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Research Article

Community Perception and Attitudes Toward Plastics and Microplastic Pollution: A Case Study in the Red River Delta, Vietnam

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Abstract

Plastics and microplastic contamination pose increasing threats to human health, food safety, and environmental sustainability. In Vietnam, rapid urbanization, economic growth, and population expansion have contributed to a surge in plastic waste, intensifying pollution across regions such as the Red River Delta. This study adopts the theory of planned behavior (TPB) to explore community perceptions, attitudes, and behavioral intentions regarding plastic and microplastic pollution. A quantitative research design was employed, with data collected through structured questionnaires administered to 1,305 respondents via a stratified multistage sampling strategy across four provinces in the Red River Delta. Descriptive statistics and multiple linear regression analyses were conducted to examine the influence of the TPB constructs on behavioral intention. The results reveal that all three TPB components significantly affect behavioral intention. Among them, attitude has the strongest positive influence, indicating that personal beliefs about the benefits of reducing plastic use are key drivers. Perceived behavioral control also has a positive effect, whereas subjective norms have a small but statistically significant negative influence. This result offers important cultural insights into the social dynamics surrounding plastic use in Vietnam. The novelty of this research lies in its application of the TPB framework to analyze microplastic-related behavioral intentions at the community level in Vietnam, a context that remains understudied in the current literature. This study provides valuable insights for developing targeted interventions and public policies aimed at reducing plastic consumption and promoting sustainable environmental practices in the country.

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Introduction

Public and scientific concern over the dangers of microplastics is increasing because of their widespread presence in the environment and their potential risks to ecosystems and human health [1–6]. Plastics are highly valued for their versatility, light weight, durability, and affordability, making them indispensable in modern society [7]. However, microplastics pose serious threats to food safety and human health, raising substantial environmental concerns [4–5]. Moreover, the extensive use of plastics, especially single-use products, has led to significant waste accumulation, resulting in the degradation of land and water resources and disruptions to food chains [8].

The United Nations Environment Program defines microplastics as plastic particles with a size of less than 5 mm, and these particles are further categorized as either primary or secondary microplastics [9]. Primary microplastics are intentionally manufactured for industrial and domestic applications (e.g., microbeads in cosmetics and personal care products), whereas secondary microplastics result from the fragmentation and degradation of larger plastic materials [10]. Owing to their small size and vast surface area, microplastics are great sponges

for absorbing pollutants and distributing them into the environment, posing a threat to the ecosystem [10].

Microplastics are found throughout the environment, and their potential risks to human health and ecosystems have increasingly drawn the attention of both the scientific community and the general public [1, 11]. Global plastic production has risen steadily, reaching 359 million metric tons in 2018 and 400.3 million metric tons by 2022 [6, 12]. A considerable portion of this plastic ends up in aquatic systems, with over 8 million metric tons entering the oceans each year. Alarmingly, more than 90% of this marine plastic pollution originates from just ten rivers, eight of which are located in Asia [13]. Vietnam presents a critical case study of this global plastic crisis. Driven by rapid economic growth, industrialization, and urbanization, the country's per capita plastic consumption rose from 3.8 kg in 1990 to 81 kg in 2019 [14].

However, this surge has not been matched by corresponding improvements in waste management infrastructure. Vietnam now produces approximately 23.5 million tons of solid waste annually, 71% of which are disposed of in landfills, many of which are unsanitary [14–15]. Additionally, between 2.8 and 3.1 million tons of plastic waste are discharged on land each year, while an estimated 0.28 to 0.73 million tons reach the ocean [13].

Waste collection remains inadequate: 10–15% of waste in urban areas and 45–60% in rural areas remains uncollected. The recycling rates are also low, with only 10% of total waste being reused or recycled and just 17% of plastic bags being reused despite their widespread daily use [13]. These socioeconomic and infrastructural challenges present serious dilemmas for policymakers, who must balance industrial and environmental protection, which increases the degree of environmental pressure.

