Factors Affecting the Intention to Implement Pro-environmental Behaviors: A Case of Riverside Communities in Cotabato City Rivers, Mindanao Island, Philippines

Peter Jan D. de Vera (corresponding author)
Natural Sciences Department, College of Arts and Sciences, Mindanao State University-Maguindanao, Dalican, Datu Odin Sinsuat, Maguindanao del Norte, Bangsamoro Autonomous Region in Muslim Mindanao (BARMM), Philippines
peterjandevera0302@gmail.com

Nancy C. Alombro
Natural Sciences Department, College of Arts and Sciences, Notre Dame University, Cotabato City, Bangsamoro Autonomous Region in Muslim Mindanao (BARMM), Philippines

Shaima M. Patadon
Natural Sciences Department, College of Arts and Sciences, Notre Dame University, Cotabato City, Bangsamoro Autonomous Region in Muslim Mindanao (BARMM), Philippines

John Paul A. Catipay
Natural Sciences Department, College of Arts and Sciences, Notre Dame University, Cotabato City, Bangsamoro Autonomous Region in Muslim Mindanao (BARMM), Philippines
Science Department, Senior Highschool, Notre Dame University, Cotabato City, Bangsamoro Autonomous Region in Muslim Mindanao (BARMM), Philippines

Publication Information:
Received 28 June 2023, Accepted 3 October 2023, Available online 24 April 2024
DOI: 10.21463/jmic.2024.13.1.02

Abstract

Rivers are known to be the emitters of waste in the world's oceans. Most of the top ten rivers that contribute to the waste in the world's oceans are situated in the Philippines indicating poor solid waste management in the country. Studies focusing on the pro-environmental behaviors among the riverside communities in the country are very limited. Thus, this study investigates the factors affecting the intention to implement pro-environmental behaviors among the riverside communities along the Cotabato City rivers, Mindanao Island. This study utilizes the Theory of Planned Behavior (TPB) model to determine the factors affecting the intention to implement pro-environmental behaviors (n = 387). Results showed that Attitude (ATT) and Subjective Norms (SN) have significant direct effects on the intention to implement pro-environmental behaviors among the respondents. Moderation analysis showed that gender has significant effects on the relationship between Perceived Behavioral Control (PBC) and Intention (IN) to implement pro-environmental behaviors. The results of this study may provide insights into the policy design to promote and enhance the resident's intention to

implement pro-environmental behaviors for river conservation and protection. Extending the TPB model to assess other internal and external factors that may affect pro-environmental behaviors is recommended for future studies.

Keywords

plastic pollution | river conservation | structural equation modeling | theory of planned behavior

Introduction

The Philippines has about 421 principal rivers (Scott 1989) and several studies had been conducted highlighting the importance of these rivers in terms of economic (Choe et al., 1996; Dusaran et al., 2010; Gorme et al., 2010) and biological perspectives (Alcala et al. 2010; Opiso et al., 2014; Malabrigo et al. 2014). However, rivers had been noted to be one of the contributors of plastic waste in the oceans (Leberton et al. 2017; van Emmerik et al. 2022). In fact, eight of the top ten rivers that mostly contribute to plastic waste discharges in the world's oceans are situated in the Philippines (Ritchie, 2021). Poor solid waste management and improper waste disposal, particularly in rivers are one of the leading causes of plastic and water pollution (Ferronatto and Torretta, 2019; Lestari and Trihadiningrum, 2019; Escañan and Bacosa, 2022). The unregulated disposal of plastic waste in rivers can contribute to the degradation of aquatic ecosystems (Abreo et al., 2016; Abreo et al., 2019; Pacilan and Bacosa, 2022), and threats to public health (Maquart et al., 2022). Rivers are vital sources of freshwater and habitats for various species and provide essential services to communities (van der Ploeg et al., 2017). Therefore, there is a need to address the issue of solid waste management and promote pro-environmental behaviors among residents living along rivers for its conservation and protection (Hoffmann and Muttarak, 2020).

Residents living along rivers have a critical role in the conservation and protection of rivers through the implementation of pro-environmental behaviors (Srinivas, 2016). The daily activities of these residents such as proper plastic waste disposal, reduced use of single-use plastics, and responsible consumption may have a significant impact on the health of the rivers (Diola et al., 2020). Thus, understanding the factors affecting the intentions of residents living along rivers to implement pro-environmental behaviors are important in formulating effective strategies to promote and ensure the sustainable conservation of rivers (Zhong et al., 2019).

Cotabato City, situated on Mindanao Island, is geographically positioned between the Rio Grande de Mindanao and the Tamontaka Rivers. This strategic location renders it susceptible to the accumulation of floodwater from the neighboring Ligawasan marshland in Maguindanao del Norte, as documented in the "Philippines: master plan: report from 2013. The Esteros, Tamontaka, Matampay, and Rio Grande de Mindanao Rivers represent a subset of numerous rivers that traverse Cotabato City and ultimately discharge into Ilana Bay. These rivers provided economic and biodiversity services to the people residing near the area (Corcoro et al., 2012). The study of Corcoro et al. (2012), pointed out that these rivers are very important to residents aboding along the Cotabato City rivers. The majority of these residents used these rivers for laundry purposes, bathing, and for drinking. However, Rio Grande de Mindanao River has been noted to be one of the top ten transporters of plastic waste in the world's oceans (Ritchie, 2021). This indicates that areas where this river traverses may have poor local waste management practices. Thus, improving waste management and promoting pro-environmental behaviors are essential to avoid further degradation of the rivers (Janmaimool, 2017).

Several studies had been noted a positive correlation between pro-environmental behaviors and improved solid waste management (Zhang et al., 2015; Crociata et al., 2016; Cheirrito-Arruda et al., 2018). Determining the factors that may influence the intention to engage in pro-environmental behaviors may lay down insights into the factors that may contribute to the improvement of solid waste management practices (Tang et al., 2022). Understanding the factors influencing the intentions of the residents living along the Cotabato City rivers to implement pro-environmental behaviors may help craft research-based decisions, policies, and programs that may help enhance solid waste management. The role of residents living along these rivers is crucial in implementing pro-environmental behaviors and this can contribute to the conservation and protection of rivers. However, there is a gap in understanding the factors influencing the intentions to implement pro-environmental behaviors among the riverside communities in the Philippines, especially in Cotabato City.

