Exploring the Role of Personal Norms and Environmental Concerns in Pro-Environmental Behavior: A Value-Belief-Norm Theory Perspective

Tusyanah Tusyanah[1]*; Amin Pujiati[2]; Wijang Sakitri[3]; Setia Budi Wibowo[4]; Ismiyati Ismiyati[5]

[1 3 4] Doctorate Program of Economics Education, Universitas Negeri Semarang, Semarang, Indonesia
[2] Department of Economics Development, Universitas Negeri Semarang, Semarang, Indonesia
[5] Department of Economics Education, Universitas Negeri Semarang, Semarang, Indonesia

*E-mail: tusyanah@mail.unnes.ac.id

Abstract. This study investigates the relationships between personal values, beliefs, social norms, and pro-environmental behavior (PB) using the Value-Belief-Norm (VBN) theory framework. Through quantitative methods, including structural equation modeling with Partial Least Squares (SEM-PLS), data from 162 university students were analyzed. Results indicate that altruistic values (AV) indirectly influence PB through personal norms (PN), while biospheric values (BV) positively predict PB directly. Environmental concerns (EC) shape personal norms, emphasizing the role of awareness in driving sustainable behavior. Conversely, egoistic values (EV) do not directly impact PB, suggesting individualistic orientations may not drive environmentally friendly behavior. Notably, personal norms emerge as the strongest predictor of PB, highlighting the importance of internalized moral obligations in fostering sustainability. This research contributes to understanding the complex dynamics underlying pro-environmental behavior, informing interventions and policies to promote environmental consciousness and action.

Keywords: Pro-Environmental Behavior, The Value-Belief-Norm (VBN) Theory, Personal Norms, Environmental Concerns

1 Introduction

The importance of increasing awareness about the potential impacts of climate change on our lives and the planet cannot be overstated. As scientists and policymakers agree, climate change is a pressing issue with far-reaching consequences. From rising

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sea levels to more frequent and intense weather extremes, the impacts of climate change are already manifesting in various ways. By understanding the individual and societal dynamics crucial to addressing the climate crisis and achieving the ambitious goals in the Paris Agreement and other climate change mitigation efforts, we can better design interventions and policies to motivate pro-environmental behavior.

The VBN theory offers a practical and valuable framework for achieving this objective. In their groundbreaking 1999 study on the VBN theory, Stern et al. provided a foundational understanding of how people's attitudes and actions toward the environment are shaped by their values, beliefs, and perceived social norms. Since then, researchers have applied this framework to investigate the personal, social, and environmental factors that impact pro-environmental decision-making in diverse populations and contexts.

For example, a study in Taiwan found that values related to environmental protection significantly predicted pro-environmental behavior among university students [1]. Similarly, research in Indonesia examined how climate change influenced pro-environmental actions and found that beliefs about the human cause of climate change and its seriousness were critical factors in predicting pro-environmental behavior [2].

These findings underscore the potential of the VBN theory to inform the design of interventions and policies that resonate with people's underlying values, beliefs, and social norms to promote more sustainable practices. By harnessing the power of the VBN theory, we can create a more positive future where people make choices that protect and preserve our planet for generations to come; as the IPCC report states, climate change is an existential threat that requires collective action on a global scale.

The VBN theory offers valuable insights for mobilizing the public and guiding policymakers toward the systemic changes needed to address this crisis head-on. By integrating the VBN framework into our efforts to combat climate change, we can build a stronger foundation for a sustainable future. The VBN theory can be successfully applied in various contexts, from promoting sustainable travel choices in urban areas to encouraging responsible post-consumption behaviors like recycling and reuse [3]. These applications highlight the versatility of the VB theory and its potential to drive positive environmental change across different sectors and populations. By continuing to refine and apply the VBN theory innovatively, we can create more effective strategies for motivating pro-environmental behavior and mitigating the impacts of climate change. As [4] show, the VBN theory can be applied to encourage responsible post-consumption behaviors like recycling and reuse, demonstrating its relevance and applicability across various environmental issues. By leveraging the insights from the VB theory, we can design more compelling interventions and policies that resonate with people's values, beliefs, and social norms and ultimately drive more sustainable practices and help mitigate the impacts of climate change. As [3] demonstrate in their study on marine conservation, the VBN theory can be successfully applied in marine contexts as well, providing valuable insights for encouraging pro-environmental behavior in these unique environments.