Vietnam's rapid economic development and rising living standards have contributed to increased demand for consumer goods, much of which are packaged in plastic. This trend is particularly evident in urban areas, where industrialization and modernization have led to a surge in single-use plastic consumption. The growing reliance on plastic materials, however, has outpaced the country's waste management capacity, creating complex policy challenges that intersect with economic planning, environmental regulation, and public health priorities [14].

In response to the growing plastic pollution crisis, the Vietnamese government has joined several international agreements and established a comprehensive legal and institutional framework for environmental protection. Vietnam has shown a strong commitment to reducing plastic waste and safeguarding the environment, ecosystems, and oceans.

The country is a party to key international conventions related to plastic pollution, including the United Nations Convention on the Law of the Sea (1982), the London Convention (1972) and London Protocol (1996), the MARPOL 73/78 Convention, the Stockholm Convention (joined in 2004), and the Basel Convention (1989). These legal instruments provide a foundation for Vietnam to cooperate internationally and to develop and revise national policies on plastic waste management [15].

Domestically, several important laws have been enacted, including the Law on Environmental Protection (2020), the Law on Environmental Protection Tax (2010), the Law of the Sea of Vietnam (2012), and the Law on Natural Resources and Environment of Sea and Islands (2015). The 2015 Penal Code includes provisions on environmental crimes: Article 235 addresses corporate liability for pollution, Article 237 covers violations in environmental incident response, and Article 239 addresses illegal imports of waste into Vietnam [15, 16].

Against this policy background, it is increasingly important to explore how individuals and communities perceive plastic pollution and to identify the key factors that influence their behavioral responses.

While environmental awareness of microplastic pollution is increasing globally, few empirical studies have examined how such awareness translates into behavioral change, especially in developing countries such as Vietnam. Research has largely emphasized the technical, legal, or environmental dimensions, with limited attention given to the psychological and behavioral factors related to plastic consumption and waste management.

Several recent studies have explored public perceptions and attitudes toward plastic and microplastic pollution across different countries. In Korea, citizens expressed a strong willingness to pay to reduce oceanic microplastics [17], whereas in Portugal, factors such as age, education, and gender were found to influence recycling and plastic-reduction behaviors [18]. Complementing these findings, Henderson and Green [19] emphasized how public understanding of microplastics is often shaped by emotionally charged media imagery rather than scientific knowledge.

In Vietnam, research on urban consumers in Hanoi has shown that attitudes do not significantly influence plastic reduction intentions [20], whereas a more recent study among farmers in the Red River Delta (RRD) revealed that both attitudes and perceived behavioral control are significant predictors of behavioral intentions [21]. These studies consistently highlight that although awareness levels are increasing, actual engagement in plastic reduction practices remains limited and uneven across demographic groups (e.g., by age, gender, education, and profession).

However, community-level studies in Vietnam remain limited. This study aims to fill that gap by systematically examining public awareness and behavioral intentions

related to plastic and microplastic pollution in the Red River Delta.

The theory of planned behavior (TPB) offers a well-established framework to investigate how attitudes, subjective norms, and perceived behavioral control (PBC) influence behavioral intentions [22]. It has been widely applied in studies on recycling, reducing plastic use, and other pro-environmental behaviors. However, few studies have employed the TPB to examine behavioral intentions related to plastic and microplastic pollution in Vietnam.

This study aims to address this gap by exploring public perceptions, attitudes, and behavioral intentions toward plastic and microplastic pollution in the RRD. The findings are intended to support the development and refinement of legal and policy frame-works related to waste management, including plastic and microplastic pollution, in Vietnam and to inform community-based interventions promoting more sustainable behavioral practices.

Materials and methods

1) Study area and theoretical framework

This study was conducted in the RRD region of northern Vietnam, focusing on the provinces of Vinh Phuc, Hanoi, Ha Nam, and Nam Dinh, which lie along the lower stretches of the Red River (Figure 1). The RRD covers approximately 21,278.6 km^2 and had an estimated population of 23.73 million in 2023, with a population density of approximately 1,115 persons per km^2 [23]. These provinces were purposively selected due to their demographic diversity, proximity to the Red River, and mixed urban, peri-urban, and rural characteristics. The region's rapid economic growth and high levels of plastic consumption make it a critical area for examining environmental behavior.

