



Understanding pro-environmental behavior: the effects of social influence and environmental awareness in Cambodian context

Bora Ly¹

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Abstract

This study delves into the interplay between social influence and environmental understanding, shaping pro-environmental behavior from an environmental psychology perspective. Conducted through a cross-sectional survey with 271 participants in Cambodia, the research employs structural equation modeling to quantitatively analyze relationships. Results demonstrate the significant predictive role of both social influence and environmental awareness in pro-environmental behavior, supporting the value-belief-norm theory. Notably, social norms strongly influence personal norms, driving pro-environmental actions. Also, heightened environmental awareness increases recognition of consequences and responsibility, encouraging pro-environmental behavior. These findings highlight socio-cultural and environmental consciousness aspects in nurturing sustainability. While acknowledging cultural context and self-reported measures, this study lays a foundation for future research and informs policies to promote pro-environmental behavior. It suggests leveraging environmental awareness and social norms as effective strategies for sustainable practices.

Keywords Environmental knowledge · Pro-environmental · Social influence · Value-belief-norm theory

Introduction

Environmental knowledge is a fundamental antecedent to pro-environmental behavior (PB), albeit often underestimated due to methodological constraints and variability in measurement approaches. Recent research reveals that this knowledge is intimately tied to general knowledge, contributing to 7% of the variance in environmentally significant behavior (Geiger et al. 2019). While environmental education programs underline the importance of knowledge transmission for their success, the actual impact of environmental knowledge (EK) on PB remains methodologically challenging to ascertain (Geiger et al. 2019; Kollmuss and Agyeman 2002). This challenge arises from the Dunning-Kruger effect, where individuals overestimate their knowledge, resulting in a weak to zero correlation between self-reported cognitive abilities and objective ability measures in the environmental domain (Dunning et al. 2003; Geiger et al. 2019).

Equally, social norms, a form of social influence (SI), have emerged as potent facilitators of PB (Cialdini and Goldstein 2004). These norms, influenced by expectations of others' behavior and the consequences of conformity or deviation, have instigated notable environmental and societal shifts, such as reduced single-use plastic consumption and flight shaming (Perry et al. 2021). This study seeks to elucidate the intricate relationship between EK, SI, and PB within the specific context of public sector employees in Cambodia—a demographic hitherto under-researched but pivotal in shaping public attitudes and policy compliance towards environmental initiatives. The choice to study public employees in Cambodia was guided by the desire to investigate a unique subset of individuals who hold a significant role in policy creation and implementation. Their involvement in shaping environmental policies and practices allows us to examine how their attitudes and behaviors influence broader societal norms and environmental outcomes. The study seeks to uncover insights that can inform policy-making processes and institutional practices within Cambodia's public sector by targeting this group.

Additionally, this investigation aimed to shed light on the mediation effect of EK on the relationship between SI and PB, thereby offering significant implications for policy

✉ Bora Ly
ly.bora@pucsr.edu.kh

¹ College of Graduate Studies, Walailak University 222
Thaiburi, Tha Sala, Nakhon Si Thammarat 80160, Thailand

formulation and practical applications. Hence, it addressed a literature gap and practical implications for policymakers and educators. These insights can be leveraged to design interventions to foster PB among a demographic instrumental in shaping public attitudes and policy compliance. In a world grappling with unprecedented environmental challenges, a nuanced understanding of the interplay between EK, SI, and PB is indispensable for devising effective strategies to steer society toward a more sustainable future. Accordingly, it is poised to provide valuable insights to inform the path towards enhanced sustainability.

Theoretical framework

Environmental psychology has undergone significant transformations recently, with scholars exploring novel theories and models to comprehend and forecast pro-environmental behavior (PB). The value-belief-norm (VBN) theory, which suggests that personal values shape beliefs, establish personal norms, and result in PB, is undoubtedly an influential model in environmental psychology. However, the domain has expanded beyond this sole focus, introducing newer theories and empirical research considering numerous internal and external elements. Apart from individual factors such as attitudes, control beliefs, and personality traits, external aspects, including social norms, time, effort, monetary costs, infrastructural design, and policy initiatives, influence PB (Kühn and Bobeth 2022). Recent discourse among scholars implies that environmental psychologists should shift their focus towards predictors of high-impact behaviors, collective actions, social and societal transformations, cultural norms, and the interplay between individual behavioral changes and transformations in the socio-economic system. This shift in focus signifies a move towards a more comprehensive understanding of PB that incorporates the larger socio-economic context in which individuals are embedded (Kühn and Bobeth 2022). There is also a push toward critical environmental psychology, which argues that understanding PB necessitates a stronger focus on ideological influences, structures, and power. This emerging perspective critiques the field's historical emphasis on individual behavior change and calls for more attention to social connections, societal frameworks, and power dynamics. This viewpoint disputes the idea of individuals acting in isolation. It emphasizes the significance of broader social circumstances, societal structures, power dynamics, and their role in individual life stories and societal procedures. The concept asserts the necessity to comprehend what kinds of pro-environmental attitudes, values, or social norms are perpetuated in the context of individuals and how these are molded by power dynamics, the economic fabric of society, prevailing ideologies, and political structures (Kühn and Bobeth 2022).