This study employs the Theory of Planned Behavior to determine the factors influencing the intentions of the riverside communities in the Cotabato City rivers to implement pro-environmental behaviors. This study also investigated the moderating effects of gender in the intention to implement pro-environmental behaviors. The results of this study can help policymakers and stakeholders develop targeted interventions that promote pro-environmental behaviors and create sustainable communities along rivers.

Materials and Methods

Survey questionnaire design

A standard questionnaire was utilized to obtain the necessary data needed for identifying the socio-demographic profile and the factors affecting the intention to implement pro-environmental behaviors of the residents of the riverside communities along the Cotabato City rivers in Mindanao Island. The survey questionnaire includes the cover letter indicating the ethical issues regarding confidentiality, the demographic profile, and the items of each latent variable in the Theory of Planned Behavior (TPB) model. All items that were used to measure each latent variable in the TPB model were adapted from several published studies. Prior to the data collection, the survey questionnaire was submitted to the panel of experts for content and face validity. Then, a pre-test was conducted to determine the reliability and consistency of the items in the survey questionnaire through Cronbach's alpha coefficient. Each item in the latent variable for the TPB model was measured using a five-point Likert scale (1 – Strongly disagree to 5 – Strongly agree). All items were written in English and then translated into Tagalog.

All of the respondents were duly informed about the purpose of the study, and informed consent was secured from them. The confidentiality and anonymity of the respondents were strictly complied with during the collection, analysis, and reporting of the data.

Description of the study area surveyed

The study was conducted in Cotabato City, Maguindanao del Norte, Mindanao Island (7.2047°N, 124.2310°E) (Figure 1). The area is surrounded and traversed by numerous rivers. The water from these rivers discharges to Ilana Bay, which is situated in the eastern portion of the city. The area is enriched with marine resources and is considered one of the top producers of crabs in the Bangsamoro Autonomous Region in Muslim Mindanao (BARMM) region annually (Fernandez, 2011). The population of Cotabato City as of 2020 is about 325,079 and is projected to be increasing. The riverside communities that were surveyed in this study were situated along the four (4) rivers that traverse Cotabato City. These rivers are Matampay, Tamonataka, Esteros, and Rio Grande de Mindanao Rivers which traverse fifteen (15) barangays;

Bagua I, Bagua II, Bagua III, Kalanganan, Poblacion I, Poblacion II, Poblacion III, Poblacion V, Poblacion VI, Poblacion VII, Rosary Heights II, Rosary Heights VI, Rosary Heights X, Tamontaka I, and Tamontaka II. These communities were chosen due to accessibility and were located within and near the commercial center of the city, The riverside communities were surveyed from November 2022 to February 2023.

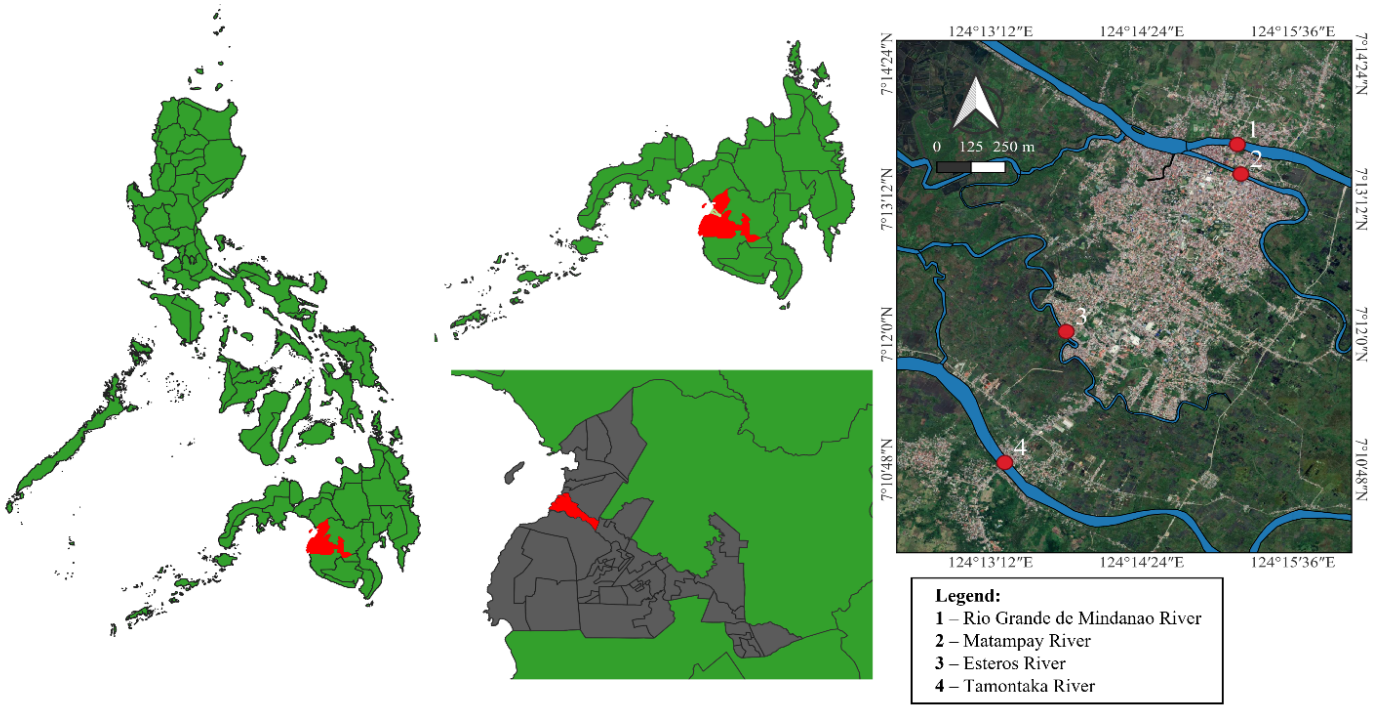

Fig 1. Map of Cotabato City, Maguindanao del Norte, Bangsamoro Autonomous Region in Muslim Mindanao (BARMM), Mindanao Island, Philippines.

