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BRIDGING THE GREEN GAP IN EMERGING ECONOMIES: MOVING FROM KNOWLEDGE TO ENVIRONMENTAL BEHAVIOUR

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ABSTRACT

This study explores how emerging economies could translate environmental knowledge into concrete environmental actions. More specifically, the study examines the relationship between citizens' knowledge of environmental issues and their pro-environmental behaviour, with a particular focus on waste management behaviour. While existing literature has primarily emphasized direct causal relationships, this study adopts an intensive framework that investigates the mediating mechanisms linking knowledge to action. Drawing on the theories of planned behaviour, environmental protection behaviour, and environmental behaviour, a comprehensive conceptual model was developed to capture the multidimensional dynamics of this relationship. Accordingly, questionnaire data were collected from 598 citizens in Tunisia. The results, analyzed using PLS-SEM, reveal that environmental knowledge significantly influences environmental sensitivity and behavioural control. However, environmental knowledge alone does not guarantee pro-environmental behaviour; effective action requires the existence of both environmental self-efficacy and perceived controllability. These findings substantially enrich the theoretical understanding of the transition from knowledge to environmental action and provide practical recommendations to promote more sustainable behaviours.

KEYWORDS: Environmental Knowledge, Environmental Behaviour, Environmental Sensitivity, Knowledge-Action Gap, Perceived Behavioural Control, Waste Management.

1. INTRODUCTION

Faced with the contemporary environmental emergency, waste management constitutes a major global challenge that calls for innovative public policies (Sobaih et al., 2024). Additionally, the greening economy has become crucial for ensuring sustainable development. This requirement is more pressing in a context where global waste production is expected to increase 70% by 2050 (World Bank Group, 2018). Paradoxically, 65% of consumers prefer to buy from environmentally friendly companies and are willing to pay a premium of 9.7% for ecological products (Iliopoulou et al., 2024). However, there is a gap between ecological awareness and actual consumer behaviour. This phenomenon, often referred to as the "green divide" (Mkhize and Ellis, 2018), highlights a challenge in translating environmental concerns into concrete actions for ensuring sustainable development.

The gap between values and actions represents a complex issue in environmental transition. Eşsiz et al. (2022) demonstrated that psychographic factors such as risk aversion and subjective knowledge play a crucial moderating role in the consistency between environmental values and green behaviours. The same study showed that consumers with greater subjective knowledge of the environment show greater consistency between their values and their behaviours. Green behaviour requires transformational leadership (Sobaih et al., 2022) and green mindfulness, spiritual intelligence, environmental self-identity (Alshebami et al., 2023).

Research on environmental behaviour has explored different ways to understand this gap. First, the moderating role of environmental knowledge as several studies (e.g. Fraj-Andrés and Martínez-Salinas, 2007; Suki, 2013) have demonstrated that the level of environmental knowledge influences the relationship between pro-environmental attitudes and the behaviours adopted. Thus, a better understanding of ecological issues would encourage the implementation of concrete actions. Second, predictive factors beyond knowledge such as perceived self-efficacy and established recycling habits can predict the adoption of green purchasing behaviours (Cardoso & van Schoor, 2017). Third, the influence of attitudes and values, e.g. positive attitudes, beliefs and values towards the environment are considered important drivers of environmental behaviour (Fraj and Martinez, 2007; Pawaskar et al., 2018; Straupaite, 2023). These attitudes, influenced by personal and functional factors, shape purchasing intentions and behaviours. Fourth, the weight of social and psychological factors, e.g. social norms, anticipated feelings of pride or guilt, and the connection felt with nature also play a role in the adoption of sustainable behaviours (Han, 2021). Fifth, consumer segmentation into different segments according to their level of involvement in environmental behaviours, ranging from less committed individuals to convinced "environmentalists" (Cardoso and van Schoor, 2017; González et al., 2015). Sixth, the impact of demographic factors, e.g. age, gender and education level, on ecological behaviours, with certain demographic groups being more inclined to adopt pro-environmental practices (González et al., 2015; Schäfferné, 2007).

However, it is important to emphasize that most of the above-discussed studies have focused on behaviours and have often been conducted primarily in developed countries. It is therefore crucial to broaden the scope of research to encompass a greater diversity of behaviours and to consider the specificities of emerging economies (Gupta and Agrawal, 2017). This study addresses this gap by exploring the influence of knowledge on environmental problems on the behaviour of Tunisian citizens, particularly in relation to waste management. The question of this study is: to what extent a better understanding of environmental issues can promote environmental sensitivity, concern for the environment and the feeling of control over one's actions?