These diverse applications of the VBN theory underscore its flexibility and potential to drive positive environmental change across a wide range of contexts and populations. By building on the literature on personal norms and applying the VBN theory

innovatively, we can create more effective strategies for motivating pro-environmental behavior and mitigating the impacts of climate change. As [5] show in their study on hotel sustainability decisions, the VBN theory can be successfully applied to understand consumer decisions in the context of green hotels, demonstrating its relevance and applicability across a wide range of environmental issues and sectors.

These findings highlight the versatility of the VBN theory and its potential to drive positive environmental change in diverse contexts. By continuing to integrate the VBN theory into our efforts to combat climate change and promote sustainability, we can build a stronger foundation for a more positive future. As [3] demonstrate in their review of the VBN theory's applications, the theory has been successfully applied in various contexts, from promoting sustainable travel choices in urban areas to encouraging responsible post-consumption behaviors like recycling and reuse. These diverse applications underscore the theory's flexibility and potential to drive positive environmental change across various contexts and populations. By innovatively refining and applying the VBN theory, we can create more effective strategies for motivating pro-environmental behavior and mitigating the value-belief-norm theory's relevance and versatility. As [4] show, the VBN theory can be applied to encourage responsible post-consummation behaviors like recycling and reuse, demonstrating its relevance and applicability across various environmental issues.

The primary objective of the study is to conduct an in-depth analysis of pro-environmental behavior using the Values-Beliefs-Norms (VBN) theory. This theory will serve as the framework for evaluating and understanding the perspectives and behaviors related to the environment, making it a central element in the investigation.

2 Literature Review

2.1 Value Belief Norm Theory (VBN)

The Value Belief Norm (VBN) theory was first established by [6] to explain the influence of human values on behavior in an environmentalist context. This theory posits a relationship between values, beliefs, norms, and behavior in a casual chain. According to Schwartz's definition from 1992, value is a fundamental concept that guides our behavior based on desirable trans-situational goals. These goals can vary in relative importance depending on the individual, but they serve as a framework for decision-making and action-taking. In essence, values provide a set of principles that help us prioritize our actions and shape our attitudes towards various aspects of life, from personal relationships to societal norms. For the value components, altruistic values, biospheric values, egoistic values, and openness to change values were proposed based on Schwartz's theory of fundamental values. Altruistic value is collective value concerning other people and living species, which motivates people to engage in PEB. The second type of value, biospheric, emphasizes the biosphere, the environment, and the ecosystem. The third type of value, egoistic, refers to self-interest regarding society, which includes wealth, authority, and influence. Last but not least, openness to change refers to stimulation and self-direction based on the motivation of independent thought and action, which conflicts with the motivation of fulfilling others' expectations.

According to this theory, an individual's values shape how they perceive the world around them and affect their understanding of the potential outcomes of their actions. This understanding leads them to believe that they have the power to prevent the negative consequences of their actions. Building on this concept, [6] posit that this belief in personal agency creates a sense of moral obligation for individuals to take environmentally responsible actions.

2.2 Pro-Environmental Behavior (PEB)

Pro-Environmental Behavior (PEB) refers to an individual's conscious effort to reduce the negative impact of their actions on the environment. Such behavior includes adopting sustainable practices, reducing waste, conserving energy and other resources, and making eco-friendly choices that promote the environment's well-being. PEB is an essential aspect of responsible citizenship that helps preserve the natural environment for future generations. [7], and [8] emphasize the autonomy of actors and reduce harm to the world. Further, based on the perspective of the impact of behavior on the environment, the definition of pro-environmental behavior is subsequently extended to minimize the harm to the environment and benefit it. This definition focuses on improving environmental conditions while reducing negative impacts on the environment, including greenhouse gas emissions and waste of natural resources. In addition, from the sustainability perspective, pro-environmental behavior refers to behaviors that help improve environmental sustainability[9] This paper argues that pro-environmental behavior consciously protects the environment and improves sustainability. These behaviors can be applied only to specific locations, such as conservation behavior, or can involve general pro-environmental behavior, such as recycling, energy saving, and green purchasing [10].