To investigate the underlying factors influencing behavior, this study adopted the TPB as its theoretical framework [22]. According to the TPB, behavioral intention is determined by three key factors: attitude, subjective norms, and perceived behavioral control (Figure 2).

Attitude is defined as an individual's overall positive or negative feelings about performing the behavior in question, which may be assessed as a summation of one's beliefs regarding the different consequences of that behavior, weighted by the desirability of those consequences.

Subjective norms refer to one's perception of whether people important to that person expect the person to perform the intended behavior and are represented as a weighted combination of the expected norms of different referent groups, such as friends, colleagues, or supervisors at work.

Behavioral control is one's perception of internal or external controls constraining the behavior in question. Internal controls may include the person's ability to perform the intended behavior (self-efficacy), whereas external control refers to the availability of external resources needed to perform that behavior (facilitating conditions). The TPB also suggests that individuals may intend to perform a behavior but lack the resources to do so; therefore, perceived behavioral control can directly influence behavior, in addition to its indirect effect through intention.

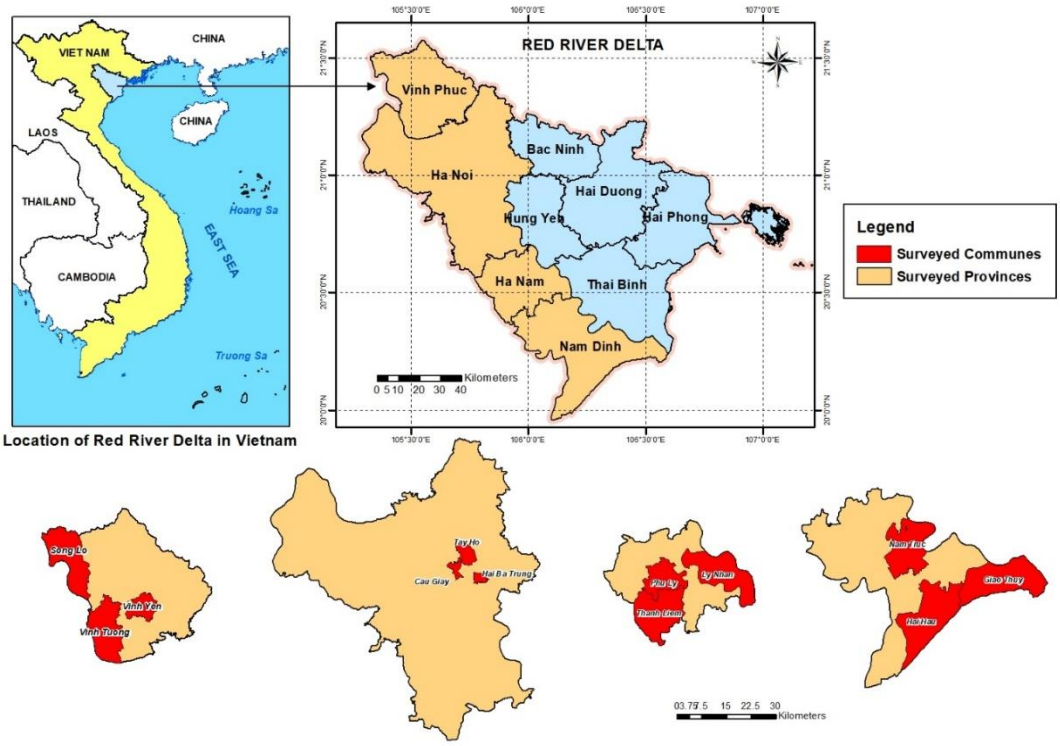

Figure 1 Study area in the Red River Delta (RDD).

