

The Dual Dimension of Consciousness: Environment and Health as Predictors of Environmentally Friendly Behavior

Joan S. Awingan¹, and Shi ching Wu²

¹Biology Department, Adamson University, Manila, Philippines

²Environmental Education, TransWorld University, Douliu, Taiwan

Article Info

Article history:

Received Apr 23, 2025

Revised May 27, 2025

Accepted Jun 27, 2025

Online First Jun 29, 2025

Keywords:

Community Participation

Environmental Awareness

Health Awareness

Pro-Environmental Behavior

ABSTRACT

Purpose of the study: This study was conducted to determine the influence of environmental and health awareness on people's pro-environmental behavior.

Methodology: The subjects in this study were 203 residents of Tondo District, Manila, Philippines, selected using non-probability sampling and accidental sampling techniques. Confirmatory Factor Analysis (CFA) was used to test the validity of the measuring instrument, and Multiple Regression Analysis was used to test the research hypotheses.

Main Findings: The results of the study indicate that there is a joint influence of environmental awareness and health on the pro-environmental behavior of people living in Tondo District, Manila, Philippines. The results of the minor hypothesis test indicate that general belief, personal attitude and health self-monitoring have a significant influence on Pro-environmental. The results also show that the proportion of Pro-environmental variance explained by all independent variables is 26.9%, while the remaining 73.1% is influenced by other variables outside this study.

Novelty/Originality of this study: The novelty of this study lies in its integrated examination of environmental awareness and health as dual predictors of pro-environmental behavior in society. Unlike previous studies that focused solely on the ecological or health dimensions, this research offers a holistic perspective, highlighting how shared awareness influences people's sustainable actions in their daily lives.

This is an open access article under the [CC BY](https://creativecommons.org/licenses/by/4.0/) license



Corresponding Author:

Joan S. Awingan,

Biology Department, Adamson University

00 San Marcelino St., Ermita, Manila, Metro Manila, Philippines

Email: jsawngn112@gmail.com

1. INTRODUCTION

Environmental issues have become a global concern as the negative impacts of human activities on the natural environment increase [1], [2]. Global warming, air and water pollution, and ecosystem damage pose serious challenges to the Earth's sustainability [3], [4]. Amid this crisis, it is crucial to encourage pro-environmental behavior among every individual in society [5], [6]. This behavior includes conscious actions such as waste management, energy conservation, and the use of environmentally friendly transportation. Efforts to encourage behavioral change in society require an understanding of the factors that influence it.

One important factor influencing pro-environmental behavior is environmental awareness [7], [8]. This awareness encompasses an individual's understanding, attitude, and responsibility for environmental conditions and preservation. Individuals with high environmental awareness tend to be more concerned and active in preserving their surroundings [9], [10]. This awareness can be developed through education, public campaigns,

and personal experience [5], [11]. Therefore, the role of environmental awareness in triggering behavioral change requires further research.

In addition to environmental awareness, health awareness also contributes to pro-environmental behavior. People who are aware of the importance of health tend to choose lifestyles that also have a positive impact on the environment [12], [13]. Examples include choosing organic food, avoiding plastic use, and walking or cycling more frequently. These healthy lifestyles benefit not only individuals but also the wider environment [14], [15]. Therefore, it is important to explore the relationship between health awareness and environmentally friendly behavior.

Unfortunately, many people still have low awareness of the impact of their behavior on the environment and health. Lack of information, low awareness, and a consumerist lifestyle are the main causes [16], [17]. However, positive change can only occur if the public has a comprehensive understanding and high awareness. Educational interventions and public policies have not fully addressed the root of this problem. Therefore, an awareness-based approach needs to be the primary strategy in designing behavior change programs [11], [18].