Contemporary empirical studies have broadened the scope of the VBN theory to investigate new environments, such as energy conservation behaviors in the workplace. For example, research carried out in China utilized the VBN theory to scrutinize energy conservation practices within the workplace. The findings indicated that biospheric values significantly predicted pro-environment beliefs, awareness of consequences, and ascription of responsibility, which influenced energy conservation behavior in the workplace. This study exemplifies how the VBN theory can be utilized and extended to understand PB in different contexts. It underscores the ongoing relevance of the VBN theory even as environmental psychology continues to evolve and expand (Al Mamun et al. 2022). Recognizing the diversity of factors that influence PB and the growing emphasis on societal structures, power relations, and cultural norms in environmental psychology is crucial. This broader and more nuanced understanding of PB can help to develop more effective interventions for PB and contribute to the larger goals of sustainability and environmental protection. By integrating these newer perspectives and empirical studies into future work, researchers can ensure that their work is informed by and contributes to current theoretical developments. This will also enable them to address the central challenge of environmental psychology today: how the discipline can adapt to increase its impact and take on a more prominent role in promoting large-scale societal and systemic change within the social-ecological transformation (Kühn and Bobeth 2022). Therefore, this paper used the VBN to guide predictions of behavior based on observations of the values and beliefs of the individuals, values and beliefs shared by their community, and social influence (Chuang et al. 2020). Sustainability analyses have been extensively based on this theory (Ghazali et al. 2019; Liobikienė and Poškus 2019; Megeirhi et al. 2020; Wensing et al. 2019).

SI and PB

The use of communication to satisfy human needs is common among individuals. This process leads to the creation of social norms that reflect the collective opinions of group members about how to behave (Clark et al. 2019). Social influence is, therefore, crucial for shaping sustainable consumption behavior. Geng et al. (2017) suggest that social influence significantly impacts sustainable consumption among Chinese consumers. Consumers gather and share knowledge as members of the same social group or society. Equally, Chinese government agencies and nongovernmental organizations play a significant role in helping young Chinese adopt sustainable consumption habits (Geng et al. 2017). As a result, they weigh and consider the opinions of others when rating products or services (Clark et al. 2019; Farrow et al. 2017; Goyal and Goyal 2021). Also, promoting

recycling among families and friends will significantly change their environmental behavior (Han and Xu 2020). According to Cui et al. (2021), social influence is essential when encouraging the adoption of electric vehicles, widely regarded as the most environmentally friendly option. Furthermore, Chen et al. (2016) argue that antecedents such as peer pressure, environmental concerns, a positive self-perception, and social influence drive adolescent purchases of environmentally friendly goods.

Khalique et al. (2020) reported that social influence, green identity, and environmentally friendly brands influenced green purchasing decisions in Pakistan. Moreover, they assert that consumers who identify with environmentalists will always purchase green and environmentally friendly products. Hence, social influence is a significant factor in encouraging environmental behavior. Accordingly, social influence should be utilized when persuading others to select environmentally friendly goods and assisting consumers in differentiating between green and non-green ones (Khare 2019).

Blose et al. (2020) examined American and Chinese consumers and found that students would be interested in grassroots efforts to promote recycling through their families, friends, and neighbors. The influence of these groups on consumer purchasing decisions, awareness of products, and consumption habits is significant. Moreover, they are a source of information that influences both environmental knowledge and pro-environmental behavior since they transmit values and practices that directly affect the identity of the individual (Blose et al. 2020). In a related finding, positive and negative messages concerning sustainability on social media significantly impact consumer decisions to purchase sustainable items (Saeed et al. 2019). Matthies et al. (2012) argue that setting a role model can substantially influence how children react to their environment. Therefore, the study proposes the following:

H1: SI is significantly associated with PB.

H2: SI is significantly associated with EK.

Pro-environmental knowledge and behavior

Understanding the environmental consequences of human activity demonstrates an understanding of environmental knowledge (Afsar et al. 2016). Also, environmental knowledge entails understanding the natural environment, its principles, relationships, and ecosystems (Ahmad et al. 2021). Along with the environmental challenges and consequences, sustainable development requires everyone to participate. Similarly, environmental knowledge is the ability to comprehend and articulate the relative health of environmental systems (Dresner et al. 2015).

Individuals with good environmental knowledge engage in various environmental-friendly behaviors daily and are essential in directing environmental advancements (Amoah and Addoah 2021; Kim et al. 2021). However, several studies have found varied conclusions about protecting the environment. For example, environmental concerns are more important to consumers than product understanding (Di Martino et al. 2019). The authors suggest that consumer understanding of environmental issues does not affect their attitudes toward ecologically friendly or green items. However, green buying intentions are not significantly associated with environmental knowledge (Vicente-Molina et al. 2013). In addition, Lee (2011) found that environmental awareness is not associated with the desire to pay a premium for environmentally friendly clothes.

Similarly, other studies find no significant correlation between EK and green customer behavior (Chekima et al. 2016; Leonidou and Skarmeas 2017; Zarei and Maleki 2018). It has been shown that knowledge alone does not influence PB but is required for such behavior (Vicente-Molina et al. 2018). Using EK to understand PB can prove helpful and statistically significant (Amoah and Addoah 2021). Also, EK consumers are more likely to purchase green items, showing that overall environmental knowledge affects green purchasing intentions (Chekima et al. 2016).

Moreover, there is evidence that young millennials are more likely to buy eco-friendly products when they are aware of the environment and concerned (Alhosseini Almodarresi et al. 2019; Boeve-de Pauw et al. 2019; Liobikienė and Poškus 2019; Otto and Pensini 2017). Besides, environmentally knowledgeable consumers are more likely to choose green products, while environmentally insensitive consumers are less likely to do so (Alhosseini Almodarresi et al. 2019). Furthermore, according to Ode and Ayavoo (2020), knowledge application mediates knowledge management and firm innovation in Nigeria, which is a significant factor. Additionally, Jung et al. (2011) found that knowledge mediated the relationship between communication and political engagement in America through indirect effects of knowledge and efficacy. Finally, Zheng et al. (2010) found that knowledge and experience completely mediated the influence of organizational culture on organizational effectiveness. This work aims to understand better how personal environmental knowledge affects the association of social influence and pro-environmental behavior. Therefore, the study proposes the following:

H3: EK is significantly associated with PB.

H4: EK mediates the association between SI and PB.