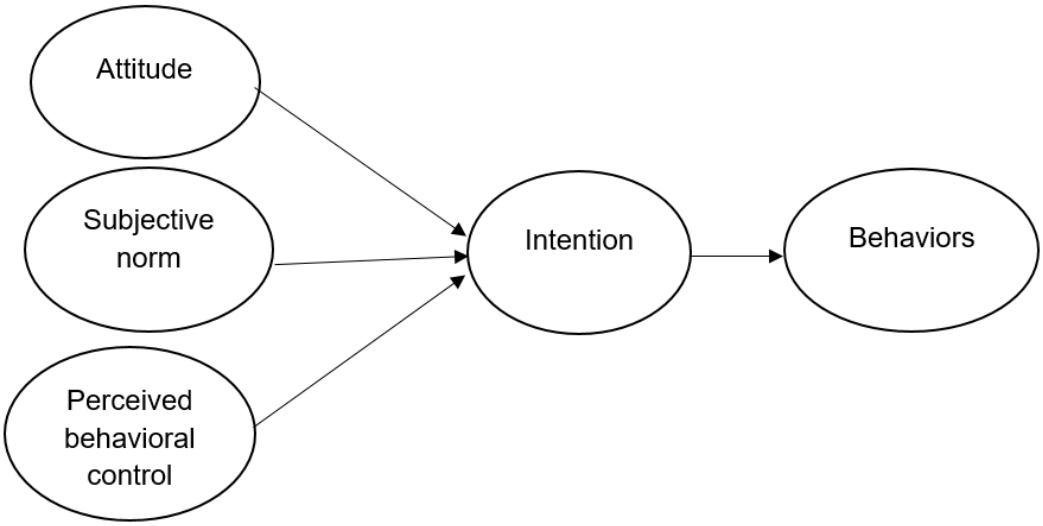

Figure 2 Theory of planned behavior model [22].

2) Sample and sampling strategy

A stratified multistage sampling strategy was employed to ensure geographic and demographic representativeness across the four selected provinces. The participants were recruited from multiple settings, including universities, industrial zones, and community cultural centers, to capture a diverse range of socio-demographic characteristics, such as age, gender, education, and occupation. Stratification was based on province of origin to maintain geographic balance within the sample.

A total of 1,400 questionnaires were distributed, with 350 allocated to each of the four provinces to ensure balanced representation. After data cleaning, 1,305 valid responses were retained. The minimum required sample size was calculated via Cochran's formula for categorical data, assuming a 95% confidence level, a 5% margin of error, and maximum variability ($p = 0.5$), yielding a required sample size of 384 [24]. Therefore, the final sample exceeded this threshold, allowing for robust statistical analysis

3) Design of the questionnaire

A structured questionnaire was designed to assess community perceptions, attitudes, and behavioral intentions concerning plastic and microplastic pollution. The instrument comprises three main sections. The first section introduces the study's objectives and includes a concise explanation of microplastics. The second section collected sociodemographic data, such as age, sex, education, and occupation. The third section was based on the TPB and included items measuring attitudes, subjective norms, perceived behavioral control, and behavioral intentions, rated on a 5-point Likert scale (from "strongly disagree" [1] to "strongly agree" [5]). Participation was voluntary, and all respondents were informed that their responses would remain anonymous and confidential.

4) Data collection

The survey was conducted between June 2023 and December 2024, with in-person data collection carried out by trained enumerators. Each enumerator was assigned to one of four provinces—Vinh Phuc, Hanoi, Ha Nam, and Nam Dinh—with an equal distribution of 350 questionnaires per province to ensure balanced regional representation.

A multistage sampling strategy was employed. The process began with university students and was subsequently expanded to include participants from industrial zones and community cultural centers, thereby capturing a broader demographic range, including working-class and nonstudent populations.

Prior to participation, all the respondents were informed about the study's objectives, provided verbal informed consent, and were assured of the anonymity and confidentiality of their responses. After data cleaning, a final sample of 1,305 valid responses was retained, reflecting a high response rate and good data quality.