Various studies have examined pro-environmental behavior from social, economic, and educational perspectives [19], [20]. However, few studies have integrated environmental awareness and health awareness variables simultaneously [21], [22]. Yet, these two aspects are interrelated and have the potential to reinforce each other in shaping people's behavior. This study attempts to fill this gap by analyzing the combined influence of both forms of awareness on pro-environmental behavior. Thus, the results are expected to provide a new perspective in the field of environmental behavior studies.

Many regions still face significant challenges in environmental management and healthy lifestyles [23], [24]. Urbanization, increasing waste volumes, and a lack of environmentally friendly public facilities are major problems [25], [26]. Therefore, understanding public awareness is an important first step. This research provides a picture of the extent to which the public is aware of the relationship between the environment and health in their daily lives. The results can also inform the formulation of policies that are more responsive to the community's social conditions.

Although various studies have examined pro-environmental behavior through the perspectives of knowledge, attitudes, and social factors, research that simultaneously integrates environmental awareness and health awareness as two complementary predictors is still very limited. Yet, these two dimensions are strongly linked in shaping people's lifestyles and daily decisions, especially in densely populated areas vulnerable to health risks and environmental degradation. The novelty of this study lies in its integrated analysis, which positions both forms of awareness as psychological constructs that work together to influence pro-environmental behavior. Furthermore, the urgency of this research is heightened given the low level of public awareness of the relationship between healthy living and environmentally friendly behavior, as well as the persistent high levels of health and pollution problems in urban areas such as Tondo District. Therefore, the results of this study are crucial as a basis for designing more effective educational interventions and public policies, particularly those that prioritize a dual awareness approach to strengthen sustainable behavior at the community level.

Based on this background, this study aims to examine the influence of environmental awareness and health awareness on pro-environmental behavior in the community. It also aims to determine whether these two forms of awareness support each other in shaping sustainable behavioral patterns. The findings of this study are expected to provide theoretical and practical contributions to efforts to change public behavior. Furthermore, the results can provide input for government agencies and social organizations in designing more effective educational programs. This approach is expected to create a more caring, healthy, and environmentally friendly society.

2. RESEARCH METHOD

2.1. Research Subjects

The population in this study was the people living in Tondo District, Manila, Philippines. The sample size was 203 individuals aged 20–60 years. The sampling method used was non-probability sampling, where not all individuals in the population have an equal chance of being selected [27], [28]. The technique used was accidental sampling, which involves selecting individuals who happened to be encountered by the researcher during data collection in the field.

2.2. Data Collection Techniques

In this study, the data collection technique used a scale as a measurement tool. The scale used was a Likert scale, which is a statement of opinion presented to respondents indicating agreement or disagreement. Responses to each item on this instrument ranged from the highest (very positive) to the lowest (very negative) [29]. This data collection instrument consisted of positive (favorable) and negative (unfavorable) statements. The highest score was given to the "strongly agree" response option, and the lowest score was given to the "strongly

disagree" response option. The highest score for unfavorable statements was given to the "strongly disagree" response option, and the lowest score was given to the "strongly agree" response option.

Table 1. Likert Scale Scores

Scale	Favorable	Unfavorable
Very Often	4	1
Often	3	2
Not Often	2	3
Very Not Often	1	4

2.3. Research Instruments

The pro-environmental behavior measurement tool used is based on a modification of Davies, Green and Reed from the results of adapting the items and indicators of the General Ecological Behavior Scale developed by Kaiser by including various types of pro-environmental behavior without including questions containing a person's intentions towards the behavior.

Table 2. Pro-Environmental Behavior Indicators

Indicator	Statement Number
Recycling	1,2,3
Mobility and Transportation	4,5,6
Waste avoidance	7,8,9
Consumerism	10,11,12
Energy conservation	13,14,15
Vicarious, Social behavior	16,17,18
Total	18

In this study, researchers measured environmental awareness using a measuring tool adapted from Shancez and Lafuente which uses three components of environmental awareness [30], [31], namely general beliefs/values, personal attitudes, information/knowledge.