Methodology

This study uncovered the relationship between SI, EK, and PB. Both theoretical and practical considerations informed the decision to concentrate on public employees within Cambodia. The questionnaire-based quantitative research approach and hypothesis constructed were used to test these relationships. Thus, quantitative analysis was deemed appropriate for this study since it can assess the intensity of a phenomenon (Queirós et al. 2017). Likewise, structural equation modeling (SEM) was also used to analyze the data. A covariance-based approach and the partial least squares (PLS) approach are widely utilized in SEM. Because PLS-SEM is more accurate than covariance-based testing for nonparametric and unprecedented data, this project chose PLS-SEM over covariance-based testing (Henseler 2018) and considering the emergence of complexity in existing theories (Hair et al. 2019). Equally, studies of perceptions and behavior can be conducted using this method (Ali et al. 2020; Raza et al. 2020; Ting et al. 2019). Equally, the statistics were computed using SPSS. Finally, the SEM was evaluated using SmartPLS3.

Due to their convenience and availability, convenience sampling techniques were used in this study (Bryman 2016), targeting public employees in Cambodia. Also, it is most appropriate for social science research (Rowley 2014). According to Soper (2020), a sample size of 200 participants is required to achieve statistical power ($1 - \beta = 0.95$), significance level ($\alpha = 0.05$), predicted effect ($\lambda = 0.3$), and latent variables of three with 18 observable variables. The study gathered 271 returned questionnaires, surpassing the essential requirement of 200, thereby providing sufficient data for the analysis. The demographic breakdown of the respondents showed that males constituted 52.9% and females 47.1%, 84.1% of respondents were between 18 and 35, while the remaining 15.9% were over 35 years old. Regarding education levels, 80.8% were bachelor, 15.6% were master, and 3.6% held doctorate degrees.

Measurement instruments

This study encompasses three primary variables: social influence, pro-environmental behavior, and environmental knowledge. The scale items were adapted from existing literature to fit the present context. All scales are deemed significant on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). Initially, the five-item measurement of SI was adapted from the works of Abreu and Mendes (2012), Hong et al. (2004), Rehman and Dost (2013), and Shanmugham and Ramya (2012). Moreover, the seven-item scale for PB was derived from Robertson and Barling (2017).

Lastly, the constructs for EK, encompassing six items, were sourced and adjusted from Mostafa (2007).

Confirmatory factor analysis (CFA) was employed to validate the measurement instruments for social influence, pro-environmental behavior, and environmental knowledge. Through CFA, the study assessed the reliability, convergent validity, and discriminant validity of the constructs. The adequacy of the measurement model was evaluated by analyzing factor loadings, internal consistency (Cronbach's alpha and composite reliability), and criteria such as the average variance extracted. Discriminant validity was assessed using the Fornell-Larcker criterion and HTMT ratios. These steps ensure the robustness and validity of the measurement instruments.

Measurement assessment

Evaluating the measurement model encompasses an analysis of internal consistency, convergent validity, and discriminant validity (Hair et al. 2016, 2011; Henseler et al. 2009). Outer loading values of 0.7 or higher are considered satisfactory (Hair et al. 2016). The internal consistency of the constructs was determined by computing composite reliability (CR) and Cronbach's alpha values. All the CRs were above the suggested value of 0.70 (Fornell and Larcker 1981). Each construct surpassed the 0.70 threshold for Cronbach's alpha. A strong convergent validity was observed as the average variance extracted (AVE) exceeded 0.50. The main results of the assessment, including loadings, Cronbach's alpha, CR, and AVE, are outlined in Table 1.

The following two methods determined discriminant validity in this study. Initially, the square root of the AVE of each element was compared to its correlation with other factors. A construct is considered to have sufficient discriminant validity if the square root of the AVE surpasses the respective correlations (Fornell and Larcker 1981). Following the data, the square root of AVE for the construct exceeded the correlation among the constructs (see Table 2). In addition, the heterotrait-monotrait ratio of correlations (HTMT) was used to assess discriminant validity further. Henseler et al. (2015) suggested a threshold value of 0.9; consequently, an HTMT value greater than 0.9 could pose issues for contested discriminant validity. As shown in Table 2, the discriminant validity of all constructs was affirmed.

Structural model

The structural model outcomes were scrutinized once the construct validity and reliability were verified. Before this stage, each construct underwent a multicollinearity test, and the variance inflation factor (VIF) was determined to eliminate the possibility of multicollinearity. As per Hair

Table 1 Factor loadings, reliability, and validity

Constructs	Loadings
Social influence (SI) (Cronbach's alpha=0.873, CR=0.908, AVE=0.664)	
SI1-I learn a lot about green products from my friends	0.848
SI2-I learn about environmental issues from my friends	0.839
SI3-I discuss with my friends environmentally friendly products	0.867
SI4-I discuss with my friends environmental issues	0.759
SI5-I always buy environmentally friendly products with my friends	0.753
Pro-environmental behavior (PB) (Cronbach's alpha=0.907, CR=0.926, AVE=0.644)	
PB1-I help my co-workers be environmentally friendly at work	0.758
PB2-I encourage my co-workers to turn off work-related equipment when not in use	0.807
PB3-I promote environmentally friendly behaviors among my co-workers	0.813
PB4-I persuade my organization to purchase environmentally friendly products	0.704
PB5-I permanently reduces the amount of energy consumption	0.870
PB6-I discuss with my leader how my organization can become more environmentally friendly	0.842
PB7-I encourage my organization to reduce its environmental impact	0.812
Environmental knowledge (EK) (Cronbach's alpha=0.906, CR=0.928, AVE=0.682)	
EK1-I know more about recycling than most people	0.829
EK2-I understand the implications of different types of product packaging on the environment	0.835
EK3-I understand the symbols and phrases used for the environment on product packaging	0.880
EK4-I have extensive knowledge about environmental issues	0.805
EK5-I know how to choose environmentally friendly products	0.861
EK6-I understand the process and benefits of recycling beyond the knowledge of the average person	0.737

