The effects of sustainability knowledge dimensions on sustainability intention, sustainable attitude and sustainable behavior toward water supply and consumption

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A B S T R A C T

The purpose of this paper is to empirically investigate the effect of sustainability knowledge dimensions which are recycling knowledge, reuse knowledge and use efficiently knowledge on sustainability intention, attitude and behavior toward water consumption. This study is important while it is the first empirical study that has examined the links between a set of sustainable water consumption concepts within an "water-poor," Arab developing country context. A conceptual model of the connections between the above-mentioned factors was developed and the posited hypotheses were tested using a survey data set of 512 questionnaires collected from consumers in Jordan. The findings show that use efficiently knowledge has the strongest effect on sustainable intention, followed by recycling knowledge and reuse knowledge. Moreover, use efficiently knowledge has the strongest effect on a sustainable attitude followed by reuse knowledge and recycling knowledge. Additionally, sustainable intention has a stronger effect on sustainable behavior than sustainable attitude. Such results would provide useful insights for policymakers, nonprofit organizations, and businesses to integrate themes of sustainable behavior into their policies and programs, thereby facilitating better progress toward the sustainability of water resources in developing countries.

1. Introduction

Massive economic development, climate change, population explosion, and consumption patterns have led to the continuous exploitation and depletion of natural resources, drawing global attention to environmental issues (Kumar and Yadav, 2021; Chatterjee et al., 2022). Freshwater, a limited natural resource, is unevenly distributed. No ecological resource may be stressed to be more essential to human health and well-being than water (Knuth et al., 2018). Water scarcity has become a global area of concern, with much recent research focusing on reducing the negative impact of residents' activity (Cosgrove & Loucks, 2015). Several parts of the world are now confronting severely challenging circumstances in terms of water availability (Boulay et al., 2018), conflicts over shared resources (Liu et al., 2017), and excessive consumption beyond capacity (Bunsen et al., 2021). The sustainable consumption of freshwater is perceived as one of the most critical means to achieve sustainability in societies and ecosystems, as outlined by the United Nations Development Programme (UNDP, 2023), and it is an effective solution to address consumption challenges at the global level (Saari et al., 2021). Ecological consumer behavior, as a broad concept, encompasses a wide variety of actions such as improving living quality, meeting requirements, reducing waste, and maximizing available resources (Marzouk & Mahrobehaviors, 2020). To achieve the goal of reducing demand for virgin water and significantly improving water circularity, the 6Rs (Reduce, Reuse, Recycle, Reclaim, Recover, Restore) strategies have been recommended by many scholars such as Kakwani and Kalbar (2020). However, investigating two or three strategies due

to region-specific situations could be a valuable approach to addressing diverse needs and challenges in different areas (Jeong & Park, 2020; Preisner et al., 2022; van Schaik et al., 2021). This is especially important because sustainability is a complex process that is highly sensitive to various external factors (Al Awadhi & Alshurideh, 2023; Ghazal et al., 2023).

Nevertheless, consumers are less likely to adopt sustainable practices if they are uninformed about environmental challenges (Alshura et al., 2023; Joghee et al., 2023). Hence, knowledge about sustainability and the environment is an important factor in achieving the goal of sustainable consumption (Heeren et al., 2016; Cherradi & Tetik, 2020). Likewise, a substantial percentage of societies, particularly in developing countries, lack adequate awareness of environmental concerns to behave properly (Alshurideh et al., 2019; Louzi et al., 2022). Environmental knowledge is frequently considered the primary motivator for sustainable behavior (Peattie, 2010). According to the findings, consumer green behavior is significantly influenced by knowledge and attitude (Khan et al., 2020). Also, individuals' intentions to acquire ecologically friendly items are significantly influenced by their environmental awareness (Kaufmann, Panni, & Orphanidou, 2012). Therefore, it would be advantageous for this research to examine the effect of sustainability knowledge on sustainability behavior and provide a logical explanation for the nature of the relationship by integrating two other important components, namely sustainability intention and sustainability attitude, in the water sector in Jordan.

2. Importance of the Study

Unsustainable consumption lifestyles of consumers contribute directly to 30-40% of environmental deterioration (Ghaffar et al., 2023). Due to its significance in shifting the sustainability paradigm, the area of sustainable consumption behavior has attracted a lot of consideration from governments, higher education, businesses and citizens (Dong et al., 2020).