Table 3. Environmental Awareness Indicators

Aspect	Indicator
General belief/Values	Attitudes toward global environmental conditions
	Level of agreement with statements related to environmental concern
	Support for actions toward water improvement and management
Information / knowledge	The extent to which an individual considers themselves informed about environmental issues
	A person's specific environmental knowledge
Personal attitudes	Level of agreement with statements related to an individual's attitude toward pro-environmental behavior (personal norms and self-efficacy)
	Level of agreement with pro-environmental proposals.

Next, researchers measured health awareness using a measuring tool adapted from Gould which uses four components of environmental awareness, namely health alertness, health self-consciousness, health involvement, and health self-monitoring.

Table 4. Health Awareness Indicators

Aspect	Indicators
Health Alertness	A person's level of health awareness
Health Self consciousness	A person's awareness of their health.
Health Involvement	A person's involvement in maintaining their health.
Health Self – Monitoring	An individual's ability to monitor and demonstrate healthy behaviors.

2.4. Data Analysis Techniques

Prior to data analysis, Confirmatory Factor Analysis was used to assess the construct validity of each item and to test the theoretically derived factor structure [32], [33]. Factor analysis is a statistical analysis method used to reduce the factors influencing a variable to a set of indicators without losing significant information [34]. Through factor analysis, construct variable data (factor scores) are obtained as input for further analysis or research data.

In this study, hypotheses will be tested using statistical analysis. Therefore, the existing research hypothesis will be transformed into a null hypothesis. This null hypothesis will be tested in the subsequent statistical analysis. Multiple regression analysis, with more than one independent variable, is used to determine their influence on the dependent variable. In this study, there are eight independent variables and one dependent variable. The regression line equation formula is used:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + \dots + b_8X_8 + b_9X_9 + e$$

3. RESULTS AND DISCUSSION

Hypothesis testing was conducted to determine the influence between variables in this study. The analysis was conducted using Multiple Regression Analysis. The data analyzed were factor scores or true scores obtained from the factor analysis results. The researcher then converted these factor scores into T-scores.

In conducting regression analysis, three factors were assessed: the R-squared value to determine the percentage of dependent variance explained by the independent variables; the overall effect of the independent variables on the dependent variable; and the significance of the regression coefficients for each independent variable.

Hypothesis testing was conducted in several stages. First, the researcher examined the R² value to determine the percentage of independent variance explained by the dependent variable. A table containing the R² values can be seen in Table 5 below:

Table 5. Regression Analysis Summary Model

Model	R	R Square	Adjusted R Square	Standars Error of the Estimate
1	.519 ^a	.269	.235	13.11847

a. Predictors: (Constant), Gender, Information, Education level, Health Self Consciousness, Health Alertness, General Belief, Health Involvement, Personal Attitude Health Self-monitoring

Based on the data in Table 5, the R² value is 0.269, or 26.9%. This means that the proportion of variance in pro-environmental behavior explained by all independent variables in this study is 26.9%, while the remaining 73.1% is influenced by other variables outside this study. The second step is to analyze the impact of all independent variables on pro-environmental behavior. The results of the F test can be seen in Table 6:

Table 6. ANOVA of the Overall Influence of General Belief, Personal Attitude, Information, Health Alertness, Health Self-Consciousness, Health Involvement, Health Self-Monitoring, Education Level and Gender on Pro-Environment

Model		Sum of Aquares	df	Mean Square	F	Sig.
1	Regression	12236.655	9	1359.628	7.900	.000 ^a
	Residual	33214.179	193	172.094		
	Total	45450.834	202			

a. Predictors: (Constant), Gender, Information, Education level, Health Self-Consciousness, Health Alertness, General Belief, Health Involvement, Personal Attitude Health Self-monitoring

b. Dependent Variable: Pro-environment

Based on the table above, it is known that the Sig. value in the rightmost column is 0.000. Thus, it is known that the Sig. value <0.05, then the major hypothesis that states there is no significant influence of the dimensions of environmental awareness (general belief, information, and personal attitude), dimensions of health awareness (health alertness, health self-consciousness, health involvement, and health self-monitoring) and demographics (level of education and gender) on pro-environmental behavior is rejected. This means that there is a significant influence of general belief, information, personal attitude, health alertness, health self-consciousness, health involvement, health self-monitoring, level of education and gender on pro-environmental behavior.