Respondents of the Study

The statistical population of this survey research includes all the residents of the riverside communities along the Matampay, Tamonataka, Esteros, and Rio Grande de Mindanao Rivers that traverse Cotabato City. In this regard, there were fifteen (15) barangays surveyed in this study and were classified based on the river that traverses their respective area. The number of samples to be included in this study was determined using an available sample size calculator for structural equation models by Soper (2023). This study applies a stratified random sample technique and each river was considered as a separate stratum. The riverside communities in each river were divided into twenty-one (21) quadrants, and in each quadrant six (6) households were randomly selected for the survey. The survey was conducted through face-to-face interviews.

A total of 504 survey questionnaires were prepared for the face-to-face interviews. However, only 99.4% of the respondents had only agreed and were interviewed using the prepared survey questionnaire. Before data analysis, 42 responses were omitted due to several items were not answered or the items have a standard deviation of less than 0.3. Prior to structural equation modeling (SEM), responses that were considered multiple outliers were also determined using Mahanalobis distance and were removed. Only a total of 387 responses were considered valid and were used for SEM.

Structural Equation Modelling (SEM)

Microsoft Excel (2021) was used to encode the results of the survey. The SPSS 26 and AMOS 22 were utilized for the Structural Equation Modelling (SEM). SEM analyzed if the proposed model fits the collected data while considering the measurement errors at the same time (Fan et al., 2016). Since this study employs the Theory of Planned Behavior (TPB) model, five latent variables were considered. These were attitude (ATT), subjective norms (SN), perceived behavioral control (PBC), intention (IN), and pro-environmental behavior (PEB). In the survey questionnaire used for data collection, both the attitude (ATT) and the subjective norms (SN) have five items while the rest of the latent variables each have six items. All items used to measure each latent variable were adapted from published studies (Milfont and Duckitt, 2010; Hong et al., 2014; Jaiswal and Kant, 2018; Akitsu and Ishihara, 2018; Han and Cheng, 2020; Jacob et al., 2021; Gibson et al., 2021). Several Goodness-of-Fit (GOF) measures were used to assess if the model fits the data. The moderating effects of the gender (male and female) and the age group were determined using multi-group analysis.

Results and Discussion

Descriptive Characteristics of the Respondents

The demographic of the respondents (Table 1) shows that 67.6% are female. The distribution of respondents based on age is highest in 15-24 years old (40.3%) while least in 54-64 years old (8.8%). Most of the respondents were married (61.3%) and most have attained the elementary level only (44.4%). Most of the respondents were residing near or along the rivers for more than a decade (62.1%) and most had a household monthly income of less than P5,000.00 (79.3%).

Table 1. Descriptive characteristics of the residents of the riverside communities along the Cotabato City rivers (*n* = 387).

Variable	Category	Frequency	Percentage
Gender	Male	185	32.4%
	Female	279	67.6%
Age	15-24 years old	187	40.3%
	25-34 years old	93	20.0%
	35-44 years old	47	20.7%
	45-54 years old	41	10.1%
	55-64 years old		8.8%
Civil Status	Single	150	30.6%
	Married	279	61.3%
	Divorced	16	4.1%
	Widowed	19	4.1%
Educational Background	Elementary graduate	206	44.4%
	Junior high school graduate	136	29.3%
	Senior high school graduate	74	15.9%
	Technical - Vocation graduate	12	2.6%
	College Graduate	36	7.8%
Number of Years of Residence	Less than 1 year	38	8.2%
	one to five	67	14.4%
	six to ten	70	15.1%
	11 years and above	288	62.1%
Household Monthly Income	Less than ₱5,000.00	368	79.3%
	₱5,001.00 - ₱10,000.00	77	16.6%
	₱10,001.00 - ₱15,000.00	7	1.5%
	₱15,001.00-₱20,000.00	5	1.1%
	More than ₱20,001.00	6	1.3%

Utilization of Cotabato City Rivers

Table 2 shows the manner of utilization of the Cotabato City rivers by the respondents. Most of the respondents utilized the rivers through the laundry (61.84%) and the washing of utensils (25.44%). This mode of utilization of the riverside communities along the Cotabato City rivers by the residents can be attributed to several factors such as lack of access to alternative facilities, economic considerations, cultural and traditional practices, perceived convenience, and lack of awareness regarding environmental impacts (Wang and He, 2022).

Table 2. Manner of the utilization of the rivers in Cotabato City (*n* = 387).

Manner of Utilization	Frequency	Percentage
Laundry	141	61.84%
Washing utensils	58	25.44%
Personal hygiene	13	5.71%
Food preparation	2	0.88%
Bathing	12	5.26%
Economic purpose	2	0.88%

The Validity and Reliability of the Model

The model used in this study was evaluated using the composite reliability and construct validity (Table 3). Cronbach's alpha reflects the reliability of the scales used in the survey questionnaire. The recommended threshold value for Cronbach's alpha should be greater than 0.70. All Cronbach's alpha values of the latent variables exceed the recommended threshold value (Table 3), thus the items for each variable are considered to be reliable. The internal consistency of each construct in the present study is reflected by the composite reliability (CR). The recommended value for the CR should be above 0.70 and all the constructs in the present study exceeded the threshold value (Table 3). To determine if the items used in this study truly measure their respective latent variables, construct validity was evaluated. The construct validity was determined using the factor loadings and the average variance extracted (AVE). The recommended level for the AVE should be more than 0.5 and it is used to assess the overall amount of variance in the items as accounted by the latent variable. The AVE of the latent variables in this study ranged from 0.642 to 0.727 (Table 3), thus exceeding the recommended threshold value. Table 4 shows the final factor loading of each item used to measure each latent variable in this study. Those items that did not reach the recommended threshold value will be omitted and all items that exceeded the recommended level of 0.6 were retained. Overall, the final model that was used in this study can be considered valid and reliable.

Table 3. Construct validity and reliability of the final model.

Latent Variable	Cronbach's α	Average Variance Extracted (AVE)	Composite Reliability (CR)
Attitude	0.925	0.704	0.905
Subjective Norms	0.898	0.642	0.899
Perceived Behavioral Control	0.940	0.727	0.930
Intention	0.914	0.680	0.894
Pro-environmental Behaviors	0.906	0.650	0.881

Table 4. Latent variables and items used in the survey questionnaire.