2. CONCEPTUAL FRAMEWORK

Pro-environmental behaviour (PEB) or environmental behaviour (E-behaviour) is defined as any action aimed at avoiding the degradation of the natural environment (Giannelloni, 1998). This definition is enriched by the work of Jaoued Abassi et al. (2017) which highlights its positive impact on the environment. Understanding the determinants of these behaviours becomes crucial, particularly in a context where recent studies demonstrate a significant gap between environmental intentions and actions. Indeed, although consumers demonstrate a growing preference for ecological practices and are willing to pay more for environmentally friendly products (Iliopoulou et al., 2024), converting these intentions into tangible actions remains a main challenge.

Research has recognized numerous factors influencing E-behaviour, counting psychological factors, perceived behavioural control (Janmaimool and Denpaiboon, 2017; Wu et al., 2021) and demographic influences (Janmaimool, 2024; Babazadeh et al., 2023). Knowledge of problems

related to ecology constitutes a fundamental element in the adoption of eco-responsible behaviour. In this context, recent study (Eşsiz and al., 2022) highlighted the importance of psychographic factors, indicating that the level of subjective knowledge about the environment and the perception of risk play a determining role in the coherence between environmental values and actual behaviours. This perspective enriches our understanding of the gap between knowledge and action, by shedding light on the psychological mechanisms that facilitate the conversion of knowledge into real behaviours.

This research is based on three major theoretical foundations which make it possible to understand the complexity of these relationships. First, Ajzen's Theory of Planned Behaviour (TPB) (1991) highlights the intention to act as a determinant of behaviour, influenced by attitude, subjective norms and perceived behavioural control. Second, Giannelloni's Theory of Environmental Protection Behaviours (1998) enriches the TPB by incorporating individual motivations and contextual constraints. Third, Zaiem's Theory of Ecological Behaviour (2005) highlights the importance of ecological sensitivity and environmental concern, thus providing a complementary framework for understanding the mechanisms for moving from knowledge to action. The combination of these three theoretical approaches allows us to establish a robust conceptual framework for analyzing the complex relationships between environmental knowledge and environmental behaviours, particularly in the context of waste management. This multidimensional perspective offers a hard basis for appreciating the mechanisms that facilitate or delay the transformation of knowledge into concrete actions.

2.1. Knowledge of Environmental Problems and E- Behaviour

Several studies suggest a direct, positive correlation between environmental knowledge and pro-environmental behaviours. Ng (2020) found a significant association between knowledge, intention, and behaviour specifically related to clean recycling at home. Similarly, Geiger et al. (2019) showed that action-specific knowledge influenced corresponding behaviours. Díaz-Siefer et al. (2015) further demonstrated a direct relationship between both human-environment system knowledge and environmental action knowledge and pro-environmental behaviour. Otto and Kaiser (2014) observed that greater exposure to conservation-related information is linked to stronger ecological engagement, suggesting a broader impact of environmental knowledge. Meinhold and Malkus (2005) nuanced this relationship by showing that environmental knowledge moderates the relationship between pro-environmental attitudes and behaviours, particularly for males. However, it's important to acknowledge that not all studies have found such connections; for instance, Paço and Lavrador (2017) found no relationship between knowledge and environmental behaviour. This mixed evidence highlights the complexity of the knowledge-behaviour relationship.

Therefore, our first hypothesis is

H1: Knowledge of environmental problems positively influences E-behaviour.

2.2. Effects of Knowledge of Environmental Problems on Environmental Sensitivity

Environmental issues represent major challenges for the planet and human health (Özçağlar, 2007). In this context, ecological sensitivity, defined as "the importance given to environmental issues" (Müller, 2020), takes on crucial importance. This sensitivity is not limited to knowledge but involves an affective reaction and a personal perception of risk (Bardes, 2002, cited by Müller, 2020). According to Levy et al. (2014), this sensitivity promotes more responsible individual behaviour regarding the preservation of the environment.

Zaiem (2005) highlights a positive relationship between environmental knowledge and ecological sensitivity. The latter acts as a mediating variable between knowledge and ecological actions. The author emphasizes that "environmental knowledge reflects the degree of knowledge regarding ecological issues (pollution problems, conservation of nature, risks linked to environmental degradation, the components of the ecosystem, knowledge of ecological products), and that "ecological sensitivity has knowledge as its antecedent". Hence our second hypothesis:

H2: Environmental knowledge positively influences environmental sensitivity.