The final step is to examine the regression coefficients for each independent variable. To determine whether the resulting regression coefficients are significant, look at the Sig. column (sixth column). If Sig. <0.05, the resulting regression coefficient significantly influences pro-environmental behavior, and vice versa. The magnitude of the regression coefficients for each IV on pro-environmental behavior can be seen in Table 7 below.

Table 7. Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	20.446	5.230		3.909	.000
	General belief	.179	.082	.179	2.180	.030
	Information	-.041	.078	-.041	-.524	.601
	Personal attitude	.396	.090	.396	4.402	.000
	Health alertness	-.034	.084	-.034	-.409	.683
	Health self-consciousness	.139	.071	.139	1.958	.052
	Health involvement	.133	.092	.133	1.444	.150
	Health self-monitoring	-.226	.087	-.226	-2.603	.010
	Education level	.811	.950	.054	.854	.394
	Gender	-1.407	1.921	-.046	-.732	.465

a. Dependent Variable: Pro-environment

Based on the table, the pro-environmental regression equation can be seen: $20,446 + 0.179$ (General Belief) $- 0.41$ (Information) $+ 0.396$ (Personal Attitude) $- 0.034$ (health alertness) $+ 0.139$ (health self-consciousness) $+ 0.133$ (health involvement) $- 0.226$ (health self-monitoring) $+ 0.811$ (Education level) $- 1.407$ (Gender).

The results of the study indicate that general beliefs/values, personal attitudes, health self-awareness, and health self-monitoring significantly influence pro-environmental behavior.

The general belief variable has a significant, positive effect on pro-environmental behavior [19], [35]. This means that the higher a person's general belief in environmental values, the higher their tendency to engage in pro-environmental behavior. General beliefs/values in non-pro-environmental sectors influence pro-environmental behavior. In the context of this study, most respondents demonstrated relatively low levels of general beliefs. This is reflected in their negative perceptions of waste, which they consider to have no economic value, and in the lack of organized waste management and water conservation systems in their local environment.

The personal attitude variable also has a significant, positive effect on pro-environmental behavior. The more positive a person's personal attitude toward environmental issues, the higher their pro-environmental behavior. The low level of personal attitude among the majority of participants is evident in their minimal active participation in maintaining environmental cleanliness [36], which ultimately impacts the high risk of flooding in the areas where they live.

Furthermore, health self-awareness also demonstrated a significant positive influence on pro-environmental behavior [37], [38]. The greater an individual's awareness of their health, the greater their tendency to engage in pro-environmental behavior [39], [40]. However, the majority of participants in this study demonstrated low levels of health self-awareness. This is evident in their lack of concern about the health impacts of unhealthy lifestyles, such as smoking and the accumulation of waste in their neighborhoods.

In contrast, the health self-monitoring variable showed a significant, negative effect on pro-environmental behavior [41], [42]. This means that the lower an individual's self-monitoring of their health, the higher their tendency to engage in pro-environmental behavior, and vice versa. In this study, most respondents did not actively monitor their health, such as through regular exercise, cycling, or regular health check-ups. Furthermore, the data also showed a high prevalence of diarrhea compared to other regions, as well as a predominance of respondents who smoked.

Other variables, such as information, health alertness, health involvement, education level, and gender, did not show a significant effect on pro-environmental behavior. The information variable did not have a significant effect. The low impact of this variable may be due to the lack of access to information or education about the importance of environmental conservation received by participants. Health alertness also did not show a significant effect on pro-environmental behavior. This can be explained by respondents' low awareness of the potential for diseases caused by environmental pollution.