Table 2 Discriminant Validity-Fornell and Larcker criterion

	EK	PB	SI
EK	0.826		
PB	0.743	0.802	
SI	0.594	0.602	0.815
HTMT			
EK			
PB	0.805		
SI	0.645	0.661	

Table 3 Hypotheses testing

	Path coefficient	SD	t-value	p-value	Decision
H1: SI->PB	0.243	0.043	5.647	0.000	Supported
H2: SI->EK	0.594	0.057	10.415	0.000	Supported
H3: EK->PB	0.600	0.034	17.903	0.000	Supported
		R^2		Q^2	
EK	0.353		0.230		
PB	0.592		0.369		

et al. (2011), the acceptable range for VIF tolerance in PLS-SEM lies between 0.20 and 5.0, and a VIF exceeding 5.0 or less than 0.20 signifies an issue with multicollinearity. The results indicated no multicollinearity, as the VIF values varied from 1.8 to 3.4. Furthermore, the capability of the model to predict endogenous constructs was assessed. This evaluation involved consideration of the coefficient of determination (R^2), cross-validated redundancy (Q^2), path coefficients (β), and the relevance of paths. The degree of hypothesis confirmation was gauged using standardized path coefficients. The effectiveness of the model is calculated by the power of each structural path (Gallardo-Vázquez and Sánchez-Hernández 2014). This was determined by utilizing the R^2 value of the latent dependent variable. Therefore, for every path between constructs, the ideal values should meet or surpass 0.1 (Falk and Miller 1992). Similarly, the R^2

value of 0.75, 0.50, or 0.25 for endogenous latent variables can be deemed significant, moderate, or weak, respectively (Hair et al. 2011; Henseler et al. 2009). The data (Table 3) showed that all R^2 values were between 0.353 and 0.592 for EK and PB, implying moderate outcomes and the model's predictive efficacy. Additionally, the Stone-Giesser test or cross-validated redundancy Q^2 was employed to appraise the predictive relevance of the endogenous constructs. A Q^2 exceeding 0 confirms the model's predictive significance, while a Q^2 less than 0 indicates an issue with the model (Castro and Roldán, 2013). Hence, it can be inferred that the prediction of constructs is substantial as the construct Q^2 values were 0.230 and 0.369 for EK and PB, respectively (See Table 3).

In the same vein, the issue of model misalignment can be sidestepped by utilizing the standardized root mean square

residual (SRMR) in PLS-SEM (Henseler et al. 2016). It is the standardized discrepancy between observed and predicted correlations (Hu and Bentler 1999; Kenny 2020). In this context, SRMR was employed to measure the overall model alignment. Nonetheless, an explicit SRMR threshold for PLS-SEM has not been proposed (Hair et al. 2016). Thus, an SRMR value less than 0.10 indicates a suitable model fit (Hu and Bentler 1998; Kara et al. 2022; Worthington and Whittaker 2006). This particular study yielded an SRMR of 0.09, demonstrating that it offered a suitable model fit.

Additionally, further examinations for fit adequacy and hypothesis testing were conducted to confirm the significance of the relationships (Table 3). The data supported H1, positing a positive link between SI and PB. The calculated path coefficient of 0.243 indicated that SI exerts a modest yet significant influence on PB. This finding was substantiated by a t -value of 5.647 ($p < 0.001$), underscoring the statistical significance of the relationship. This result implies that individuals tend to engage in pro-environmental behaviors when exposed to social influences that promote such behaviors.

The robust statistical support for H1 underscores the role of social dynamics in fostering positive environmental actions. The study also investigated the influence of SI on EK, leading to the formulation of H2. The analysis revealed a significant positive effect of SI on EK, with a path coefficient of 0.594. The corresponding t -value of 10.415 ($p < 0.001$) indicated a highly significant relationship. This outcome suggests that exposure to social influences contributes significantly to individuals' acquisition of environmental knowledge. Thus, individuals subjected to positive social cues are more likely to possess greater environmental knowledge. The robust empirical support for H2 highlights the pivotal role of social interactions in enhancing individuals' understanding of environmental issues. In further probing the dynamics of PB, the study assessed the impact of EK on PB, forming H3. The analysis yielded a substantial positive path coefficient of 0.600, indicating a strong influence of EK on PB. The calculated t -value of 17.903 ($p < 0.001$) emphasized the high statistical significance of this relationship. This outcome signifies that individuals with a deeper understanding of environmental issues are more inclined to engage in pro-environmental behaviors. The empirical substantiation of H3 underscores the importance of fostering environmental knowledge to promote and sustain positive environmental actions.

Finally, H4 evaluates if EK is a mediator in the connection between SI and PB (Table 4). The method of

5000-bootstrapping suggested by Hair et al. (2016) was employed in this study to investigate mediating influences. The total effect of SI on PB was found to be 0.599 ($t = 11.284$), signifying the overall influence of SI on PB. After accounting for the direct effect of SI on PB ($\beta = 0.243$, $t = 5.647$), the mediation analysis revealed an indirect effect via EK. Specifically, the mediating role of EK in the relationship between SI and PB was supported, with an estimated path coefficient of 0.356 ($t = 10.085$) and a $p < 0.001$. The 95% confidence interval for the indirect effect (0.279 to 0.421) fell entirely above zero, providing strong evidence for mediation. These results support H4, affirming that EK mediates the relationship between SI and PB. The findings of this mediation analysis highlight the nuanced mechanisms through which social influence shapes individuals' pro-environmental behaviors. The mediating role of environmental knowledge underscores the importance of knowledge acquisition in driving behavior change within the environmental context.