3 Method

The type of research used in this research is quantitative research, where data collection and measurement are carried out in the form of numbers, which are then analyzed in statistical form. [11] states that quantitative research methods are based on positivism's philosophy. These methods are used to study specific populations or samples by collecting and analyzing data using statistical techniques. They were totaling 162 students. Data were tabulated and analyzed using SEM-PLS.

Table 1. The Operational Definitions of Each Variable

No	Variables	Definitions	Indicators
1	Biospheric values (BV)	Biospheric values are defined as a value orientation in which people assess phenomena based on costs or benefits to the ecosystem or biosphere [6]	Respecting the earth Unity with nature Protecting the environment Preventing pollution Sources: [8]
2	Egoistic values (EV)	Egoistic values are defined as people who do not care much about the well-being of others or their relationships with others, such as narcissists [12]	Social power: control over others, dominance Wealth: material possessions, money Authority: right to lead or command Influential: having an impact on people and events Ambitious: hardworking, aspiring Source: [13]
3	Altruistic values (AV)	Altruistic values (AV) are defined as personal values that encourage individuals to work for the welfare of others (including society and the biosphere). The primary focus of an individual's AV is prioritizing the collective well-being of others, including society and the ecosystem, rather than pursuing individual interests.	Equality A world at peace Social justice Helpful Source: [13]
4	Environmental Concerns (EC)	Environmental concerns (EC) are defined as awareness that environmental conditions are threatened by human resource consumption and pollution.	Natural Balance Anthropocentrism Human exceptionalism Ecological crisis Growth limitation Source: [14]

5	Personal norms (PN)	Feelings of moral obligation to do what is considered the "right thing" are known as personal norms. An example of a personal norm is reducing meat consumption to help preserve the earth. This concept was first introduced by Schwartz and Howard in 1981.	Buying organic milk Buying energy-saving light bulbs Source-separating Taking public transport Source: [15]
6	Pro-environmental behavior (PB)	Pro-environmental behavior refers to actions intended to enhance environmental conditions and reduce detrimental effects on the natural world whenever feasible [8]. These actions may be directed at specific settings, like conservation efforts, or encompass broader pro-environmental activities such as recycling, conserving energy, and making environmentally friendly purchases [10]	Conservation Environmental Citizenship Food Transportation Source: [16]

4 Result and Analysis

When conducting Structural Equation Modeling (SEM) analysis using Smart PLS, it is vital to consider three criteria for evaluating the outer model: convergent validity, discriminant validity, and reliability testing.

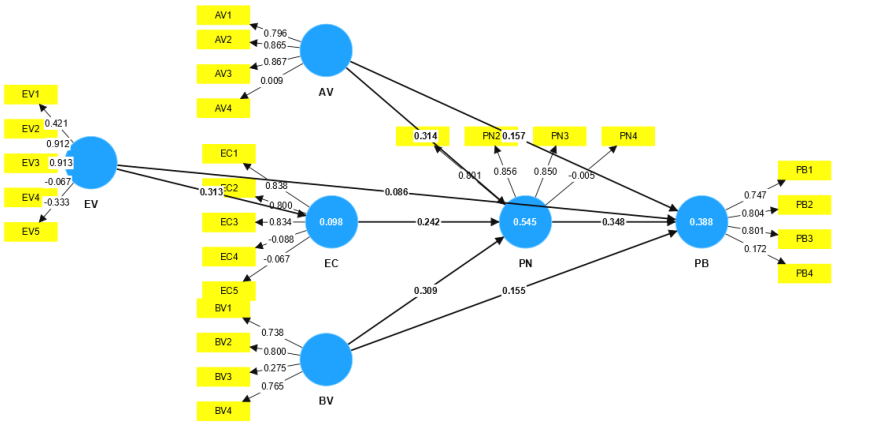

Figure 1. Outer Model (Measurement Model)