Individual participation in maintaining personal health remains relatively low, as evidenced by the lack of medical consultations and health-related educational activities, such as public awareness of the dangers of smoking. The variable of education level was not significant for pro-environmental behavior, higher education was positively related to such behavior. Finally, gender also did not significantly influence pro-environmental behavior. Gender is not a dominant factor without adequate educational and socioeconomic background support. The majority of female respondents in this study were housewives with secondary education, which may explain the insignificant role of gender in pro-environmental behavior.

The findings of this study provide significant implications for the development of educational programs and community-based interventions. The integration of environmental and health awareness shows that pro-environmental behavior change cannot stand alone without considering factors related to individual physical

well-being. Therefore, these results can serve as a foundation for local governments, educational institutions, and social organizations to design more comprehensive strategies—such as environment-based health programs, integrated cleanliness campaigns, or training on healthy and environmentally friendly lifestyles in densely populated areas. This integrated approach has the potential to enhance the effectiveness of interventions because it addresses individual motivation from both ecological sustainability and personal health perspectives. However, this study has several limitations. The use of non-probability sampling, particularly accidental sampling, restricts the generalizability of the findings to a broader population. In addition, the reliance on self-report instruments may introduce social desirability bias, where respondents tend to provide socially favorable answers. This study also assessed relationships between variables at a single point in time, making it unable to capture behavioral changes longitudinally. Moreover, other potential influencing variables—such as social norms, physical environmental conditions, or economic pressures—were not included in the model. Future research is recommended to employ longitudinal designs, more representative sampling techniques, and broader contextual variables to provide a more comprehensive understanding of the factors shaping pro-environmental behavior.

4. CONCLUSION

Based on the results of the research data analysis, it can be concluded that there is a significant influence of general belief/values, information, personal attitude, health alertness, health self-consciousness, health involvement, health self-monitoring, education level and gender on pro-environmental behavior. Based on the results of the overall variance proportion, pro-environmental behavior is influenced by general belief/values, information, personal attitude, health alertness, health self-consciousness, health involvement, health self-monitoring, education level and gender. Meanwhile, in the results of the hypothesis test that has been conducted, there are four significant variables, namely general belief/values, personal attitude, health self-consciousness and health self-monitoring. Future studies also need to include broader contextual variables, such as social norms, physical environmental conditions, and economic factors, so that the prediction model of pro-environmental behavior becomes more comprehensive and representative.

ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to all respondents who generously participated in this study and provided valuable data. Appreciation is also extended to the academic advisors, colleagues, and institutional partners who offered constructive feedback and support throughout the research process. Furthermore, the authors acknowledge the contributions of the enumerators and field assistants who assisted in the data collection. Finally, the authors thank the journal editors and reviewers for their insightful comments that helped improve the quality of this manuscript.