2.3. Effects of Knowledge of Environmental Problems on Environmental Concern

Many studies show that greater environmental knowledge issues tend to increase concern for the environment the more people distinguish environmental problems, the more worried they tend to be. This returns a broader shift in thinking known as the "new environmental paradigm" (NEP) (Dunlap & Van Liere, 1978, cited in Müller & Esson Ekwa, 2020), which highlights augmented awareness

of and concern for the environment. Significantly, environmental concern is more than only knowing about the issues; it includes a cognitive dimension (thoughts and understanding), an affective dimension (feelings and emotions), and a behavioural dimension (intended actions). This multifaceted nature of environmental concern points to the potential for knowledge to convert into tangible pro-environmental behaviour. Therefore, our third hypothesis is:

H3: Environmental knowledge positively influences environmental concern.

2.4. Effects of Knowledge of Environmental Problems on Perceived Behavioural Control

Ajzen's TPB (1985) posits a crucial link between perceived behavioral control and pro-environmental behavioral intentions, suggesting individuals are more likely to act pro-environmentally when they believe they possess the capacity to do so (Labbouz & Marchand, 2011). Ajzen (2002) later refined the concept of perceived behavioral control, distinguishing between two key components: self-efficacy and controllability. Self-efficacy refers to an individual's belief in their ability to successfully perform the target pro-environmental behavior, encompassing their assessment of the behavior's difficulty and their confidence in their capabilities. Controllability, conversely, represents the perceived degree to which performing the behavior is under the individual's control, rather than being subject to external barriers or constraints. This distinction is critical, as it acknowledges that even highly self-efficacious individuals might be deterred by perceived insurmountable external obstacles. Based on the theoretical premise that increased environmental knowledge fosters a stronger sense of agency by enhancing both self-efficacy and controllability, we hypothesize:

H4a: Environmental knowledge positively influences self-efficacy.

H4b: Environmental knowledge positively influences controllability.

2.5. Effect of Environmental Sensitivity on E-behaviour

Zaiem (2005) states that actions helping to protect the environment concern all stakeholders, emphasizing that "the positive relationship between behaviour and ecological sensitivity is stronger". This relationship suggests that ecological sensitivity is a powerful driver of environmental action. The more sensitive an individual is to environmental issues, the more likely he or she is to adopt concrete ecological behaviours. Additionally, Stern et al. (1999) showed that ecological sensitivity is a key element in the formation of pro-environmental attitudes and can lead to concrete actions in favor of environmental protection. Our fifth hypothesis is then the following:

H5: Environmental sensitivity positively influences E-behaviour.

2.6. Effects of Environmental Concern on E-behaviour

Bérubé (2012) emphasizes that since the 1920s and 30s, social psychology has been interested in the link between attitudes and behaviour. Attitude, defined as the evaluation of behaviour in a favorable or unfavorable sense (Ajzen, 1991), directly impacts actions. "More precisely, the positive or negative attitude automatically arises from behavioural beliefs" (Bérubé, 2012). However, Giannelloni (1998) notes that this relationship can be unstable due to various contextual factors, such as social norms or economic constraints. Our sixth hypothesis is then the following:

H6: Environmental concern positively influences E- behaviour.

2.7. Effect of Perceived Behavioural Control on E-behaviour

Axelrod and Lehman (1993) point that high levels of environmental concern do not always translate into action. Maloney and Ward (1973) view the ecological crisis as a crisis of maladaptive behaviour. Labbouz and Marchand (2011) specify that "behaviour is influenced by personal norm, itself determined by awareness of the problem and its consequences as well as by the attribution of responsibility". Ajzen (1991) enhances that "perceived behavioural control is supposed to have a direct effect on behaviour when voluntary control over behaviour is reduced." Hence our seventh hypothesis:

H7-a: Self-efficacy positively influences E-behaviour.

H7-b: Controllability positively influences E-behaviour.

2.8. The Mediating effect of Environmental Sensitivity, Environmental Concern and Perceived Behavioural Control

The relationship between environmental knowledge and pro-environmental behaviour (PEB) is more nuanced than initially theorized. While early models proposed a direct causal link, research consistently reveals a substantial "knowledge-action

gap" (Kollmuss & Agyeman, 2002), underscoring the need to investigate mediating factors. This complex pathway involves several key psychological constructs.