Convergent Validity

Convergent validity tests were carried out to assess outer loading and Average Variance Extracted (AVE) values. Table 2 shows the convergent validity by looking at the Average Variance Extracted (AVE) value in each research variable, i.e., in Table 2 as follows:

Table 2. Average Variance Extracted (AVE) Values for Research Variables

	Average Variance Extracted (AVE)	Level of AVE	Notes
AV	0,533	0,5	Valid
BV	0,562	0,5	Valid
EC	0,510	0,5	Valid
EV	0,592	0,5	Valid
PB	0,569	0,5	Valid
PN	0,524	0,5	Valid

Source: Processed Primary Data, 2023

In Table 2, it can be seen that the Average Variance Extracted (AVE) value in each research variable meets the rule of thumb, i.e., the Average Variance Extracted (AVE) value > 0.5. Thus, the variables in this research can become suitable research constructs.

Discriminant Validity

Discriminant validity testing is used to determine whether an indicator can be a good measure of the construct, with each indicator having to have a highly correlated value.

Discriminant validity can be seen through the cross-loading value; if the cross-loading value of the indicator in the variable is > 0.5, then it is considered valid. In this research, a minimum limit of 0.5 is used as a reference in determining whether a cross-loading value is valid or not. The value of the cross-loading indicator results for each research variable can be seen in Table 3 below:

Table 3. Cross Loading Factor

	AV	BV	EC	EV	PB	PN	Noted
AV1	0,796						Valid
AV2	0,865						Valid
AV3	0,867						Valid
AV4	0,009						Valid
BV1		0,738					Valid
BV2		0,800					Valid
BV3		0,275					Valid
BV4		0,765					Valid
EC1			0,838				Valid
EC2			0,800				Valid
EC3			0,834				Valid
EC4			-0,088				Valid
EC5			-0,067				Valid
EV1				0,421			Valid
EV2				0,912			Valid
EV3				0,913			Valid
EV4				-0,067			Valid
EV5				-0,333			Valid
PB1					0,747		Valid
PB2					0,804		Valid
PB3					0,801		Valid
PB4					0,172		Valid
PN1						0,801	Valid
PN2						0,856	Valid
PN3						0,850	Valid
PN4						-0,005	Valid

Reliability Test

Structural Equation Modeling (SEM) also requires reliability assumptions to measure the internal consistency of indicators used as a measuring tool for research variables. Reliability testing in SmartPLS 4.0 is done by looking at *Cronbach's alpha*

and composite reliability. *Cronbach's alpha* testing measures the lower limit of construct reliability values. Meanwhile, composite reliability is used to measure the actual value of construct reliability. [17] state that the rule of thumb is that the alpha or composite reliability value must be > 0.7, even though a value > 0.6 is still acceptable. The following are the results of *Cronbach's alpha*, which are presented in Table 9 as follows:

Table 4. Cronbach's Alpha of Each Variable

	Cronbach's alpha	**Taraf *Cronbach's Alpha***	**Notes**
AV	0,617	0,7	Reliable
BV	0,580	0,7	Reliable
EC	0,520	0,7	Reliable
EV	0,298	0,7	Reliable
PB	0,560	0,7	Reliable
PN	0,616	0,7	Reliable

Source: Processed Primary Data, 2023

Table 9 shows that the *Cronbach's alpha* value for each variable is > 0.7. Thus, each variable in this research is reliable and suitable for use as a research variable.

Inner Model Test (Structural Model)

The inner model or structural model test is used to determine the effect of the construct. The inner model test was analyzed using R-square, Q-square, and t-test for the significant value.