The vision of the United Nations of achieving sustainable development can be attained by considering 17 objectives, one of them is about responsible consumption and production, by prioritizing practices concerning sustainable consumption and production such as attaining ecologically responsible administration and utilizing natural resources effectively by 2030, confirming that everybody is well-informed about sustainable growth and practicing their lives accordingly, provoking developing nations to improve their scientific and technical capability in order to embrace more environmentally friendly consumption and industrial practices (UN, 2022). Humans consume more than 80% of available water (WRI (Water Resources Institute), 2019). As a result, existing depleting water resources must be restocked in order to supply an appropriate quantity of water for current and future generations (Kakwani & Kalbar, 2022). The quality and quantity of useable water are swiftly degrading in large regions of the world due to rising urbanization (WRI Water Resources Institute, 2019). Water security in cities is jeopardized, impeding environmental, economic and social growth (Hoekstra et al., 2018). 17 nations are classified as having 'very high water stress' globally (Kakwani and Kalbar, 2022). Jordan is one of the world's most water-stressed countries (world population review, 2024). Overconsumption has a detrimental impact on biodiversity and ecological services in watersheds biodiversity (Damiani et al., 2019; Dorber et al., 2019). Previous research has shown that water use has a direct impact on environmental systems as well as the long-term political and economic stability of the country (Pierrat et al., 2023). As a result, numerous stakeholders' eco-friendly strategies have recently received increased attention from policymakers, organizations, scholars and millennials (Lavuri, 2021). Not only in developed nations m but also in developing ones where Individual behavior and societal structure are fluctuating rapidly (Marzouk, 2019).

As earlier investigation has shown, consumer behavior models and theories focused on consumers in developed nations may not be effective in explaining consumer behavior in emerging economies (Mahrous, 2019; Yarimoglu and Binboga, 2019). Moreover, only a few research efforts have been undertaken in developing countries and have produced limited findings in sustainable consumption behavior (Wijekoon and Sabri, 2021). Most earlier investigations on sustainable consumer behaviors have concentrated on the green products context (Brewer, 2019; Ceylan, 2019; Park & Lin, 2020; Rausch and Kopplin, 2021; Sung & Woo, 2019). On the other hand, previous studies on consumer knowledge were limited (Turunen and Halme, 2021). According to the research that conducted to measure sustainability knowledge among consumers Li and Leonas (2022) have found, that most consumers are unfamiliar with sustainable products, practices and challenges. Consumers who lack adequate knowledge and trust in sustainable issues may encounter additional challenges when transforming their attitudes toward behavior (Cherradi & Tetik, 2020). Empirical evidence suggests that a robust understanding of sustainability principles significantly influences one's sustainable behaviors (Blazquez et al., 2020). As a result, alternative factors that might explain the indirect relationship between consumer knowledge of social and environmental consciousness and environmental behavior must be sought (Rausch & Kopplin, 2021). Green attitude and intention have frequently been proven to influence genuine green consumption behavior (Nguyen et al., 2018, 2019). To measure green behaviour in an emerging context, the study also incorporates the theory of planned behavior (TPB) and reasoned action (TRA), which were introduced by Ajzen (1991) and Ajzen and Fishbein (2000). These theories have been applied in all-inclusive behavioral studies (Elahi et al., 2022; Alam et al., 2023). To the best of our knowledge, no single research has been done on the relationship between Sustainability Knowledge, Sustainability Intention, Attitude and Behavior, therefore this study aims to bridge the gap and contribute to practice and theory.

3. Sustainability Knowledge

Sustainability knowledge is defined as a general awareness of the facts, concepts, and connections in the subject of the biotic ecosystems and natural environment; thus, environmental knowledge necessitates an understanding of the environment by

consumers, fundamental connections that culminate in the ecosystem, or realization of the entire systems and reciprocal obligations required for long-term development. (Khan et al., 2020). This growing knowledge and preference for sustainable consumption is expected to affect consumer actions and decisions. (Yadav et al., 2019). Consumers must be conscious of their environmental influence, be willing to maintain the ecosystem, and be motivated to adopt consumption patterns that fit their environmental aims and values to show their social and environmental obligations (Ogiemwonyi et al., 2023).

A high degree of comprehension leads to more pro-environmental behavior (Khan et al., 2020). To address the challenge of lack of sustainability knowledge among consumers, scholars have suggested greater engagement with consumers on sustainability to increase consumer understanding of the environmental perspective (Turunen and Halme, 2021). Nonetheless, firms' communication practices with customers appear insufficient, as consumers complain about a lack of resources to increase their understanding of sustainable practices (Turunen and Halme, 2021). This research will focus on recycling, reuse and use efficiently knowledge of consumers, due to their relevance to the water sector in Jordan.

4. Literature review

4.1 Recycling knowledge

Recycled water utilization is critical for increasing water supply, alleviating supply-demand imbalances, and minimizing water pollution, all of which are critical for enhancing the water supply system and guaranteeing water environmental security, governments place a great priority on recycled water (Li et al.,2022). Also, Water recycling is one effective strategy to satisfying the world's rising water demand in an era of decreasing freshwater reserves (Glick et al., 2019). Additionally, several factors, including governance, finance, and availability of wastewater recycling technology, may have an impact on the recycling process (Craddock et al., 2021). Keep in mind that acceptance is crucial in initiatives that embrace recycled water. Also, it is mentioned that any promotional techniques that do not consider residents' desires and social factors may be inefficient in influencing residents' intentions (Li et al.,2022). Moreover, several articles on recycled water consumption behaviors or intentions concentrate on internal and external environmental variables affecting the public. Internal public variables, for example, include objective characteristics such as economic level, education, age, religious and cultural values (Mu'azu et al., 2020; Zhu et al., 2019) as well as subjective aspects including environmental consciousness, risk perception, attitudes and preconceptions (Hou et al., 2021, Hou et al., 2021; Etale et al., 2020b; Ricart & Rico, 2019). External environmental influences include regional water resource circumstances, the naming of recycled water, the aim of reuse, and the local policy context (Taher et al., 2019; Glick et al., 2019). It is unclear, nevertheless, how urban dwellers with diverse social backgrounds plan to utilize recycled water for varied purposes (Craddock et al., 2021). Based to the previous explanation, the effect of recycling knowledge on sustainable intention and sustainable attitude can be shown as:

H₁: *Consumers recycling knowledge positively influence consumers' sustainable intention.*

H₂: *Consumers recycling knowledge positively influences consumers' sustainable attitude.*

4.2 Reuse knowledge

Water reuse is seen as a technologically realistic solution for meeting the growing national, agricultural and industrial demands. Water reuse is frequently hampered by a lack of acceptability and contemptuous attitudes, in addition to problems such as infrastructure, environmental health and legislation (Al-Saidi, 2021). Water reuse is becoming more popular across the world as a feasible solution to local water scarcity, water reuse has numerous advantages, including increased water supply, ecological enhancements from reduced polluted water discharge, prospects to boost groundwater or enlarge agriculture, and additional advantages such as the generation of fertilizers or energy via valorization of wastewater (McClaran et al., 2020). Water reuse can be a feasible solution for increasing water efficiency, lowering water shortages, and buffering natural shocks like droughts (Brown et al., 2018; Lee and Jepson 2020). As such, it may be viewed as a tool for reaching major sustainability objectives such as SDG 6.3 on sustainable water quality, wastewater treatment, and safe reuse, and SDG 6.4 on water-use efficiency and water shortages (Al-Saidi, 2021). Wastewater treatment, for example, is developing speedily, predominantly in nations impacted by water inadequacy and dry circumstances, as well as the escalating effects of climate change (Mu'azu et al., 2020; Scruggs & Thomson 2017; Bichai et al., 2018; Lee & Jepson 2020). The capacity to tackle the multi-dimensional problems of large-scale water reuse determines the expansion and variety of reuse supply infrastructure (Bichai et al., 2018; Lee & Jepson 2020). Despite these limitations, the scholarly literature indicates that the concept of water reuse is well received by policymakers, corporate managers, and official authorities as a confrontation of internal and external water-use challenges (Chen et al., 2015a; Smith et al., 2015). While water reuse is often regarded favorably as a water supply alternative, empirical research frequently reveals less favorable attitudes toward the direct use of water for cooking, drinking, bathing, or swimming (Fielding et al., 2018). Water quality awareness and understanding, as well as the hazards connected with water reuse, appear to be poor across areas. This conclusion is accompanied by a greater demand for additional information from consumers. This is due to the fact that knowledge about water treatment procedures has been shown to be relatively inadequate in several contexts (Fielding et al., 2018). To add more, risk perception and trust were highlighted by Fielding et al. (2018) as among numerous "psychological" elements of acceptance investigations, with other difficulties such as societal norms, justice, distaste, environmental issues, knowledge, and so on. According to the previous explanation, the effect of reuse knowledge on sustainable intention and sustainable attitude can be shown as:

H₃: *Consumers reuse knowledge positively influence consumers' sustainable intention.*

H₄: *Consumers reuse knowledge positively influence consumers' sustainable attitude.*

4.3 Use efficiently knowledge

Increasing water use efficiency is a crucial tactic in the worldwide water crisis response. Enhancing water use efficiency and water governance starts with evaluating the body of knowledge about water use efficiency (Cheng et al., 2023). Many of the studies that have been done so far concentrate on the amount of overconsumption that goes beyond carrying capacity when discussing the sustainability of water use (Bunsen et al., 2021; Li et al., 2020). Willis at al. (2013) concluded that water consumption data is needed to evaluate water savings in homes utilizing efficient devices and how savings fluctuate between different community sectors (i.e. disaggregating water use for showers, toilets, clothes washers and landscape irrigation etc.). Also, a modern technique for evaluating the total effectiveness of family indoor water consumption was presented by (Vieira et al., 2018). Three primary components make up this assessment methodology: the performance of water consumption devices based on penalty functions, the comparison with peers aggregated by clustering approaches, and the evaluation based on efficient patterns. Water use efficiency has also acquired extraordinary consideration in the agriculture domain also, due to the reason that improving water usage efficiency in irrigated agriculture is thus critical for the survival of sustainable agricultural output (World Bank, 2020; Bwambale et al., 2022). To add more, smart irrigation systems have the potential to enhance water consumption efficiency, especially with the development of wireless communication technology, monitoring systems, and improved management algorithms for efficient irrigation scheduling. Competition for precious water resources from other sectors of the economy has prompted agriculturalists, irrigation engineers, and policymakers to reconsider how water is used in agriculture (Bwambale et al., 2022). According to a study investigated the connections among water efficiency modifications, profit, and risk for companies operating in the worldwide consumer packaged goods market. Water efficiency improvements lower risk and boost profits. However, this study finds the reverse impact on enterprises with low operational efficiency (Fu & Jacobs, 2022). Moreover, the importance of industrial water efficiency to society and the environment is growing, and many managers are starting to prioritize it (Fu & Jacobs, 2022). Operations managers must have a deeper awareness of the impacts of water efficiency because water is a necessary component of many industrial processes. Widespread industrial applications include shipping, dilution, washing, chilling, and fabricating (USGS, 2021). According to the previous explanation, the effect of use efficiently knowledge on sustainable intention and attitude can be shown as:

H₅: *Consumers use efficiently knowledge positively influence consumers' sustainable intention.*

H₆: *Consumers use efficiently knowledge positively influence consumers' sustainable attitude.*

4.4 Sustainability intention

Sustainable consumption intention is linked to a person's interest in the environment and ecology, which is frequently perceived as a direct effect of environmental disasters (Alzubaidi et al., 2021). Personal norms have been determined to mediate this relationship (Adnan et al., 2018). In TPB, attitude plays a vital role while predicting the behavioral   intentions of the person (Kuo et al., 2018). Also, negative and positive attitudes have an impact on intention and behavior in certain acts, which offers a good direction to improve commitment (Yadav & Pathak, 2017). Based on a study that examined low-income families' intentions and behavior toward green consumption. The findings established a beneficial influence of attitude and perceived behavioral control on green product intention and consumption (Al Mamun et al., 2018). Additionally, according to one recent investigation of factors affecting green consumption, (Eberle et., 2023) has revealed that ecological knowledge, healthy consumption, consumer attitude, and pricing awareness are all drivers of organic food purchase intention. Another interesting finding is that gender and family wealth had a positive moderating influence on the association between price awareness and intention to buy organic food. However, the fundamental thesis in the studies in this category is that attitude is only weakly connected to intention and behavior unless it is combined with other factors relevant to the consumer's self (ElHaffar et al., 2020). Consumers who have self-transcendent values, for example, are more likely to engage in green behavior than those who do not (Jacobs et al., 2018). According to the previous explanation, the effect of sustainable intention on sustainable behavior can be shown as:

H₇: *Consumers' sustainable intention positively influences consumers' sustainable behavior.*

4.5 Sustainability attitude

Attitudes are described as positive or negative appraisals of cognitive ideas about a certain topic, person, object, event, or conduct (Maio et al., 2018). Furthermore, it might be either negative or positive, several previous research has revealed that attitude, as a psychological sensation, is one of the most significant determinants of green behavior (Nguye et al., 2018). Some of the previous examinations have been undertaken in several countries to investigate the significance of attitude, particularly in green shopping, recycling behavior, eco-friendly packaging, and waste management. (Aman et al., 2012; Paul et al., 2016; Kumar, 2019; Prakash et al., 2019). Also, most of the previous research discovered that attitude has a significant impact on the intentions of environmentally conscious consumers (Kumar et al., 2021). An individual with an accountable attitude toward ecological products, on the other hand, might have a positive mindset to make better environmental selections

(Ogiemwonyi & Jan 2023). Furthermore, persons with favorable pro-environmental attitudes will involve in green practices that will result in green behavior (Varshneya et al., 2017). However, a convincing consequence was obtained where the attitude was determined to be irrelevant (Tan et al., 2019, 2022). To add more, environmental attitudes may also be connected to various challenges that involve more effort to carry out green activities such as recycling, looking for, and paying higher prices for green items. When analyzing green purchase behavior, attitude is a crucial component to consider. People's willingness to buy green items is more promising when they have a favorable attitude towards behavior (Bulsara and Trivedi, 2023). Moreover, positive attitudes towards environmental sustainability, according to Trail and McCullough (2021), affect positive intentions to follow such ecological behaviors. According to the previous explanation, the effect of sustainable attitude on sustainable behavior can be shown as:

H₈: *Consumers sustainable attitude positively influences consumers' sustainable behavior.*

4.6 Sustainable behaior

Rather than pure environmental conservation, emphasis has been placed on environmentally sustainable behavior (Wei, Li, Liu, & Wu, 2019). According to Ogiemwonyi and Jan (2023), the potential that people would have liked to do everything in their power to protect the environment and advance sustainability through green actions is evident. To add more, though the justifications for why consumers choose to take real actions or not vary, earlier research has shown that societal pressure or unique personal characteristics can influence a person's decision to behave. Comparably, green behavior, is the act of adopting initiatives that uphold environmental principles and are thought to be safer for people and the wider community (Alam et al., 2023). Keep in mind that green behavior provides a remedy for humankind and lessens environmental issues triggered by an unsustainable consumption pattern. For example, using large amounts of non-recyclable resources could harm the ecology. Previous research has demonstrated that several environmental issues stem from unsustainable consumption and impulsive behavior brought on by air and water pollution (Bala et al., 2023). To clarify, according to more recent studies, 85% of the world's population has been impacted by activities caused by humans. (Timsit and Kaplan, 2021). The adoption of green products has gradually changed because of this paradigm shift in consumer behavior. It shows that consumers are becoming more open to purchasing green goods due to their increased advantages and moral appeal (Ogiemwonyi & Harun, 2021).

