by incorporating three primary factors: attitudes, subjective norms, and perceived behavioral control.

It is important to note that the TPB expands on the TRA by adding the factor of perceived behavioral control. This addition highlights the importance of considering factors beyond attitudes and subjective norms that can affect an individual's capability to engage in a behavior (Koop et al., 2019).

Attitude (ATT) is similar to TRA, which refers to an individual's positive or negative assessment of engaging in a specific behavior. It includes the individual's beliefs regarding the consequences of the behavior and their assessment of those consequences. Positive attitudes toward a behavior enhance the likelihood of intending to perform that behavior, whereas negative attitudes decrease it (Sharma & Foropon, 2019).

Following the TRA framework, subjective norms (SN) describe an individual's perception of societal pressure to either participate in or abstain from specific behavior. It encompasses the individual's beliefs about what influential others expect them to do and their willingness to conform to those expectations. SN shapes intentions, as individuals are more inclined to intend to engage in a behavior if they perceive it as socially expected or endorsed.

Perceived behavioral control (PCB) was introduced as an additional factor in the TPB, indicating an individual's perception of the ease or difficulty of performing a behavior. This perception considers internal and external factors affecting behavior, including personal capabilities, resources, and situational constraints. Higher PCB enhances the likelihood of intending to engage in a behavior.

Intentions are seen as the immediate precursor to behavior in the TPB. The theory posits that the stronger an individual's intention to engage in a behavior, the greater the likelihood of them performing that behavior. However, the theory also acknowledges that behavioral intentions can be influenced by additional factors such as habits, past behavior, and external constraints (Ahmmadi et al., 2021).

The TPB has been extensively applied to comprehend and forecast various behaviors, encompassing health-related, environmental, and organizational behaviors. It provides a comprehensive framework integrating cognitive, social, and control factors in shaping human behavior.

For this study, TPB is employed to forecast an individual's intention to adopt sustainable water consumption behaviors. In this context, behavior is considered the primary outcome of behavioral intention, which is influenced by the individual's attitude toward the behavior, beliefs about societal norms (subjective norm), and perceptions of the ease or difficulty of behavior change (perceived behavioral control or self-efficacy). This well-established theory posits that individuals decide their behavior after considering available options.

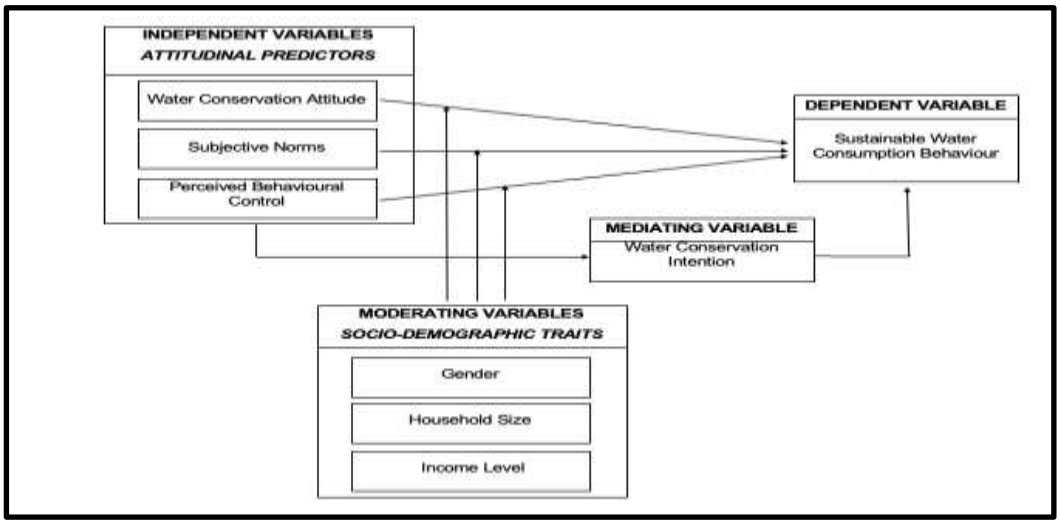
3. Models on Water Consumption

Water consumption models are vital instruments for comprehending and forecasting water utilization patterns in diverse settings, including residential, agricultural, industrial, and urban environments. These models usually include a few factors, such as population increase, economic activities, climate conditions, technological improvements, and policy changes. They assist in predicting future water demand, recognizing possible deficits, and assessing the efficacy of water conservation tactics (Wang et al., 2014).

The TPB offers a psychological framework for predicting and comprehending individual and household water usage patterns. The TPB suggests that an individual's actions are directly impacted by their intention to carry out those actions. This intention was influenced by three crucial factors namely: (1) attitudes - ATT, (2) subjective norms - SN, and (3) perceived behavioral control - PCB. By incorporating these elements, a water consumption model based on the TPB may forecast the likelihood of individuals adopting water-saving behaviors. For instance, a household that has favorable views towards water conservation senses substantial social backing for such actions and possesses confidence in its capacity to adopt water-saving strategies is more inclined to decrease its water consumption (Gregory & Leo, 2003).

This methodology can be utilized to develop focused interventions to encourage water conservation. Possible strategies could involve implementing educational campaigns to boost positive attitudes, establishing community programs to build subjective norms, and providing resources and tools to improve perceived behavioral control (Corral-Verdugo et al., 2003). The TPB-based strategy provides a comprehensive approach to promoting sustainable water use practices by addressing the psychological factors influencing behavior.