Additionally, the variance accounted for (VAF) was utilized in this research to calculate relative absorption and estimate the mediator's potency. The strength of the mediation impact (VAF value) on the connection between SI and PB was 0.59, as per the VAF formula devised by Hair et al. (2013). This indicates that EK is a supplementary partial mediator in the relationship between SI and PB since both direct and indirect effects were significant and positive. Such outcomes endorse the mediating capacity of environmental knowledge within the conceptual model.

Discussion

As environmental psychology undergoes transformative shifts, it is becoming increasingly multidimensional, extending its scope beyond the VBN theory (Kühn and Bobeth 2022). This study, centered on the Cambodian governmental sector, aligns with this paradigmatic evolution by employing the VBN theory while integrating SI and EK. Such an approach responds to academic calls for a shift towards predictors of high-impact behaviors, social and societal transformations, and incorporation of broader socio-economic contexts (Kühn and Bobeth 2022). It also touches upon the emergent emphasis on critical environmental psychology, which underscores the need for a deeper understanding of social frameworks, power dynamics, and ideological influences in PB.

Table 4 Mediation analysis

	Total effects		Direct effects		Indirect effects				
	β	t -value	β	t -value	Hypotheses	β	t -value	p value	BI (2.5–97.5%)
SI->PB	0.599	11.284	0.243	5.647	H4: SI->EK->PB	0.356	10.085	0.000	0.279–0.421

The data initially affirm that SI significantly impacts PB within Cambodian public organizations, an area frequently under-researched. Compared to studies conducted in China focusing on energy conservation behaviors in workplaces through the lens of VBN theory (Al Mamun et al. 2022). However, what makes this study distinct is its focus on Cambodia and, specifically, government employees—a demographic often overlooked in environmental psychology research. The high impact of SI on PB among Cambodian public employees suggests that societal norms and expectations play a more profound role in this context than might be apparent in Western settings. This unique Cambodian perspective posits SI as a powerful instrument for policy reform, suggesting that Cambodia's community leaders and high-ranking officials can be especially effective in advocating for sustainable practices.

Moreover, the results found a significant positive correlation between SI and EK. While such connections have been explored (Kühn and Bobeth 2022), this suggests that within the Cambodian public organization, social networks are more than just platforms for interaction—they serve as critical channels for disseminating environmental knowledge. This finding indicates a valuable policy direction; incorporating environmental education into training programs or workshops for government employees could produce multiplier effects throughout society. Additionally, consistent with broader literature (Al Mamun et al. 2022), EK positively influences PB. However, this work extends this discourse by showing how EK is an empowerment tool, specifically among Cambodian public employees. Unlike research focused on individual attributes, this work stresses the importance of socio-economic factors and policy imperatives within a Cambodian context. This underscores the need for policy initiatives to bolster environmental literacy within this demographic, potentially utilizing existing governmental communication channels for effective dissemination.

Ultimately, the study's finding that EK serves as a mediator between SI and PB offers a rich avenue for further exploration. In the context of Cambodian public employees, the implications are particularly intriguing. When employees are already equipped with environmental awareness, social campaigns or policy mandates that foster pro-environmental behavior are more likely to be effective. EK heightens the individual's awareness and contributes to a shift in values and attitudes toward environmental sustainability. Therefore, as public employees deepen their environmental understanding, social norms and influences around them can more effectively guide them toward sustainable practices.

Additionally, EK provides individuals the cognitive tools to act meaningfully on social influences. When people understand the environmental ramifications of their choices, social cues or directives translate into significant pro-environmental actions. This nuanced understanding also

holds the potential for better resource allocation within governmental policies and programs. Knowing that EK mediates SI and PB allows for more targeted educational and awareness campaigns. It suggests that policymakers could design initiatives to simultaneously enhance EK while leveraging SI, for example, by coupling social campaigns with workshops or seminars to raise environmental awareness. Likewise, this mediated relationship has specific implications for performance metrics. Understanding the role of EK in this dynamic allows for establishing new evaluative measures for environmental policies, essentially factoring in knowledge gain as an indicator of effectiveness alongside observed changes in behavior. For instance, areas with high SI but low EK could be targeted for educational interventions, as a modest increase in knowledge might yield significant improvements in pro-environmental behavior.

The implications of these findings are particularly salient in the Cambodian context. Given the hierarchical nature of Cambodian society and its emphasis on communal living and social harmony, SI can be a potent factor in shaping public behavior. Therefore, improving EK at the higher levels of government can lead to ripple effects that influence the entire organizational structure. If adequately educated about environmental issues, government leaders and officials can better wield their social influence to encourage sustainable practices among their subordinates and within their communities. Therefore, the interplay of SI, EK, and PB in this study enriches academic discourse and provides actionable insights for policy formulation, particularly within the context of Cambodia.

Limitation

Although this study offers valuable insights, it is not exempt from certain limitations. Firstly, the study relies predominantly on self-reported measures, which can be susceptible to social desirability biases. Respondents may overstate their environmental knowledge or pro-environmental behavior to align with perceived social norms, thus potentially skewing the results. Secondly, the focus on public employees in Cambodia may limit the generalizability of the findings. While valuable for understanding this demographic, the insights may not directly apply to other sectors or cultural contexts. Cambodia's unique socio-political landscape and cultural norms may interact differently with EK, SI, and PB than in other settings. Thirdly, the cross-sectional nature of the research design makes it challenging to establish causal relationships between the variables studied. While EK was found to mediate the relationship between SI and PB, longitudinal studies are needed to confirm these pathways over time and rule out alternative explanations. Another limitation pertains to the scope of the environmental knowledge assessed. The study did not distinguish between different

types of environmental knowledge, such as factual, procedural, or effectiveness knowledge, each of which could have varying impacts on pro-environmental behavior.