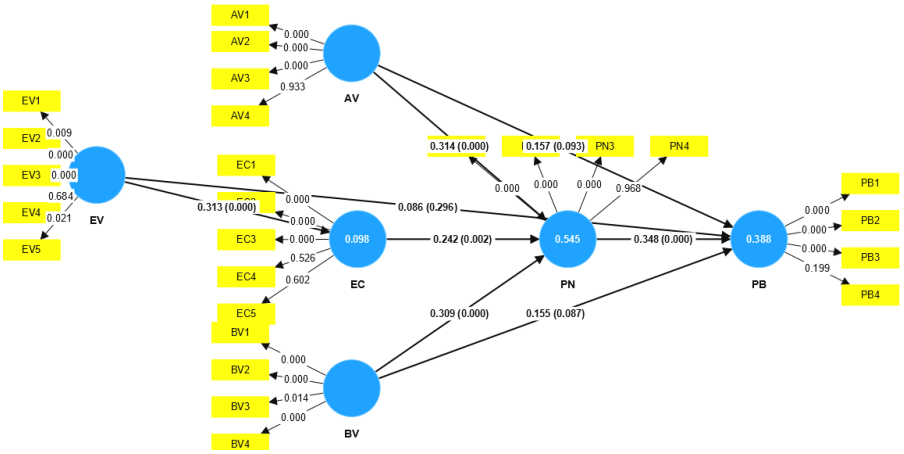

Figure 2. Inner Model (Structural Model)

Square Test

The R-square (R2) test is a fundamental statistical measure used in structural equation modeling (SEM) to evaluate how well the model explains the variation in dependent variables (endogenous) based on the variation in independent variables (exogenous). It tells us how much of the change in the dependent variables can be accounted for by the independent variables included in the model.

According to [18], who provided guidelines for interpreting R-square values, a high R-square value (greater than 0.67) indicates a robust model fit, meaning that the independent variables in the model effectively explain the variation in the dependent variables. Values between 0.33 and 0.67 suggest a moderate model fit, while values below 0.33 indicate a weak model fit, implying that the model may not adequately capture the variation in the dependent variables.

Table 5. R-Square

	R-square	Adjusted R-square	Notes
EC	0,098	0,092	Weak
PN	0,545	0,536	Moderate
PB	0,388	0,372	Moderate

Source: Processed Primary Data, 2023

Table 5. shows the model's explanatory power level for each construct examined. Environmental concerns (EC) have a relatively low R-square value of 0.098, indicating that the model explains only a tiny portion of the variation in environmental concerns. Other factors influencing individuals' environmental concerns are likely not accounted for in the model.

On the other hand, personal norms (PN) exhibit moderate explanatory power, with an R-square of 0.545. It implies that the model explains a significant proportion of the variance in personal norms. The included independent variables effectively capture the factors influencing personal norms related to pro-environmental behavior.

Similarly, pro-environmental behavior (PB) also shows moderate explanatory power, with an R-square of 0.388. It indicates that the model explains a substantial portion of the variation in pro-environmental behavior. However, additional factors influencing PB may still need to be included in the model.

Hypotheses Testing

Hypotheses testing in this research can be seen based on p-value and total effect to know the impact of a variable.

Table 6. Total Effects

	Original Sample (O)	Mean (M)	Standard deviation	T statistics (O/STDEV)	(P values)	Hypotheses	Notes

				(STD EV)				
AV -> PB		0,157	0,152	0,093	1,680	0,093	H1	Rejected
AV -> PN		0,314	0,314	0,081	3,888	0,000	H2	Accepted
BV -> PB		0,155	0,155	0,091	1,713	0,087	H3	Rejected
BV -> PN		0,309	0,309	0,073	4,217	0,000	H4	Accepted
EC -> PN		0,242	0,248	0,078	3,091	0,002	H5	Accepted
EV -> EC		0,313	0,337	0,086	3,634	0,000	H6	Accepted
EV -> PB		0,086	0,107	0,082	1,044	0,296	H7	Rejected
PN -> PB		0,348	0,348	0,082	4,262	0,000	H8	Accepted
EV -> EC -> PN -> PB		0,026	0,030	0,017	1,581	0,114	H9	Rejected
EV -> EC -> PN		0,076	0,084	0,037	2,053	0,040	H10	Accepted
AV -> PN -> PB		0,109	0,109	0,038	2,888	0,004	H11	Accepted
BV -> PN -> PB		0,108	0,107	0,034	3,130	0,002	H12	Accepted

Source: Processed Primary Data, 2023

In analyzing the structural equation model with partial least squares (SEM-PLS) results, we observed several hypotheses regarding the influence of different variables on Pro-environmental behavior (PB). Out of the 12 hypotheses tested, 8 (eight) hypotheses was accepted, while others were rejected based on statistical significance.