Figure 4: Sustainable water consumption behavior (SWCB) model



Source: Developed by authors

4. Findings and Discussion

Underlying the TPB models and collections from prior studies, this study presents a new model that indicates SWCB in Figure 1. Three attitudinal predictors (ATT, SN, and PCB) are included as the independent variables in sustainable water consumption behavior (SWCB) analysis. In addition, the model also tested the socio-demographic traits at the moderating variable between the attitudinal predictor and SWCB.

The first factor that influences the SWCB is the consumer's attitudes. ATT is crucial as it determines motives for conserving water (Corral-Verdugo et al., 2003). According to De Bruijn (2010), ATT is formed of two different components, which are emotional and cognitive. Based on Hassell and Cary (2007), consumers' attitudes and beliefs have been shown to positively influence SWCB, which is related to water demand. However, Aitken et al. (1994) found that attitudes negatively affect water consumption behavior.

The second factor that influences the SWCB is subjective norms (SN). The SN relates to the person's social pressure to engage or refrain from engaging in a certain behavior, such as water consumption (Ajzen, 1991; Trumbo & O'Keefe, 2001). SN is defined as perceived external approbation or behavior expectations on water (Armitage & Conner, 2001). SN has a positive influence on intentions to consume water. Nevertheless, the SN appears to have negatively influenced the consumers' intention to consume water (Yazdanpanah et al., 2016).

Then the third factor is perceived behavioral control (PCB). The PCB is defined as people's view of the simplicity and difficulty of carrying out the behavior of interest (Ajzen, 1991). Studies by Shahangiana et al. (2021) believed that PCB positively affects consumer's behavioral intentions. Conversely, Marzouk and Mahrous (2020) found that PCB negatively affects water consumption behavior since other factors can impact water consumption behavior.

Based on the model in Figure 4, water conservation intention is the mediating variable that will mediate the relationship between attitudinal predictors and SWCB. Intention indicates a favorable or unfavorable evaluation of a person's behavior in a particular circumstance (Kaiser & Scheuthle, 2003). This tells that the

way people consume water is a representation of their intentions. Intention predicts consumer's behavior to control their behavioral actions (Fishbein & Ajzen, 2011).

Moreover, this study employs socio-demographic traits as the moderating variables for the model. The socio-demographic traits consist of gender, household size and income level. Gender not only focuses on the literal meaning of women's and men's viewpoints. Other than that, their status, responsibilities, rights, and involvement in many areas are also considered. Gender diversity differs significantly when considering obtaining water resources (Upadhyay, 2005), consuming water (Caruso et al., 2015) and decision-making and policies (Kholif & Elfarouk, 2014). Next, household size can be explained when describing sustainable consumption behaviors. According to Knuth et al. (2018), household size can explain water consumption. The larger families tend to consume more water than the smaller ones since they use appliances that consume water more frequently.

In addition, Ramsey et al. (2017) stated that income, social norms, age and self-efficacy positively impact water consumption behavior. Level income can either reduce or increase water consumption depending on a person. A higher-level income might purchase more energy-efficient appliances that can save more water but habitually use the appliance more frequently. However, a lower-level income might not purchase energy-efficient appliances but have a habit of using the appliances less frequently (Shan et al., 2015).

Overall, attitudinal predictors measures by ATT, SN, and PCB significantly influence the SWCB. These predictors influence consumers' motivation, engagement, and views that may influence water intention and consumption behavior. Furthermore, consumer intention could mediate the relationship between attitudinal predictors and SWCB as it will evaluate consumers' favorable and unfavorable actions. Besides that, the model also found that socio-demographic traits, including gender, household size, and income level, influence SWCB. These traits could strengthen or weaken the direct relationship between institutional predictors and SWCB. Therefore, the attitudinal predictor, intentions, and socio-demographics are the critical variables significantly influencing water consumption behaviour to ensure sufficient water for the next generation.

5. Conclusion

The Water Resources Study for 2000 to 2050 projected the expected water shortages in specific regions of Malaysia. The northern states of Perlis, Kedah, and Penang are anticipated to face a water shortage ranging from 221 million to 246 million cubic meters (mcm). Similarly, Selangor and Melaka could experience water shortages of 1,000 mcm and approximately 200 mcm to 336 mcm, respectively. These projections and issues are important to mitigate potential water scarcity in the future. Therefore, this study aims to identify the variables that could influence and affect consumer behavior when consuming water.

It suggests exploring the motivations, attitudes, and external factors that shape people's intention to conserve water. The TPB served as the basis for understanding the relationship between attitudinal predictors and water consumption behavior. Then, consumer intention could mediate the relationship between attitudinal predictors and SWCB as it will evaluate the consumer's favorable and unfavorable actions. Besides that, the model also found that socio-demographic traits, including gender, household size, and income level, influence SWCB.

By understanding these factors, the research aims to provide insights and contribute to promoting and encouraging SWCB for a more sustainable future. Furthermore, raising awareness of the importance of water conservation can encourage responsible water use. Then, it could have an impact on individual and collective actions. This study contributes to the body of knowledge by introducing the framework on the water. This study could help other researchers in the field of water consumption across the countries. By implementing sustainable practices and managing water resources effectively, we can work towards securing water availability for current and future generations, even in the face of growing demands.

This study also contributes to policy implementation by having collaborative efforts at local, national, and international levels. The government at all levels could collaborate by providing education and outreach programs that can promote behavioral changes and instill a culture of water stewardship in communities and

industries (Flores et al., 2022). By examining the drivers and motivations associated with SWCB, this study aims to contribute to developing effective interventions and policies for achieving sustainable water resource management. By leveraging and applying the model, behavioral changes that contribute to a more sustainable and resilient water future would be encouraged.

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