Latent Variable	Items	Mean	Std	Factor Loading	
				Initial	Final
Attitude	I would go out of my way to help with recycling campaigns.	4.17	0.627	0.842	0.848
	I will persuade others to help implement pro-environmental behaviors.	4.24	0.619	0.826	0.855
	I am the kind of person that makes efforts to implement pro-environmental behaviors.	4.24	0.617	0.832	0.840
	I will be upset if the pro-environmental behaviors will not be implemented properly.	4.12	0.692	0.844	0.814
	I am willing to help raise funds in order to support the implementation of pro-environmental behaviors.	4.14	0.702	0.876	-----
Subjective Norms	I value the opinion and feelings of my friends in implementing pro-environmental behaviors.	4.13	0.605	0.782	0.781
	My family thinks I should apply pro-environmental behaviors.	4.15	0.613	0.875	0.875
	My friends and most people who are important to me think that I should implement pro-environmental behaviors.	4.10	0.572	0.817	0.817
	I really care what people think around me about implementing pro-environmental behaviors.	4.13	0.613	0.792	0.793
	My family has implemented pro-environmental behaviors before.	4.07	0.645	0.733	0.734
Perceived Behavioral Control	Actions to implement pro-environmental behaviors are in areas within the scope of our community.	2.65	1.094	0.871	0.860
	It is easy to have a personal budget in place for the implementation of pro-environmental behaviors.	2.86	1.139	0.860	0.872
	The community responds well in implementing pro-environmental behaviors.	2.85	1.098	0.881	0.870
	Barangay officials in our area have time to guide us in implementing pro-environmental behaviors.	2.87	1.122	0.865	0.875
	I have resources, time, and opportunities to implement pro-environmental behaviors.	2.91	1.158	0.827	----
	Implementing pro-environmental behaviors is easy for me.	2.61	1.093	0.807	0.784
Intention	I am willing to volunteer for a river clean-up and wetland restoration event.	4.09	0.542	0.713	----
	I am interested in attending lectures and workshops for the proper implementation of pro-environmental behaviors.	4.10	0.601	0.785	----
	I will support the restrictions states in the pro-environmental behaviors.	4.12	0.559	0.785	0.788
	I am always thinking of ways to implement pro-environmental behaviors.	4.08	0.597	0.803	0.785
	I am willing to make an effort to implement pro-environmental behaviors.	4.14	0.548	0.888	0.911
	I plan to regularly inform my community about the implantation of pro-environmental behaviors.	4.15	0.576	0.820	0.808
Pro-environmental Behavior	I bring my own Eco bag or basket when making grocery shopping.	4.06	0.693	0.784	0.761
	I take the initiative in cleaning my surroundings.	4.17	0.560	0.794	0.818
	I actively pay attention to various environmental-related information.	4.13	0.520	0.832	0.867
	I actively participate in environmental publicity and education activities organized by the government and my community.	4.09	0.578	0.820	0.776
	I actively participate in environmental protection activities organized by private environmental protection groups.	3.95	0.645	0.773	----
	I maintain forests or green spaces at my own expense.	4.04	0.633	0.734	----

---- means items that were deleted in the final model

The overall fit of the model was determined using various fit indices (Table 5). The Chi-square was not used as one of the indices in this study due to its sensitivity to sample size (Bearden et al., 1982). The Goodness of Fit (GFI) and the Comparative Fit Index (CFI) were used to assess the overall fit of the proposed model (Hooper et al., 2008). The Incremental Fit Index (IFI), Tucker Lewis Index (TLI), and Adjusted Goodness of Fit Index (AGFI) were used to validate the fitness of the proposed model (Hooper et al., 2008). And the parsimonious fitness of the model used in this study was assessed using the Root Mean Square Error (RMSEA) (Hooper et al., 2008). All the threshold values recommended for each fit indices used in this study and their respective observed values in the final model were indicated in Table 5. All the observed values exceeded the threshold value for each model fit index. Thus, the final model in this study fits the collected data.

Table 5. The goodness of fit indices used to validate the final model for this study.

The goodness of fit measures of SEM	Parameter estimate	Minimum cut-off	References
Incremental Fit Index (IFI)	0.918	>0.80	Gefen et al., 2000
Tucker Lewis Index (TLI)	0.908	>0.80	Gefen et al., 2000
Comparative Fit Index (CFI)	0.918	>0.80	Gefen et al., 2000
The goodness of Fit Index (GFI)	0.863	>0.80	Gefen et al., 2000
Adjusted Goodness of Fit Index (AGFI)	0.833	>0.80	Gefen et al., 2000
Root Mean Square Error (RMSEA)	0.074	<0.08	Steiger, 2007

Factors Affecting the Intentions to Implement Pro-environmental Behaviors

Upon the analysis of the results of the SEM (Figure 2), it was found that only the Subjective Norms (SN) (β = .612, $p < 0.01$) and Attitude (ATT) (β = .612, $p < 0.01$) were able to describe the variation in the Intention (IN) to implement pro-environmental behaviors (55%). The Intention (IN) is also statistically significant towards Pro-environmental behavior (PEB) (β = 0.326, $p < 0.01$). However, the Perceived Behavioral Control (PBC) (β = .055, $p > 0.01$) is not statistically significant to Intention (IN). Applying the theory of planned behavior, only the Subjective Norms (SN) and the Perceived Behavioral Control (PBC) have significant effects on the intentions of the respondents along the Cotabato City rivers to implement pro-environmental behaviors.