Environmental sensitivity, characterized by empathy towards the environment, mediates the knowledge-PEB relationship. Sivek (2002) supports this mediating role, arguing that possessing factual knowledge about environmental issues does not guarantee responsible environmental behaviour. Indeed, research indicates that knowledge in isolation has a limited direct effect on behaviour, explaining little variance in individual actions. Instead, environmental sensitivity encompassing empathy, emotional connection with nature, and genuine concern emerges as a crucial prerequisite for PEB. Sivek (2002) emphasizes sensitivity's mediating role, transforming knowledge into action motivation. Without this affective component, knowledge may remain abstract and fail to inspire meaningful change. Conversely, strong environmental sensitivity fosters enduring commitment to environmental protection. Hungerford and Volk (1990) describe environmental sensitivity as an "entry-level variable," facilitating the conversion of knowledge into personal investment.

Environmental concern, representing an individual's evaluation of environmental issues, constitutes another critical mediating pathway. Milfont and Duckitt (2010) connected environmental knowledge to preservationist attitudes, which subsequently predicted pro-environmental behaviours. Finally, perceived behavioural control (PBC), defined as the perceived ability to perform a specific behaviour, represents a significant mediating factor. Lauren et al. (2016) found that action-related knowledge enhanced PBC, which in turn led to increased waste reduction behaviours. This mediating role of PBC is also supported by Bamberg and Möser's (2007) meta-analysis. This study will also investigate the mediating influence of the three primary constructs. Therefore, building upon the preceding arguments, we propose the following additional hypothesis:

H8: The relationship between environmental knowledge and E-behaviour is mediated by (a) environmental sensitivity, (b) environmental concern, (c) self-efficacity and (d) controllability.

The conceptual model (Figure 1) presents the hypothesized relationships between environmental knowledge and pro-environmental behaviour, mediated by environmental sensitivity, environmental concern, and perceived behavioural control. These hypotheses will be tested empirically to validate the proposed relationships.

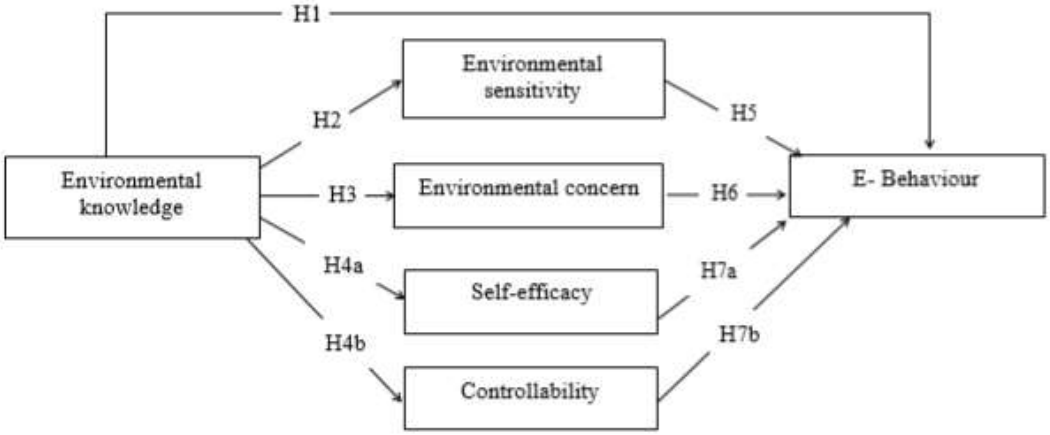

Figure 1: Moving From Environmental Knowledge to Pro-Environmental Behaviour Framework.

3. METHODOLOGY

This research employs a quantitative research approach to scrutinize the influence of ecological knowledge on citizens' pro-environmental behaviour, specifically regarding waste management. A questionnaire was considered to collect data on participants' knowledge of environmental problems, environmental sensitivity, environmental concern, perceived behavioural control and environmental behaviour.

3.1. Population and Sample

The study targeted a sample of 598 citizens concerned in daily waste management, counting residents of both urban and rural areas. This choice of sample makes it possible to analyze pro-environmental behaviour in various socio-economic

contexts. The selection of respondents was done according to the method of convenience, with a balanced distribution between sexes and age groups, to guarantee the representativeness of the sample. This sample size is considered acceptable for analysis, in accordance with the recommendations of Commey and Lee (1992).

3.2. Measurement Scales

A five-point Likert scale was used to measure the research variables. Recognized scales from the literature were selected to measure the constructs (See table1, annexe1), with some item phrasing somewhat modified to fit the specific context of this study (Frikha, 2019). Precisely, we used the Zaiem (2005) scale to measure Knowledge of environmental problems, Environmental Sensitivity, and E-behaviour. To measure Perceived Behavioural Control, we employed the Compeau & Higgins (1995) scale, which is two-dimensional, comprising a perceived control dimension and a self-efficacy dimension. For Environmental Concern, the Lin and Svrgabaveva (2016) scale was employed (see appendix).