Additionally, the research did not examine the potential moderating factors that could influence the relationships among EK, SI, and PB. For instance, individual personality traits, external barriers such as institutional policies, or broader socio-economic factors could interact with these variables in complex ways that were not captured in the current study. Finally, while the study contributes to the theoretical understanding by integrating elements of the VBN theory with the constructs of SI and EK, it does not explore other potentially relevant theories or frameworks. This limitation means that other theoretical perspectives that could offer additional nuances to understanding pro-environmental behavior were not considered.

Despite these limitations, the study provides a crucial steppingstone for future research. It underscores the need for further studies that are more diverse in scope and methodology, offering a deeper understanding of the intricate relationships between social influence, environmental knowledge, and pro-environmental behavior, particularly in under-researched settings like Cambodia.

Conclusion

In the realm of evolving environmental psychology, this study delves into the confluence of social dynamics, environmental knowledge, and pro-environmental behavior within the public organization in Cambodia. By amalgamating the VBN theory with the influences of SI and EK, this research contributes insights germane to Cambodia's socio-cultural milieu. The study underscores the potent role of SI in driving PB among Cambodian public employees, a demographic often underrepresented in environmental psychology literature. This underscores the efficacy of societal norms in influencing behavior, suggesting that harnessing social influence can effectively promote sustainable practices.

Furthermore, the established correlation between SI and EK among Cambodian public employees accentuates the significance of social networks as conduits for disseminating environmental knowledge. This identifies a strategic avenue for policy formulation, advocating for integrating environmental education into training programs to enhance awareness. An important aspect of the study is the mediation that EK establishes between SI and PB, demonstrating its potential for transformation. As environmental awareness deepens, social influences gain efficacy in guiding sustainable actions, fostering a shift in values and attitudes towards environmental sustainability. SI has demonstrated a significant ability to shape behaviors within the Cambodian

context, characterized by social harmony and hierarchical structures. Strengthening EK among public officials possesses the potential to catalyze broader cultural shifts, embedding sustainability within the framework of the Cambodian public sector.

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Data availability Data will be available on request.

Declarations

Competing interests The authors declare no competing interests.

References

- Abreu M, Mendes V (2012) Information, overconfidence and trading: do the sources of information matter? *J Econ Psychol* 33(4):868–881. <https://doi.org/10.1016/j.joep.2012.04.003>
- Afsar B, Badir Y, Kiani US (2016) Linking spiritual leadership and employee pro-environmental behavior: the influence of workplace spirituality, intrinsic motivation, and environmental passion. *J Environ Psychol* 45:79–88. <https://doi.org/10.1016/j.jenvp.2015.11.011>
- Ahmad S, Islam T, Sadiq M, Kaleem A (2021) Promoting green behavior through ethical leadership: a model of green human resource management and environmental knowledge. *Leadersh Org Dev J* 42(4):531–547. <https://doi.org/10.1108/LODJ-01-2020-0024>
- Al Mamun A, Hayat N, Mohiuddin M, Salameh AA, Ali MH, Zainol NR (2022) Modelling the significance of value-belief-norm theory in predicting workplace energy conservation behaviour. *Front Energy Res* 10:940595
- Alhosseini Almodarresi SM, Tabataba'i-Nasab SM, Bagheri Garabolagh H, Mohammadi F (2019) Does citizenship behavior have a role in changing attitude toward green products? *Int J Manag Sci Eng Manag* 14(4):284–292. <https://doi.org/10.1080/17509653.2018.1563874>
- Ali M, Puah C-H, Ayob N, Raza SA (2020) Factors influencing tourist's satisfaction, loyalty and word of mouth in selection of local foods in Pakistan. *Br Food J* 122(6):2021–2043
- Amoah A, Addoah T (2021) Does environmental knowledge drive pro-environmental behaviour in developing countries? Evidence from households in Ghana. *Environ Dev Sustain* 23(2):2719–2738. <https://doi.org/10.1007/s10668-020-00698-x>
- Blose JE, Mack RW, Pitts RE, Xie HY (2020) Exploring Young U.S. and Chinese consumers' motivations to recycle. *J Int Consum Mark* 32(1):33–46. <https://doi.org/10.1080/08961530.2019.1618776>
- Boeve-de Pauw J, Van Hoof J, Van Petegem P (2019) Effective field trips in nature: the interplay between novelty and learning. *J Biol Educ* 53(1):21–33. <https://doi.org/10.1080/00219266.2017.1418760>
- Bryman A (2016) *Social research methods*. Oxford University Press
- Castro I, Roldán JL (2013) A mediation model between dimensions of social capital. *Int Bus Rev* 22(6):1034–1050
- Chekima B, Chekima S, Syed Khalid Wafa SAW, Igau OA, Sondoh SL (2016) Sustainable consumption: the effects of knowledge, cultural values, environmental advertising, and demographics. *Int J Sustain Dev World Ecol* 23(2):210–220. <https://doi.org/10.1080/13504509.2015.1114043>