5) Results

All the data were coded and analyzed via IBM SPSS Statistics version 20. Descriptive statistics were computed to summarize demographic characteristics and general trends in perceptions, attitudes, and behaviors.

Construct validity was assessed through exploratory factor analysis (EFA) via principal component analysis with varimax rotation. The Kaiser–Meyer–Olkin (KMO) measure and Bartlett's test of sphericity were employed to evaluate the sampling adequacy and factorability of the data.

Multiple linear regression (MLR) analysis was subsequently conducted to assess how attitudes, subjective norms, and perceived behavioral control (the three independent variables) are related to the dependent variable, behavioral intention. Statistical significance was set at $p < 0.05$.

In accordance with the TPB [22], behavioral intention was conceptualized as the primary dependent variable. It was operationalized through the item "I am willing to reduce my plastic use to help mitigate plastic pollution." This item captures the individual's expressed readiness to act and reflects the motivational factors influencing behavior rather than actual behavioral outcomes.

On the basis of the TPB framework, this study proposed the following hypotheses:

Hypothesis 1 (H1): Attitudes toward reducing plastic and microplastic pollution positively influence behavioral intentions.

Hypothesis 2 (H2): Subjective norms positively influence behavioral intention.

Hypothesis 3 (H3): Perceived behavioral control positively influences behavioral intention.

Multiple linear regression was employed to evaluate both the individual and combined effects of the TPB constructs on behavioral intention while controlling for potential overlaps among predictors [25–26].

Results

1) Demographics and background of participants

A total of 1,305 individuals participated in the survey, comprising 620 males (47.5%) and 685 females (52.5%). The participants ranged in age from 18-70 years, with the majority falling into the 18-35 years age group (45.7%), followed by those aged 36-45 years (29.2%), 46-55 years (13.6%), and 56-70 years (11.6%). With respect to educational background, 312 respondents (23.9%) had not completed high school, 610 (46.7%) had completed high school, 305 (23.4%) held a bachelor's degree, and 78 (6.0%) held a master's degree. In terms of geographic distribution, 288 participants (22.1%) were from Vinh Phuc, 314 (24.1%) were from Hanoi, 325 (24.9%) were from Ha Nam, and 387 (29.0%) were from Nam Dinh.

2) Descriptive statistics

Table 1 presents the descriptive statistics for the core constructs of the TPB: attitudes, subjective norms, PBC, and behavioral intentions. All the items were measured on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree).

As shown in Table 1, the mean score for behavioral intention (M = 3.92, SD = 0.80) was the highest among all the constructs, indicating a strong willingness among the participants to reduce plastic use. This reflects growing environmental awareness in the Vietnamese context.

The attitudes toward plastic reduction (M = 3.56, SD = 0.65) and subjective norms (M = 3.57, SD = 0.74) suggest moderately favorable personal beliefs and perceived social pressure to act in a proactive manner. The relatively high standard deviation for subjective norms may reflect variation between urban and rural participants regarding social expectations.

PBC (M = 3.65, SD = 0.79) indicates that respondents generally felt capable of reducing plastic use. However, the higher variability suggests that actual control may be affected by structural barriers such as limited access to alternatives, financial constraints, or insufficient local infrastructure.

These findings are consistent with a recent TPB-based study on sustainable agriculture in the Red River Delta, which revealed that both attitudes and perceived behavioral control significantly influence behavioral intentions among farmers [21]. However, they differ from earlier research on urban consumers in Hanoi, where attitude was not identified as a significant predictor of the intention to reduce plastic waste [20]. This contrast may reflect regional or contextual differences in environmental awareness, as well as variations in demographic and cultural characteristics across study populations. The stronger effect of attitude observed in the present study, which was conducted in an area experiencing rapid economic development, high plastic consumption, and diverse settlement patterns, suggests that pro-environmental beliefs have become increasingly salient in recent years, particularly as plastic pollution continues to attract heightened public and policy attention.

Overall, while attitudes and social norms play important roles, this study underscores the decisive influence of perceived behavioral control and behavioral intention on pro-environmental behavior. To translate high intent into action, policymakers should address practical barriers by improving access to plastic-free alternatives, supporting grassroots environmental initiatives, and enhancing infrastructure to enable sustainable choices.