3.3. Data Collection

To reach a diverse population, the questionnaire was administered online. Respondents expressed their level of agreement with statements related to the study variables using a 5-point Likert scale, ranging from "Strongly Disagree" to "Strongly Agree." This scale format, recommended by Zaiem (2005), makes it possible to "improve the finesse of the measurement and establish an overall score". Demographic characteristics of the sample (N=597) are presented in Table 1. Most participants (64.8%) were between 40 and 60 years of age, with smaller proportions in the 18-40 (27.6%) and over-60 (7.5%) age ranges. The sample exhibits a high level of educational attainment (94.5% with tertiary education). The gender distribution is relatively balanced (53.5% male, 46.5% female).

Table 1: Sample Structure.

Variable	Frequency	Percentage
Age		
From 18 to 40 years	165	27.6
From 41 et 60 years	387	64.8
More than 60 years	45	7.5
Education		
Primary	3	0.5
Secondary	30	5.0
University	564	94.5
Gender		
Male	320	53.5%
Female	277	46.5%

3.4. Reliability and Discriminant Validity

The collected data were analyzed using PLS-SEM software. Initially, items with outer loadings below 0.4 were removed to ensure measurement quality. In the second round of analysis, several items, E_B_2 (0.625), E_B_5 (0.659), K_4 (0.635), K_9 (0.587), S_4 (0.685), S_5 (0.660), and Self_E_1 (0.626), were discarded because their loadings fell below the acceptable threshold. During the third round, Self_E_3 (0.684) was also removed for the same reason. By the fourth round, all remaining loadings exceeded the standard cutoff of 0.7, as shown in Table 2.

Table 2: Loadings.

Construct	Loadings	Construct	Loadings	Construct	Loadings
C_1	0.864	Self_E_2	0.731	S_10	0.806
C_2	0.898	Self_E_4	0.784	S_6	0.828
Concern_1	0.810	Self_E_5	0.861	S_7	0.869
Concern_2	0.884	Self_E_6	0.833	S_8	0.829
Concern_3	0.935	Self_E_7	0.922	S_9	0.866
E_B_3	0.871	Self_E_8	0.855	K_1	0.923
E_B_6	0.900	Self_E_9	0.830	K_3	0.852
E_B_8	0.910	Self_E_10	0.934		

Additionally, the Cronbach's alpha coefficients, which range from 0.714 to 0.942 (Table 3), are above the recommended minimum of 0.7, confirming internal consistency. The composite reliability

values, between 0.874 and 0.952, also surpass the threshold of 0.7. Moreover, the Average Variance Extracted (AVE), ranging from 0.705 to 0.799, indicates good convergent validity (Hair et al., 2014). Taken together, these results affirm the reliability and validity of the measurement model.

Table 3: Cronbach's Alpha, composite Reliability, and AVE.

	Cronbach's alpha	Composite reliability	AVE
Concern	0.873	0.909	0.770
Control	0.714	0.874	0.777
E-Behavior	0.876	0.922	0.799
Knowledge	0.738	0.882	0.789
Self-Efficacy	0.942	0.952	0.716
Sensitivity	0.896	0.923	0.705

Table 4 shows evidence of discriminant validity using the Fornell-Larcker criterion. The square root of the AVE for each construct (shown on the diagonal) is greater than its correlations with all other constructs, supporting discriminant validity. This specifies that each construct measures a distinct concept.

Discriminant validity is also confirmed through HTMT matrix as shows in Table 5, where all values are below 0.85 (Hair et al., 2021).

Table 4: Discriminant Validity Fornell-Larcker Criterion.

	Concern	Control	E-Behavior	Knowledge	Self-Efficacy	Sensitivity
Concern	0.878					
Control	0.067	0.881				
E-Behavior	-0.021	0.360	0.894			
Knowledge	0.037	0.361	0.196	0.888		
Self-Efficacy	0.165	0.668	0.343	0.239	0.846	
Sensitivity	0.053	0.572	0.246	0.405	0.549	0.840

Table 5: HTMT Matrix.

	Concern	Control	E-Behavior	Knowledge	Self-Efficacy
Control	0.096				
E-Behavior	0.025	0.437			
Knowledge	0.039	0.491	0.223		
Self-Efficacy	0.191	0.824	0.367	0.273	
Sensitivity	0.075	0.716	0.257	0.479	0.584

Hypothesis Testing and Discussion The model explains 16.4%, 13%, 0.1%, 5.7%, and 15.9% of the variability in sensitivity, control, concern, self-efficacy, and E_behavior, respectively. Table 6 presents the results of hypothesis testing, examining the relationships among the study variables.