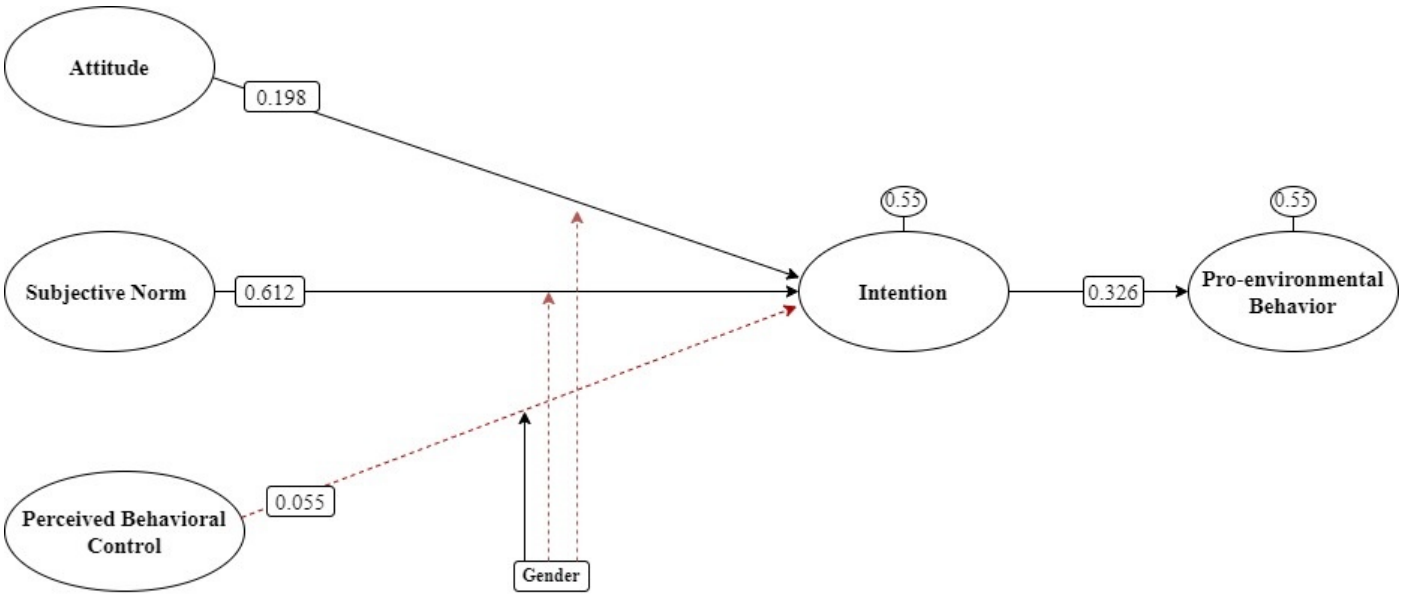

Fig 2. The final model after structural equation modeling. Broken lines indicate no significant direct effects. The figure shows that both Attitude (ATT) and Subjective Norms (SN) have significant direct effects on the Intention (IN) to implement pro-environmental behaviors. Gender indicates moderate effects on Perceived Behavioral Control (PCB) to Intention (IN) to implement pro-environmental behaviors.

The findings of this study indicated that Subjective Norms (SN) have the most significant direct effects (0.612) toward intention (IN) to implement pro-environmental behaviors, compared to Attitude (ATT) (0.198). The participation of the residents along the Cotabato City rivers in implementing pro-environmental behaviors is influenced by their social relations (Videras et al. 2012; Macias and Williams, 2014). Families and communities play a significant role in shaping individuals' subjective norms regarding the implementation of pro-environmental behaviors (Gronhoj and Thogersen, 2012). Several studies had also indicated the significant effects of Subjective Norms (SN) on the intention to implement pro-environmental behaviors (see Onel, 2017; Han and Cheng, 2020; Warner, 2021). The findings of this study are also similar to the study conducted by Yang et al. (2020) where Subjective Norms (SN) have significant direct effects on the pro-environmental behavior towards haze mitigation in China. The result of this study is also consistent with the findings of Gumasing et al. (2023) in which the Subjective Norms (SN) have the highest significant effect on the pro-environmental behavioral intention of accepting renewable energy sources among Filipinos in the National Capital Region (NCR). However, the finding of this study differs from Suminguit et al. (2023) in which no significant direct effects on the Subjective Norms (SN) were noted on the Junior High School students at Notre Dame University, Cotabato City, Mindanao Island, Philippines to implement pro-environmental behaviors. The inconsistent results of subjective norms towards intention to implement pro-environmental behaviors might suggest that this variable might be vulnerable to internal and external factors involved in different studies (Vicente-Molina et al., 2013).

Attitude (ATT) is another significant contributor to the intention to implement pro-environmental policies among the residents of the riverside communities along the Cotabato City rivers. Contrary to the typical pattern observed in many Theory of Planned Behavior (TPB) model studies, where Attitude (ATT) is anticipated to have the most significant effect on Intention (IN), closely followed by Subjective Norms (SN), this study reveals a departure from this expected relationship (Leeuw et al., 2015). In this study, the respondents showed a positive attitude toward the intention to implement pro-environmental policies (mean on a scale of 1-5, with high numbers representing a positive attitude, 4.182). Moreover, the results of this study are also in line with other studies involving assessments of factors affecting the intention to implement pro-environmental behaviors (see Janmaimool and Khajohnmanee, 2019; Miller et al., 2022).

A study conducted by Simpao and Yabut (2022) among university students in Metro Manila, Philippines indicated that attitude plays an important role in their environmental conservation behavior. The high extent of environmental attitude is also correlated with the high extent of pro-environmental behaviors (Hornejas, 2021). This paper and other studies conducted regarding the assessment of factors affecting the intention to implement pro-environmental policies suggest that Attitude (ATT) is an important factor in pro-environmental intentions.

Perceived Behavioral Control (PBC) was not found to be significantly impacting the intention to implement pro-environmental policies. This finding contradicts some other Theory of Planned Behavior studies involving the intention to implement pro-environmental policies (Chang et al., 2022; Galván-Mendoza et al., 2022; Kumar et al., 2022;). According to Sheeran et al. (2002), the strength of perceived behavioral control (PBC) toward intention (IN) may depend on the demographic profile of the respondents. This may be the reason the results of this study contradict most of the literature. Moreover, the results of this study also point out that the respondents in the present study are not confident or in control in implementing pro-environmental behaviors (mean on a scale of 1-5, with high numbers representing a positive perceived behavioral control, 2.79). To improve the perceived behavioral control of the respondents, concerned government agencies and stakeholders may educate the individuals residing along the Cotabato City rivers regarding the positive impacts of implementing pro-environmental behaviors (Grilli and Curtis, 2019).

Moderating Effects of Gender

Table 6 shows the moderating effects of the gender (male and female) among the relationships in the final model. However, only the Perceived Behavioral Control (PBC) toward Intentions (IN) to implement pro-environmental behaviors was found to have a significant difference between males and females ($p = 0.025$). Males had found to have a weak negative Perceived Behavioral Control (PBC) (path coefficient = -0.031) compared to females (path coefficient = 0.118).

Table 6. Moderating effects of gender and age toward the intention to implement pro-environmental behaviors.