Table 1 Descriptive statistics of the TPB constructs

Variables	n	Minimum	Maximum	Mean	Std. Deviation
Attitude	1,305	2.17	4.83	3.56	0.65
Subjective norm	1,305	1.00	5.00	3.57	0.74
Perceived behavioral control	1,305	1.50	5.00	3.65	0.79
Behavioral intention	1,305	1.00	5.00	3.92	0.80
Valid N (listwise)	1,305				

3) Correlation analysis

Table 2 presents the Pearson correlation coefficients among the core constructs of the TPB, namely, attitudes, subjective norms, PBC and behavioral intentions, which are measured as the willingness to reduce plastic use.

Attitude has a strong and statistically significant positive correlation with behavioral intention ($r = 0.582$, $p < 0.001$), suggesting that individuals with favorable views toward reducing plastic use are more likely to intend to act accordingly. This finding supports the TPB framework, which posits that attitude is a primary determinant of behavioral intention.

PBC shows a moderate positive correlation with behavioral intention ($r = 0.269$, $p < 0.001$), indicating that those who feel capable of reducing plastic use are more inclined to act. Additionally, PBC is positively correlated with attitude ($r = 0.263$, $p < 0.001$) and weakly correlated with subjective norms ($r = 0.100$, $p < 0.001$), suggesting modest interconnections among the TPB constructs.

In contrast to TPB expectations, subjective norms demonstrate a weak but statistically significant negative correlation with behavioral intention ($r = –0.058$, $p = 0.037$). This suggests that perceived social pressure exerts minimal influence on individual intention. In fact, it may even discourage plastic reduction behavior. Possible explanations include conflicting social norms, limited public engagement, or weak trust in environmental messaging, suggesting the need for further qualitative exploration.

In Vietnam, the widespread availability and habitual use of plastic bags, particularly in traditional markets and households combined with limited public communication and weak social reinforcement, may contribute to the persistence of unsustainable practices. Although regulatory tools such as environmental taxes have been introduced, inadequate enforcement and a lack of accessible, affordable alternatives continue to hinder meaningful behavioral change [14].

The correlation between attitude and PBC ($r = 0.26$, $p < 0.001$) suggests that individuals who hold favorable views toward plastic reduction also tend to feel more capable of acting. In contrast, subjective norms show virtually no correlation with attitude ($r = 0.01$) and only a weak positive association with perceived behavioral control ($r = 0.10$), indicating that social expectations are largely disconnected from personal motivation and the perceived ability to change behavior.

These patterns were further confirmed via regression analysis. Attitude emerged as the strongest predictor of behavioral intention ($\beta = 0.55$, $p < 0.001$), followed by perceived behavioral control ($\beta = 0.13$, $p < 0.001$), whereas subjective norms had a small but statistically significant negative effect ($\beta = –0.08$, $p < 0.001$). These findings support Hypotheses H1 and H3 but not H2, highlighting that policy interventions should prioritize strengthening individual attitudes and perceived efficacy rather than relying solely on normative pressure.

4) Exploratory factor analysis (EFA)

To assess the construct validity of the measurement instrument based on the TPB, an exploratory factor analysis (EFA) was conducted via principal component analysis with varimax rotation.

The KMO measure of sampling adequacy was 0.83, indicating that the data were suitable for factor analysis [25–26]. Bartlett's test of sphericity was statistically significant, $x^2 (66) = 4265.47$, $p < 0.001$, confirming that correlations among items were sufficient for factor extraction.

On the basis of the criterion of eigenvalues greater than 1 and visual inspection of the scree plot, four components were extracted. These components aligned with the four core TPB constructs: attitudes, subjective norms, PBC, and behavioral intentions. After varimax rotation, the four components accounted for 71.29% of the total variance, with individual contributions of 30.37%, 15.94%, 13.87%, and 11.12%, respectively (Table 3).