Figures 2 and 3 show the path coefficients and t values.

Table 6: Hypothesis Tests.

	β	t	p	Decision
Knowledge -> E_Behavior	0.080	1.803	0.072	Rejected
Knowledge -> Sensitivity	0.405	9.534	0.000	Accepted
Knowledge -> Concern	0.037	0.690	0.491	Rejected
Knowledge -> Self_Efficacy	0.239	6.493	0.000	Accepted
Knowledge -> Control	0.361	8.736	0.000	Accepted
Self_Efficacy -> E_Behavior	0.204	3.547	0.000	Accepted
Control -> E_Behavior	0.207	3.256	0.001	Accepted
Concern -> E_Behavior	-0.070	1.533	0.126	Rejected
Sensitivity -> E_Behavior	-0.013	0.248	0.805	Rejected

According to the statistical analysis, environmental knowledge does not directly affect pro-environmental behaviour ($\beta = 0.080$, $t = 1.803$, n.s.; $p > 0.05$), a finding consistent with Paço and

Lavrador (2017) but inconsistent with Díaz-Siefer et al. (2015), Ng (2020), and Geiger et al. (2019). Consequently, H1 is rejected, indicating that knowledge alone is insufficient to trigger behavioural change. Similarly, environmental knowledge shows no significant effect on environmental concern ($\beta = 0.037$, $t = 0.690$, n.s.; $p > 0.05$), and thus no impact on individuals' interest in ecological issues, which contradicts Stern et al. (1999). Hypothesis H3 is therefore rejected.

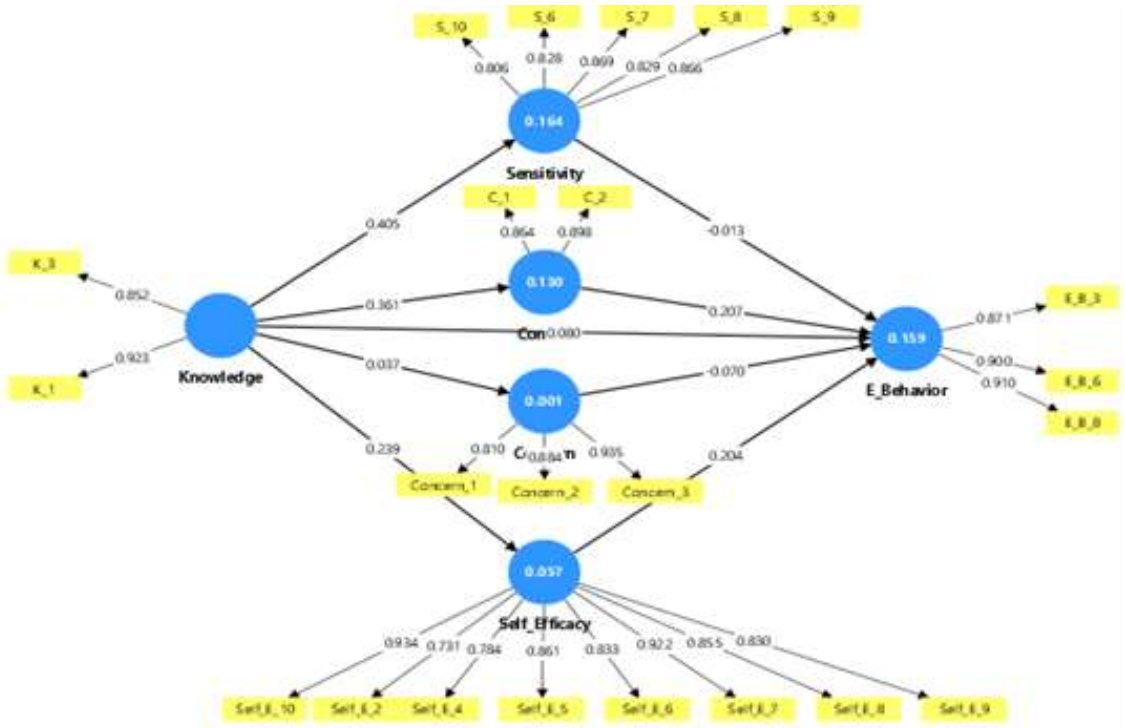

Figure 2: Path Coefficients.