Path to Intention	Path coefficients (Male)	Path coefficients (Female)	p-value
Attitude	0.167	0.191	0.895
Subjective Norms	0.684	0.658	0.231
Perceived Behavioral Control	-0.031	0.118	0.025*

* significant at $p < 0.05$

The results of this study coincide with the other studies that investigated the moderating effects of gender (male and female) towards the intention to implement pro-environmental behaviors (Schahn, et al. 1990; Dagher et al., 2015; Karimi et al., 2022). According to Xiao and McCright (2013), women have stronger pro-environmental values and knowledge than men and this claim was also supported by several studies (Zelezny et al., 2000; Li et al., 2022). Pro-environmental knowledge was also found to have significant effects and can enhance perceived behavioral control (PBC) (Galvan-Mendoza et al., 2022). This may be the possible reason for the high perceived behavioral control (PBC) of females compared to males in the present study but further studies should be conducted to verify this claim.

Conclusion

This paper analyzes the factors affecting the intentions to implement pro-environmental behaviors in the riverside communities along Cotabato City rivers using the Theory of Planned Behavior. This study also investigated the mediating role of gender in attitude (ATT), subjective norms (SN), and perceived behavioral control (PBC) towards the intention to implement pro-environmental behaviors. It was found that among the factors affecting the intention to implement pro-environmental behaviors, only the perceived behavioral control (PBC) has no significant direct effects on the intention to implement pro-environmental behaviors. The perceived behavioral control is stronger in females and is significantly different in males. This study may draw some important policy implications for environmental protection in the Cotabato City rivers. The policy design to promote the resident's intention to implement pro-environmental behaviors should consider these factors to enhance the ability of the riverside communities to conduct pro-environmental behaviors. Concerned government agencies and other stakeholders may also conduct education and awareness campaigns tailored specifically for males, emphasizing the benefits and feasibility of implementing pro-environmental behaviors for Cotabato City river protection and conservation. Since there are different internal and external factors that may affect the intention to implement pro-environmental behaviors, it is recommended for future studies extend the TPB model used in this study to further examine the factors affecting the intention to implement pro-environmental behaviors.

Acknowledgments

The authors would like to extend their sincerest gratitude to the Ministry of Science and Technology, Bangsamoro Autonomous Region in Muslim Mindanao (MOST-BARMM) for funding this research. Appreciation is also extended to the Barangay Local Government Units of Cotabato City for supporting the team during the conduct of the study.

References

Abreo, N.A., Macusi, E.D., Blatchley, D.D., Cuenca, G.C., 2016. Ingestion of marine plastic debris by Green Turtle (Chelonia mydas) in Davao Gulf, Mindanao, Philippines. Philippine Journal of Science 145(1), 17-23.

Abreo, N.A., Siblos, S.K., Macusi, E.D., 2019. Anthropogenic marine debris (AMD) in Mangrove forests of Pujada Bay, Davao Oriental, Philippines. Journal of Marine and Island Cultures, 9(1): 38-53. doi:10.21463/jmic.2020.09.1.03

Alcala, E.L., Bucol, A., Averia, L.T., Dusaran, R. N., 2010. A study on the invertebrate and vertebrate biodiversity of the Jalaur River system of Iloilo, Panay, Philippines. Silliman Journal. 51(1), 190-223.

Akitsu, Y., Ishihara, K.N., 2018. An integrated model approach: exploring the energy literacy and values of lower secondary students in Japan. 4(3), 161-186. doi:10.12973/ijem.4.3.161

Bearden, W. O., Sharma, S., Teel, J. E., 1982. Sample size effects on chi-square and other statistics used in evaluating causal models. Journal of Marketing Research, 19(4), 425–430. doi:10.1177/002224378201900404

Chang, M.Y., Kuo, H.Y., Chen, H.S., 2022. Perception of climate change and pro-environmental behavioral intentions of forest recreation area users - a case of Taiwan. Forests. 13(9), 1-17.doi:10.3390/f13091476

Cheirrito-Arruda, E., Rosa, A.L., Paccola, E.A., Macuch, R.D., Grossi-Milani, R., 2018. Pro-environmental behavior and recycling: literature review and policy considerations. Ambiente & Sociedade. 21, 1-18. doi:10.1590/1809-4422asoc0209r3vu18L4AO

Choe, K. A., Whittington, D., Lauria, D. T.,1996. The economic benefits of surface water quality improvements in developing countries: a case study of Davao Philippines. Land Economics. 72(4): 519-537. doi.org/10.2307/3146913

Corcoro, T.O., Alombro, N.C., Herrera, W., 2012. Water analysis of Cotabato City rivers and its implication to human and aquatic life. American International Journal of Contemporary Research. 2(7): 17-31.

Crociata, A., Agovino, M., Sacco, P.L., 2016. Neighborhood effects and pro-environmental behaviors: the case of Italian separate waste collection. Journal of Cleaner Production. 135(1): 80-89. doi:10.1016/j.jclepro.2016.06.083

Dagher, G., Itani, O., Kassar, A. N., 2015. The impact of environment concern and attitude on green purchasing behavior: gender as the moderator. Contemporary Management Research, 11(2), 179-206. doi:10.7903/cmr.13625

Diola, B.L.D., Tanchuling, M.A.N., Bonifacio, D.R.G., Delos Santos, M.J.N. Characterization of plastic pollution in rivers: case of Sapang Baho river, Rizal, Philippines, EGU General Assembly 2020. doi:10.5194/egusphere-egu2020-22467, 2020

Dusaran, R.N., Pabulayan, R.A.V., 2010. Socio-economic assessment of the households along the Jalaur River system, Province of Iloilo, Panay Island. Silliman Journal. 51(1), 265-284.

Escañan, A.S., Bacosa, H. P., 2022. Assessment of riverine plastic flux in Pulot river and its tributary in Sofornio Española, Palawan, Philippines. Journal of Marine and Island Cultures. 11(2), 1-12. doi:10.21463/jmic.2022.11.2.01

Fan, Y., Chen, J., Shirkey, G., John, R., Wu, S.R., Park, H., Shao, C., 2016). Applications of structural equation modeling (SEM) in ecological studies: an updated review. Ecological Processes. 5 (19), 1-12. doi:10.1186/s13717-016-0063-3

Fernandez, E., 2011, December 13. Cotabato's mud crabs get limelight in feast. Inquirer. Net. Retrieved from https://newsinfo.inquirer.net/110543/cotabato%E2%80%99s-mud-crabs-get-limelight-in-feast

Ferronato, N., Torretta, V., 2019. Waste mismanagement in developing countries: a review of global issues. International Journal of Environmental Research and Public Health. 16(6): 1-28. doi:10.3390/recycling6010006

Galván-Mendoza, O., González-Rosales, V.M., Leyva-Hernández, S.N., Arango-Ramírez, P.M., Velasco-Aulcy, L. 2022. Environmental knowledge, perceived behavioral control, and employee green behavior in female employees of small and medium enterprises in Ensenada, Baja California. Frontiers in Psychology. 13:1-19. doi:10.3389/fpsyg.2022.1082306.