Green behavior is significant because, in contrast to unethical behavior or purchases that may cause unintended environmental harm, it works to minimize and prevent ecological issues by promoting eco-friendly purchases. In fact, if consumers are prepared to encourage and accept responsible consumption as well as behave responsibly towards the ecological system, they may make a significant contribution. Sustainable behavior might be the solution to these unmaintainable local purchases and consumption, which are an issue for numerous underdeveloped and developing countries in addition to affluent ones (Ogiemwonyi et al., 2023).

5. The study model
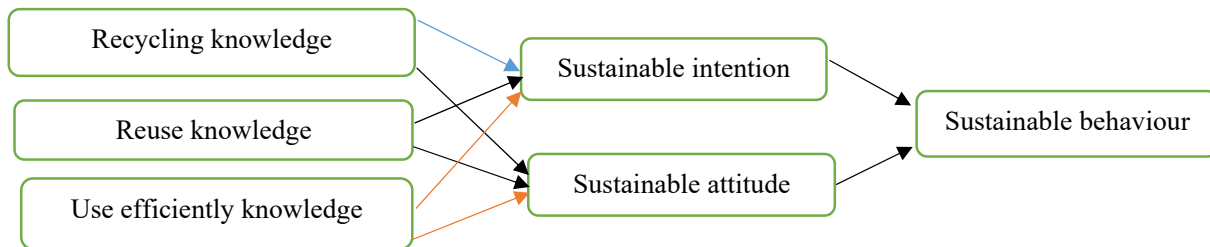
6. Analysis

This study employed the partial least squares structural equation modeling (PLS-SEM), using SmartPLS 4. This study used PLS-SEM for the following reasons. First, this method improves the accuracy and consistency of results by incorporating measurement errors (Hair et al., 2011). Second, it is also particularly useful when dealing with complex models with multiple variables (Hair et al., 2013). Last, the structural and measurement models are analyzed simultaneously, resulting in accurate measurements (Barclay et al., 1995).

6.1 Demographic characteristics

Table 1 shows that 68.4% of survey respondents were females and 31.6% were males. A youthful demographic is evident in the age distribution, with 52.5% of respondents being between 20 and 30 years old. In terms of marital status, 69.1% of respondents are single, while 27.0% are married. Most participants have bachelor's degrees (59.6%), followed by those with secondary education (21.3%). It was found that 57.2% of respondents had 0-3 years of experience, and 17.8% had 3-5 years. As to employment levels, mid-level jobs account for 58.6% of respondents, senior-level jobs for 31.3%, and executive-level jobs for 10.2%.

Table 1
Demographic characteristics

Characteristic	Frequency	Percent	Characteristic	Frequency	Percent
Gender			**Educational level**		
Male	162	31.6	Secondary school	109	21.3
Female	350	68.4	Diploma	60	11.7
Age			Bachelor	305	59.6
Under 20	115	22.5	Masters	33	6.4
20 - less than 30	269	52.5	PhD	5	1.0
30 - less than 40	88	17.2	**Years of experience**		
40 -less than 50	33	6.4	0-3 years	293	57.2
50 -less than 60	5	1.0	3-5 years	91	17.8
Over 60	2	0.4	5-10 years	46	9.0
Marital status			more than 10 years	82	16.0
Single	354	69.1	**Levels of employee**		
Married	138	27.0	Senior-level	160	31.3
Divorced	16	3.1	Mid-level	300	58.6
Widowed	4	0.8	Executive-level	52	10.2

6.2 Common method bise (CMB)

The validity of research findings can be significantly influenced by common method biases (CMB) when data are collected from a single source all at once (Lindell & Whitney, 2001). To address this issue, several strategies were incorporated before and after the data collection phase (Podsakoff et al., 2003). Initially, a pretest was conducted to clarify any unclear wordings. Moreover, all personal information and names of participants were not asked for in the study. After data collection, collinearity analysis was performed. The variance inflation factors (VIFs) of each construct were all lower than the accepted limit of 5 (Hair et al., 2021).

6.3 Measurement model

The results are shown in Table 2 and Fig. 2. Convergent validity and discriminant validity were assessed for the measurement model. To assess the convergence validity of the model, loading, composite reliability, and AVE are examined. The factor loadings of all factors were higher than 0.7 (Hair et al., 2019). It was found that composite reliability and average variance were higher than 0.7 and 0.5, respectively (Usakli & Kucukergin, 2018; Fornell & Larcker 1981). Moreover, Cronbach's alpha values exceeded the cut-off value of 0.7 (Hair et al., 2017). Cognitive validity was established based on these criteria.

Table 2
Measurement model.