When analyzing the direct effects on pro-environmental behavior, we found that personal norms (PN) had the most significant direct impact. It suggests that an individual's norms are vital in shaping their environmental actions and significantly influencing their behavior. Following personal norms, biospheric values (BV) were the second most influential predictor of pro-environmental behavior. It indicates a positive relationship between individuals' environmental concerns and engagement in environmentally friendly behavior. On the other hand, egoistic values (EV) showed no significant direct effect on pro-environmental behavior, suggesting that self-centered values may not strongly motivate environmentally friendly actions.

Our analysis showed that both Altruistic values (AV) and Biospheric values (BV) were effectively mediated by Personal norms (PN) in influencing Pro-environmental behavior (PB). It means that individuals with altruistic or biospheric values are more likely to engage in pro-environmental behavior due to the influence of their norms. The descriptions of each hypothesis can be seen below:

AV -> PB (H1): This hypothesis posits that Altruistic values (AV) significantly affect Pro-environmental behavior (PB). However, it is rejected due to a p-value of 0.093, indicating insufficient evidence to support this relationship. Altruistic values (AV) do not significantly influence Pro-environmental behavior (PB). It shows that, although a person may have Altruistic values (AV), these are not always reflected in concrete actions to protect the environment. We suspect these actions may be due to time constraints, costs, or a lack of awareness of practical ways to support the environment.

AV -> PN (H2): This hypothesis suggests that Altruistic values (AV) significantly influence Personal norms (PN). It is accepted with a p-value of 0.000, indicating strong evidence supporting this relationship. Altruistic values (AV) influence Personal norms (PN). Although Altruistic values (AV) do not directly encourage pro-environmental behavior, they can form Personal norms (PN) that influence a person's actions towards the environment. This finding is consistent with the findings of [19], who state that altruistic values (AV) act as a factor that influences personal norms (PN). The findings suggest that the right strategy is to make consumers aware of the negative impact of excessive energy consumption on the environment, especially for future generations.

BV -> PB (H3): The hypothesis posited that Biospheric Values (BV) have an insignificant impact on Pro-environmental Behavior (PB). This hypothesis was tested and subsequently rejected, as indicated by a p-value of 0.087. Therefore, it is concluded that Biospheric Values (BV) do not significantly influence Pro-environmental Behavior (PB). This suggests that other factors may be more critical in driving Pro-environmental Behavior.

BV -> PN (H4): This hypothesis suggests that Biospheric values (BV) significantly influence Personal norms (PN). It is accepted with a p-value of 0.000, indicating strong support for this relationship. Biospheric values (BV) influence Personal norms (PN), showing that individual awareness of the importance of the biosphere for human life can form the basis for developing internal norms that encourage pro-environmental actions. In this case, biospheric values influence individuals' attitudes toward the environment and shape their norms (PN), guiding actions to protect and maintain the environment.

EC -> PN (H5): This hypothesis proposes that Environmental concerns (EC) significantly affect Personal norms (PN). It is accepted with a p-value of 0.002, indicating strong evidence supporting this relationship. Environmental concerns (EC) also influence Personal norms (PN). This finding suggests that the greater a person's awareness of environmental issues, the more likely they are to internalize Personal Norms (PN) that encourage pro-environmental actions. This finding is consistent with [20], who found that environmental concerns (EC) influence personal norms (PN) regarding single-use plastic, highlighting the increasing global concern over the use of single-use plastics, especially in food packaging.

EV -> EC (H6): This hypothesis suggests that Egoistic values (EV) significantly influence Environmental concerns (EC). It is accepted based on a p-value of 0.000, indicating strong support for this relationship. Meanwhile, selfish values do not have a significant influence on pro-environmental behavior. This finding could indicate that a more individualistic or egoistic orientation is less likely to influence a person's decision to act for the environment.