REFERENCES

- [1] M. Petrov, Z. Nikolaeva, and A. Dimitrov, "The impact of anthropogenic activity on the global environment," *Int. Sci. J.*, vol. 8, no. 2, pp. 59–64, 2023.
- [2] M. Kabir *et al.*, "Impacts of anthropogenic activities & climate change resulting from increasing concentration of Carbon dioxide on environment in 21 st Century ; A Critical Review," in *IOP Conf. Series: Earth and Environmental Science 1194*, 2023, pp. 1–6. doi: 10.1088/1755-1315/1194/1/012010.
- [3] S. K. Sahoo, A. K. Das, S. Samanta, and S. S. Goswami, "Assesing the Role of Sustainable Development in Mitigating the Issue of Global Warming," *J. Process Manag. New Technol.*, vol. 11, no. 1, pp. 1–21, 2023.
- [4] X. M. Chen, A. Sharma, and H. Liu, "The Impact of Climate Change on Environmental Sustainability and Human Mortality," *Environments*, vol. 10, no. 165, pp. 1–12, 2023, doi: <https://doi.org/10.3390/environments10100165>
- [5] J. Amriwijaya and V. Anindita, "Exploring The Emotional Landscape of Environmental Action: The Role of Hope in Pro-Environmental Behavior," *Int. J. Soc. Educ.*, vol. 2, no. 7, pp. 2217–2230, 2025.
- [6] L. Zebardast and M. Radaei, "The influence of global crises on reshaping pro-environmental behavior, case study: the COVID-19 pandemic," *Sci. Total Environ. J.*, vol. 811, no. January, pp. 1–11, 2022, doi: <https://doi.org/10.1016/j.scitotenv.2021.151436>.
- [7] W. Si, C. Jiang, and L. Meng, "The Relationship between Environmental Awareness , Habitat Quality , and Community Residents ' Pro-Environmental Behavior — Mediated Effects Model Analysis Based on Social Capital," *Int. J. Environ. Res. Public Health*, vol. 19, pp. 1–20, 2022.
- [8] B. Handoyo, I. K. Astina, and R. L. Mkumbachi, "Students' environmental awareness and pro-environmental behaviour: preliminary study of geography students at state university of malang," in *International Geography Seminar*, 2021, pp. 1–8. doi: 10.1088/1755-1315/683/1/012049.
- [9] L. Omarova and S. Jo, "Employee Pro-Environmental Behavior : The Impact of Environmental Transformational Leadership and GHRM," *Sustainability*, vol. 14, pp. 1–18, 2022, doi: <https://doi.org/10.3390/su14042046>.
- [10] R. M. Probosari, F. Sarwendah, and A. Nugraheni, "Raising Environmental Awareness in School : A Case Study of Environmental Education Through Implementation Adiwiyata-based Curriculum," in *Proceeding Biology Education Conference*, 2021, pp. 181–190.