- Chen YS, Tien WP, Lee YI, Tsai ML (2016) Greenwash and green brand equity. In 2016 Portland International Conference on Management of Engineering and Technology (PICMET) pp 1797–1803
- Chuang F, Manley E, Petersen A (2020) The role of worldviews in the governance of sustainable mobility. *Proc Natl Acad Sci* 117(8):4034. <https://doi.org/10.1073/pnas.1916936117>
- Cialdini RB, Goldstein NJ (2004) Social influence: compliance and conformity. *Annu Rev Psychol* 55:591–621
- Clark RA, Haytko DL, Hermans CM, Simmers CS (2019) Social influence on green consumerism: country and gender comparisons between China and the United States. *J Int Consum Mark* 31(3):177–190. <https://doi.org/10.1080/08961530.2018.1527740>
- Cui L, Wang Y, Chen W, Wen W, Han MS (2021) Predicting determinants of consumers' purchase motivation for electric vehicles: an application of Maslow's hierarchy of needs model. *Energy Policy* 151:112167. <https://doi.org/10.1016/j.enpol.2021.112167>
- Di Martino J, Nanere MG, Dsouza C (2019) The effect of pro-environmental attitudes and eco-labelling information on green purchasing decisions in Australia. *J Nonprofit Public Sect Mark* 31(2):201–225. <https://doi.org/10.1080/10495142.2019.1589621>
- Dresner M, Handelman C, Braun S, Rollwagen-Bollens G (2015) Environmental identity, pro-environmental behaviors, and civic engagement of volunteer stewards in Portland area parks. *Environ Educ Res* 21(7):991–1010. <https://doi.org/10.1080/13504622.2014.964188>
- Dunning D, Johnson K, Ehrlinger J, Kruger J (2003) Why people fail to recognize their own incompetence. *Curr Dir Psychol Sci* 12(3):83–87
- Falk RF, Miller NB (1992) A primer for soft modeling. University of Akron Press
- Farrow K, Grolleau G, Ibanez L (2017) Social norms and pro-environmental behavior: a review of the evidence. *Ecol Econ* 140:1–13. <https://doi.org/10.1016/j.ecolecon.2017.04.017>
- Fornell C, Larcker DF (1981) Structural equation models with unobservable variables and measurement error: algebra and statistics. *J Mark Res* 18(3):382–388
- Gallardo-Vázquez D, Sánchez-Hernández MI (2014) Structural analysis of the strategic orientation to environmental protection in SMEs. *BRQ Bus Res Q* 17(2):115–128
- Geiger SM, Geiger M, Wilhelm O (2019) Environment-specific vs. general knowledge and their role in pro-environmental behavior. *Front Psychol* 10:718
- Geng D, Liu J, Zhu Q (2017) Motivating sustainable consumption among Chinese adolescents: an empirical examination. *J Clean Prod* 141:315–322. <https://doi.org/10.1016/j.jclepro.2016.09.113>
- Ghazali EM, Nguyen B, Mutum DS, Yap S-F (2019) Pro-environmental behaviours and value-belief-norm theory: assessing unobserved heterogeneity of two ethnic groups. *Sustainability* 11(12):3237 (<https://www.mdpi.com/2071-1050/11/12/3237>)
- Goyal M, Goyal RK (2021) Confirming antecedents of green consumption intention: a sustainable model for food aggregators. *IETE J Res* 67(5):634–645. <https://doi.org/10.1080/03772063.2021.1906336>
- Hair JF, Ringle CM, Sarstedt M (2011) PLS-SEM: indeed a silver bullet. *J Mark Theor Pract* 19(2):139–152
- Hair JF, Hult GTM, Ringle C, Sarstedt M (2016) A primer on partial least squares structural equation modeling (PLS-SEM). Sage publications
- Hair JF, Black WC, Babin BJ, Anderson RE (2019) Multivariate data analysis (8 ed.). Cengage Learning
- Hair JF, Hult GTM, Ringle C, Sarstedt M (2013) A primer on partial least squares structural equation modeling (PLS-SEM) (1 ed.) Sage, Thousand Oaks
- Han R, Xu J (2020) A comparative study of the role of interpersonal communication, traditional media and social media in pro-environmental behavior: a China-based study. *Int J Environ Res Public Health* 17(6):1883. (<https://www.mdpi.com/1660-4601/17/6/1883>)
- Henseler J (2018) Partial least squares path modeling: Quo vadis? *Qual Quant* 52(1):1–8
- Henseler J, Ringle CM, Sarstedt M (2015) A new criterion for assessing discriminant validity in variance-based structural equation modeling. *J Acad Mark Sci* 43(1):115–135
- Henseler J, Hubona G, Ray PA (2016) Using PLS path modeling in new technology research: updated guidelines. *Ind Manag Data Syst* 116(1):2–20
- Henseler J, Ringle CM, Sinkovics RR (2009) The use of partial least squares path modeling in international marketing. In *New challenges to international marketing*. Emerald Group Publishing Limited
- Hong H, Kubik JD, Stein JC (2004) Social interaction and stock-market participation. *J Finance* 59(1):137–163. <https://doi.org/10.1111/j.1540-6261.2004.00629.x>
- Hu L-T, Bentler PM (1998) Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychol Methods* 3(4):424
- Hu LT, Bentler PM (1999) Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Struct Equ Model: Multidiscip J* 6(1):1–55
- Jung N, Kim Y, de Zúñiga HG (2011) The mediating role of knowledge and efficacy in the effects of communication on political participation. *Mass Commun Soc* 14(4):407–430. <https://doi.org/10.1080/15205436.2010.496135>
- Kara E, Kirpik G, Kaya A (2022) A research on digital violence in social media. In *Handbook of Research on Digital Violence and Discrimination Studies*. IGI Global
- Kenny DA (2020) Measuring Model Fit. Retrieved December 25, 2021 from <http://davidakenny.net/cm/fit.htm>
- Khalique M, Iftikhar S, Bin Yaacob MR, Tahir A (2020) Antecedents and mediating role of green buying behavior. *Market Forces* 15(2):22–22
- Khare A (2019) Green apparel buying: role of past behavior, knowledge and peer influence in the assessment of green apparel perceived benefits. *J Int Consum Mark* 1–17. <https://doi.org/10.1080/08961530.2019.1635553>
- Kim YD, Nam C, LaPlaca AM (2021) Marketing and communicating sustainability through college athletics: the effects of pro-environmental initiatives on the belief-attitude-intention hierarchy. *J Mark Higher Educ* 1–21. <https://doi.org/10.1080/08841241.2021.1892897>
- Kollmuss A, Agyeman J (2002) Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environ Educ Res* 8(3):239–260
- Kühn T, Bobeth S (2022) Linking environmental psychology and critical social psychology: theoretical considerations toward a comprehensive research agenda. *Front Psychol* 13:947243
- Lee S (2011) Consumers' value, environmental consciousness, and willingness to pay more toward green apparel products. *J Glob Fashion Market* 2(3):161–169. <https://doi.org/10.1080/20932685.2011.10593094>
- Leonidou CN, Skarmas D (2017) Gray shades of green: causes and consequences of green skepticism. *J Bus Ethics* 144(2):401–415. <https://doi.org/10.1007/s10551-015-2829-4>
- Liobikienė G, Poškus MS (2019) The importance of environmental knowledge for private and public sphere pro-environmental behavior: modifying the value-belief-norm theory. *Sustainability* 11(12):3324. (<https://www.mdpi.com/2071-1050/11/12/3324>)
- Matthies E, Selge S, Klöckner CA (2012) The role of parental behaviour for the development of behaviour specific environmental norms – the example of recycling and re-use behaviour. *J Environ*