EV -> PB (H7): This hypothesis posits that Egoistic values (EV) significantly affect Pro-environmental behavior (PB). However, it is rejected due to a p-value of 0.296, indicating insufficient evidence to support this relationship. While egoistic values (EV) may not directly drive pro-environmental behavior (PB), they can indirectly influence it by shaping environmental concerns (EC), which in turn affect personal norms (PN) and, consequently, pro-environmental behavior (PB).

PN -> PB (H8): This hypothesis suggests that Personal norms (PN) significantly influence Pro-environmental behavior (PB). It is accepted with a p-value of 0.000, indicating strong support for this relationship. Personal norms (PN) emerge as a significant predictor of Pro-environmental behavior (PB), highlighting the importance of internalized moral obligations in fostering sustainable actions.

EV -> EC -> PN -> PB (H9): This hypothesis proposes a sequential relationship where Egoistic values (EV) influence Environmental concerns (EC), which then influence Personal norms (PN) and finally impact Pro-environmental behavior (PB). It is rejected due to a p-value of 0.114, indicating insufficient evidence to support this complex relationship. Environmental concerns (EC) play a crucial role in linking Egoistic values (EV) with Pro-environmental behavior (PB). Individuals who may initially prioritize personal interests over environmental concerns may begin to act on behalf of the environment when they become aware of the negative consequences that may arise.

EV -> EC -> PN (H10): This hypothesis suggests that Egoistic values (EV) significantly influence Environmental concerns (EC), which in turn influence Personal norms (PN). It is accepted with a p-value of 0.040, indicating strong support for this sequential relationship. Egoistic values (EV) may not directly drive pro-environmental behavior (PB). However, when coupled with increased environmental awareness, individuals are more likely to adopt pro-environmental behavior in response to their concerns.

AV -> PN -> PB (H11): This hypothesis proposes a sequential relationship where Altruistic values (AV) influence Personal norms (PN), which then influence Pro-environmental behavior (PB). It is accepted with a p-value of 0.004, indicating strong evidence supporting this sequential relationship. Moreover, these findings emphasize the importance of internal factors within individuals supported by actual actions to protect the environment. Personal norms (PN) are significant in directing individual behavior, reinforcing that individuals' values and beliefs guide their environmental actions.

BV -> PN -> PB (H12): This hypothesis also suggests a sequential relationship where Biospheric values (BV) influence Personal norms (PN), which then influence Pro-environmental behavior (PB). It is accepted with a p-value of 0.002, indicating strong support for this sequential relationship.

The research findings uncovered strong connections between an individual's values, beliefs, and engagement in environmentally friendly behaviors. Pro-environmental behavior encompasses actions to safeguard the environment from various forms of harm. A variety of factors influence this behavior.

While prioritizing concern for others (AV) may not always directly result in sustainable actions, it can significantly shape our internal moral guidelines (PN) regarding what is ethically correct. Additionally, placing a high value on nature (BV) strongly influences the shaping of our internal moral standards and drives environmentally responsible behaviors. Moreover, being concerned about the state of the environment (EC) also plays a crucial role in guiding our internal moral compass, indicating that heightened awareness fosters a sense of responsibility. Even when our focus is primarily on self-interest (EV), showing concern for the environment can prompt action if we increase our awareness.

The results are vital for promoting environmentally friendly actions and highlighting the significance of values, beliefs, and consciousness in shaping a sustainable future.

5 Conclusion

Analyzing the structural equation model with partial least squares (SEM-PLS) results provides valuable insights into the factors influencing pro-environmental behavior (PB). It is concluded that:

1) Personal norms (PN) emerge as the most influential factor directly impacting pro-environmental behavior. It underscores the significance of individuals' internalized moral obligations in shaping their environmental actions.
2) Altruistic values (AV) and Biospheric values (BV) were identified as successful mediators in the relationship between themselves and PB, mediated through PN. It suggests that individuals' altruistic and biospheric values influence their pro-environmental behavior partially through personal norms.
3) While some hypotheses were rejected, indicating no significant direct or mediated effects, these findings still contribute to our understanding of the complex interplay between values, norms, and behavior in the environmental context.

Understanding these dynamics can inform strategies to promote pro-environmental actions and foster a more environmentally conscious society.

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