- [11] M. H. Zikargae, A. G. Woldearegay, and T. Skjerdal, "Empowering rural society through non-formal environmental education : An empirical study of environment and forest development community projects in Ethiopia," *Heliyon*, vol. 8, no. August 2021, p. e09127, 2022, doi: 10.1016/j.heliyon.2022.e09127.
- [12] A. N. Daly, E. J. O'Sullivan, and J. M. Kearney, "Considerations for health and food choice in adolescents," in *Proceedings of the Nutrition Society*, 2022, pp. 75–86, doi: 10.1017/S0029665121003827.
- [13] Z. Huang, Y. Zhu, J. Deng, and C. Wang, "Marketing Healthy Diets : The Impact of Health Consciousness on Chinese Consumers ' Food Choices," *Sustainability*, vol. 14, pp. 1–11, 2022, doi: <https://doi.org/10.3390/su14042059>.
- [14] A. Baobeid, M. Koç, and S. G. Al-ghamdi, "Walkability and Its Relationships With Health , Sustainability , and Livability : Elements of Physical Environment and Evaluation Frameworks," *Front. Built Environ.*, vol. 7, no. September, pp. 1–17, 2021, doi: 10.3389/fbuil.2021.721218.
- [15] L. Steg, "Psychology of Climate Change," *Annu. Rev. of Psychology*, vol. 74, pp. 391–421, 2023.
- [16] M. Simanjuntak and rahma I. Harbani, "Consumerism Behaviour of Indonesian Consumer : The Role of Self-Sufficiency and Information-Seeking," *J. Manaj. dan Organ.*, vol. 13, no. 1, pp. 1–11, 2022.
- [17] M. Farid and D. Saputra, "Media , Consumerism and the Environment : The Relationship of Media and Consumptive Behavior of Urban Society to Environmental Damage," *Muharrrik J. Dakwah dan Sos.*, vol. 4, no. 02, pp. 255–266, 2021, doi: 10.37680/muharrrik.v4i02.1011.
- [18] C. Ourdas and S. Ponis, "Evaluating the Effects of Gamification in Behavioural Change : A Proposed SEM-Based Approach," *Sustainability*, vol. 15, pp. 1–31, 2023, doi: <https://doi.org/10.3390/su15065442>.
- [19] H. Tian and X. Liu, "Pro-Environmental Behavior Research : Theoretical Progress and Future Directions," *Int. J. Environ. Res. Public Health*, vol. 19, pp. 1–16, 2022, doi: <https://doi.org/10.3390/ijerph19116721>.
- [20] Z. Zeng, W. Zhong, and S. Naz, "Can Environmental Knowledge and Risk Perception Make a Difference ? The Role of Environmental Concern and Pro-Environmental Behavior in Fostering Sustainable Consumption Behavior," *Sustainability*, vol. 15, pp. 1–23, 2023, doi: <https://doi.org/10.3390/su15064791>.
- [21] S. K. Shah, T. Zhongjun, A. Sattar, and Z. Xinhao, "Technology in Society Consumer ' s intention to purchase 5G : Do environmental awareness , environmental knowledge and health consciousness attitude matter ?," *Technol. Soc.*, vol. 65, no. April, pp. 1–9, 2021, doi: 10.1016/j.techsoc.2021.101563.
- [22] Y. Li and B. Shan, "Exploring the role of health consciousness and environmental awareness in purchase intentions for green-packaged organic foods : an extended TPB model," *Front. Nutr.*, vol. 12, no. February, pp. 1–10, 2025, doi: 10.3389/fnut.2025.1528016.
- [23] A. Z. Balqis and D. Awang, "Analysis of Society Behaving in Environmental Health Management in Indonesia," in *SHS Web of Conferences*, 2024, pp. 1–6.
- [24] P. Resolute, "Applying cultural perspective in Indonesia municipal solid waste management process towards a grounded climate concept and action : A mini-review of opportunities and challenges," *Waste Manag. Res.*, vol. 42, no. 10, pp. 873–881, 2024, doi: 10.1177/0734242X241262711.
- [25] A. F. Koko and M. Bello, "Exploring the Contemporary Challenges of Urbanization and the Role of Sustainable Urban Development: A Study of Lagos City, Nigeria," *J. Contemp. Urban Aff.*, vol. 7, no. 1, pp. 175–188, 2023, doi: <https://doi.org/10.25034/jcua.2023.v7n1-12>.
- [26] M. A. Rahaman, A. Kalam, and M. Al-Mamun, "Unplanned urbanization and health risks of Dhaka City in Bangladesh: uncovering the associations between urban environment and public health," *Front. Public Heal.*, vol. 11, no. October, pp. 1–18, 2023, doi: 10.3389/fpubh.2023.1269362.
- [27] S. J. Stratton, "Population Research: Convenience Sampling Strategies," *Prehosp. Disaster Med.*, vol. 36, no. 4, pp. 373–374, 2021, doi: 10.1017/S1049023X21000649.
- [28] M. M. Rahman, "Sample Size Determination For Survey Research And Non-Probability Sampling Techniques: A Review And Set Of Recommendations," *J. Entrep. Bus. Econ.*, vol. 11, no. 1, pp. 42–62, 2023, [Online]. Available: www.scientificia.com
- [29] H. Taherdoost, "Designing a Questionnaire for a Research Paper: A Comprehensive Guide to Design and Develop an Effective Questionnaire," *Asian J. Manag. Sci.*, vol. 11, no. 1, pp. 8–16, 2022, doi: 10.51983/ajms-2022.11.1.3087.
- [30] I. Masriah, I. Rachman, D. Ardianto, and T. Matsumoto, "Assessing the Validity and Reliability of Environmental Awareness Measurement Tools in Agricultural Area School," *Int. J. Sci. Adv.*, vol. 6, no. 3, pp. 550–562, 2025, doi: 10.51542/ijscia.v6i3.22.
- [31] J. Manuel, A. Navia, S. S. Sánchez, and D. C. Guevara, "Environmental awareness of university students in Colombia," *Knowl. Perform. Manag.*, vol. 8, no. 1, pp. 104–114, 2024, doi: 10.21511/kpm.08(1).2024.08.
- [32] G. J. Bean and N. K. Bowen, "Item Response Theory and Confirmatory Factor Analysis : Complementary Approaches for Scale Development," *J. Evid. Based. Soc. Work*, vol. 18, no. 6, pp. 597–618, 2021, doi: 10.1080/26408066.2021.1906813.
- [33] M. A. Aljaberi *et al.*, "Rasch Modeling and Multilevel Confirmatory Factor Analysis for the Usability of the Impact of Event Scale-Revised (IES-R) during the COVID-19 Pandemic," *Healthcare*, vol. 10, pp. 1–20, 2022, doi: <https://doi.org/10.3390/healthcare10101858>.
- [34] B. I. Sappaile, A. T. Abeng, and N. Nuridayanti, "Exploratory Factor Analysis as a Tool for Determining Indicators of a Research Variable : Literature Review," *Int. J. Educ. Narrat.*, vol. 1, no. 6, pp. 352–361, 2023, doi: <https://doi.org/10.55849/ijen.v1i6.387>.
- [35] M. Tamar, H. Wirawan, T. Arfah, and R. P. S. Putri, "Predicting pro-environmental behaviours : the role of environmental values , attitudes and knowledge," *Manag. Environ. Qual. An Int. J.*, vol. 32, no. 2, pp. 328–343, 2021, doi: 10.1108/MEQ-12-2019-0264.
- [36] L. Ma, P. Shahbaz, S. Haq, and I. Boz, "Exploring the Moderating Role of Environmental Education in Promoting a Clean Environment," *Sustainability*, vol. 15, pp. 1–19, 2023, doi: <https://doi.org/10.3390/su15108127>.
- [37] W. Fu, J. Fang, and B. Chang, "Caring for yourself , caring for nature : a pro- environmental mechanism of self-