Constructs	Items	Factor loading	AVE	CA	CR	VIF
Recycling knowledge	RK1	0.810	0.692	0.851	0.900	3.148
	RK2	0.842				
	RK3	0.845				
	RK4	0.830				
Reuse knowledge	RUK1	0.795	0.689	0.849	0.898	3.597
	RUK2	0.826				
	RUK3	0.852				
	RUK4	0.846				
Use efficiently knowledge	UEK1	0.823	0.671	0.837	0.891	3.137
	UEK2	0.824				
	UEK3	0.804				
	UEK4	0.826				
Sustainable intention	SI1	0.798	0.650	0.820	0.881	2.768
	SI2	0.827				
	SI3	0.802				
	SI4	0.796				
Sustainable attitude	SA1	0.806	0.650	0.820	0.881	2.768
	SA2	0.835				
	SA3	0.814				
	SA4	0.768				
Sustainable behavior	SB1	0.848	0.737	0.881	0.918	-
	SB2	0.870				
	SB3	0.865				
	SB4	0.852				

Notes: AVE: Average variance extracted; CA: Cronbach's alpha; CR: Composite reliability; VIF: Variance inflation factor

To assess discriminant validity, this study used the method proposed by Fornell and Larcker (1981). It is recommended that the square root of the Average Variance Extracted (AVE) for every construct should be greater than its correlation with other

constructs. Table 3 highlights these square roots in bold along the diagonal. The square root of AVE for each construct was greater than their correlation with each other, confirming discriminant validity.

Finally, we examined the overall model before examining the structural model. The goodness of fit was examined by calculating the standardized root mean square residual (SRMR) and the normed fit index (NFI). The SRMR and NFI values were 0.062 and 0.835, respectively. Hu and Bentler (1999) recommend an SRMR value of less than 0.08. For the NFI value, a value closer to one indicates a better fit (Lohmoller, 1989). Hence, the model is acceptable.

Table 3
Discriminant validity

Constructs	RK	RUK	SA	SB	SI	UEK
RK	**0.832**					
RUK	0.799	**0.830**				
SA	0.746	0.780	**0.806**			
SB	0.732	0.726	0.751	**0.859**		
SI	0.740	0.753	0.799	0.776	**0.806**	
UEK	0.764	0.798	0.795	0.793	0.806	**0.819**

Notes: Bold and diagonal values are the square root of AVE, and off-diagonal represent correlation matrix.
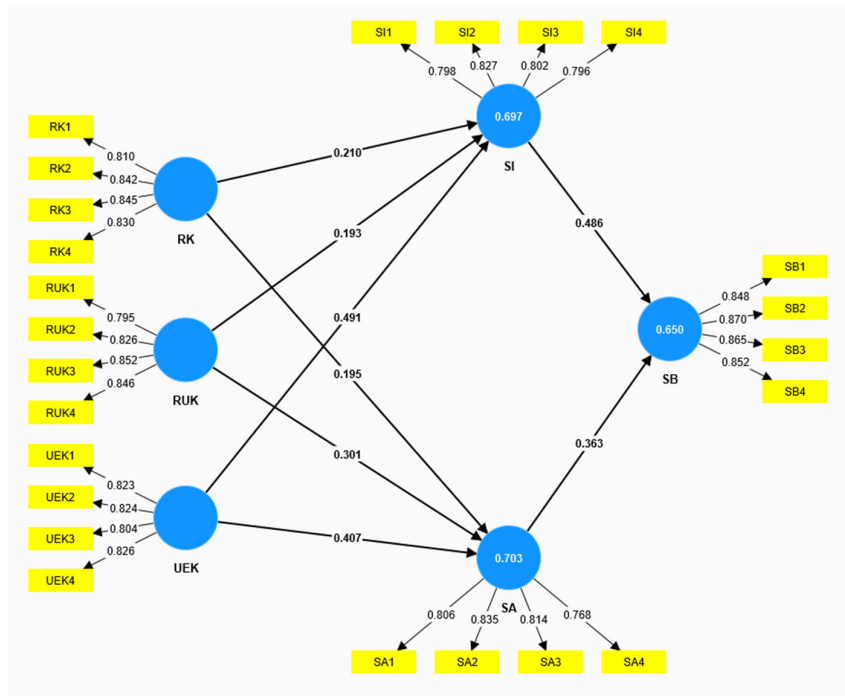
Fig. 2. Measurement model

6.4 Structural model

After confirmatory testing of the measurement model's validity and reliability and the model fit, the structural model was evaluated in terms of coefficient determination (R^2), predictive relevance (Q^2), and the path coefficient (β). For the path coefficient (β), the model was tested using bootstrapping (5000 samples). The results are shown in Table 4 and Fig. 3. Recycling knowledge has a positive influence on sustainable intention (β = 0.210, p < 0.001) and on sustainable attitude (β = 0.195, p < 0.001), confirming H1 and H2. Reuse knowledge has a positive influence on sustainable intention (β = 0.193, p = 0.001) and on sustainable attitude (β = 0.301, p < 0.001), confirming H3 and H4. Use efficiently knowledge has a positive influence on sustainable intention (β = 0.491, p < 0.001) and on sustainable attitude (β = 0.407, p < 0.001), confirming H5 and H6. The results also showed that use efficiently knowledge has the strongest impact on sustainable intention and on sustainable attitude. Moreover, sustainable intention has a positive influence on sustainable behavior (β = 0.486, p < 0.001), confirming H7. Lastly, sustainable attitude has a positive influence on sustainable behavior (β = 0.363, p < 0.001), confirming H8. In terms of coefficient determination, the R^2 value for sustainable behavior is 0.650, indicating that sustainable intention and sustainable attitude explain 65% of the variance in sustainable behavior. Moreover, recycling knowledge, reuse knowledge, and use efficiently knowledge explain 69.7% of the variance in sustainable intention and 70.3% of the variance in sustainable attitude. Based on the R^2 values, we concluded that this model had a moderate to substantial explanatory power (Hair et al., 2017). Furthermore, a Stone-Geisser blindfolding method was also used to examine predictive relevance, which