- Psychol 32(3):277–284. <https://doi.org/10.1016/j.jenvp.2012.04.003>
- Megeirhi HA, Woosnam KM, Ribeiro MA, Ramkissoon H, Denley TJ (2020) Employing a value-belief-norm framework to gauge Carthage residents' intentions to support sustainable cultural heritage tourism. *J Sustain Tour* 28(9):1351–1370. <https://doi.org/10.1080/09669582.2020.1738444>
- Mostafa MM (2007) Gender differences in Egyptian consumers' green purchase behaviour: the effects of environmental knowledge, concern and attitude. *Int J Consum Stud* 31(3):220–229. <https://doi.org/10.1111/j.1470-6431.2006.00523.x>
- Ode E, Ayavoo R (2020) The mediating role of knowledge application in the relationship between knowledge management practices and firm innovation. *J Innov Knowl* 5(3):210–218. <https://doi.org/10.1016/j.jik.2019.08.002>
- Otto S, Pensini P (2017) Nature-based environmental education of children: environmental knowledge and connectedness to nature, together, are related to ecological behaviour. *Glob Environ Chang* 47:88–94. <https://doi.org/10.1016/j.gloenvcha.2017.09.009>
- Perry GLW, Richardson SJ, Harré N, Hodges D, Lyver POB, Maseyk FJF, Taylor R, Todd JH, Tylianakis JM, Yletyinen J, Brower A (2021) Evaluating the role of social norms in fostering pro-environmental behaviors [perspective]. *Front Environ Sci* 9. <https://doi.org/10.3389/fenvs.2021.620125>
- Queirós A, Faria D, Almeida F (2017) Strengths and limitations of qualitative and quantitative research methods. *Europ J Educ Stud*
- Raza SA, Ahmed R, Ali M, Qureshi MA (2020) Influential factors of Islamic insurance adoption: an extension of theory of planned behavior. *J Islam Mark* 11(6):1497–1515
- Rehman Z-u, Dost M (2013) Conceptualizing green purchase intention in emerging markets: an empirical analysis on Pakistan. The 2013 WEI International Academic Conference Proceedings
- Robertson JL, Barling J (2017) Toward a new measure of organizational environmental citizenship behavior. *J Bus Res* 75:57–66. <https://doi.org/10.1016/j.jbusres.2017.02.007>
- Rowley J (2014) Designing and using research questionnaires. *Manag Res Rev*
- Saeed MA, Farooq A, Kersten W, Ben Abdelaziz SI (2019) Sustainable product purchase: does information about product sustainability on social media affect purchase behavior? *Asian J Sustain Soc Responsib* 4(1):9. <https://doi.org/10.1186/s41180-019-0029-3>
- Shanmugham R, Ramya K (2012) Impact of social factors on individual investors' trading behaviour. *Proc Econ Fin* 2:237–246. [https://doi.org/10.1016/S2212-5671\(12\)00084-6](https://doi.org/10.1016/S2212-5671(12)00084-6)
- Soper DS (2020) A-priori sample size calculator for structural equation models [Software] <https://www.danielsoper.com/statcalc>
- Ting H, Fam K-S, Jun Hwa JC, Richard JE, Xing N (2019) Ethnic food consumption intention at the touring destination: the national and regional perspectives using multi-group analysis. *Tour Manag* 71:518–529
- Vicente-Molina MA, Fernández-Sáinz A, Izagirre-Olaizola J (2013) Environmental knowledge and other variables affecting pro-environmental behaviour: comparison of university students from emerging and advanced countries. *J Clean Prod* 61:130–138. <https://doi.org/10.1016/j.jclepro.2013.05.015>
- Vicente-Molina MA, Fernández-Sáinz A, Izagirre-Olaizola J (2018) Does gender make a difference in pro-environmental behavior? The case of the Basque Country University students. *J Clean Prod* 176:89–98. <https://doi.org/10.1016/j.jclepro.2017.12.079>
- Wensing J, Carraresi L, Bröring S (2019) Do pro-environmental values, beliefs and norms drive farmers' interest in novel practices fostering the Bioeconomy? *J Environ Manag* 232:858–867. <https://doi.org/10.1016/j.jenvman.2018.11.114>
- Worthington RL, Whittaker TA (2006) Scale development research: a content analysis and recommendations for best practices. *Couns Psychol* 34(6):806–838
- Zarei A, Maleki F (2018) From decision to run: the moderating role of green skepticism. *J Food Prod Mark* 24(1):96–116. <https://doi.org/10.1080/10454446.2017.1266548>
- Zheng W, Yang B, McLean GN (2010) Linking organizational culture, structure, strategy, and organizational effectiveness: mediating role of knowledge management. *J Bus Res* 63(7):763–771. <https://doi.org/10.1016/j.jbusres.2009.06.005>

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