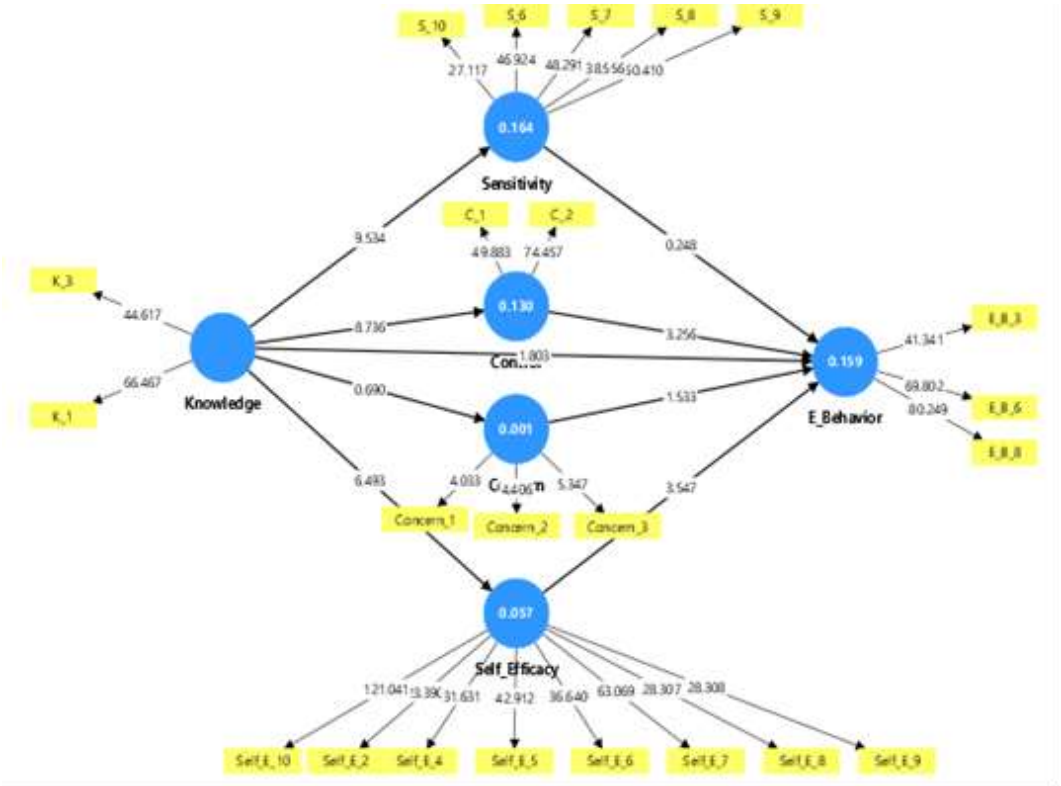

Figure 3: t values.

By contrast, environmental knowledge exerts a strong positive influence on environmental sensitivity ($\beta = 0.405$, $t = 9.534$, $p < 0.05$), in line with Kollmuss & Agyeman (2002), Kaiser & Fuhrer (2003), and Giannelloni (1998). It also significantly predicts self-efficacy ($\beta = 0.239$, $t = 6.493$, $p < 0.05$) and controllability ($\beta = 0.361$, $t = 8.736$, $p < 0.05$), consistent with Bandura's (1997) conceptualization of perceived control and further supported by Homburg & Stolberg (2006). Accordingly, H2, H4a, and H4b are validated, highlighting the central role of environmental knowledge in shaping attitudes and perceptions of control.

Despite these positive effects on psychological factors, our results reveal that neither environmental sensitivity ($\beta = –0.013$, $t = 0.248$, n.s.; $p > 0.05$) nor environmental concern ($\beta = –0.070$, $t = 1.533$, n.s.; $p > 0.05$) significantly predict pro-environmental behaviour. Thus, H5 and H6 are rejected, pointing to the persistence of the "attitude–behaviour gap" (Kollmuss & Agyeman, 2002). This indicates that individuals who are sensitive to or concerned about environmental issues do not necessarily translate these attitudes into concrete actions, a discrepancy already noted in prior literature but still puzzling for behavioural prediction.

In contrast, perceived behavioural control emerges as a decisive factor. Self-efficacy significantly predicts pro-environmental behaviour ($\beta = 0.204$, $t = 3.547$, $p < 0.05$), validating H7a, while controllability also has a significant effect ($\beta = 0.207$, $t = 3.256$, $p < 0.05$), supporting H7b. These findings underscore that individuals' belief in their own ability, combined with a perception of control over contextual constraints, are key drivers of sustainable action.

Regarding the mediating effect of environmental knowledge on pro-environmental behaviour, H8c and H8d are supported. The results indicate that knowledge influences behaviour indirectly, operating solely through self-efficacy and controllability, which appear to be crucial for motivating action ($p < 0.05$; Table 6). This finding is consistent with Lauren et al. (2016) but contrasts with the results of Sivek (2002), Hungerford and Volk (1990), and Milfont and Duckitt (2010).