5) Regression analysis and hypothesis testing

To examine the predictive power of the TPB constructs, a multiple linear regression analysis was performed with behavioral intention, measured as the willingness to reduce plastic use, as the dependent variable and attitude, subjective norms, and PBC as the independent variables.

As shown in Table 4, the regression model explains approximately 36% of the variance in behavioral intention ($R^2 = 0.36$), with a slightly lower adjusted R^2 of 0.36, indicating a moderate level of explanatory power. This indicates moderate predictive power and suggests that attitudes, subjective norms, and PBC collectively explain a meaningful proportion of the variance.

Table 2 Correlation matrix among the TPB constructs and behavioral intentions (n = 1,305)

Variables	Attitude	Subjective norm	Perceived behavioral control	Behavioral intention
Attitude	1			
Subjective norm	0.01	1		
Perceived behavioral control	0.26**	0.10**	1	
Behavioral intention	0.58**	–-0.06*	0.27**	1

Note: $p < 0.05$ (*), $p < 0.01$ (**). Correlations are Pearson's r coefficients.

Table 3 Total variance explained by four extracted components

Component	Initial eigenvalues	% of variance	Cumulative %	Rotation sums of squared loadings	% of Variance	Cumulative %
1	3.69	33.50	33.50	3.34	30.37	30.37
2	1.56	14.21	47.72	1.75	15.94	46.31
3	1.48	13.50	61.21	1.53	13.87	60.17
4	1.11	10.08	71.29	1.22	11.12	71.29

Note: Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Table 4 Model summary of the regression analysis predicting behavioral intention

Model	R	R^2	Adjusted R^2	Std. error of the estimate
1	0.60	0.36	0.36	0.64

Note: Predictors: (Constant), Perceived behavioral control, Subjective norm, Attitude.

The ANOVA results (Table 5) confirm that the overall regression model is statistically significant, $F(3, 1301) = 243.28$, $p < 0.001$, indicating that the three predictors jointly account for a significant proportion of the variance in behavioral intention.

This finding indicates that perceived social pressure may have little to no influence or even a slightly discouraging effect on individuals' intention to reduce plastic use.

Interpretation and hypothesis testing

H1: Attitude → Intention

Attitude was the strongest predictor of behavioral intention ($\beta = 0.55$, $p < 0.001$). Individuals with a positive attitude toward reducing plastic use were significantly more likely to express the intention to engage in this behavior. This finding is consistent with the TPB and prior studies emphasizing the central role of attitudes in shaping pro-environmental behaviors [27–29].

H2: Subjective norm → Intention

Subjective norms exhibited a small but statistically significant negative effect ($\beta = -0.08$, $p < 0.001$), suggesting that, in some contexts, social pressure may discourage pro-environmental intentions. In Vietnam, where plastic bag use remains socially accepted and commonplace, the absence of strong social expectations to reduce plastic may contribute to this result. This finding aligns with previous research indicating that when environmentally responsible behaviors are not socially reinforced, subjective norms may have limited or even adverse effects on behavioral intentions [30–31].

H3: PBC → Intention

Perceived behavioral control was also a significant predictor of behavioral intention ($\beta = 0.13$, $p < 0.001$), indicating that individuals who feel more capable of reducing plastic use are more likely to express an intention to do so, although the effect was weaker than that of attitude. This finding supports previous research emphasizing the role of self-efficacy and enabling conditions in motivating sustainable behavior [27, 31].

Conclusion of regression findings

The regression model provides strong support for H1 (Attitude → Intention) and H3 (PBC → Intention). However, H2 (Subjective Norm → Intention) is not supported.

These results emphasize that attitude is the most influential determinant of behavioral intention, whereas perceived behavioral control plays a supporting role by enabling individuals to act. Subjective norms, by contrast, appear weak or even counterproductive in this specific cultural context.