Gibson, L.P., Magnan, R.E., Kramer, E.B., Bryan, A.D., 2021. Theory of planned behavior analysis of social distancing during the COVID-19 pandemic: focusing on the intention-behavior gap. Annals of Behavioral Medicine. 55(8): 805-812. doi:10.1093/abm/kaab041

Gorme, J.B., Maniquiz, M.C., Song, P., Kim, L.H., 2010. The water quality of the Pasig river in the City of Manila, Philippines: current status, management, and future recovery. Environmental Engineering Research, 15(3): 173-179. doi:10.4491/eer.2010.15.3.173

Gronhoj, A., J. Thorgorsen, J., 2012. Action speaks louder than words: the effect of personal attitudes and family norms on adolescents' pro-environmental behavior. Journal of Economic Psychology. 33(1): 292-302. doi:10.1016/j.joep.2011.10.001

Grilli, G., Curtis, J., 2021.Encouraging pro-environmental behaviors: a review of methods and approaches. Renewable and Sustainable Energy Reviews. 135(12):1-27. doi:10.1016/j.rser.2020.110039/

Gumasing, M.J., Bayola, A., Bugayong, S.L., Cantona, K.R., 2023. Determining the factors affecting Filipinos' acceptance of the use of renewable energies: a pro-environmental planned behavior model. Sustainability. 15(7702), 1-21. doi:10.3390/su15097702

Han, R., Cheng, Y., 2020. The influence of norm perception on pro-environmental behavior: a comparison between the moderating roles of traditional media and social media. Environmental Research and Public Health. 17(7164), 1-18. doi:10.3390/ijerph17197164

Hoffmann, R., Muttarak, R., 2020. Greening through schooling: understanding link between education and pro-environmental behavior in the Philippines. Environmental Research Letters. 15, 1-15. doi:10.1088/1748-9326/ab5ea0

Hong, D.Y., Fan, Y.C., Xiao, C.Y., 2014. Re-examining the measurement quality of the Chinese new environmental paradigm (CNEP) scale: an analysis based on the CGSS 2010 data. Sociological Studies. 4:49-72.

Hooper, D., Coughlan, J., Mullen, M. R., 2008. Structural equation modelling: guidelines for determining the model fit. Electronic Journal of Business Research Methods. 6(1): 53-60.

Hornejas, J., 2021. Environmental attitude of junior high school students: basis for proposed intervention. Sapienza: International Journal of Interdisciplinary Studies. 2(1): 298-314. doi:10.51798/sijis.v2i1.79

Jacob, J., Valois, P., Tessier, M., 2021. Using the theory of planned behavior to predict the adoption of heat and flood adaptation behaviors by municipal authorities in the province of Quebec, Canada. Sustainability. 13(5), 1-16. doi:10.3390/su13052420

Jaiswal, D., Kant, R., 2018. Green purchasing behavior: a conceptual framework and empirical investigation of Indian consumers. Journal of Retailing and Consumer Services. 41, 60-69. doi:10.1016/j.jretconser.2017.11.008

Janmaimool, P., 2017. Application of protection motivation theory to investigate sustainable waste management behaviors. Sustainability. 9(7): 1-16. doi:10.3390/su9071079

Janmaimool, P., Khajohnmanee, S., 2019. Roles of environmental system knowledge in promoting university students' environmental attitudes and pro-environmental behaviors. Sustainability. 11(16):1-18. doi:10.3390/su11164270

Karimi, S., Liobikienė, G., Alitavakoli, F., 2022. The effect of religiosity on pro-environmental behavior based on the theory of planned behavior: a cross-sectional study among Iranian rural female facilitators. Frontiers in Psychology. 13(745019): 1-12. doi:10.3389/fpsyg.2022.745019.

Kumar, R., Verma, A., Shome, A., Sinha, A., Sinha, S., Jha, P.K., Kumar, R., Kumar, P., Das, S., Sharma, P., Prasad, P.V., 2021 Impacts of plastic pollution on ecosystem services, sustainable development goals, and need to focus on circular economy and policy interventions. Sustainability. 13(17), 1-40. doi:10.3390/su13179963.

Leberton, L.C., Van der Zwet, J., Damsteeg, J.W., Slat, B., Andrady, A., Reisser, J., 2017. River plastic emissions to the world's oceans. *Nature Communications*, 8, 15611.

Leeuw, A., Valois, P., Ajzen, I., Schmidt, P., 2015. Using the theory of planned behavior to identify key beliefs underlying pro-environmental behavior in high school students: implications for educational intervention. Journal of Environmental Psychology. 42: 128-138. doi:10.1016/j.jenvp.2015.03.005.

Lestari, P., Trihadiningrum, Y., 2019. The impact of improper solid waste management to plastic pollution in Indonesian coast and marine environment. Marine Pollution Bulletin. 149(9): 110505. doi:10.1016/j.marpolbul.2019.110505

Li, Y., Wang, B., Saechang, O., 2022. Is female a more pro-environmental gender? evidence from China. International Journal of Environmental Research and Public Health. 19(13): 1-11. doi: 10.3390/ijerph19138002

Macias, T., Williams, K., 2014. Know your neighbors, save the planet social capital and the widening wedge of pro-environmental outcomes. Environment and Behavior. 48, 391-420. doi:10.1177/0013916514540458

Malabrigo, P. L., Umali, A. G. & Elec, J. P. (2014): Riparian flora of Kaliwa river watershed in the Sierra Madre mountain range, Philippines. Ecosystems & Development Journal. 5(1): 11-22.