Table 6: Mediating Tests.

	β	t	p
Knowledge -> Self_Efficacy -> E_Behavior	0.049	2.904	0.004
Knowledge -> Control -> E_Behavior	0.075	3.003	0.003

This analysis distinguishes two aspects of behavioural control and reveals their relative importance in the environmental context. The results demonstrate that the perception of the effectiveness of their actions is a determining factor: individuals who believe in the positive impact of their actions are more likely to adopt ecological behaviours.

These findings offer valuable insights into the theory of planned behaviour, demonstrating that the pathway from knowledge to action is not linear but mediated by complex psychological processes. Our research enriches existing theoretical frameworks (Cardoso & van Schoor, 2017; Straupaite, 2023) by highlighting the specific psychological factors that influence whether environmental knowledge translates into tangible pro-environmental behaviour.

Our results contribute significantly to the theory of planned behaviour by demonstrating that the relationship between knowledge and action is not direct but mediated by complex psychological factors. This discovery enriches the existing theoretical framework (Cardoso and van Schoor, 2017; Straupaite, 2023) by identifying the psychological factors that intervene between environmental knowledge and tangible pro-environmental behaviour. This nuanced understanding is vital for designing operative interventions to promote sustainable practices.

4. CONCLUSION

This study aimed to explore the impact of environmental knowledge on citizens' pro-environmental behaviour, with a particular focus on waste management. In the context of the "green gap" highlighted in the literature (Mkhize & Ellis, 2018), our research provides new insights into the mechanisms that mediate the transition from environmental knowledge to action. The results underscore the importance of knowledge about environmental problems, particularly those related to waste management, as a key factor in fostering awareness, concern, and behavioural control. These findings not only support previous research but also clarify the mediating mechanisms through which knowledge translates into action. This emphasizes the critical role of environmental education and information in promoting sustainable lifestyles. However, translating knowledge into actual behavioural change is effective only when

individuals perceive their actions as meaningful and necessary for environmental preservation, and when they feel a sense of control over their outcomes.

To enhance waste management practices, it is essential to actively involve citizens so that they adopt responsible behaviours, such as selective sorting, reducing energy consumption, or choosing eco-designed products. Based on these insights, companies and organizations have a central role to play in fostering these behaviours among employees, customers, and partners. Effective communication strategies are crucial, demonstrating the tangible impact of individual actions on the environment. Organizations can highlight their own ecological initiatives, set examples, and showcase measurable contributions to sustainable development. Within organizations, promoting collective involvement in environmental protection such as reducing paper waste, using public transport, and implementing internal waste sorting programs can further reinforce responsible behaviours.

Our study also demonstrates the strong influence of self-efficacy the belief in one's ability to act on pro-environmental behaviours. Businesses and organizations can enhance self-efficacy by providing accessible and practical solutions for ecological action, including user-friendly recycling programs, training in eco-friendly practices, and tools to monitor personal environmental impact. Recognizing and rewarding positive actions, while illustrating their real-world effects, can inspire broader adoption of sustainable practices.

It is crucial to facilitate pro-environmental actions by reducing their financial, temporal, and procedural costs. Providing personalized guidance and support helps individuals overcome perceived barriers, ensuring that even motivated and knowledgeable citizens can effectively implement sustainable behaviours.

The managerial implications are clear: promoting sustainable waste management requires not only raising awareness of ecological issues but also reducing perceived barriers to action. Simplifying recycling systems, lowering the costs of eco-friendly products, and encouraging collective participation are key strategies to create an environment conducive to responsible behaviour. Making pro-environmental actions easier, more accessible, and rewarding enhances their adoption and long-term sustainability.

Certain limitations inherent to our study can be announced. First, the sample of participants was chosen by convenience, which limits the generalization of the results to the entire population. Second, the study relied on self-reported data, which may introduce social desirability bias, as participants may be tempted to overestimate their eco-friendly behaviours. Third, the cross-sectional nature of our study does not allow capturing the temporal evolution of ecological behaviours.

Future research could take a longitudinal approach to examine the temporal dynamics of the evolution of ecological behaviours. Furthermore, exploring moderating variables, such as cultural context and social norms could enrich our understanding of the mechanisms of transforming knowledge into actions. Finally, this research opens the way to study the role of innovative technologies in waste management. These technological perspectives, coupled with a better understanding of the psychological mechanisms identified in our study, could significantly contribute to the literature on ecological transition and behavioural change.

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