From a policy perspective, interventions should prioritize promoting positive attitudes through educational campaigns and public awareness initiatives. An improved understanding of the environmental and health impacts of plastic pollution can foster more favorable attitudes, which, as demonstrated in this study, are the strongest predictor of behavioral intentions [28, 31]. Additionally, improving access to sustainable alternatives can strengthen PBC, and building stronger social norms through peer influence and community-based engagement may help realign public behavior with environmental goals.

Table 5 ANOVA summary for the regression model predicting behavioral intention

Source	Sum of squares	df	Mean square	F	p
Regression	299.74	3	99.91	243.28	< 0.001
Residual	534.29	1301	0.41		
Total	834.03	1304			

Note: Dependent Variable: I am willing to reduce my plastic use to help mitigate plastic pollution.
Predictors: (Constant), Perceived behavioral control, Subjective norm, Attitude

Table 6 Regression coefficients for predicting behavioral intention

Predictor	B	SE	β	t	p
Constant	1.35	0.14	—	9.73	< 0.001
Attitude	0.67	0.03	0.55	23.84	< 0.001
Subjective norm	-0.09	0.02	-0.08	-3.52	< 0.001
Perceived behavioral control	0.14	0.02	0.13	5.76	< 0.001

Note: Dependent variable: I am willing to reduce my plastic use to help mitigate plastic pollution.

These findings also contribute novel insights to the literature. While the centrality of attitudes is consistent with TPB theory, the negative relationship observed between subjective norms and intentions diverges from conventional TPB expectations, highlighting the contextual nature of social influence in behavioral models. In the Vietnamese cultural context—where communal behaviors may be shaped by ambiguous or even conflicting social norms—individuals may be more influenced by personal conviction than by perceived social expectations. This discrepancy underscores the importance of integrating localized sociocultural factors when applying TPB-based models of environmental behavior.

Limitations and directions for future research

Despite its contributions, this study has several limitations. First, it relies on self-reported data, which may be subject to social desirability bias, and participants might overstate their intentions to appear more environmentally responsible. Second, the cross-sectional nature of the data limits causal inference; future longitudinal studies would be valuable in tracking changes in behavior and intention over time. Third, the study was conducted in only four provinces of the RRD, which may limit the generalizability of the findings to other regions in Vietnam.

Future research should explore how cultural values, environmental knowledge, and trust in public institutions interact with TPB constructs to shape plastic-reduction behavior. Qualitative studies could also provide deeper insight into why subjective norms exert a negative influence in this context. Moreover, examining the role of media campaigns, school-based education, and community engagement could help identify more effective strategies for shifting public attitudes and strengthening pro-environmental norms.

Conclusions

This study used the TPB to explore community perceptions, attitudes, and behavioral intentions regarding plastic and microplastic pollution in the RRD, Vietnam. Using multiple linear regression analysis, the TPB model was found to explain approximately 36% of the variance in behavioral intention on the basis of the adjusted R^2 value, demonstrating moderate predictive capacity.

Among the three TPB constructs, attitude emerged as the strongest predictor, indicating that individuals with favorable views toward plastic reduction are significantly more likely to intend to reduce their plastic use. PBC also had a significant positive influence, suggesting that individuals who are capable of engaging in environmentally friendly behavior are more inclined to act. In contrast, subjective norms displayed a weak and negative association with behavioral intention, implying that prevailing social pressures currently do not support, and may even hinder, proenvironmental actions.

These findings underscore the importance of prioritizing individual attitudes and perceived control in environmental behavior change initiatives. Specifically, policies aimed at reducing plastic use in Vietnam should:

First, environmental education should be integrated into both formal and informal learning systems to foster positive environmental attitudes.

Second, infrastructure and access to sustainable alternatives (e.g., reusable products, recycling facilities) should be improved to increase individuals' capacity to act.

Third, they should implement sustained media campaigns, promote peer-led advocacy, and deliver consistent policy signals that endorse sustainable behavior.

By aligning behavioral insights with policy design, Vietnam can better tailor its plastic reduction strategies to local social and psychological drivers. Future research should explore how cultural factors shape the role of subjective norms and assess how behavioral intentions translate into long-term action through longitudinal and experimental studies.

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