showed Q^2 values exceeding zero. Consequently, the research model successfully predicted sustainable behavior ($Q^2 = 0.655$), sustainable intention ($Q^2 = 0.690$), and sustainable attitude ($Q^2 = 0.697$).

Table 4
Testing Hypotheses.

Hypotheses	Relationship	Path	t-value	p-value	Direction	Results
Hypothesis 1	RK → SI	0.210	3.752	0.000	Positive	Supported
Hypothesis 2	RK → SA	0.195	3.537	0.000	Positive	Supported
Hypothesis 3	RUK → SI	0.193	3.182	0.001	Positive	Supported
Hypothesis 4	RUK → SA	0.301	4.766	0.000	Positive	Supported
Hypothesis 5	UEK → SI	0.491	7.524	0.000	Positive	Supported
Hypothesis 6	UEK → SA	0.407	7.266	0.000	Positive	Supported
Hypothesis 7	SI → SB	0.486	8.787	0.000	Positive	Supported
Hypothesis 8	SA → SB	0.363	5.962	0.000	Positive	Supported

Coefficient determination

$R^2_{SI} = 0.697$ $R^2_{SA} = 0.703$ $R^2_{SB} = 0.650$

Predictive relevance

$Q^2_{SI} = 0.690$ $Q^2_{SA} = 0.697$ $Q^2_{SB} = 0.655$
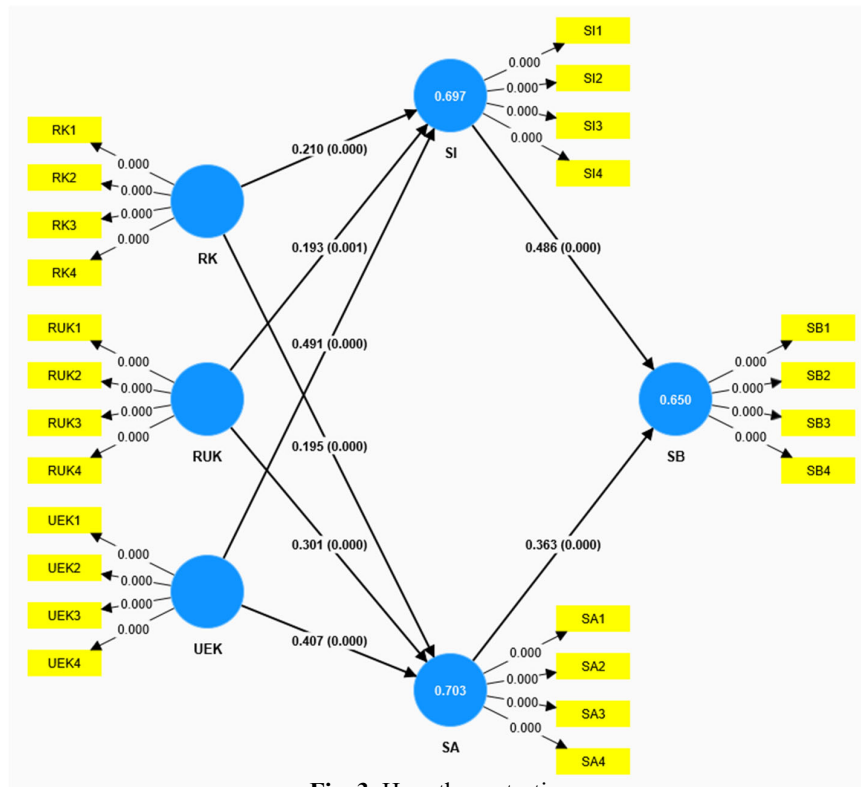
Fig. 3. Hypotheses testing

7. Discussion

This study aims to examine how sustainability knowledge influences sustainability intention, attitude, and behavior toward water consumption. The results are as follows. First, consumers' recycling knowledge has a positive impact on sustainable intentions. The use of recycled water contributes to the improvement of environmental security and water supply systems (Li et al., 2022). According to Glick et al. (2019), enhanced knowledge of recycling techniques helps consumers make informed decisions, resulting in a more reflective sustainable intention. Achieving sustainable intentions requires consumers to be aware and informed about recycling processes (Craddock et al., 2021). Similarly, recycling knowledge positively impacts consumers' sustainable attitudes. Resident knowledge and understanding of recycled water and its associated technologies are crucial to its acceptance (Li et al., 2022). Having this knowledge raises a positive attitude towards sustainability since consumers gain a better understanding of how their actions impact the environment. In contrast, environmental consciousness and risk perception are subjective factors that are shaped by knowledge, and subsequently affect attitudes toward sustainability (Hou et al., 2021; Etale et al., 2020b).