Maquart, P.O., Froehlich, Y., Boyer, S., 2022. Plastic pollution and infectious diseases. Lancet Planet Health. 6, 842-845. doi:10.1016/S2542-5196(22)00198-X

Milfont, T.L., Duckitt, J., 2010. The environmental attitudes inventory: a valid and reliable measure to assess the structure of environmental attitudes. *Journal of Environmental Psychology, 30*(1), 80–94. doi:10.1016/j.jenvp.2009.09.001

Miller, L. B., Rice, R. E., Gustafson, A., Goldberg, M. H., 2022. Relationships among environmental attitudes, environmental efficacy, and pro-environmental behaviors across and within 11 countries. Environment and Behavior. 54(8), 1063-1096. doi:10.1177/00139165221131002

Onel, N., 2017. Pro-environmental purchasing behavior of consumers: the role of norms. Social Marketing Quarterly. 23(2), 103-121. doi:10.1177/1524500416672440

Opiso, E.M., Quimpang, V.T., Leano, E.P., Galan, G.L., Acma, F.M., Coritico, F.P., Labadan, A., Forten, R.R., Coquilla, K.L., Bruno, A.G., Amoroso, V., 2014. Assessment of biodiversity and water quality in association with land use in the Alanib river, Mt. Kitanglad Range Park, Philippines. Asian Journal of Biodiversity. 5(1), 1-31. doi: 10.7828/ajob.v5i1.481

Pacilan, C.J. Bacosa, H.P., 2022. Assessment of microplastic litter on coastal seabeds of Sultan Naga Dimaporo, Lanao del Norte, Philippines. Journal of Marine and Island Cultures. 11(2), 13-25. doi:10.21463/jmic.2022.11.2.02

Philippines: master plan includes dredging of rio de grande and tamontaka, 2013, August 22. Dredging Today. Bussiness and Finance

Ritchie, H., 2021, May 01. Where does the plastics from the oceans come from? Our World in Data. https://ourworldindata.org/ocean-plastics

Schahn, J., Holzer, E., 1990. Studies of individual environmental concern: the role of knowledge, gender, and background variables. Environment and Behavior. 22(6), 767-786. doi:10.1177/0013916590226003

Scott, D. A (ed.)(1989). A Directory of Asian Wetlands. International Union for the Conservation of Nature and Natural Resources. Gland, Switzerland and Cambridge, United Kingdom.

Sheeran, P., Trafimow, D., Finlay, K., Norman, P., 2002. Evidence that the type of person affects the strength of the perceived-behavioral control-intention relationship. British Journal of Social Psychology. 41(2):253-270. doi:10.1348/014466602760060129

Simpao, A.C., Yabut, H., 2022. Conservation behavior among students in a University in Metro Manila: the moderating role of attitudes on the impact of environmental knowledge. Asia-Pacific Social Science Review. 22(3): 95-108.

Soper, D.S., 2022. A-priori sample size calculator for structural equation models [software]. Available from https://www.danielsoper.com/statcalc.

Srinivas, H., 2016, April. Communities along rivers: importance of community networking to preserve local rivers. Global Development Research Center. Retrieved from https://www.gdrc.org/oceans/river-mgmt.html

Suminguit, K., Piguing, R., Lumogdang, H., Torio, A., Acuna, C., Catipay, JP., De Vera, PJ., 2023. Factors affecting the intentions to implement a “no plastic policy” in Cotabato City, Philippines. Davao Research Journal. 14(1): 84-93. doi:10.59120/drj.v14i1.98

Tang, D., Shi, L., Huang, X., Zhao, B., Bethel, B.J., 2022. Influencing factors on the household-waste-classification behavior of urban residents: a case of study in Shanghai. International Journal of Environmental Research and Public Health. 19(11): 1-16. doi:10.3390/ijerph19116528

van der Ploeg, J., Vermeersch, L., Rodriguez, D., Balbas, M., van Weerd, M., 2017. Establishing freshwater protected areas to protect biodiversity and improve food security in the Philippines. WorldFish Center. Retrieved from https://digitalarchive.worldfishcenter.org/handle/20.500.12348/426

van Emmerick, T., Melink, Y., Hauk, R., Waldshlager, K., Schreyers, L., 2022. Rivers as plastic eservoirs. Frontiers of Water. 3:786936. doi:10.3389/frwa.2021.786936

Vicente-Molina, M.A., Fernandez-Sainz, A., Izagirra-Olaizola, J., 2013. Environmental knowledge and other variables affecting pro-environmental behaviour: Comparison of university students from emerging and advanced countries. Journal of Cleaner Production. 61: 130-138. doi:10.1016/j.jclepro.2013.05.015

Videras, J., Owen, A.L., Conover, E., Wu, S., 2012. The influence of social relationships on pro-environment behaviors. Journal of Environmental Economics and Management. 63, 35-50. doi:10.1016/j.jeem.2011.07.006

Wang, H., He. G., 2022. Rivers: linking nature, life, and civilization. Rivers. 1(1): 25-36. doi:10.1002/rvr2.7

Warner, L. A., 2021. Who conserves and who approves? predicting water conservation intentions in urban landscapes with referent groups beyond the Traditional 'important Others'. Urban For. Urban Green. 60 (2), 127070. doi:10.1016/j.ufug.2021.127070

Xiao, C., McCright, A.M., 2013. Gender differences in environmental concern: revisiting the institutional trust hypothesis in the USA. Environment and Behavior. 47(1): 17-37. doi:10.1177/0013916513491571

Yang, X., Chen, L., Wei, L., Su, Q., 2020. Personal and media factors related to citizens’ pro-environmental behavioral intention against haze in China: a moderating analysis of TPB. International Journal of Environmental Research and Public Health. 17(7): 1-18. doi:10.3390/ijerph17072314

Zelezny, L.C., Chua, P.P., Aldrich, C., 2000. Elaborating on gender differences in environmentalism. *Journal of Social Issues. 56*(3), 443-457. doi:10.1111/0022-4537.00177

Zhang, D., Huang, G., Yin, X., Gong, Q., 2015 Residents' waste separation behaviors at the source: using SEM with the theory of planned behavior in Guangzhou, China. International Journal of Environmental Research and Public Health. 12, 9475–91. doi: 10.3390/ijerph120809475

Zhong, F., Li, L., Guo, A., Song, X., Cheng, Q., Zhang, Y., Ding, X., 2019. Quantifying the influence path of water conservation awareness on water-saving irrigation behavior based on the theory of planned behavior and structural equation modelling: a case study from Northwest China. Sustainability. 11(4967), 1-16. doi:10.3390/su11184967