- compassion and intervention study,” *BMC Psychol.*, vol. 13, pp. 1–14, 2025, doi: <https://doi.org/10.1186/s40359-025-03389-2>.
- [38] S. O. Ballazhi, L. Bexheti, K. S. Ivanoska, and I. Neziri, “Social Norms And Health Literacy As Predictor Of Pro-Environmental Behavior : Evidence From North Macedonia,” *Knowl. – Int. J.*, vol. 67, no. 6, pp. 1137–1142, 2024.
- [39] G. Castellini, M. Acampora, L. Provenzi, L. Cagliero, L. Lucini, and S. Barelo, “Health consciousness and pro - environmental behaviors in an Italian representative sample : A cross - sectional study,” *Sci. Rep.*, vol. 13, pp. 1–9, 2023, doi: [10.1038/s41598-023-35969-w](https://doi.org/10.1038/s41598-023-35969-w).
- [40] S. Kousar, M. Afzal, and F. Ahmed, “Environmental Awareness and Air Quality : The Mediating Role of Environmental Protective Behaviors,” *Sustainability*, vol. 14, pp. 1–20, 2022, doi: <https://doi.org/10.3390/su14063138>.
- [41] M. C. Dirt and O. Prundeanu, “Narcissism and Pro-Environmental Behaviors : The Mediating Role of Self-Monitoring, Environmental Control and Attitudes,” *Sustainability*, vol. 15, pp. 1–16, 2023, doi: <https://doi.org/10.3390/su15021571>.
- [42] Y. Liu and X. Li, “Pro-Environmental Behavior Predicted by Media Exposure , SNS Involvement , and Cognitive and Normative Factors,” *Environ. Commun.*, vol. 15, no. 7, pp. 954–968, 2021, doi: [10.1080/17524032.2021.1922479](https://doi.org/10.1080/17524032.2021.1922479).