This study found that reuse knowledge has a positive impact on sustainable intentions. Al-Saidi (2021) and McClaran et al. (2020) emphasize the importance of educating people about the benefits of water reuse, including the increased supply and ecological improvements it can offer. Through this knowledge, a positive intention towards sustainability is raised by highlighting how reuse can address water scarcity (Brown et al., 2018; Lee and Jepson 2020). Furthermore, Consumers' attitudes toward sustainability are shaped by their knowledge of water reuse. A more favorable attitude toward sustainable practices can be adopted if people understand the complexities and benefits of large-scale water reuse projects (Bichai et al., 2018; Lee and Jepson 2020). In addition, risks perception and trust are strongly influenced by knowledge in shaping attitudes towards water reuse (Fielding et al., 2018).

Additionally, consumers' sustainable intentions are positively influenced by their efficient use of knowledge. The global water crisis requires understanding water use efficiency (Cheng et al., 2023). Therefore, consumers become aware of the importance of efficient water use, which raises sustainable intentions (Willis et al., 2013). Moreover, sustainable attitudes are positively influenced by knowledge about efficient water use. USGS and Fu & Jacobs (2022) indicate that a positive attitude toward sustainability is a result of understanding the importance and impact of water efficiency in various sectors. Increasing knowledge leads to a more responsible and sustainable attitude, particularly in industries where water is critical.

Consumers sustainable intentions has a positive impact on sustainable behavior. According to Alzubaidi et al. (2021) and Adnan et al. (2018), sustainable intentions directly influence green behaviors. Similarly, Mamun et al. (2018) found a direct relationship between green product intentions and consumption behaviors. In addition, Sustainable attitude has a positive influence on Sustainable behaviors. Several studies have shown that attitudes predict green behavior (Maio et al., 2018; Nguye et al., 2018). Trail and McCullough (2020) indicate that positive attitudes toward environmental sustainability led to more eco-friendly behavior.

8. Conclusion & Implications

This study has developed and empirically tested a theoretical framework that examines the effect Sustainability Knowledge (Recycling knowledge, Reuse knowledge, and Use Efficiently knowledge on sustainability Intention, Sustainability Attitude and Sustainable behavior of water consumption. The data collected from 512 water consumers in Jordan during the period December 2023 to January 2024. Which was later analyzed using the SMART-PLS technique. The study revealed significant findings. The results show that the dimension of Use Efficiently Knowledge (UEK) in Sustainability Knowledge (SK) has the strongest impact on Sustainable Intention (SI), followed by Recycling Knowledge (RK) and Reuse Knowledge (REK). Furthermore, Use Efficiently Knowledge (UEK) has the most significant effect on Sustainable Attitude (SA), followed by Reuse Knowledge (RK) and Recycling Knowledge. Additionally, sustainable intention has a stronger impact on sustainable behavior than sustainable attitude.

Essentially, these findings can be used by businesses, environmental organizations, and governments to create more successful campaigns, initiatives, and laws that encourage consumer behavior that is sustainable. They can inspire people to lead more sustainable lives by highlighting the significance of use efficiently knowledge and implementing techniques to improve recycling and reuse knowledge. Furthermore, practitioners can prioritize interventions that focus on shaping intentions rather than just attitudes by realizing that sustainable intention has a higher influence on sustainable behavior than sustainable attitude.

Theoretical implication

This study contributes to the literature on sustainability and consumer behavior by establishing a clear relationship between sustainability knowledge and behavior toward water consumption. Findings suggest that greater awareness of sustainability issues affects both intentions and attitudes towards sustainable water use, resulting in more sustainable behaviors. According to the results, efficient water use knowledge has the strongest impact on raising sustainable intentions and attitudes, highlighting the need for targeted educational efforts with an emphasis on practical and efficient water use.

These results can help researchers and academics studying consumer behavior, environmental psychology, and sustainability better understand the variables impacting sustainable intentions and behaviors. It offers insightful information about the significance of knowledge recycling, reuse, and efficient usage in promoting sustainable goals and attitudes.

Practical implication

To promote water sustainability, policymakers and educators should enhance public awareness and education. Consumer education programs focusing on the impact of water use and strategies for sustainable consumption are essential. This insight can be particularly beneficial for water companies because it can help them align their practices with sustainability principles and communicate their efforts effectively.

Recommendation and limitation

There is a need for future research to explore different types of sustainability knowledge and the impact they have on consumer behavior across a variety of cultural and geographic contexts. A long-term study of sustainability education's effects on

behavior change would provide valuable insight for continuous improvement of sustainability practices. This study focuses on the water consumption behavior of Jordanians, which limits its generalizability. Additionally, self-reported measures can sometimes not accurately reflect actual behavior due to their reliance on self-reporting.

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